

Business Industry Sector Perspectives on the Findings of the Millennium Ecosystem Assessment

The following contributions have been authored by individuals who are familiar with the progress that has been made in addressing ecosystem services issues in parts of a sector, usually in single companies or groups of leading companies. The analysis of each example is not intended to be representative of the position or performance of the entire sector, but to show that there is evidence of positive change in the sectors covered.

The industry sectors from which the contributions are drawn each contain a mixture of international corporations, national companies, entrepreneurial smaller and medium-size enterprises (SMEs) and informal local businesses. Each part of a sector may have different impacts and dependence on ecosystem services.

In many of the examples, the process of changing performance in industry sectors has followed a common sequence, though the detail varies considerably between sectors. It is anticipated that the factors described below, which are examples of the actions of leading companies moving toward more sustainable operations will also be important considerations as businesses work to understand and act upon the findings of the MA.

- (a) A realization by the leaders of major companies that their long-term business interests, survival as well as profitability, depend on understanding and addressing a wide range of the expectations of key audiences.
- (b) An understanding of the range of drivers, usually enlightened self-interest, but there is often a recognized ethical case for action. Objectives of individual or collective company action usually include differentiation within the sector, seeking relative competitive advantage.
- (c) A broad consultation process, typically over a number of years, to identify stakeholder expectations and establish how to address them.
- (d) The development of strong and mutually supportive partnerships with external organizations as key components of the implementation of agreed action plans.
- (e) Voluntary commitments to processes and actions that deliver better environmental and social outcomes, with external verification.
- (f) Engagement with public policy development and, by example, influencing the development of legislation affecting all parts of the sector, thus raising performance across the industry.
- (g) Commitment to transparent reporting and accountability for performance.

AGRI-BUSINESS

Authored by Andrew Bennett, *Syngenta Foundation for Sustainable Agriculture*

The word “Agriculture” covers a wide range of ecosystems management practices, including crop and livestock production and agro-forestry; sometimes it is extended to include food processing and marketing, forestry, fishing and aquaculture.

Agricultural production is primarily on large numbers of individually managed units, whose impacts on ecosystems are often unplanned and unintended. Production practices are strongly influenced by external drivers such as climate change, land tenure, production subsidies, market and consumer preferences and access to technologies, inputs and credit.

The agricultural sector is characteristically served by some large agriculture-based industries. These fall into four major groups:

Those that supply production inputs – seed, fertilizer, machinery and power, pesticides, credit etc.

Those that process the products – the principle being the food industries.

Those that retail the products – supermarkets and food chains.

Those that rely on the landscape services – such as tourism, leisure, water supplies.

The industry is segmented and diverse, such that the supply and value chain is often fragmented and serving the requirements of different customers. Agriculture depends on a large number of ecosystems around the world both directly and indirectly and is the basis of the livelihoods of the majority of poor people.

WHAT THE MILLENNIUM ECOSYSTEM ASSESSMENT TELLS AGRI-BUSINESS

Food production has doubled over the last 40 years, but nearly 1 billion people remain under-nourished. The MA predicts that the demand for food and other goods and services produced by agriculture will double over the next generation. Combinations of population, economic and urbanisation growth will drive these demands.

These demands will diversify and must be met with less water, no additional land and in competition with the expanding needs of conservation, infrastructure and urbanisation. These changes are, and will be, driven by markets (consumers), public opinion and regulation.

Production agriculture has had a major impact on the ecosystems of the world. Many ecosystems have been damaged, particularly though intensive systems of production and the over use of marginal and fragile ecosystems. However the demand for a full range of ecosystem services is projected to double over the coming years.

The MA tells us that these demands must be met without further degradation and with the restoration of damaged ecosystems. This presents both opportunities and threats for agri-business.

The opportunities will be in the form of markets for new technologies, information, products and services; the threats and risks will be in the form of increased regulation, liability to prosecution, customer alienation, pressures from civil society and stockholders and restricted access to genetic resources and other raw materials.

Solutions will take time and they will require better integrated and cross-sectoral approaches. Solutions will involve tradeoffs that should be based on good science, stakeholder engagement and careful monitoring.

It is in self-interest of agri-business to be proactive and be in the forefront of taking action.

HOW THIS MIGHT IMPACT ON AGRI-BUSINESS PRACTICES AND OPERATIONS

Licence to Operate

Public concern over ecosystem damage is reflected in a growing number of international, national and local laws and regulations aimed at protecting or restoring ecosystems. The MA provides further evidence of damage to ecosystems and will add further to public concerns and pressures for action and more regulation.

Reputation and Brand Risk

Consumer concerns are increasing the pressures on farmers to use production systems that are less damaging to ecosystems and deliver produce containing less unwanted and potentially toxic residues. Farmers and customers will seek technologies with a lower environmental impact.

This points to the importance of vigorous corporate social responsibility programs, developing new production systems and effective product stewardship programs that ensure the safe and reliable use of products.

Cost of Capital and Perceived Investor Risk

Stock value is a good barometer of both profitability and investor confidence in the longer-term performance of a company. Those companies whose products and processes are not seen to help protect or restore ecosystems will be seen as inherently more risky.

Access to Raw Materials

Access to land, forest, water bodies and genetic diversity provides the basis for producing many new products. Failure to address concerns over ecosystem damage could restrict access to these essential assets or in extreme cases could result in their destruction; such has been seen with some fisheries. There are several multilateral environmental agreements, which now include provisions for misuse of ecosystems. Positive support for and compliance with these agreements could help agri-business to identify opportunities and build partnerships. Many companies are now joining in sourcing agreements with producers and customers to assure supplies of high quality produce and responsible production systems.

Operational Impacts and Efficiencies

Much has been done and could be done by agri-business to reduce the impact of their operations and those of their customers on ecosystems by reducing or recycling waste and increasing the efficiency of operations.

New Opportunities and New Technologies

The challenge to increase production while reducing or restoring ecosystems will necessitate and create markets for new technologies and management systems; for example:

- water efficiency – drip irrigation
- low energy systems of production – conservation tillage
- drought tolerance
- tolerance to salinity
- pest and disease resistance
- higher yields
- more nutritious food
- reduction of waste and recycling

However new technologies, while helping, will only work if supported by good management practices, effective institutions and realistic policies. This points towards agri-business taking a wider interest in management systems, rural institutions and contributing constructively to policy development.

THE NEED TO ACT

There is a strong business case to act and to be pro-active. This goes beyond simple compliance and the normal boundaries of ‘Corporate Social Responsibility’.

There is a need for **leadership** and for **dialogue** between producers, technology developers, consumers and stakeholders on how the challenges of increased demand and ecosystem restoration will be achieved. Currently these important debates are distracted by controversy. This cannot continue; solutions lie in purposeful coalitions and partnerships.

Solutions will require **investment** by both the public sector and business and industry in programmes aimed at building awareness, developing skills in and systems for impact assessment and monitoring and identifying good practice.

The agri-business sector is well equipped to assess ecosystem health and impacts because of the **stewardship responsibilities**, often developed to satisfy freedom to operate requirements when products are approved for release. While some of this information is commercially sensitive, the techniques could help **partnerships/coalitions** with parties in the public sector and civil society to better manage and monitor ecosystems.

Development of new business opportunities are possible through **new technologies and production systems and processes**, which are more efficient and have a lower environmental impact and protect and restore ecosystems. The technologies should be safe, reliable, profitable and affordable. These will need to be built into a range of **low impact or organic production systems as well as the more intensive systems** that will be needed to satisfy the growing demands.

Transgenic technologies offer opportunities to develop products that are more nutritious and tolerant to water stress, climate change, pests and diseases, however the deployment of transgenic materials is controversial and governed by national biosafety rules and the Cartagena Protocol. While this adds to the costs of their development and release, there is no alternative other than to work with society and respond to their concerns over possible ecosystem and health impacts. It is possible that with more public and private sector investment in genomics and bioinformatics it might be possible to find new and less controversial ways of developing new plants and processes.

EXAMPLES OF GOOD PRACTICE

There are a growing number of examples of good practice. Many of these have been developed through collaboration between business and industry with civil society and academic groups. Examples of good practice are the Forestry Stewardship Scheme, the Marine Stewardship Scheme and the Sustainable Agricultural Initiative developed by the Food industry. The overall coverage of these schemes is still relatively small but growing. They have clearly demonstrated that it is possible to achieve profitable production with ecosystem protection and restoration.

Customers are also increasingly looking for 'chain of custody' production and delivery systems that provide assurances of methods of production and product reliability, for example fair trade, organic, Max Havilar, Café Direct, and the collaborative coffee initiative between Starbucks, Conservation International in Mexico described in the next section.

There is scope to develop more of these schemes at a local level bearing in mind that one key ingredient in their credibility and long term profitability is the use of independent third party monitoring and certification.

FOLLOW-UP AND MONITORING

It is in the self-interest of agri-business to recognise these trends and work with others to develop solutions.

MANAGING AGRICULTURAL SUPPLY CHAINS: THE CASE OF COFFEE

Authored by Glen Prickett, *Conservation International*

Coffee, the largest legally traded agricultural commodity in the world, is grown in some of the Earth's most threatened ecosystems. The coffee-growing frontier is now expanding to sensitive ecosystems in countries that are home to an incredible diversity of life. In addition to the negative impacts on natural habitat, the current global over-supply and subsequent falling price of coffee is hurting the livelihoods of farmers who grow high-quality coffee using traditional, shade-grown, production systems that benefit biodiversity. This trend threatens the long-term availability of high-quality coffee essential for the continued success of the specialty coffee industry.

Conservation International (CI), an international NGO working on biodiversity conservation, has partnered with Starbucks, the specialty coffee retailer, to encourage coffee cultivation methods that protect biodiversity and improve the livelihoods of coffee farmers around the world. Their collaboration began in 1998 with a field project working with farmers in Chiapas, Mexico, to produce Starbucks Shade Grown Mexico(tm), an ecologically sound, premium coffee. CI and Starbucks have launched additional field projects in other key coffee growing countries, which have resulted in two additional coffees coming to market, Conservation Colombia(tm) and Starbucks Peru(tm). In 2004, Starbucks purchased over 1.8 million pounds of "conservation coffee" at premiums well above local prices.

Based on the success of these field projects, Starbucks and CI developed green coffee sourcing guidelines and a preferred supplier pilot program to incorporate environmental and social standards into the company's worldwide purchasing criteria. In 2004, based on this pilot, Starbucks launched the Coffee and Farmer Equity (CAFE) Practices Program, with a goal of purchasing 60% of its coffee under environmental and social guidelines by 2009.

Through the course of the partnership's field projects, the availability of credit to small farmers was identified as a key constraint to environmentally sound coffee production. In an effort to overcome this constraint, Starbucks in 2003 made a \$2.5 million loan to the Verde Ventures Fund, an investment fund managed by CI that provides debt and equity financing to small and medium-sized businesses in priority regions for biodiversity conservation worldwide.

MINING

Authored by David Richards, *Rio Tinto*

The mining sector has historically had a significant impact on ecosystems and the services they provide. Because of the locations where mineral deposits are often located and the nature of mining processes, the industry often has a significant impact on services such as water quantity and quality, and ability of soils to process excess nutrients and wastes. The mining sector must continue to seek out ways in which they can minimize their impacts on these and other services. The MA provides a rich source of fundamental information and insights for the mining sector to draw upon in developing business plans and managing operations.

REPUTATION AND BRAND RISK

Mining is an upstream industry sector and rarely encounters expressions of consumer preference which might be jeopardized by a failure to address key MA findings. However, companies increasingly find their reputation with key audiences is an important element of their business, and there are signs that brand value is emerging for some suppliers into some markets. There has always been a vociferous campaign opposing mining, and a failure by the industry to respond to the findings of the MA would intensify this and give it a fresh focus following the Environmental Impact Review.

A leading group of companies in the mining industry has made significant progress since 2000 in adopting principles of sustainable development. The Mining, Minerals and Sustainable Development (MMSD) project, carried out by the International Institute for Environment and Development (IIED), commissioned by the World Council for Sustainable Development acting for the Global Mining Initiative (GMI), completed a major report on the industry in 2002 (see www.iied.org/mmsd). The International Council on Mining and Metals (ICMM) was formed in 2001 to take forward the challenges to the industry that are contained in the MMSD report, and in 2003 the ICMM published its Sustainable Development Framework and High Level Principles that commit member companies to a range of accountable actions (see www.icmm.com).

This concerted effort will differentiate the sector, allowing external audiences to identify companies that have made a commitment to improving environmental and social performance and to answering to that commitment. In the future, brand value may accrue to companies as a result of this differentiation, and the value of their reputation should rise accordingly. It is important that the impetus for this activity comes not from the fear of stricter regulation but from the willingness to use voluntary codes to improve performance in the sector.

The MA findings lie somewhere between society's needs and its expectations. The sector can be expected to respond to the MA findings in a differentiated manner. Leading companies will seek to enhance their reputation by making their due contribution to society's response, whereas many companies will wait for legislation to force them to change operating practices.

ACCESS TO RAW MATERIALS

The mining industry requires continued access to land for exploration and production. Individual mineral deposits have a finite life and the resources are not renewable, but society continues to need minerals. Improved recycling will meet an increasing portion of this need, but economic development in less developed countries is likely to more than offset this trend.

Mining uses small areas of land in relation to the economic value it generates, but historically the area affected by mining development can be large. Seeking access to new land potentially brings conflict with other land-use, including the maintenance of ecosystem services. Like many other industries, impacts of mining often extend beyond the mine itself: water pollution can have effects downstream, air pollution can affect vegetation and soil over entire airsheds, and the secondary development accompanying mining can increase pressure on natural resources around mines beyond their sustainable capacity. These effects are not inevitable. Modern technology, coupled with the best design, construction and management, and overseen by good corporate and national governance structures, can deliver the benefits of mineral development without incurring unacceptable environmental and social impacts.

Mining has traditionally been a high water user, and has typically degraded the quality of significant quantities of water. The MA findings indicate that water – availability, access, quality, cost, and conservation – should be at or near the top of a priority list for immediate action. The mining industry must plan for its rights of access to water to be challenged and even extinguished. This will drive up one of the industry’s operating cost elements and fuel research into minimizing processes that degrade water quality and into cost-effective means of treating polluted water. New mining projects, particularly those in areas already suffering water stress, should be designed to be at worst, neutral in their effect on water resources.

The implications of the MA findings are that governments must take more intervention in favor of conservation land-uses if the worst scenarios are to be avoided. Placing more areas off limits for mining is a decision of society, and the mining industry may not seek to challenge it at a global level. The mining industry is exploring ways to integrate mineral development with biodiversity conservation, water management and all other actual and potential resource uses into a regional assessment and decision-making framework. This will lead to the recognition of more “No Go” areas where conservation objectives override development opportunities. But it will primarily be governments that will implement changes related to siting, and there is ample scope for differences of approach in the countries of a region to create distortions in a way that does not deal fairly with all parts of the industry.

Decisions on access to resources are properly in the hands of governments, which have a range of priorities, both domestic and global, to address. The natural resource sector is seen as a reserve of natural capital, part of which might be transformed into human or social capital through well-planned sustainable development. The challenge for mining, and one which the ICMM and its members have taken up, is to present to governments and their constituencies development opportunities which offer an equitable mix of economic, social and environmental benefits and costs. The MA findings also seek to

address human well-being as a product of the best management of ecosystem services. The convergence of these objectives gives hope that responsible mining can play a full part in helping governments to respond to the MA findings.

NEW BUSINESS OPPORTUNITIES AND PARTNERSHIPS

The mining industry would be an obvious user of new technologies that enable industrial development to have less adverse impacts on and to be less dependent on ecosystem services. Particular areas for opportunity are water and energy efficiency. The industry would seek to take the lead in applications that are sector-specific but would wish to work with others where applications would be equally applicable to many sectors.

In the case of biodiversity, individual companies have formed partnerships with conservation organizations based around work of mutual high priority. Outcomes of these relationships include investment in conservation programs, development of biodiversity management plans on land owned by mining companies, and the participation of both parties in mainstreaming biodiversity in corporate risk management and decision-making processes.

Rio Tinto has had partnerships with BirdLife International, the Royal Botanic Gardens, Kew, Earthwatch, Fauna & Flora International and UNEP-WCMC since 2001; in all cases following a period of discussion and engagement. These relationships have undoubtedly raised the awareness of biodiversity as a business issue and have led to an enhanced capacity in the company to make a contribution to conservation. The ICMM has been working with IUCN since 2002 in a Dialogue designed to raise the level of performance in biodiversity management in leading companies in the mining industry. For its part, ICMM is keen to work on joint initiatives that will clarify the conditions of access to land for mining and to encourage rigorous, transparent and equitable assessments and decision-making processes on land use options. For more information see www.iucn.org/themes/business/mining/.

OPERATIONAL IMPACTS AND EFFICIENCIES

As access to and regulation of ecosystem services becomes tighter, mining companies can expect to find it increasingly difficult to secure access to land, energy and water resources, as noted above. This will drive changes in operating efficiencies in the use of these resources as well as discouraging projects and existing operations that are unable to minimize, for either technical or economic reasons or a combination, their use of ecosystem services.

Similarly, regulators acting in response to MA findings will progressively target the impacts of projects and operations on the quality and available quantity of ecosystem services that are available for use by others.

As extreme weather events related to climate change become more likely, mining operations, many of which are located in remote areas of the tropical and subtropical zones of the world, will be increasingly at risk of disruptions in production. Insuring against this risk will become more expensive, if impossible. The impact on profitability could be significant.

Recruitment and retention of highly skilled staff will be more difficult, as mine sites become less attractive places to raise families. Changing disease patterns will also affect the health impacts on productivity, recruitment and cost for mine workforces. Regional social and political tensions, many of which relate to competition over ecosystem services, will increasingly make security of mines and their employees more difficult and more expensive to deliver.

These pressures on the human element of the mining process may drive a change to more automated, capital-intensive forms of mining but this would not solve the problem. Higher capital costs draw attention to the risks and safety of project sites, and high-tech operations depend more on recruitment and retention of highly skilled staff.

CASE EXAMPLES

See the following case studies:

- WBCSD/IUCN/Earthwatch Business & Biodiversity publication 2002 (www.wbcsd.org)
- ICMM/IUCN Gland workshop on Mining and Biodiversity Best Practice July 2003 (www.iucn.org)
- ICME/World Heritage Centre Gland workshop on World Heritage and mining 2000 (www.icmm.com)
- WBCSD publication on water case studies (www.wbcsd.org)
- MMSD final report and Biodiversity publication (www.iied.org/mmsd)

OIL & GAS SECTOR

Authored by *the International Petroleum Industry Environmental Conservation Association and International Association of Oil and Gas Producers Biodiversity Working Group*

One of the key challenges facing society in development today is the access to and provision of affordable energy. Global demand for energy is expected to grow by 60% between 2002 and 2030. It is recognized that oil and gas will continue to be an important part of the fuel mix required to meet this energy demand.

The oil and gas industry spans multiple business sectors from the upstream exploration and production, midstream (processing and transport) to downstream refining and marketing of hydrocarbon products. The findings of the Millennium Ecosystem Assessment are relevant to each of these sectors. The industry, and in particular the upstream sector, operates in many different environments from desert to rainforest, arctic tundra to urban areas and plains to oceans. Industry leaders have acknowledged for some time that every environment is sensitive to operations in some way and that due care must be exercised in conducting those operations. Indeed, since 1974, industry forums such as the International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Association of Oil and Gas Producers (OGP) have examined the potential operational impacts of the industry in a variety of operational environments and produced good practice guidelines for those operations. The value of ecosystems and their services is recognized by industry leaders who are paying close attention to environmental issues such as biodiversity and freshwater amongst others.

At the same time, industry recognizes that it faces a number of challenges relating to impacts on, and management and use of, resources addressed by the MA. These include issues relating to access to raw materials (such as water), access to sensitive ecosystems for responsible oil and gas development, further reduction and prevention of operational impacts and improved efficiencies, and protection of brand and reputation. These challenges also present opportunities for the companies to find new and more effective ways to manage their operations, protect the environment, engage with stakeholders, meet evolving societal expectations, and improve overall business performance.

ACCESS TO RAW MATERIALS

Of the raw materials used by the industry the one that is probably most pertinent to the MA is water.

The oil and gas industry is dependent on fresh water as a resource and is concerned about its quality and cost. Oil and gas companies use fresh water for steam generation in processing, as a raw material in both crude oil production and petrochemical manufacture, for cooling and washing, and finally for its workforces. Some facilities can use thousands of tons per day. Industry leaders also understand the important role this resource plays in human well being and have programs to reduce consumption, recycle and reuse water where possible, and limit pollutants returned to the environment.

Many water issues (both pollution and supply) are local and can be addressed on a local basis through plans, community and stakeholder dialogue, partnerships, and specific

projects to capture, conserve, and ensure the purity of water supplies. However, the oil and gas industry understands the global/regional nature of clean water scarcity and contributes to the development of knowledge and resources through research, new technologies, and partnerships with other water users and NGOs. Future constraints on the use of fresh water, or the need to convert non-potable or saline water (such as deep groundwater or sea water) to fresh water have the potential to significantly increase operational costs. Technological advances will be key to increasing water-use efficiency and controlling water-related costs.

NEW BUSINESS OPPORTUNITIES AND PARTNERSHIPS

The findings of the MA are critical to the exploration and production sector where location of infrastructure is constrained by that of the resource. The industry extracts a resource that for most part cannot be recycled and it relies on access to new land or marine areas in order to explore and develop new resources.

Governments decide when and where to permit development activities and must consider a number of competing concerns. The issues raised by the MA illustrate that societal choices about viable uses of these land or marine areas will become more complex and critical. In some cases, the choice may be to exclude the possibility of oil and gas exploitation. However, this would not be necessary in many cases. The oil and gas industry continues to apply and develop technology and practices that provide for the development of oil and gas resources with minimal disturbance to local ecosystems.

The challenges to industry in continuing to ensure access to sensitive ecosystems in the future will lie mainly in providing assurance that it can prevent major incidents such as large oil spills and also in recognizing and mitigating the potential for cumulative and secondary impacts. These latter two are not the sole responsibility of the oil and gas industry. In most cases, government or communities should have the lead role, supported by industry and NGOs. Whatever the case, the oil and gas industry's involvement in the planning process is essential to ensure that its investments are sound and sustainable. The ability to engage with other stakeholders, to agree on relative responsibilities and to form partnerships to resolve issues where development, either directly or indirectly, may put valuable ecosystem services at risk will become a growing contributor to successful oil and gas development.

OPERATIONAL IMPACTS AND EFFICIENCIES

The direct operational impacts of the oil and gas industry have been extensively studied both by industry and others and are well known. The international oil and gas industry has sought to identify ways that increase efficiencies and reduce the environmental impacts of its activities. The industry has produced good practice guidance both for particular sources of impact, such as atmospheric emissions, as well as for operating in sensitive environments.

Complementary to this, developments in technology designed to improve business efficiency have had the benefit also of reducing the footprint of the industry. Improvements in drilling technology, waste management, and facilities design and layout have reduced overall environmental impact.

The issues raised by the MA suggest that the significance of operational impacts and efficiencies may evolve as pressure on resources increases and once common features of the environment become scarcer due to the pressure of human development generally. Such an evolution will promote the search for new technologies and operational practices that further reduce impacts and improve operational efficiencies.

REPUTATION AND BRAND RISK

As awareness of the issues addressed by the MA grows more generally amongst the industry's stakeholders, there will be an increasing likelihood that industry response to these issues will reflect on reputation and brand. The industry members of IPIECA and OGP seek to understand the concerns of those stakeholders through engagement and then to seek ways to respond to those concerns. One factor that is becoming increasingly apparent is that the industry's reputation in this area can be affected significantly by developments that lie outside of its control. Relevant to the MA findings, issues under governmental control such as land use planning, infrastructure development, distribution of income, and social welfare, as well as societal impacts enabled by, but not immediately a result of, the oil and gas operation itself may result in a negative view of the industry. In addition to establishing a record of sound environmental performance, the ability of the industry to recognize these factors and engage with government and civil society to tackle them will be key to the industry's reputation in the future.

Historical practices and incidents such as large oil spills have served to produce a lower environmental reputation for the oil and gas industry than is currently deserved. The MA provides an opportunity for the oil and gas industry to improve its reputation through positive action, communication, effective partnering, and self-improvement in the areas addressed by the MA.

To date, MA issues have not much influenced stakeholder preference amongst companies. There are signs that this is starting to change with, for example, socially responsible investment analysts and, to a lesser extent, mainstream analysts now assessing company's risk profile and performance in relation to biodiversity issues. In countries where employment opportunities are diverse, reputation in this area is increasingly a factor in attracting and retaining employees. It can be expected also that as governments around the world increasingly appreciate the value of the ecosystem services within their countries, they will seek development that not only gives them the energy and revenues they require, but that also poses least threat to the value of the ecosystem in which that development takes place. Such an aspiration would open up the possibility of a differentiation amongst companies based on their demonstrated ability to deliver both goals.

ENERGY/UTILITIES

Authored by Kristie Ebi, *Exponent Health Group*

Addressing tomorrow's electricity requirements will involve numerous stakeholders; interconnected ecological, legal, technical, and financial issues; and security concerns. The information generated in the process of conducting the MA can be used to further the development of the models needed to inform energy related policy-making at the local and national level.

Approximately 1.6 billion people in the developing world have little or no access to electricity. The benchmark for electric service has been established at 1000 kWh of electricity per person per year. This benchmark reflects basic personal needs for lighting, communication, entertainment, water, and refrigeration, as well as the electricity embedded in the local production of agriculture and other goods and services. Achieving global electrification by 2050, at a minimum level of 1000 kWh (kilowatt hours) per person per year, will require bringing electricity to 100 million new users every year for the next 50 years, which is projected to require 10,000 GW (gigawatts) of global generating capacity, or three times the current level. This is about twice the current rate of electrification.

Increasing the supply of electricity will require an integrated understanding of the infrastructure required for electricity generation, transmission, and distribution; land use; commercial, industrial, residential, and agricultural practices; habitat and indigenous species; environmental regulations; and climate change issues. The MA provides a resource for this integrated understanding.

ACCESS TO RAW MATERIALS

Almost every large electricity generation station uses water, either for cooling (thermoelectric) or for driving turbines (hydroelectric). Increasing competition for water will constrain its future use for power generation. Information from the MA can be used to aid the electricity industry in identifying approaches to resolving freshwater availability. Greatly improved integration of electricity production and water use, treatment, and recycling will help communities reduce water consumption and provide essential services at lower costs in ways that protect and enhance aquatic ecosystems. The MA can be used in the development and implementation of standards to protect water quality.

NEW BUSINESS OPPORTUNITIES AND PARTNERSHIPS

Society is attempting to resolve the historic conflict between energy use and environmental impact through mechanisms such as the United Nations Framework Convention on Climate Change. An area of growing interest is carbon storage through land use change and forestry. Article 3 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change includes afforestation, reforestation, and deforestation as activities that qualify for determination of compliance with Annex B Parties' commitments, and establishes the framework for inclusion of additional activities related to "removal by sinks in the agricultural soils and the land-use change and forestry categories"

Current estimates of carbon sinks do not consider the economic value of current land uses and management practices, and do not project the future potential for emissions reduction markets. Science-based tools and methods are needed for the evaluation and formulation of carbon strategies, and for the design and implementation of practical near-term projects. Private companies in collaboration with environmental NGOs have begun to fill that need by measuring and monitoring the carbon stored in land-use change and forestry projects. The information synthesized in the MA can inform those activities, and the MA scenarios can be used to project how drivers of ecosystem change may affect future carbon storage.

OPERATIONAL IMPACTS AND EFFICIENCIES

The MA can be used to improve operational efficiencies by better understanding of ecosystem trends. Electric utilities own and manage hundreds of thousands of acres of land in the United States. The majority of that lies in the right-of-way lands and buffer zones around their facilities. Electric utilities also own undeveloped, and often wooded, lands surrounding reservoirs and dams. As a consequence, utilities have active land management programs that often include tree planting, vegetation control, timber management, and fisheries and wildlife protection. Trees and other vegetation must be properly maintained, including the use of herbicides, to avoid causing interruptions of electric service. In the United States, utilities have worked with the Environmental Protection Agency to develop integrated vegetation management plans that aim to minimize overall risks to humans and the environment while providing safe and reliable electric service. These programs are designed to protect wildlife, groundwater, surface water, soils, utility customers and workers, and the general public. Power line rights-of-way are used as migration corridors for a wide-range of species. They also create border habitats necessary for many birds and small mammals. Land and waters owned by utility companies often serve as wildlife and wildflower preserves that are protected from development. Many tracts of land have been opened to local, state, and federal agencies for use as parks, wildlife refuges, game management areas, and natural sanctuaries.

Reference

EPRI. 2003. Electricity Technology Roadmap: Meeting the Critical Challenges of the 21st Century. 2003 Summary and Synthesis. Product 1010929. EPRI, Palo Alto, CA.

FORESTRY

Authored by John Ehrmann, *Meridian Institute* and James Griffiths, *World Business Council for Sustainable Development*

Ecosystems and the services they provide are very important for those businesses operating in the forestry sector to understand. A wide range of services from water supply and quality, to soil formation to spiritual values are fundamental to the ability of forestry-based businesses to operate and supply people with the goods and services they have come to expect and demand from this sector. The MA provides a rich source of fundamental information and insights for those in forestry sector businesses to access and understand.

KEY MA FINDINGS OF IMPORTANCE TO THE FORESTRY SECTOR

1. *Ecosystem Services is a concept broader than biodiversity, which can provide a useful framework for the forestry sector to incorporate in its strategic planning and assessment activities.* The large forest product companies and a number of their associations and networks have been placing an increasing amount of attention in recent years on the concept of biodiversity and its importance to their business (*The Forests Dialogue on forests and biodiversity conservation, October 2003*). This increased appreciation for the value and complexity of global biodiversity has been extremely helpful in providing a focus for building awareness and influencing corporate decision-making.

While the MA dedicates significant focus to trends and potential response options related to biodiversity (*See MA Biodiversity Synthesis report*), it points out that changes in biodiversity have both immediate consequences for the supply of ecosystem services and long-term consequences for the resilience and sustainability of those services. The MA explores a broad range of services in addition to biodiversity that are important to forestry-sector based industries. These include fresh water, nutrient cycling, soil formation, provision of timber and wood fiber, and aesthetic and inspirational values.

The MA places people as part of ecosystems, not separate from them. This does not mean that there are not critically important issues regarding the negative impacts that people can have on ecosystem services. However, it also provides a conceptual approach to understanding and valuing ecosystems that is much broader and more robust than approaches that limit the range of services for which ecosystems are valued by society. Businesses based upon the forestry sector need to gain an understanding of the full range of ecosystem services to achieve long term sustainability.

2. *There are opportunities for the forestry sector to explore the development of new markets, based on the potential to market a broader range of value-added services through the preservation and strengthening of certain ecosystem services.* Forested lands provide support for a wide range of ecosystem services including purification and supply enhancement for freshwater, species habitat, carbon sequestration, and soil stabilization and maintenance. The MA concludes that market mechanisms can be created that capture the economic values of ecosystems and provide conservation incentives. It is also important to note, however, that poorly designed market-mechanisms can lead to serious degradation in ecosystem services over the long-term.

While there are challenges regarding the establishment of markets for these services, the concept of establishing markets for the values associated with forest lands is clearly worth exploring as a new and potentially profitable opportunity.

3. *Businesses that rely on the forestry sector should understand the changing resource management policy environment that is emerging in response to the changing value people place on traditional natural resources (like timber) and the growing value being placed on other ecosystem services (water supply, recreation, cultural services).* The MA concludes that the proportionate contribution of ecosystem services to conventional Gross Domestic Product (GDP) is declining as the relative importance of traditional natural resource sectors such as agriculture, forestry and fisheries is reduced. However, decline in these sectors is partially offset by increased contributions from other ecosystem services. For example, in some areas the value of water from forested ecosystems near urban populations can exceed the value of timber that could be harvested from those ecosystems.

These changes in the relative value of ecosystem services, as well as the influence of other drivers such as population growth and increased understanding of the potential for ecological degradation resulting from poor practices, has led to a more rigorous regulatory environment for forestry operations. This trend is likely to continue given the combined affect of increased understanding regarding the degradation of ecosystems and the increased relative value being placed on ecosystem services other than that which is realized through traditional resource extraction.

4. *Forest products companies should be aware of the wide range of policy and management tools affecting ecosystem services which exist and have been applied to the industry, at both the local and global scales.* The MA notes that local responses to problems in access and use of forest products have proliferated in recent years and are collectively more significant than efforts led by governments or international processes. It is also noted, however, that these local approaches require support of governments by way of national level enabling institutions and this is not always forthcoming.

The MA also found that public and consumer action has resulted in some important forest and trade policy initiatives that have led to improved practices in some large forest based corporations. Forest certification has become widespread in many countries and forest conditions, though the majority of certified forest are in the North, managed by large companies and exporting to Northern retailers. Around 3.5% of the world's forests are now certified (190 million hectares) accounting for nearly 17% of annual industrial roundwood production (585 million cubic meters).

5. *The emphasis that the forestry sector, particularly the multinational companies, has placed on establishing partnerships and stakeholder forums should be maintained and strengthened where possible.* An example of the adoption of this approach is the work of The World Business Council for Sustainable Development (WBCSD). The WBCSD initiated a global multi-stakeholder assessment of the pulp and paper industry in 1994 and in cooperation with the International Institute for Environment and Development (IIED), in 1996 published *Toward and Sustainable Paper Cycle*. Since that time WBCSD, WWF International, the World Resources Institute, The World Bank, and IIED jointly formed The Forests Dialogue, located at Yale University. This process is building stakeholder

alliances to jointly address sustainable forest management challenges – including forest certification, combating illegal logging and definitions and management objectives for high conservation forests and intensive forestry, and forestry and poverty alleviation. The MA emphasizes the fact that actions designed to affect ecosystem services and their interactions with people need to be tailored to the specific social and environmental context which exists.

Over the last 10 years the level of stakeholder engagement – including local communities, social and environmental NGOs – by forestry companies has expanded significantly in response to changing government permitting requirements, forest certification process and company level corporate social responsibility and sustainability reporting initiatives. Partnerships based on positive engagement between companies and environmental groups are becoming more common place and this trend should continue.

TOURISM AND VOLUNTARY ENVIRONMENTAL CERTIFICATION: THE CASE OF COSTA RICA

Authored by Jorge Rivera, *George Washington University*

Costa Rica is one of the best examples of a country that has become a popular tourist destination thanks to its political stability and an extensive system of national parks and reserves that covers about 20% of the country's territory. In 2003, more than 1.25 million tourists visited the country, a four fold increase since 1987 (ICT, 2004). This extraordinary rate of growth has made tourism the largest sector of the Costa Rican economy. During the 1990s more than one third of the foreign direct investment to the country, about \$1.2 billion, was devoted to establishing hotels and related businesses (Rivera, 1998). Currently, about 2200 hotels are operating in the country. Remarkably, more than 75 percent of these hotels did not exist in the mid 1980s (INCAE 2002). Most hotels are small, offer basic services, compete based on price, and are located close to national parks and beaches (Rivera, 2002).

The growth in the number of tourists and hotels has, nevertheless, generated detrimental effects on the environment. For example, hotel growth is associated with landscape and wetland alteration, deforestation of buffer zones, pollution of rivers, lakes and beaches, and changes in wildlife behavior (Rivera, 2004; Boo, 1990).

THIRD-PARTY, PERFORMANCE-BASED ENVIRONMENTAL CERTIFICATION FOR HOTELS

Responding to these environmental problems, the Costa Rican government established in 1997 the Certification for Sustainable Tourism program for hotels (CST). The CST is probably the first performance-based voluntary environmental program created by a developing country government. It aims to verify the implementation of beyond compliance environmental practices that are known to be valued by the large percentage of 'green' tourists visiting Costa Rica. The CST program was designed in partnership with local academic institutions, the major hotel trade association, environmental organizations, and hotel managers. Representatives of these groups are also members of the independent National Accreditation Commission that regulates the CST standards and supervises the hotel certification process.

At the beginning of 2002, nearly 200 hotels had decided to enroll in the program and the first 59 have been audited and granted environmental performance ratings. The detailed results of the CST program evaluations are available on the Internet in English, French and Spanish (<http://www.turismo-sostenible.co.cr>). In 2000 the Ministry of Tourism began highlighting the program in its international advertisements aimed at promoting tourism. These advertisements appear in National Geographic, the Discovery Channel, and CNN.

The environmental rating assigned to each CST Certified hotel is determined by independent audits performed by the CST program. These audits measure overall environmental performance based on a scale that grants hotels zero to five 'green leaves' of environmental excellence. The ratings are intended to be similar to traditional quality ratings of hotels, indicated progressively from zero to five stars. The number of 'green leaves' obtained by a hotel is based on its score in four areas of management: (1) management of the physical and biological environment, (2) environmental management

of hotel facilities, (3) guest environmental education, and (4) cooperation with local communities. These general areas are divided into 20 subcategories of environmental management that contain 153 standards.

FACTORS ASSOCIATED WITH PARTICIPATION IN THE CST PROGRAM

Recent statistical assessments of the CST program¹ (Rivera, 2001, 2002, and 2004; Rivera and de Leon 2005) indicate that government monitoring, trade association membership and hotel focus on ‘green’ consumers are significantly related to higher participation in the CST program. This evidence points out how the CST program is complemented by the general regulatory environment, the policy network context, and the competitive dynamic prevailing in the Costa Rican hotel industry. Lack of general government monitoring would greatly reduce participation. Therefore, as predicted by previous literature, traditional mandatory pressures should be seen as a key ingredient to encourage voluntary environmental behavior by firms. A policy network characterized by a history of cooperation between the government and the private sector has encouraged the proactive role of the Chamber of Tourism in promoting the CST program. Most importantly, these regulatory and industry association pressures are exerted in the context of a market with a significant segment of environmentally aware tourists (‘green’ consumers). The absence of this segment of ‘green’ consumers would significantly reduce incentives for participation in the CST program. Hence, it is not surprising that large international chain hotels that serve less environmentally conscious business travelers appear to be less likely to enroll in the program.

CST PROGRAM AND ECONOMIC BENEFITS FOR FIRMS

The bottom line is that CST affiliated hotels with higher levels of environmental performance appear to show a significant association with higher room prices, after controlling for other characteristics such as quality, size, and location. These findings suggest that the CST program is taking advantage of market incentives in the form of price premiums to promote superior environmental performance. Firms that enrolled in the CST with ‘free-riding’ purposes are not gaining significant price premiums. Under the relatively weak regulatory context of Costa Rica, this is a basic condition that has to be fulfilled by the CST to be used as an effective environmental policy instrument.

Voluntary certification initiatives such as the CST have to fulfill specific necessary conditions to avoid ‘free-riding’ behavior and differentially grant price premium benefits to firms with the best environmental performance. First, they have to be controlled by an independent third party. Second, using performance-based standards, they have to provide a clear indication of a firm’s superior environmental performance. Finally, they have to target industries that have a significant segment of ‘green’ consumers. These necessary conditions are met in Costa Rica where: (1) the CST program is controlled by an independent National Accreditation Commission; (2) green leaves of environmental excellence are granted based on adherence to performance-based standards; (3) the hotel industry has a significant segment of ‘green’ consumers.

¹ This statistical analysis involved a recursive two-stage modeling process originally developed by Heckman (1978, 1979) that controls for self-selection bias in the evaluation of voluntary choices. In the first stage a probit regression identifies variables significantly related to participation. In the second stage, ordinary linear regressions model hotels’ price and environmental performance.

PARTICIPATION IN THE CST AND BEYOND COMPLIANCE ENVIRONMENTAL PERFORMANCE

Finally, the results the assessment of the CST suggest that third-party performance-based voluntary programs such as the CST may not work effectively by solely relying on market incentives. Even when including specific environmental performance standards and third party oversight, voluntary initiatives may need to be complemented by government environmental monitoring and normative pressures arising from industry association membership. These two factors appear to be necessary conditions for making the CST program an effective environmental policy instrument for promoting beyond-compliance environmental behavior by companies.

The evidence from the CST program indicates that superior environmental performance of business that adopt voluntary environmental initiatives cannot be taken for granted. As in the case of the CST program, some participants may play a remarkable leadership role in supporting the creation of voluntary environmental programs and displaying some of the highest beyond-compliance environmental performance. However, a significant proportion of participants may also show a more reactive environmental behavior displaying little interest in participating in voluntary programs and/or opportunistically participating in these initiatives without actually intending to improve their environmental management practices.

References

Heckman, J. 1979. Sample selection bias as a specification error. *Econometrica* 47(1):153-161.

Heckman, J. 1978. Dummy endogenous variables in a simultaneous equation system. *Econometrica* 46(6):931-959.

ICT. 2004. *Costa Rican Institute of Tourism: Annual report of statistics, 2003*. San Jose, Costa Rica.

INCAE. 2002. *Tourism in Costa Rica: A competitive challenge*. Costa Rica: Central American Institute of Business Administration (INCAE for its initials in Spanish).

Rivera, J. 1998. *Public private partnerships: The tourism industry in Costa Rica*. In: *Gentry, B. 1998. Private Capital flows and the environment: Lessons from Latin America*. Cheltenham, UK: Edward Elgar Press. Pp. 223-240.

Rivera, J. 2001. Does it pay to be green in the developing world? Participation in Voluntary Environmental Programs and its impact on firm competitive advantage. WashingtonDC: Academy of Management Best Paper Proceedings.

Rivera, J. 2002. Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences*, 35, 333-360.

Rivera, J. 2004. Institutional pressures and voluntary environmental behavior in developing countries: Evidence from Costa Rica. *Society and Natural Resources*, Vol. 17:779-797.

Rivera, J., and de Leon, P. 2005. CEOs and Environmental Performance: Costa Rica's Certification for Sustainable Tourism. *Policy Sciences*, forthcoming.