Business biodiversity efforts in key industry sectors:

A background note

Draft background discussion paper for ***Session 2: The Business Case for Biodiversity: A Sectoral Overview*** of the *Biodiversity and Business* conference, a joint event combining CBD's *Third Business and the 2010 Biodiversity Challenge Conference* and DTIE's *2009 Business and Industry Global Dialogue*

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Note: this document is prepared as a draft background discussion paper for UNEP DTIE for *Session 2: The Business Case for Biodiversity: A Sectoral Overview* of the *Biodiversity and Business* conference to be held in Jakarta, Indonesia from 30 November to 2 December 2009. Comments are welcome and can be provided to UNEP DTIE. The document is not an official publication and the views expressed do not represent the decisions or the stated policy of the United Nations Environment Programme.

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1. Preface

This draft background discussion paper has been developed for the *Biodiversity and Business* conference to be held from 30 November to 2 December 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* — will focus on effectively engaging the private sector in addressing biodiversity by stressing the link between biodiversity and core business and by highlighting best case practices. This paper will specifically serve as a background document for discussions in the session "The Business Case for Biodiversity: A Sectoral Update."

The paper was developed to provide a global snapshot of major biodiversity impacts, efforts and future challenges in a number of key industries that depend and/or impact on biodiversity and ecosystem services — namely mining, energy, agrifoods & fisheries, construction & forestry, tourism, pharmaceuticals, cosmetics, fashion, and finance. The rationale for developing the paper was to highlight biodiversity efforts underway across industry in order to complement the panel and parallel sessions that focus on a selection of sectors. The paper is proposed as a draft background note for discussion at the conference and feedback and input is welcome.

The paper was developed through desk research and interviews with experts in each industry (see section 2). The paper does not put forth 'the business case' for biodiversity nor does it provide a comprehensive list or detailed description of all biodiversity impacts, efforts and challenges in all industry sectors, but rather gives a general overview and highlights some of the most important biodiversity initiatives in terms of their reach and ambition. It should be noted that philanthropic and local onsite conservation initiatives are not included, only those that are directly related to core operational activities of each industry. In addition, no assessment is given of the efficacy of these initiatives. Given that the *Biodiversity and Business* conference will be held in Indonesia, the paper makes an effort to include Indonesian and Asian examples.

2. Acknowledgements

This paper was prepared by Emma Duncan in collaboration with UNEP DTIE and with input from the following people and groups:

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3. Introduction

3.1. Background

Biodiversity 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 — largely due to human activities over the past 50 years to meet rapidly growing demands for food, fresh water, timber, fibre and fuel, which have extensively changed ecosystems. As a result, around 60% of examined ecosystem services are now degraded or being used unsustainably[1]. Climate change, also due to human activity, 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 forecast to suffer the greatest losses. This loss forms a major barrier to sustainable development in these regions and around the world.

In response, the 193 governments that are Parties to the Convention on Biological Diversity (CBD) have committed to significantly reduce the current rate of biodiversity loss by 2010. This target was endorsed by the World Summit on Sustainable Development and forms the focus for most biodiversity-related activities around the world, including those by UNEP.

As both a user of ecosystem services and a contributor to ecosystem change, business has a central role to play in achieving this effort — and indeed a direct interest in doing so. Biodiversity and ecosystem services are the single-greatest resources used by business, often either for free or at a price that does not reflect their true value. Business impacts on biodiversity are varied and can range from large scale, including habitat and biodiversity loss, to localised 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.

Failure to halt biodiversity loss and implement sustainable management of natural resources will lead to loss or increased costs of ecosystem services, as well as other business risks such as increased regulatory regimes, reputational damage and reduced access to finance and insurance. 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 CBD explicitly refers to the role of business, as do many Conferences of the Parties' (COP) decisions adopted over the years and the Convention's Strategic Plan. The CBD and divisions within UNEP such as the Division of Technology, Industry and Economics (DTIE), 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.

This paper provides an overview of major initiatives to date in a number of key industries — mining, energy, agrifoods & fisheries, construction & forestry, tourism, pharmaceuticals, cosmetics, fashion, and finance — as well as future challenges to mainstreaming biodiversity into business policies and practices.

3.2. Overview of biodiversity initiatives

Most industry initiatives described here 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

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

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.

Most of this work has been undertaken in collaboration with conservation groups, government groups, and/or academic institutions. The drivers behind such initiatives include securing continued supplies of raw materials, branding and, increasingly, new legislation.

Tools for incorporating biodiversity considerations into business policies and operations are the most well developed for mining, agriculture, fisheries, energy, tourism, forestry and finance activities; the construction, pharmaceutical, cosmetics and fashion industries generally lack such tools.

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.

3.3. Overview of future challenges

Despite these efforts, challenges remain. There are few examples of biodiversity-friendly practices being promoted and adopted at a large-scale. Similarly, there has been limited progress in mainstreaming the CBD and other intergovernmental frameworks into business policies and practices. As such, meeting projected growth within the industries described here without driving further biodiversity loss remains a major challenge.

Different industries face different challenges in mainstreaming biodiversity into business policies and practices; however a few are generally common across all. These include

- 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
- Widening the scope of most initiatives and certification schemes to directly include biodiversity considerations and demonstrate biodiversity benefits
- Wider application of access and benefit sharing in the pharmaceutical and cosmetic industries.

Issues behind these challenges include needs for:

- Strong biodiversity commitments by individual companies, with a general focus on improving environmental performance in areas that are indirectly related to biodiversity and/or not the industry's most significant impact (such as reducing pollution, greenhouse gas emissions and the use of energy, water and other natural resources in factories and office buildings)
- Increased knowledge, understanding and technical expertise on the impacts of various activities on biodiversity, how to minimize these impacts, and how to enhance biodiversity
- Increased mechanisms for ensuring that companies meet commitments made through, or principles and criteria set by, industry groups
- A focus on longer-term rather than short-term economic factors over alternative management systems, technologies and/or practices that deliver biodiversity benefits
- Stronger governance in countries, particularly those lacking strong legal and regulatory frameworks
- Increased volumes and availability of products certified under credible schemes as meeting an environmental standard
- Increased evidence for positive biodiversity benefits from certification schemes and some other approaches.

Sources

European Communities (2008) *The Economics of Ecosystems and Biodiversity: An Interim Report*
http://www.teebweb.org

F&C Asset Management (2004) *Is Biodiversity a Material Risk for Companies? An Assessment of the Exposure of FTSE Sectors to Biodiversity Risk*
http://www.businessandbiodiversity.org/pdf/FC%20Biodiversity%20Report%20FINAL.pdf

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

Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Synthesis* Island Press
http://www.millenniumassessment.org/documents/document.356.aspx.pdf

UNEP-WCMC (2002) *World Atlas of Biodiversity: Earth's Living Resources for the 21st Century*
http://www.unep-wcmc.org/information_services/publications/biodiversityatlas/presspack/press/release.htm

4. Mining

4.1. Introduction

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.

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, dirt 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%)[2]. Copper accounts for the majority of the value of metal commodities, followed by iron ore, nickel, gold, aluminium, zinc and platinum[3].

Mining has 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.

4.2. Dependence and impact on biodiversity

Except for supplies of freshwater for mineral processing, the mining industry is not dependent on biodiversity. However, it has a number of significant direct and indirect impacts on biodiversity. The industry operates in a wide range of environments — including rainforests, arctic areas, plains, coasts, and offshore areas — meaning these impacts affect a wide range of species and ecosystems around the world.

The main direct impact from extracting mineral deposits comes from surface mining, where overlying habitats and geological features are removed. 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.

The processing of recovered materials, which is often done onsite to avoid transportation of unwanted materials, 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 processing — including acids, cyanide, solvents, and sulphur dioxide — can cause air, soil, and/ or water pollution. Processing can also use large amounts of water, whose extraction can impact on local water systems.

Mining can expose metal sulfides to the atmosphere, which react with oxygen to form sulfuric acid and heavy metal oxides and can pollute local waterways. In addition, erosion of exposed land and tailings can cause sedimentation of creeks, rivers, and offshore areas.

Mining operations can additionally have significant 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.

[2] 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

[3] 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

Mining also contributes 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 processing of some materials, as well as though transportation.

It should be noted that mining can also provide benefits to biodiversity, for example by mitigating poverty-related pressures to biodiversity though the provision of employment.

4.3. Biodiversity initiatives

4.3.1. 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 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 organizations.

4.3.2. 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, including the World Gold Council, the International Platinum Group Metals Association and the International Lead Association. 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 more 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[4], a toolkit for planning mine closures that includes biodiversity considerations[5], 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 (WBCS) Cement Sustainability Initiative has published guidelines for environmental impact assessments for quarry developments[6] and case studies on quarry rehabilitation activities that contribute to restored ecosystems and enhanced biodiversity, while the International Aluminium Association 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.

There are also efforts to ensure that good practices are followed. ICMM's 18 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. The International Cyanide Management Code 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 is currently developing a certification scheme for diamond and gold jewellery that includes general environmental principles and will incorporate additional supplements including on mining.

[4] ICMM *Good Practice Guidance for Mining and Biodiversity*
[5] ICMM *Planning for Integrated Mine Closure: Toolkit*
[6] CSI *Environmental and Social Impact Assessment (ESIA) Guidelines*

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

4.3.3. 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 (see Introduction); 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.

4.4. Future challenges

The main challenge for the mining industry is getting buy-in to existing voluntary principles and good practices from companies across the industry. This is 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.

This challenge is also compounded by the expansion of mining activities into new mineral-rich 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 easily accessible areas. It is also often occurring in developing countries where governance 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

PricewaterhouseCoopers (2007) *Review of global trends in the mining industry 2007: Mine - Riding the Wave*
http://www.pwc.com/en_ZA/za/assets/pdf/pwc-mining-review-07.pdf

The Business and Biodiversity Resource Centre website *Mining and Quarrying*
http://www.businessandbiodiversity.org/mining.html (accessed 20 October 2008)

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)

5. Energy

5.1. Introduction

Energy is used each day by every person on Earth in one form or another, and its use lies at the core of modern industrialized society. Global demands for energy are growing rapidly, particularly in developing countries and countries with economies in transition seeking to supply more lighting, cooking, heat, mechanical power, transport, communication and other energy services that drive development.

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 this scenario, fossil fuels continue to dominate the energy mix, accounting for more than three-quarters of incremental demand. 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, an average annual rate of growth of 2.5% — much faster than the average rate in the rest of the world.

5.2. Dependence and impact on biodiversity

Like the mining industry, the energy industry is not dependent on biodiversity except for supplies of freshwater, in this case for electricity production. However, both the current and future rates of biodiversity loss are strongly linked to the increasing development and use of energy by society.

The most significant impact will come from climate change which, while an indirect impact, will dwarf the industry's direct impacts if fossil fuels are not replaced with low-carbon energy sources. 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[7].

Although overshadowed by the potential impact of dangerous climate change, the energy industry's direct impacts on biodiversity are also significant. Although remarkable technological advances have been made that reduce these impacts, environmental gains have often been eroded by the increased consumption of energy. Given that the industry, and particularly upstream activities, operates in a wide range of environments — including deserts, rainforests, arctic tundra, plains, coasts, and oceans — these impacts affect a wide range of species and ecosystems around the world.

One impact is habitat loss and disruption of natural systems through the building of upstream and downstream energy infrastructure such as mines, drilling platforms, power stations, large-scale solar arrays, dams, roads, pipelines, harbours, terminals, refining facilities, and power lines. Similarly, the rapid expansion of biofuels — including oil palm in Indonesia — as an agricultural crop threatens natural habitats and biodiversity in the same way as food crops (see section 6). Energy-related infrastructure can also increase access to previously undeveloped and remote areas, resulting in further damaging activities including small-scale mining, hunting, logging, and fishing.

Different fuel sources for electricity generation pose specific threats. The burning of fossil fuels can cause water, air and soil pollution, and nuclear waste remains a challenge to dispose of safely. Toxic heavy metals present in solar energy cells can contaminate soil. Wind turbines can kill wildlife, particularly migratory birds and bats, as well as disrupt marine mammals and fish in offshore sites through noise pollution and electrical impulses, respectively. In addition, the use of large amounts of water for cooling in almost all electricity production can disrupt hydrological processes.

Other activities also have various impacts. For example, seismic testing for offshore oil and gas reserves poses a risk to marine mammals such as whales. Oil spills from blowouts, pipeline leaks or shipping accidents pose a significant threat to many species and habitats, as does the transport of non-native species in the ballast water of oil tankers.

[7] 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

It should be noted that some operational sites may provide some benefit to biodiversity. For example, many 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.

5.3. Biodiversity initiatives

5.3.1. Overview

As in the mining industry, most biodiversity initiatives to date have focused on developing good practice policies, guidelines and tools to reduce the footprint of energy operations and activities. The majority of this work has been through collaborations between industry groups/individual companies and conservation organizations. 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.

5.3.2. Principles, guidelines and tools for reducing operational impacts

Several large international and regional industry associations have made broad policy statements on the need 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) has developed guidance and other resources for integrating biodiversity conservation into oil and gas development[8], while the ICMM's *Good Practice Guidance for Mining and Biodiversity* (see section 4) is relevant to integrating biodiversity conservation into mining operations for fuels such as coal and uranium. In terms of biofuels, the Roundtable on Sustainable Biofuels — as well as the Roundtables on Sustainable Palm Oil and Soy and the Better Sugar Initiative — is currently developing best practices for sustainable production of these crops. 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[9].

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[10], a guide to developing biodiversity action plans[11], and case studies on operating in sensitive environments[12].

This guidance is also sometimes influencing government policy. For example, the EU's Biofuel Directive requires the development of sustainable biofuels, with the definition for this being driven by outcomes from Roundtables for Sustainable Biofuels, Palm Oil and Soy.

Some individual energy companies have made ambitious operational commitments, standards or policies for biodiversity. Examples include Rio Tinto's commitment to net positive biodiversity for its mining operations; Shell's biodiversity standard, which recognizes World Heritage Sites as "no go" areas for its oil and gas exploration and development; 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. ICCM member companies have also committed to not explore or operate in World Heritage Sites.

[8] E.g., *A Framework for Integrating Biodiversity into the Site Selection Process* and *Biodiversity Indicators for Monitoring Biodiversity Impacts and Conservation Actions*

[9] E.g., a *Mitigation Toobox*, 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*

[10] IPIECA-OGP Biodiversity Working Group *An Ecosystem Approach to Oil and Gas Industry Biodiversity Conservation*

[11] IPIECA-OGP Biodiversity Working Group *A Guide to Developing Biodiversity Action Plans for the Oil and Gas Sector*

[12] IPIECA *The Oil and Gas Industry: Operating in Sensitive Environments*

5.3.3. 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 pursing 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.

5.3.4. Payments for Ecosystem Services

Another area of work is 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 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.

5.3.5. Biodiversity offsets

Some energy companies are involved in biodiversity offsets to compensate for residual biodiversity impacts that cannot be mitigated onsite. The BBOP principles on biodiversity offsets (see section 4) 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.

5.4. Future challenges

Meeting the projected increased demand for energy without driving further biodiversity loss poses a major challenge. Few energy sources are completely biodiversity neutral, so energy choices must made with an understanding of the trade-offs involved and the subsequent impacts on biodiversity.

The most fundamental challenge is to transition away from carbon-intensive fossil fuels and nuclear energy, moving towards sustainable energy sources based on local natural resources. However while the development and use of renewable energy sources is increasing, these still represent only a small percentage of total energy. In addition carbon capture and storage technologies — widely touted as a technology to allow coal-fired electricity generation to be viable in a carbon-constrained world — are controversial and remain largely unproven.

Another challenge is getting buy-in to existing voluntary principles and good practices from companies across the industry. One issue is that increased overseas operations of developing country energy companies with low environmental standards may challenge industry standards that so far have largely been set by groups of Western companies. A similar issue is getting buy-in to such standards from state-owned companies, which often control large reserves of natural resources.

This challenge is compounded by expansion of activities into new, often ecologically valuable, sites. For example, high oil prices and declining reserves in existing oil fields are driving oil and gas exploration further 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. Similarly, biodiversity issues need to be addressed in any expansion of hydro power — of which two-thirds of the world's economically viable potential remains unexploited, mostly in developing countries[13] — as well as intensive farming of biofuels.

Finally, 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.

[13] WBCSD (2008) *Powering a Sustainable Future* http://www.wbcsd.org/DocRoot/WKFOhBZNTQKqRQkU1uAi/powering_sustainable_future.pdf

Sources

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

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

IFC *A Guide to Biodiversity for the Private Sector: Power*
http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_Power/$FILE/Power.pdf

The Business and Biodiversity Resource Centre website *Oil and Gas*
http://www.businessandbiodiversity.org/oilandgas.html (accessed 30 September 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

Business Industry Sector Perspectives on the Findings of the Millennium Ecosystem Assessment
http://www.millenniumassessment.org/documents/document.706.aspx.pdf

6. Agrifood and fisheries

6.1. Introduction

The agrifood and fishing industries are crucial to the world economy and food supplies in modern societies. Agrifood refers to the mass production of agricultural commodities (i.e., farming of food crops, poultry and livestock) and processing of these into food and drink. The fishing industry similarly involves the capture of wild fish and farming of fish species, and the processing of these into food items. This section specifically focuses on the farming (agriculture), capture fisheries and aquaculture sectors, which have the largest impacts on biodiversity. Agriculture also involves the farming of non-food crops such as fibres (e.g., cotton) and biofuels; as far as possible this section only refers to food crops but in some cases, the figures provided refer to agriculture as a whole.

Agriculture and fisheries support 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 for both farming and fishing. There has also been a shift from extensive farming of diverse species and varieties to intensive monocultures of just a few crops. Most recently, aquaculture has emerged as a significant — and growing — supplier of fish.

Agriculture is a major land use, with agricultural land currently covering 38% of the world's land area[14]. Of this, 78% is used for livestock production[15].

Around 90% of capture fisheries target marine species, with the vast majority of principle fishing areas being located in the Pacific Ocean[16]. 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 majority of inland capture fisheries — 67% — are located in Asia, primarily in China[17].

Aquaculture currently accounts for 47% of the world's fish food supply[18]. Most aquaculture has been developed in freshwater environments, mainly in Asia.

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 coffee. Demand for food will continue to increase with increasing populations and continued rising wealth.

6.2. Dependence & impact on biodiversity

6.2.1. Agriculture

Agricultural ecosystems are important habitats for many wild plant and animal species. In addition, agricultural productivity depends on numerous species, including soil micro-organisms, pollinators, and pest predators, as well as crop and livestock genetic diversity and services provided by other ecosystems, including freshwater, climate regulation, and nutrient cycling. Various pesticides are also based on compounds present in different species. However despite this dependence on biodiversity, agriculture is the largest driver of biodiversity loss around the world.

The main impact from agriculture comes from extensive clearing of natural habitats for farming land, and especially for large scale intensive monoculture which is the largest driver of biodiversity loss. The biodiversity

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

[15] Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. and de Haan, C. (2006) *Livestock's Long Shadow: Environmental Issues and Options* FAO ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e02.pdf

[16] 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

[17] ibid.

[18] ibid.

impacts of agriculture can also be exacerbated by poor management or lack of means to maintain productivity, that lead to further land clearings to sustain yields. 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, however: some is also due to expansion of biofuels.

Agriculture is also a major contributor to climate change. Agricultural practices are responsible for around 14% of global greenhouse gas emissions[19], with sources including fertilizers, livestock, wetland rice cultivation, manure management, burning of savannah and agricultural residues, and plowing. Conversion of forests to agriculture, primarily in developing countries and particularly in tropical Asia, accounts for a roughly similar percentage of greenhouse gas emissions[20,21].

Excessive water use is another problem. Irrigation for agriculture is responsible for 70% of freshwater withdrawal[22], of which 15–35% is estimated to be unsustainable[23]. This is leaving rivers, lakes and underground water sources dry in many irrigated areas. Irrigation can also lead to increased soil salinity.

Other impacts come from the introduction of non-native species, 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[24].

In addition, 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[25].

The use of genetically modified (GM) crops may 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 genetic erosion of crops, and transfer the modified gene to other species, as well as the associated use of herbicides with some GM crops. GM crops may also facilitate further conversion of natural habitats to agriculture.

6.2.2. Capture fisheries and aquaculture

The productivity of wild fisheries is dependent on the health of marine and freshwater ecosystems, and both fishing and aquaculture are often carried out in ecologically important areas.

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[26], and 28% of the world's commerical marine fisheries are overexploited, depleted, or recovering from depletion[27]. If business continues as usual, stocks of all marine species currently fished for food are predicted to collapse by 2048[28]. In addition to threatening the target fish, declining fish

[19] 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
http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

[20] WBCSD/IUCN (2008) *Agricultural Ecosystems – Facts and Trends*
http://cmsdata.iucn.org/downloads/agriculturalecosystems_2.pdf

[21] Van der Werf, G. R., Morton, D. C., DeFries, R. S., Olivier, J. G. J., Kasibhatla, P. S., Jackson, R. B., Collatz, G. J. and Randerson, J. T. (2009) *CO_2 emissions from forest loss.* Nature Geoscience 2, 737–738

[22] WWF (2003) *Agricultural Water Use and River Basin Conservation*
http://assets.panda.org/downloads/agwaterusefinalreport.pdf

[23] Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Synthesis* Island Press
http://www.millenniumassessment.org/documents/document.356.aspx.pdf

[24] WBCSD/IUCN (2008) *Agricultural Ecosystems – Facts and Trends*
http://cmsdata.iucn.org/downloads/agriculturalecosystems_2.pdf

[25] 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

[26] Myers, R.A., and Worm, B. (2003) *Rapid worldwide depletion of predatory fish communities*. Nature, 423: 280-283

[27] 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

[28] Worm, B. et al (2006) *Impacts of biodiversity loss on ocean ecosystem services*. Science, 314: 787

populations can also result in less food for other marine species. In addition, declines in certain fish species, particularly top predators, can cause profound — and perhaps permanent — changes to marine ecosystems.

Furthermore, unselective fishing methods have caused major population declines in several non-target marine species caught as bycatch — notably other fish, sharks, seabirds, marine turtles, cetaceans, corals and invertebrates — while 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.

Large scale industrial fishing can also have indirect impacts on biodiversity by affecting the livelihoods of coastal communities, which may need to engage in increased bush meat hunting and employ more destructive fishing techniques to sustain income levels and meet protein needs.

Aquaculture impacts on biodiversity through habitat loss for fish farms, particularly of mangrove forests, diversion of freshwater into ponds, pollution and the introduction invasive alien species, parasites and disease. Aquaculture can also contribute to overfishing in marine capture fisheries to supply fishmeal and fish oil as food for farmed species, particularly for high-value species such as shrimp and salmon. However, high incomes in the high value trades such as aquarium fish and seafood provide higher opportunities for habitat conservation.

6.3. Biodiversity initiatives

6.3.1. Overview

Current biodiversity initiatives by the agriculture and aquaculture sectors focus on developing and promoting sustainable production methods that include biodiversity considerations. Examples of such schemes would include agro-forestry and mixed crop systems that can promote biodiversity and increase resistance of crops to disease. A number of specific criteria have been, or are in the process of being, developed for specific food crops and 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.

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 IUU fishing and bycatch. As for agriculture and aquaculture, this work involves collaborations with NGOs, government groups, academic institutions, and/or companies in the wider food sector.

6.3.2. Principles, guidelines and tools for sustainable agriculture

Various groups have formulated general definitions of sustainable agriculture, including the Sustainable Agriculture Initiative, the Sustainable Food Laboratory, CropLife International, the World Cocoa Foundation and the Sustainable Tree Crops Programme. These groups also work to provide knowledge and training, provide a stakeholder forum, encourage particular practices, and/or undertake pilot projects.

Several other groups have developed, or are currently developing, specific principles and criteria for individual crops: the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Sustainable Soy Association (RSSA), the Better Sugar Initiative, the Common Code for the Coffee Community (4C), and Nepresso's AAA Sustainable Quality Program for coffee. The Sustainable Agriculture Network (SAN), an NGO network, has also developed standards for sustainable coffee, tea, cocoa and various fruits, and is currently developing standards for sustainable cattle ranching. In addition, the UNCTAD BioTrade Initiative 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.

In several cases, these standards are, or will be, linked with certification schemes for producers, such as the RSPO principles and criteria, the SAN standards (recognized through the Rainforest Alliance Certified ecolabel), and Nespresso's AAA Sustainable Quality Program. Other crop-specific certification schemes developed by non-industry groups include UTZ CERTIFIED 'Good inside' for coffee, cocoa, palm oil, and tea and the Smithsonian "bird-friendly" label for coffee.

Many certification schemes have also been developed for organic farming. These mainly focus on avoiding the use of industrial fertilizers, pesticides, and GM crops; however some schemes — such as that from the International Federation of Organic Agriculture Movements (IFOAM) — additionally include general principles and standards for biodiversity conservation on farms[29]. IFOAM is also developing a more detailed biodiversity and landscape standard[30].

[29] *The IFOAM Norms for Organic Production and Processing*

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

6.3.3. 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 illegal, unregulated and unreported (IUU) fishing, eliminating excess marine fishing capacity, and eliminating shark and seabird bycatch.

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" with differing criteria[31]. The FAO has also produced guidelines for the ecolabelling of fish and fishery products from marine capture fisheries.

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.

6.3.4. 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.

6.4. Future challenges

The main biodiversity challenge for the agrifood and fisheries industries is to meet rising demand for food — and particularly for animal protein and high-value crops, which generally require more land and/or water to produce — while simultaneously conserving biodiversity and managing the natural resources on which the industries depend. A major issue for agriculture is the need to produce 50% more food than is currently produced to feed the global population by 2050 and the associated conversion of a predicted 120 million hectares of land in developing countries to achieve this, including land with high biodiversity value. Other issues include further loss of genetic diversity of agricultural crops and livestock due to further commercial intensification, and the fact that 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[32]. Particular issues for capture fisheries include governance of fishing effort on the high seas, which lies beyond national jurisdictions, as well as difficulties in assessing the status of inland fisheries.

At present, there are few examples of biodiversity-friendly agriculture practices being promoted and adopted at a large-scale. Similarly, there has been little progress in mainstreaming the precautionary and ecosystem approaches to marine fisheries, eliminating bycatch, 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 are often secondary considerations for producers. Another is that the cost and process of certification can be burdensome, or even prohibitive, for small-scale producers, especially those in developing countries.

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

[32] 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

A further problem is that only a few of the current certification schemes focus on biodiversity, and there are problems even with those that do. For example, agriculture certification schemes that include biodiversity considerations focus on the individual farm level rather than biodiversity impacts at the landscape level; the MSC has similarly been accused of failing to take ecosystem effects into account; and various aquaculture certification schemes have been accused either of being ineffective at making aquaculture more sustainable or of promoting industrial aquaculture that will harm local environments. Furthermore, there is little evidence for positive biodiversity benefits from certified sustainable agriculture. In addition, while demand for certified food products is increasing, 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[33].

Sources

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

European Communities (2008) *The Economics of Ecosystems and Biodiversity: An Interim Report* http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb_report.pdf

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

GRID- Arendal *Trends in capture fisheries and aquaculture* http://maps.grida.no/go/graphic/trends-in-capture-fisheries-and-aquaculture (accessed 11 October 2009)

IFC *A Guide to Biodiversity for the Private Sector: Agribusiness* http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_Agribusiness/$FILE/Agribusiness.pdf

IUCN (2007) *Current Knowledge of the Impacts of Genetically Modified Organisms on Biodiversity and Human Health* http://cmsdata.iucn.org/downloads/ip_gmo_09_2007_1_.pdf

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. and de Haan, C. (2006) *Livestock's Long Shadow: Environmental Issues and Options* FAO ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e02.pdf

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)

[33] 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

7. Construction and forestry

7.1. Introduction

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[34]. It is also central to social and economic development, providing housing and infrastructure essential for modern lifestyles.

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[35,36]. 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, expect for timber and wood products which come from the forestry industry.

Public and private sector forest owners manage forests for timber and non-timber products, as well as for watershed management, conservation, recreation purposes, carbon sequestration, and the provision of other important ecosystem services. Forest owners include the commercial forestry industry, whose primary focus is on maximizing timber yield for the production of wood products. Around half of global wood production comes from natural forests with the remainder coming from planted forests, including semi-natural forests and plantations[37].

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.,[38],[39]

The construction industry's growth rate — and hence that of the timber sector — 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.

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

[35] Economy watch website
http://www.economywatch.com/world-industries/construction/world.html (accessed 6 November 2009)

[36] The Business and Biodiversity Resource Centre website *Construction*
http://www.businessandbiodiversity.org/construction.html (accessed 6 November 2009)

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

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

[39] Toyne, P., O'Brien, C. and Nelson, R. (2002) *G8 and China's timber footprint: making the case for green procurement by government* WWF
http://www.wwfchina.org/english/downloads/Forest/timberreport.doc

7.2. Dependence and impact on biodiversity

7.2.1. Construction industry

Different construction activities and building materials depend on biodiversity and ecosystem services in different ways, for example for timber supplies and freshwater for use in manufacturing processes to name just two. In addition, access to new sites may be affected by a company's track record on protecting and restoring biodiversity.

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 CO_2. Overall, cement production alone accounts for 5% of anthropogenic CO_2 emissions[40]. Furthermore, buildings consume approximately 40% of all energy globally, and contribute to around 30% of CO_2 emissions from OECD countries[41]. In addition, 60% of total halocarbon emissions come from refrigerators, air conditioners and insulation in buildings[42].

Construction also has 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 extraction and production of building materials such as cement, metals and timber additionally impacts on biodiversity. Impacts related to mining are described in section X, while those related to timber sourcing are described below. 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[43], including in Indonesia where this is a major issue[44].

Construction and demolition activities also generate a large amount of waste — 40–50% of waste by weight in Europe, for example[45]. 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.

Finally, apart from contributing to climate change, the use of buildings and facilities can directly and indirectly affect biodiversity in other ways. For example, large amounts of water are often consumed in buildings, whose extraction can impact on local water systems.

7.2.2. Forestry industry

Forest ecosystems are important habitats for many wild plant and animal species, and the forestry industry depends on numerous ecosystem services, including freshwater supply, climate regulation, and nutrient cycling. Sustainable forest management has a large role to play in biodiversity conservation and preventing dangerous climate change. On the latter point, not only do forests and wood products act as carbon sinks, but the main industrial output of the forestry industry — timber — is renewable if sourced sustainably. In addition, compared to other common building materials like cement, steel, and aluminum, wood-based building materials require

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

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

[42] Levine, M., D. Ürge-Vorsatz, K. Blok, L. Geng, D. Harvey, S. Lang, G. Levermore, A. Mongameli Mehlwana, S. Mirasgedis, A. Novikova, J. Rilling, H. Yoshino (2007) *Residential and commercial buildings.* In *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter6.pdf

[43] USAID (2009) *Environmental Guidelines for Small-Scale Activities in Africa: Environmentally Sound Design for Planning and Implementing Development Activities*, Part III Chapter 4.1 *Brick and Tile Production: Cleaner Production Fact Sheet and Resource Guide* http://www.encapafrica.org/EGSSAA/bricktile.pdf

[44] Niclas Svenningsen, pers. comm

[45] European Construction Industry Federation

less energy for production, have higher thermal efficiency, and can be reused, recycled, or used as biomass for energy.

While forest loss is primarily driven by expanding agriculture, unsustainable commercial logging activities are nevertheless 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[46].

Such activities are often driven by illegal logging, which particularly occurs 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 versus legal roundwood[47,48]. Illegal logging includes various activities; those of particular concern to biodiversity 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 of Endangered Species (CITES). Such activities have been estimated to represent 5–10% of global industrial roundwood production[49].

Both legal and illegal logging activities can also indirectly affect biodiversity through the construction of logging roads, which can facilitate small-scale mining, hunting, illegal logging, fishing, and settlement within previously untouched forests.

Poorly planned and managed tree plantations for timber and wood products can negatively affect biodiversity in the same way as agriculture (see section 6).

The forestry industry, especially the pulp and paper sector, is relatively energy intensive. However, wood-based biomass is often used as a fuel which, if sourced from a sustainably managed forest, is carbon neutral/near carbon neutral. 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[50].

7.3. Biodiversity initiatives

7.3.1. 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.

A large number of guidelines and tools are available for sustainable forestry management, and the concept of sustainable forest management and sustainably sourced wood products is increasingly being included in government, industry group, and company procurement policies. “Demand side” legislation has also recently emerged that prevents wood imports and use from illegal sources.

[46] 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

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

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

[49] 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

[50] 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

7.3.2. Principles, guidelines and tools for sustainable construction

The International Council for Research and Innovation in Building and Construction's Agenda 21 on Sustainable Construction gives a general framework and guidance for sustainable construction, as does 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).

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 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 7.3.4.

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 (WBCS) Cement Sustainability Initiative on sustainable cement production, the Procura^{+} *Guidelines for Sustainable Construction* (which also include sustainable building materials; see section 7.3.4 below), 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.

Several international and national assessment, 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. Work is currently underway to develop a pan-European building environmental assessment method.

Some individual companies associated with the construction industry are also working towards more sustainable construction. Holcim, for example, has created a foundation to support sustainable construction projects, while cement producer Lafarge 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

7.3.3. Standards, guidelines and tools for sustainable forestry

A large number of groups are working on promoting and implementing sustainable forestry practices. Examples of internationally agreed criteria and guidelines that include biodiversity considerations include the FAO *Code of Practice for Forest Management*, the FAO/ Center for International Forestry Research *Guidelines for Reduced Impact Logging*, and the International Tropical Timber Organization (ITTO) *Revised Criteria and Indicators on the Sustainable Management of Tropical Forests*. A few timber tree species threatened by unsustainable harvesting are also listed on the CITES appendices.

Different groups have additionally developed certification schemes for sustainable forest management and/or sustainably produced timber and wood products. International examples include the Forest Stewardship Council (FSC), the Program for the Endorsement of Forest Certification (PEFC) and the EU Flower, while national examples include the German Blue Angel label, Canada's Environmental Choice Program, the Malaysian Timber Certification Council., and the Indonesian Ecolabelling Institute. 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*.

7.3.4. Commitments, guidelines, and tools for procurement of sustainable wood products and building materials

A number of governments have developed public procurement policies — either general or specifically for timber and wood products — that include environmental considerations. Governments are also increasingly developing legislation demanding that imported wood be legally produced, in an effort to reduce demand for illegally harvested wood and so help producer countries enforce their own laws. Examples include the US Lacey Act and the EU FLEGT due diligence proposal currently under development.

With respect to timber and wood, some forestry-related industry groups have committed to sourcing such products from legal and well-managed forests and to work towards eliminating illegal logging. These include the UK Timber Trade Federation and the Confederation of European Paper Industries. The sustainable building certification schemes mentioned above also encourage the sourcing of sustainably produced building materials, and a growing number of companies across all industries have committed to sourcing sustinably harvested wood products. Some groups are working to facilitate trade links between companies committed to responsible forestry, such as WWF's Global Forest and Trade Network (GFTN).

Various industry and other groups have published guides and tools to aid responsible procurement. The Procura+ *Guidelines for Sustainable Construction* provide guidance on sourcing sustainable building materials, and specifically exclude certain types of timber (such as from illegal sources) as well as a few hazardous substances.Over 30 guides and tools have specifically been developed for responsible timber and wood product sourcing. Those relating to timber include the Timber Trade Federation's due diligence tool for sourcing uncertified timber[51], the Timber Trade Action Plan's tool to assess the risk of illegal wood entering a supply chain[52], and WWF's *Guide to Responsible Purchasing of Forest Products*. The WRI/WBCSD *Guide to Sustainable Procurement of Wood and Paper-Based Products* provides an information framework to help individuals and organizations to better understand, select and use these different tools, with both a regional and international scope.

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

7.3.6. Biodiversity offsetting

In addition to energy and mining developments (see sections 4 and 5), 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.

7.4. Future challenges

7.4.1. Construction industry

The main biodiversity challenge for the construction industry is to ensure 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. This is especially relevant given that more people now live in urban environments than in rural environments. In addition, improved energy efficiency in existing and new buildings represents 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. In addition, most initiatives and government policies for sustainable construction to date are in developed countries and not in developing countries where most construction activity of new buildings is currently occurring.

Another challenge is 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

[51] Timber Trade Federation *Responsible Purchasing Policy*
[52] Timber Trade Action Plan *Risk Assessment Tool for Buyers*

environments. In addition, while a lifecycle approach for choosing building materials makes good sense in theory, limited coordination and cooperation between actors involved in different stages of a building's life span effectively obstructs such an approach unless it is mandated or otherwise supported by authorities. Furthermore, such actors may lack the technical expertise required to apply tools for calculating the environmental impact of construction materials and buildings.

A related challenge is defining what constitutes a "more sustainable" building material. With the exception of timber and wood products (see below), environmental certification schemes do not exist for most important construction materials. In addition, the availability of certified timber and wood products varies significantly between countries, with most of the main markets located in 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; however these are not yet fully developed and in any case may only be applicable nationally or regionally.

Finally, the focus of many developments often remains on short-term economic factors rather than on optimizing the environmental performance of buildings.

7.4.2. Forestry industry

The initiatives and legislation described above have led to significant progress being made 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. 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 main biodiversity challenge for the forestry industry is therefore to expand current work on sustainable forest management so 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.

Challenges in addressing this include lack of awareness amongst companies and individuals on sustainable harvesting techniques, a short-term focus on immediate economic factors, illegal activities, and a lack of strong national institutions and policies for forest management in some countries.

Another challenge is the low efficiency of timber processing in many developing countries.

Sources

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

CEI Bois (2006) *Tackle Climate Change: Use Wood* http://www.roadmap2010.eu/wisd/publication.html

EC Enterprise and Industry website *Sustainable Construction*

http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/sustainable-construction/index_en.htm (accessed 2 November 2009)

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

IFC *A Guide to Biodiversity for the Private Sector: Forestry*

http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_Forestry/$FILE/Forestry.pdf

Maiellaro, N. (2001) *Towards sustainable building* (GeoJournal Library) Springer

Procura+ Sustainable Procurement Campaign *Building Construction/Renovation: Procura+ Key Criteria - Extended version* http://www.procuraplus.org/fileadmin/template/projects/procuraplus/New_website/Detailed_Product_Information/Building_construction___renovation_detailed_-_Procura__Guidelines.pdf

The Business and Biodiversity Resource Centre website *Construction* http://www.businessandbiodiversity.org/construction.html (accessed 2 November 2009)

UK Green Building Council (2009) *Biodiversity and the Built Environment*
http://www.ukgbc.org/site/document/download/?document_id=598

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

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

8. Tourism

8.1. Introduction

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[53], and perhaps 10 times the number of domestic travellers[54]. 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[55].

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[56] — a few large multinational companies have a significant amount of control over the industry. Just five companies control over 60% of organized outbound travel from Europe, for example.

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%)[57]. While most international tourism arrivals are to developed countries, developing countries are rapidly increasing 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[58]. Several countries in Southeast Asia have seen particularly rapid tourism growth[59]: 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[60]. 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"[61] — represents around 7% of the global tourism market[62]. 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.

The number of international travellers has been forecast to reach over 1.5 billion globally by 2020[63]. Forecasts also suggest that tourism will become increasingly important in developing countries hosting biodiversity hotspots, particularly those in Southeast Asia.

[53] UN World Tourism Organization (2009) *World Tourism Barometer* Vol 7 No 1 January 2009 http://www.world-tourism.org/facts/eng/pdf/barometer/UNWTO_Barom09_1_en.pdf

[54] 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

[55] 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

[56] 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

[57] Conrady, R. and Buck, M. (Eds) (2008) *Trends and issues in global tourism 2008* Springer

[58] ostas, 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

[59] ibid.

[60] 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

[61] The International Ecotourism Society (TIES)

[62] Epler, B. (2007)*Tourism, the Economy, Population Growth, and Conservation in Galapagos* Darwin Foundation http://www.darwinfoundation.org/english/_upload/Epler_Tourism_Report-en_5-08.pdf

[63] World Tourism Organization (2008) *Tourism 2020 Vision: Volume 4 Europe* http://www.podepro.prd.uth.gr/programme/materiel/Sector/EUROPE%20VISION%202020.pdf

8.2. Dependence and impact on biodiversity

Much 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 and climate regulation.

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 very rarely realised, even by ecotourism ventures. For the most part, poor planning and management of tourism developments and activities — even those marketed as ecotourism and responsible tourism — 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[64], mainly from transport and particularly from aviation. Emissions from accommodation are also significant.

8.3. Biodiversity initiatives

8.3.1. Overview

Industry initiatives concerning biodiversity fall into two main types: 1) work to reduce the impact of tourism by developing principles, good practice guidelines and other tools for sustainable tourism, including certification schemes; and 2) schemes 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.

8.3.2. Principles, guidelines and tools for sustainable tourism

A number of international statements and codes have been developed that provide a general framework for ecotourism that includes biodiversity considerations. These include the 2002 Quebec Declaration on Ecotourism and the subsequent Cairns Charter on Partnerships in Ecotourism, the Mohonk Agreement for a certification program for sustainable tourism and ecotourism, and the International Ecotourism Society (TIES) Oslo Statement on Ecotourism, and the World Tourism Organization's *Global Code of Ethics for Tourism*. The Secretariat of the CBD has also signed a Memorandum of Understanding with the UN World Tourism Organization to highlight biodiversity issues in tourism.

[64] World Tourism Organization/UNEP (2008) *Climate Change and Tourism: Responding to Global Challenges* http://www.unep.fr/shared/publications/pdf/WEBx0142xPA-ClimateChangeandTourismGlobalChallenges.pdf

The Global Partnership for Sustainable Tourism Criteria (GSTC Partnership) 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.

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[65] and related web-based Biodiversity and Tourism Network, the UNEP/TOI guidelines for tourism in deserts[66], the UNEP/Conservation International/TOI guidelines for tourism in mountains[67], the TOI/Conservation International/Coral Reef Alliance guidelines for tourism in marine areas[68], and various guidelines for tourism in polar regions[69]. Others focus on specific activities, particularly by hotels and tour operators. These include IUCN's guide to sustainable use of biological resources for hotels[70]; guidelines from the International Tourism Partnership on sustainable hotel siting, design, construction and environmental management as well as a checklist for minimum standards towards a sustainable hotel; and UNEP/TOI's *Management Guide for Responsible Tour Operations* and *Implementation Guide for Responsible Tourism Coordinators*.

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, Canada's Green Leaf Eco-Rating Programme, the Audubon Green Leaf™ Eco-Rating Program in the US, Australia's ECO Certification scheme, and the Costa Rica Certificate for Sustainable Tourism program. More recently, the Sustainable Tourism Stewardship Council (which will merge with the GSTC in 2010 to form the Tourism Sustainability Council) has been working on a global accreditation program for sustainable tourism certification based on the GSTC criteria mentioned above.

Various regional and national industry groups have specific programs and projects to support and promote sustainable tourism, including the Caribbean Tourism Organization, Travelife in the EU, and the Indonesian Ecotourism Network.

Some work has been done to address greenhouse gas emissions. 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[71]. 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.

8.3.3. Supporting 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.

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[65] *CBD Guidelines on Biodiversity and Tourism Development*
[66] *Tourism and Deserts: A Practical Guide to Managing the Social and Environmental Impacts in the Desert Recreation Sector*
[67] *Tourism and Mountains: A Practical Guide to Managing the Environmental and Social Impacts of Mountain Tours*
[68] *A Practical Guide to Good Practice: Managing Environmental Impacts in the Marine Recreation Sector*
[69] Listed in: UNEP (2007) *Tourism in The Polar Regions: The Sustainability Challenge*
[70] IUCN (2008) *Biodiversity: My Hotel in Action - A Guide to Sustainable Use of Biological Resources*
[71] World Travel and Tourism Council (2009) *Leading the Challenge on Climate Change*

In some cases, tourist operators and hotels enter into community financing arrangements, where they provide direct payments or other benefits to local communities. 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 also promotes holidays in which tourists can take part in conservation activities.

8.4. Future challenges

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. Therefore, one challenge will be ensuring careful planning of new developments to avoid negative impacts on biodiversity. 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.

Another challenge is that few of the large companies with significant amounts of control over the industry have any long-term investments in particular destinations, and therefore lower interest in investing in biodiversity initiatives. Conversely, while many SMEs may 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. Even when companies have undertaken environmental initiatives, these tend to focus more on environmental management of individual operations than on biodiversity conservation.

A further issue is widespread greenwash within the industry, with terms such as “ecotourism”, “green tourism” and “responsible tourism” being used by operators not actually acting in an environmentally responsible way. This undermines efforts towards sustainable tourism, and could increase the impact of unsustainable operators if they attract more business based on their claims. Moreover, even when credible ecotourism certification standards exist and are implemented, there are few operations which can provide evidence that their activities result in significant biodiversity conservation.

Carbon offsetting for plane flights is also an emerging issue. There is evidence that travellers, particularly those accounting for the major share of emissions released, are not ready to support voluntary carbon offsets. In addition, there is a risk that the industry is choosing carbon offsetting — which has been criticized as a means for mitigating climate change — rather than making actual cuts to greenhouse gas emissions.

Sources

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

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

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

IFC *A Guide to Biodiversity for the Private Sector: Tourism and Hospitality*
http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/BiodivGuide_SectorSummary_TourismandHospitality/$FILE/Tourism+and+Hospitality.pdf

Lindsay, H. (2003) *Ecotourism: the Promise and Perils of Environmentally-Oriented Travel*
http://www.csa.com/discoveryguides/ecotour/overview.php

Spergel, B. *Raising Revenues for Protected Areas. Building Conservation Capital for the Future* WWF
http://www.worldwildlife.org/what/howwedoit/conservationfinance/WWFBinaryitem7128.pdf

UNEP (2007) *Tourism in The Polar Regions: The Sustainability Challenge*
http://www.unep.fr/shared/publications/pdf/DTIx0938xPA-PolarTourismEN.pdf

UNEP DTIE website *Environmental Impacts of Tourism*
http://www.unep.fr/scp/tourism/sustain/impacts/environmental/

World Tourism Organization/UNEP (2008) *Climate Change and Tourism: Responding to Global Challenges*
http://www.unep.fr/shared/publications/pdf/WEBx0142xPA-ClimateChangeandTourismGlobalChallenges.pdf

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

9. Pharmaceuticals

9.1. Introduction

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.

Drug discovery and development has long relied on natural compounds with medical activity found in a variety of plants, animals and microorganisms. Even with the advent of techniques to synthesize chemical compounds, 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 modeled on, natural products[72].

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 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%)[73].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.

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 in the pharmaceutical industry, screening organisms that have never been used in traditional medicine for previously unknown compounds — is also expected to grow.

9.2. Dependence and impact on biodiversity

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 a source of the compound. The current rate of biodiversity loss could negatively affect future drug discovery — indeed according to one estimate, at current plant and animal extinction rates the Earth is losing one major drug every two years[74].

The production of pharmaceutical products can impact on biodiversity in a number of ways. Over-harvesting of wild species containing medically active compounds can 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[75].

[72] United Nations University Institute of Advanced Studies (2003) *The International Regime for Bioprospecting: Existing Policies and Emerging Issues for Antarctica*
http://www.ias.unu.edu/binaries/UNUIAS_AntarcticaReport.pdf

[73] IMS Health *2008 Global Prescription Sales Information: Top-Line Industry Data*
http://www.imshealth.com

[74] UNEP-WCMC (2002) *World Atlas of Biodiversity: Earth's Living Resources for the 21st Century*
http://www.unep-wcmc.org/information_services/publications/biodiversityatlas/presspack/press/release.htm

[75] Mulliken, T. and Crofton P. (2008) *Review of the Status, Harvest, Trade and Management of Seven Asian CITES-listed Medicinal and Aromatic Plant Species* Bundesamt für Naturschutz (BfN)
http://cmsdata.iucn.org/downloads/review_of_the_status__harvest__trade_and_management_of_seven_asian_cites_listed_medic.pdf

Cultivation of plant and animal species containing medically active compounds poses similar problems as agriculture and fisheries for food production (see section 6). In addition, chemicals used in manufacturing processes can cause soil, water and air pollution, while the discharge of fermentation waste can cause turbidity in local waterways. Thermal waste from various processes can also cause temperature changes in local waterways.

The widespread and continual use, excretion, and disposal of human and veterinary medicines also have potential impacts on biodiversity. Up to 90%[76] of the medically active compound 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.

9.3. Biodiversity initiatives

9.3.1. Overview

The majority of work relating to biodiversity within the pharmaceutical industry relates to bioprospecting. 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 and other frameworks and guidelines also apply 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.

9.3.2. Bioprospecting

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 include the CBD Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits; the CBD Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity; the CBD Cartagena Protocol on Biosafety; the Convention on International Trade of Endangered Species (CITES); and the United Nations Convention on the Law of the Sea (UNCLOS).

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[77].

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. Other examples include agreements between Merck and the National Biodiversity Institute of Costa Rica (INBio); Glaxo Wellcome and Extracta in Brazil; Astra Zeneca and Griffith University in Australia; and Novartis and several institutions around the world. 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.

[76] Jones, O.A.H., Voulvoulis, N. and. Lester, J.N. (2003) *Potential Impact of Pharmaceuticals on Environmental Health* Bulletin of the World Health Organization Vol.81 No.10
http://www.scielosp.org/scielo.php?pid=S0042-96862003001000015&script=sci_arttext

[77] EFPIA *Good Business Practice & Case Studies on Biodiversity*

It is perhaps 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.

9.3.3. Sustainable harvesting of wild species

The international guidelines mentioned above also apply to harvesting of wild species containing medical compounds. Building on this, a group of conservation organizations has developed a standard for the sustainable harvesting of medicinal and aromatic plants[78].

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.

9.3.4. Manufacturing

Principles for green chemistry have been developed that aim to minimize the environmental impact of chemicals and their production[79]. 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.

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

Individual companies have also worked to reduce the footprint of their manufacturing operations.

9.4. Future challenges

A significant challenge for the pharmaceutical industry is 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.

Another challenge is sourcing medically active compounds in a sustainable manner that conserves biodiversity and the natural resources on which this biodiversity depends, both for wild harvesting and cultivation. Although regulations exist for wild collection for commercial trade, implementation of collection and trade control is often 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.

[78] *International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants*
[79] US Environmental Protection Agency *Twelve Principles of Green Chemistry*

Sources

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

CBD/UNEP/Ad Hoc Open-Ended Working Group On Access And Benefit-Sharing (2008) *Access and Benefit-Sharing Arrangements Existing in Specific Sectors*
https://www.cbd.int/doc/meetings/abs/abswg-06/information/abswg-06-inf-04-rev1-en.pdf

Chivian, E. (Ed.) (2002) *Biodiversity: Its Importance to Human Health; Interim Executive Summary* Center for Health and the Global Environment, Harvard Medical School
http://chge.med.harvard.edu/publications/documents/Biodiversity_v2_screen.pdf

EFPIA (2006) *Good Business Practice & Case Studies on Biodiversity*
http://www.efpia.org

Emerging Contaminants Workgroup of the Santa Clara Basin Watershed Management Initiative (2005) *Discussion Paper on Pharmaceutical Disposal to Sewer Systems*
http://www.pharmamanufacturing.com/whitepapers/2005/emerging-contam-wkgrp_PharmWhitePaper.pdf

Hawkins, B. (2008) *Plants for Life: Medicinal Plant Conservation and Botanic Gardens* Botanic Gardens Conservation International
http://www.bgci.org/files/Worldwide/Publications/PDFs/medicinal.pdf

IMS Health *2008 Global Prescription Sales Information: Top-Line Industry Data*
http://www.imshealth.com

International Development Research Centre website *Assessing the Benefits of Bioprospecting in Latin America.*
http://www.idrc.ca/en/ev-5571-201-1-DO_TOPIC.html (accessed 18 October 2009)

Jones, O.A.H., Voulvoulis, N. and. Lester, J.N. (2003) *Potential Impact of Pharmaceuticals on Environmental Health* Bulletin of the World Health Organization Vol.81 No.10
http://www.scielosp.org/scielo.php?pid=S0042-96862003001000015&script=sci_arttext

Laird, S. and Wynberg, R. (2009) *Access and Benefit – Sharing in Practice: Trends in Partnerships across Sectors.* CBD Technical Series No. 38
http://www.cbd.int/doc/publications/cbd-ts-38-en.pdf

Mulliken, T. and Crofton P. (2008) *Review of the Status, Harvest, Trade and Management of Seven Asian CITES-listed Medicinal and Aromatic Plant Species* Bundesamt für Naturschutz (BfN)
http://cmsdata.iucn.org/downloads/review_of_the_status__harvest__trade_and_management_of_seven_asian_cites_listed_medic.pdf

Newman, D. J. and Cragg, G. M. (2007) *Natural Products as Sources of New Drugs over the Last 25 Years* J. Nat. Prod. 70: 461–477
http://pubs.acs.org/doi/pdf/10.1021/np068054v?cookieSet=1

The Business and Biodiversity Resource Centre website *Pharmaceuticals*
http://www.businessandbiodiversity.org/pharmaceuticals.html (accessed 19 October 2009)

Van Arnum, P. (2009) *Building Sustainability into the Supply Chain and Pharmaceutical Operations*
http://pharmtech.findpharma.com/pharmtech/Building-Sustainability-into-the-Supply-Chain-and-/ArticleStandard/Article/detail/631793

10. Cosmetics

10.1. Introduction

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. Demand for cosmetics products is predicted to grow, especially for anti-aging and natural 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. This growth has mainly occurred in Europe and North America, where distribution of such products is becomingly 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[80]. Most natural products are skin care products. There is a growing trend to use food ingredients as natural and organic ingredients in cosmetics.

There is also a recent trend towards "masstige" products — high-quality mass market products with a prestigious or premium appearance — as well as towards linking cosmetic products with health benefits on top of traditional beauty benefits.

The industry is highly innovative, with major cosmetic companies replacing or reformulating around 25% of their products on average every year[81]. New product development is especially a feature of the natural 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.

10.2. Dependency and impact on biodiversity

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

The production of cosmetics can affect biodiversity in a similar manner to the production of pharmaceuticals (section 9), through over-harvesting of 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[82],[83]. Extraction of petrochemicals used in cosmetics can also pose a threat to ecosystems in the same was as extraction for energy (see section 5).

Also like pharmaceuticals, cosmetics enter sewerage systems and water sources after use, where individual ingredients may have potential impacts on biodiversity.

Volatile organic compounds (VOCs) used in aerosol products also contribute to global warming and ozone depletion.

[80] Organic Monitor website *The European Market for Natural Cosmetics 2006* http://www.organicmonitor.com/100160.htm (accessed 6 October 2009)

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

[82] FAO (1995) *Flavours and Fragrances of Plant Origin* http://www.fao.org/docrep/V5350E/V5350E00.htm

[83] Mulliken, T. and Crofton P. (2008) *Review of the Status, Harvest, Trade and Management of Seven Asian CITES-listed Medicinal and Aromatic Plant Species* Bundesamt für Naturschutz (BfN) http://cmsdata.iucn.org/downloads/review_of_the_status__harvest__trade_and_management_of_seven_asian_cites_listed_medic.pdf

10.3. Biodiversity initiatives

10.3.1. Overview

The majority of work directly relating to biodiversity within the cosmetics industry relates to natural ingredient sourcing and access and benefit sharing, with some work also on reducing the environmental impact of manufacturing processes and packaging. The industry is also working to ensure product safety; however this is not discussed here as the work is driven more by consumer health concerns than by direct concern for biodiversity.

10.3.2. Sustainable sourcing of natural ingredients and Access and Benefit Sharing

As for pharmaceuticals (section 9), various international conventions are relevant to the acquisition and use of natural resources for the development of new cosmetics, including the CBD Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits; the CBD Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity; the CBD Cartagena Protocol on Biosafety; and the Convention on International Trade of Endangered Species (CITES).

To date no major cosmetics 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.

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. Together with the Union for Ethical BioTrade, the Initiative has developed a verification system for native natural ingredients to ensure that companies working under biotrade comply with these principles and criteria. 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.

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 currently under development for wild plant products, including ingredients for cosmetics, includes both biodiversity and access and benefit sharing standards.

A few individual companies have included biodiversity considerations in their sourcing and/or manufacturing policies. 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. Natura Cosmeticos has developed a product line based on natural ingredients from Brazilian biodiversity that are sustainably sourced in partnership with local communities, and some of which are certified according to FSC and other standards. Beraca has similar business plan of sustainably sourcing its natural products from Brazilian biodiversity. L'Oreal's The Body Shop sources palm oil meeting the RSPO standards for its soaps and plans to use FSC-certified wood wherever possible. Some companies, including Natura, the Aveda Corporation and the Body Shop, have also incorporated access and benefit sharing measures into their business practices.

10.3.3. Manufacturing

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.

10.4. Future challenges

As for pharmaceuticals, a significant challenge is to ensure 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. To date however, the cosmetics industry has generally incorporated few, if any, CBD requirements into its practices and has low levels of awareness of access and benefit sharing issues.

Another challenge is sourcing natural ingredients in a sustainable manner. Implementation of best practice for such sourcing requires demand from educated consumers and credible certification schemes; however at present there is low consumer understanding of natural and organic products, a lack of harmonized or uniform standards for natural ingredients, and growing number of symbols and logos. An important issue is that natural and organic products are not necessarily sustainably sourced — and so could have a greater impact on biodiversity than chemically synthesized products. Some species used as sources of natural ingredients are not easily cultivated, such as sandalwood, so pressure on wild populations is likely to remain high.

Chemicals used in cosmetic products are also an issue. 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[84]. While this mainly has implications for human health, the presence of such chemicals in the environment is also a biodiversity issue. More knowledge is needed on the long-term and population effects of chemicals used in cosmetics, including nanoparticles, on particular species and biodiversity in general.

Sources

Baker, J. (2008) *Make-up keeps looking good*
http://www.smartcompany.com.au/Premium-Articles/Industry-Trends/20080207-cosmetics-toiletries-industry-trend.html

FAO (1995) *Flavours and Fragrances of Plant Origin*
http://www.fao.org/docrep/V5350E/V5350E00.htm

Freedonia (2006) *Cosmetic & Toiletry Chemicals to 2010 - Market Research, Market Share, Market Size, Sales, Demand Forecast, Market Leaders, Company Profiles, Industry Trends*
http://www.freedoniagroup.com/Cosmetic-And-Toiletry-Chemicals.html

ICEA website *Sustainability and Green Chemistry in Cosmetics Featured in New Summit*
http://www.icea.info/tabid/57/articleType/ArticleView/articleId/275/Default.aspx

Laird, S. and Wynberg, R. (2009) *Access and Benefit – Sharing in Practice: Trends in Partnerships across Sectors.* CBD Technical Series No. 38
http://www.cbd.int/doc/publications/cbd-ts-38-en.pdf

OASIS (2009) *Organic and Sustainable Industry Standards, Inc. Health and Beauty Products*
http://www.oasisseal.org/OASIS_Standard_100_draft.pdf

Organic Monitor website *The European Market for Natural Cosmetics 2006*
http://www.organicmonitor.com/100160.htm (accessed 6 October 2009)

Organic Monitor website *Consumer Insights: Natural & Organic Personal Care Products in UK*
http://www.organicmonitor.com/123160.htm (accessed 6 October 2009)

Organic Monitor website *Global Natural Cosmetic Sales Approaching US $7 Billion*
http://www.organicmonitor.com/r1709.htm (accessed 6 October 2009)

Organic Monitor website *The European Market for Natural Cosmetics 2009*
http://www.organicmonitor.com/100260.htm (accessed 6 October 2009)

Pitman, S. (2008) *EPA Digs Deeper on Cosmetics Pollution*
http://www.cosmeticsdesign.com/Formulation-Science/EPA-digs-deeper-on-cosmetics-pollution

Union for Ethical Bio Trade (2009) *The Beauty of Sourcing with Respect*
http://www.ethicalbiotrade.org/dl/UEBT-Beauty_of_Sourcing-Web_20090519.pdf

[84] The Campaign for Safe Cosmetics website
http://safecosmetics.org//article.php?list=type&type=30 (accessed 6 October 2009)

11. Fashion

11.1. Introduction

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.

The industry is now very fast moving, with styles typically changing every six months. This, combined with cheaper prices, has led to increased consumption of fashion items. For example, in the UK the amount spent on clothing and textiles from 1997 to 2007 grew by 34%[85]. 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 and particularly in 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%).[86,87]

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.

"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.

11.2. Impact on biodiversity

The production of different fibres and other raw materials used for textiles and accessories affects biodiversity in different ways. Extraction of petrochemicals for synthetic fibres poses the same threats as extraction for energy (see section 4), while the manufacturing of synthetic fibres is energy-intensive and produces various by-products, including volatile organic compounds, solvents and heavy metals, that can pollute air or water sources. 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 (see section 6). 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[88]. 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[89].

[85] Reducing the Impact of Textiles on the Environment website http://www.ritegroup.org/news.php (accessed 8 October 2009)
[86] Plunkett Research, Ltd. *Introduction to the Apparel & Textiles Industry* http://www.plunkettresearch.com/Industries/ApparelTextilesFashions/ApparelTextilesFashionsTrends/tabid/158/Default.aspx
[87] World Trade Organization (2008) *International Trade Statistics* http://www.wto.org/english/res_e/statis_e/its2008_e/its2008_e.pdf
[88] 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)
[89] 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)

Over-harvesting of wild species — including endangered species such as crocodiles, snakes, seals, and Tibetan antelope — for leather, fibres or other raw materials can cause population declines and/or damage the wider ecosystem. Poaching of Tibetan antelope to make luxury shahtoosh shawls, for example, has seen their population drastically decline[90].

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. Such processes also use toxic chemicals and produce effluents which 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[91]. Laundering also produces solid waste and waterborne effluents.

All these environmental impacts are exacerbated by the large volumes of fashion items consumed each year.

11.3. Biodiversity initiatives

11.3.1. Overview

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 reptile skins that complies with CITES regulations.

11.3.2. Guidelines and tools for sustainable textile production

The Better Cotton Initiative has produced production principles and criteria for cotton production that include general biodiversity considerations, and is working with farmers and other stakeholders in the supply chain to share best practice and knowledge. The IFOAM principles for organic agriculture (see section 6) apply to cotton and other fibre crops; various national and regional trade associations have developed certification schemes for organic textiles based on the IFOAM principles but additionally including standards for processing and manufacturing[92]. 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 100 and the European Eco label, which limit the use of certain chemicals. The Eco label also requires reduced water pollution throughout the production chain. 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.

11.3.3. Sustainable sourcing of reptile skins

A growing number of initiatives focus on the sustainable sourcing and use of reptile skins, including from crocodiles, alligators, caimans and various snake species. For example 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.

[90] 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)

[91] 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

[92] Listed at: http://organicclothing.blogs.com/my_weblog/2006/04/certified_organ.html

11.4. Future challenges

The main issue for the fashion industry is to source raw materials for textiles and accessories in a sustainable manner. A major challenge in achieving this is the lack of an internationally coordinated approach to eco-fashion. Various labels and certification schemes for clothing and textiles have been established, especially for organic textiles; however as for organic food, few 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.

While organic production of natural fibres does not have a primary focus on the sustainable use of biodiversity, it can nevertheless help in efforts towards achieving this. However organic fibres and textiles currently represent only a very small percentage of the total market — just 0.18% in the case of cotton. In addition, organic farming methods can be less productive than conventional methods — by up to 50% in the case of cotton — adding to the challenge of producing all natural fibres organically. New fibres based on bamboo, corn and soy are often promoted as replacements for petrochemical-based fibres; however these are also currently niche markets.[93]

Sources

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

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

Khan, S, R, Khwaja, M, A, Khan, A, M, Ghani, H, Kazmi, S. (1999) *Environmental Impacts and Mitigation Costs Associated with Cloth and Leather Exports from Pakistan.*
http://www.tradeknowledgenetwork.net/pdf/sdpifullrprt_s.pdf

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)

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

12. Finance

12.1. Introduction

The finance industry provides a variety of services related to money management, including lending, fund management, security trading, insurance, and real estate. Financial institutions and instruments include commercial banks, investment banks, venture capitalists, credit agencies, multi-lateral development banks and agencies, brokerage houses, fund managers, and insurance and reinsurance agencies.

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 (13%)[94].

12.2. Dependence and impact on biodiversity

While financial institutions may not be directly dependent on biodiversity, they are nevertheless exposed to biodiversity-related risks through the companies in which they invest and/or insure. Business risks arising from a company's failure to manage biodiversity-related risks — such as lowered financial performance, reputational damage, increased operating costs, and/or reduced access to natural resources — translate to a number of direct and indirect risks to institutions providing financial services to the company, including reputational damage, liability risk, increased regulatory scrutiny, increased default risk, lower investment returns, and increased insurance claims. Industries with high impacts and/or high dependency on biodiversity pose the greatest biodiversity-related risks to financial institutions.

Similarly, while the operations of individual companies may have direct and indirect impacts on biodiversity — e.g., through conversion of habitat, CO_2 emissions and the sourcing of natural products — the finance industry's predominant impact comes through its lending, investment and insurance decisions. The nature of these indirect impacts depends on the activities of the companies being invested in and/or insured.

12.3. Biodiversity initiatives

12.3.1. Overview

The concept of sustainable finance and responsible investment is gaining ground. 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.

A growing number of "green" financial products and services are also becoming available, although to date most of these focus on climate change and energy and not directly on biodiversity. In addition, opportunities presented by new markets directly and indirectly related to biodiversity — such as emissions trading, biodiversity and carbon offsets, and payments for ecosystem services — are increasingly being recognized. Some institutions are specifically providing finance to sustainable businesses.

12.3.2. Principles, guidelines and tools for incorporating environmental assessments 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 UNEP Statement by Financial Institutions on the Environment & Sustainable Development lays out general principles for including environmental, social, and governance issues, including biodiversity and ecosystem services, into decision-making in lending, investment, and insurance operations. At the sector level, the UN Principles for Responsible Investment give general principles for asset managers and institutional investors for including environmental governance as part of the investment analysis and decision-making process, while the Climate Wise Principles give general principles for including climate change in insurance activities. The Equator Principles — developed from the International Finance Cooperation (IFC) Performance Standards described below — are more specific, requiring project finance clients to take specific actions to assess and manage biodiversity impacts.

[94] 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

Individual financial institutions have also developed their own lending and investment conditions. For example, the International Finance Cooperation (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. 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 in wetlands on the Ramsar List. 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.

The tools used by financial institutions for assessing and managing biodiversity risks typically include checklists, environmental and social impact assessments, client risk assessments, environmental audits, and biodiversity action plans. A range of specific tools have also been developed to help the industry assess environmental risk in specific industries. Examples include the World Commission on Dams framework for decision-making[95] and WWF's related I*nvestor's Guide to Dams*, Insight Investment's biodiversity benchmark for companies in the mining and utilities sectors[96], and WWF's *Guidelines for Investment in Operations that Impact Forests*.

The UNEP Finance Initiative and partners have also produced a number of tools to assist financial institutions to understand, assess, and manage environmental governance issues, such as the Natural Value Initiative's (NVI) Ecosystem Services Benchmarking tool for companies with an agricultural supply chain and the Forest Footprint Disclosure Project (FFD Project) which is modelled on the Carbon Disclosure Project but with a biodiversity focus.

12.3.3. "Green" products and services

In addition to the tools described above for assessing and managing environmental and social risks, some institutions have launched branded "sustainable" or "ethical" funds that only invest in businesses meeting certain environmental and social criteria, as well as funds comprising companies working towards solutions for specific environmental challenges, such as low-carbon technologies to help avoid dangerous climate change. Other groups, such as national social investment forums like UKSIF, are working to raise awareness of the concept of sustainable investment and increase the number of such services and products.

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 many 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 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, and avoided deforestation credits. PES initiatives include the Katoomba Group's Ecosystem Market Place and Forest Carbon Partnership Facility, while one example of an institution dedicated to biodiversity offsetting is CDC Biodiversité, a subsidiary of the French Caisse des Dépôts et Consignations. 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.

[95] *Dams and Development: A New framework for Decision-Making*
[96] *Biodiversity: Towards Best Practice for Extractive and Utility Companies*

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. Increasingly, some banks are also using biodiversity to differentiate their brands and attract new customers. For example, HSBC and Nedbank's Green Trust — founded jointly with conservation organization WWF-South Africa in 1990 to protect the biodiversity of South Africa — donate 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.

12.3.4. Support to "green" enterprises

A few conservation groups, development banks 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. These include the International Finance Corporation's Environmental Business Finance Program, the Nature Conservancy's EcoEnterprises Fund, Conservation International's Verde Ventures, Root Capital, and the Central American Markets for Biodiversity Project.

A range of innovative financing mechanisms are also making the case for biodiversity- and ecosystem service-based businesses, including the Finance Alliance for Sustainable Trade and the World Resources Institute's New Ventures Programme.

12.4. Future challenges

The finance industry has a central role to play in guiding future development, based on which businesses it chooses to invest in and insure. However despite the work described above, a number of challenges remain for the industry to routinely support sustainable development that safeguards biodiversity.

One challenge is that understanding and awareness of biodiversity within the finance industry generally remains low. There are a number of reasons for this. Many can be linked to classic market failures, such as uncertainty over cause and effect, responsibility and materiality of risks, externalities, and free-riders, while others relate to limited internal capacities, insufficient skills, and lack of robust tools for assessing and managing risks and opportunities associated with a company's management of its biodiversity impacts and dependence.

There is also a need to develop consistent lending, investment and insurance requirements relating to biodiversity and ecosystem services. This has been achieved to some extent through the Equator Principles; however these only apply to project finance — and even then only to projects over US$10 million in non-OECD countries.

Sources

Birgden, H, Guyatt, D, Jia, X (2009) *Gaining Ground: Integrating Environmental, Social and Governance (ESG) Factors into Investment Processes in Emerging Markets. Mercer and International Finance Corporation* Mercer and IFC
http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/p_SI_GainingGround_Mercer/$FILE/270309MIC9080_IFC+Report_WEB+secured.pdf

Grigg, A., Cullen, Z., Foxall, J., and Strumpf, R. (2009) *Linking shareholder and natural value. Managing biodiversity and ecosystem services risk in companies with an agricultural supply chain*. Fauna & Flora International, United Nations Environment Programme Finance Initiative and Fundação Getulio Vargas
http://www.unepfi.org/fileadmin/documents/linking_shareholder_natural_value.pdf

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

The Business and Biodiversity Resource Centre website *Finance*
http://www.businessandbiodiversity.org/finance.html (accessed 26 October 2009)

UNEP (2006) *Class of 2006: Industry Report Cards on Environment and Social Responsibility*
http://www.uneptie.org/shared/publications/pdf/DTIx0827xPA-Class2006.pdf

UNEP FI (2007) *Green Financial Products & Services: Current State of Play and Future Opportunities*
http://www.unepfi.org/fileadmin/documents/ceo_briefing_green.pdf

UNEP FI (2008) *Biodiversity and Ecosystem Services: Bloom or Bust?*
http://www.unepfi.org/fileadmin/documents/bloom_or_bust_report.pdf

UNEP FI (2009) *The Global State of Sustainable Insurance*
http://www.unepfi.org/fileadmin/documents/global-state-of-sustainable-insurance.pdf

13. Conclusions

Biodiversity will be greatly affected by the way in which the industries presented in this paper grow and develop. This is especially the case for biodiversity in developing countries, where several industries are predicted to expand.

Different industry groups have developed frameworks, principles, guidelines and tools to minimize their environmental impacts, some of which include biodiversity considerations and a few of which incorporate internationally agreed frameworks such as the CDB. In some cases these efforts are industry-wide, while others are regional, national and/or sector-specific. Most initiatives are in collaboration with conservation groups, government groups, and/or academic institutions. The drivers behind such initiatives include securing continued supplies of raw materials, branding and, increasingly, new legislation.

The nature of these principles, guidelines and tools is generally similar across all industries. Large international and regional industry associations have tended to make broad policy statements on the need to reduce environmental impacts; however these rarely include biodiversity as a direct consideration. Good practice guidelines and tools specifically for incorporating biodiversity considerations into business policies and operations have tended to come from smaller industry groups, and 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.

Tools for incorporating biodiversity considerations into business policies and operations are the most well developed for mining, agriculture, fisheries, energy, tourism, forestry and finance activities; the construction, pharmaceutical, cosmetics and fashion industries generally lack such tools.

There are several emerging areas of biodiversity work, including Payments for Environmental Services and biodiversity offsets and banking. 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.

Despite these efforts, however, there are few examples of biodiversity-friendly practices being promoted and adopted at a large-scale. Similarly, there has been limited progress in mainstreaming the CBD and other intergovernmental frameworks into business policies and practices. As such, meeting projected growth within the industries described here without driving further biodiversity loss remains a major challenge.

One key challenge across all industries is 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 general issue is that alternative management systems, technologies and/or practices that deliver biodiversity benefits are often secondary considerations behind short-term economic factors. Another is limited knowledge, understanding and technical expertise on the impacts of various activities on biodiversity, how to minimize these impacts, and how to enhance biodiversity.

A further issue is that for the most part, there is no mechanism for ensuring that companies meet commitments made through, or principles and criteria set by, industry groups. The mining industry is the exception, with a few industry groups working to ensure that good practice is followed. Governance is also an issue in some countries, particularly in developing countries lacking strong legal and regulatory frameworks.

Credible certification schemes offer assurance that standards and criteria have been met; however the volume of certified products remains very small. For example, less than 5% of the internationally traded volume of agricultural food products is certified, while organic cotton represents just 0.18% of the total market. In addition, the availability of certified products remains limited, with most markets being located in Europe and North America.

Another major challenge is that many “sustainable” initiatives to date do not directly focus on biodiversity. This is true for most certification schemes as well — and even schemes that do include biodiversity considerations still have problems, such as failing to take ecosystem effects into account. Furthermore, there is little evidence for positive biodiversity benefits from certification schemes.

Similarly, strong biodiversity commitments by individual companies are few. While many have made efforts to reduce the environmental footprint of their operations, for the most part this appears to have focused on reducing pollution, greenhouse gas emissions and the use of energy, water and other natural resources, and so only indirectly relates to biodiversity and/or does not address the industry’s main biodiversity impact(s).

A related challenge comes from emerging approaches and technologies for mitigating climate change related biodiversity impacts. For example, carbon capture and storage technologies — widely touted as a technology to allow coal-fired electricity generation to be viable in a carbon-constrained world — are controversial and remain largely unproven. In addition, 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 sole means to address climate change and biodiversity impacts, at the expense of actually reducing the environmental impact of operations.

Finally, access and benefit sharing remains a challenge for the pharmaceutical and cosmetic industries. 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. Key issues include a general lack of adequate national laws for access and benefit sharing, a lack of clarity over the legal meaning of various concepts related to genetic resources, and low levels of awareness of access and benefit sharing issues.