



# Biodiversity and ecosystem services scaling up business solutions

Company case studies that help achieve global biodiversity targets



wbcSD ecosystems



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# Scale up, speed up and put the sound up



I believe business can help solve today's urgent biodiversity and ecosystem challenges. But what can companies actually do?

The challenges associated with ecosystem degradation and biodiversity loss are huge and complex. As a consequence, there are many different ways to tackle them. The company case studies in this report demonstrate what some businesses are doing. For example, you will read about innovative technologies and products that lessen the impact on our natural resources and help preserve our soil and water systems, about how biodiversity-rich areas have been dedicated to conservation, or how degraded land has been restored and enhanced.

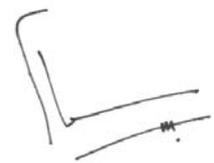
There are three critical elements to success, and I cannot emphasize their importance enough. All of them are highlighted in this collection of case studies:

- 1 Raising awareness and educating companies, as biodiversity and ecosystem services are still very new to most of us;<sup>1</sup>
- 2 Partnering with others, in particular local stakeholders, environmental experts and government regulators; and
- 3 Measuring, monitoring, accounting for, and ultimately reporting on, ecosystem impacts and dependence. This is far from straight-forward, but tools have been developed to help.<sup>2</sup>

Building on our 2010 collection, these new case studies show how companies are positively responding to the global biodiversity targets set by the UN Convention on Biological Diversity (CBD) in 2010 – the so-called “Aichi Targets”. You will see icons on each case study showing which targets have been addressed. They also demonstrate approaches that can be repeated by others, and have significant potential for scaling-up and learning.

Many of our leading member companies have been on a steep learning curve about their ecosystem impact and dependence. Many of them have acted upon these and developed solutions that are illustrated in the following pages. We are moving in the right direction, but there is still more to be done. In order to achieve meaningful and lasting ecosystem benefits, we have to take our actions a step further by:

- **Scaling up** – so that these pockets of innovative actions and solutions have an exponential impact;
- **Speeding up** – so that our positive efforts help catch up with, and then overtake, the rate of ecosystem degradation and biodiversity loss as soon as possible; and
- **Putting the sound up** – so that our solutions are heard loud and clear, can be shared more effectively, and ultimately, inspire others.



**Peter Bakker**  
President WBCSD

<sup>1</sup> WBCSD's Business Ecosystems Training (BET) is a comprehensive capacity building program specifically designed for businesses to increase their understanding of biodiversity and ecosystem-related issues to better manage their impact and dependence.

<sup>2</sup> Key practical tools include the Ecosystem Services Review (ESR) that the World Resources Institute (WRI) developed with the Meridian Institute and the WBCSD; the WBCSD's Guide to Corporate Ecosystem Valuation (CEV), and the WBCSD's Global Water Tool. Work around categorizing and mapping tools is currently being carried out by the WBCSD as well.

# Business, biodiversity and ecosystem services in a nutshell

Business and ecosystems are linked. All businesses affect ecosystems and rely on the critical provisioning services (freshwater, fiber, food) and regulatory services (climate regulation, flood control, water purification, waste treatment) they provide.

However, 60% of the world's ecosystem services have been degraded over the past 50 years. The Economics of Ecosystems and Biodiversity (TEEB) – initiated by the G8+5 environment ministers (2007-2010) – revealed that the costs of ecosystem degradation are huge. For example, US\$ 2 to US\$ 5 trillion in ecosystem services are lost each year, just from deforestation. This scale of loss and value is clearly material to large companies operating globally. In 2005, the United Nations (UN) Convention on Biological Diversity (CBD) set a Biodiversity Target to be reached by 2010, but unfortunately, it was missed. So in 2010, the UN International Year of Biodiversity, the CBD agreed on a new set of targets that were measurable and tangible, called the "Aichi Targets" (see box) and named after the province where the conference took place, in Nagoya, Japan. Also, in recognition of the urgent need for action, the UN General Assembly declared 2011-2020 as the UN Decade for Biodiversity.

Ecosystem change presents both business opportunities and risks, such as operational (e.g. increased scarcity and cost of raw materials), regulatory and legal (e.g. public policies such as taxes and moratoria on extractive activities), reputational (e.g. relationships and image from media and non-governmental organizations), market and product (e.g. consumer preferences) and financing (e.g. availability of capital). For the CBD Conference in 2010, the WBCSD prepared a set of case studies called "*Responding to the Biodiversity Challenge*" demonstrating how business is positively contributing to achieving the CBD's three core objectives. This new report builds on that collection and shows examples of how business is already contributing to the achievement of the Aichi Targets, which are to be reached by 2015 or 2020, depending on the specific target.



# What are the Aichi Targets?

The complete set of targets is listed below.



## Strategic Goal A

Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

### Target 1

By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

### Target 2

By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, and reporting systems, as appropriate.

### Target 3

By 2020, at the latest incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed, in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.

### Target 4

By 2020, at the latest, governments, business and stakeholders at all levels have taken steps to achieve, or have implemented plans for, sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.



## Strategic Goal B

Reduce the direct pressures on biodiversity and promote sustainable use

### Target 5

By 2020, the rate of loss of all natural habitats, including forests, is at least halved and, where feasible, brought

close to zero, and degradation and fragmentation is significantly reduced.

### Target 6

By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species; fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

### Target 7

By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

### Target 8

By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

### Target 9

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

### Target 10

By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.



## Strategic Goal C

improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

### Target 11

By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas

The overarching vision behind the Aichi Targets is:

*“By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.”*

of particular importance for biodiversity and ecosystem services, are conserved, through effectively and equitably managed, ecologically-representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

#### Target 12

By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

#### Target 13

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, (including other socio-economically, as well as culturally valuable species), is maintained, and strategies have been developed and implemented to minimize genetic erosion and safeguard their genetic diversity.



### Strategic Goal D Enhance the benefits to all from biodiversity and ecosystem services

#### Target 14

By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, the poor and vulnerable.

#### Target 15

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

#### Target 16

By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits

Arising from their Utilization is in force and operational, consistent with national legislation.



### Strategic Goal E Enhance implementation through participatory planning, knowledge management and capacity building

#### Target 17

By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

#### Target 18

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

#### Target 19

By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

#### Target 20

By 2020, at the latest, the mobilization of financial resources to effectively implement the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent on resource needs assessments to be developed and reported by Parties.

# On the ground business actions

**11** Company: Michelin  
Country: Spain  
Page 28



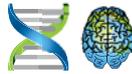
**4** Company: EDP  
Country: Portugal  
Page 14



**20** Company: Syngenta  
Country: Hungary  
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**19** Company: Suncor  
Country: Canada  
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**24** Company: Weyerhaeuser  
Country: USA  
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**6** Company: Fibria  
Country: Brazil  
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**22** Company: Vale  
Country: Brazil  
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**5** Company: Evonik Industries  
Country: Morocco  
Page 16



**10** Company: L'Oréal  
Country: Morocco  
Page 26



**13** Company: Portucel Soporcel Group  
Country: Worldwide  
Page 32



**15** Company: PUMA  
Country: Worldwide  
Page 36



**17** Company: Rio Tinto  
Country: Worldwide  
Page 42



Relevance	Strategic Goal				
	A	B	C	D	E
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+					

18 Company: Shell  
Country: Ireland  
Page 44



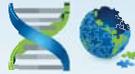
16 Company: Reliance Industries  
Country: India  
Page 40



9 Company: Komatsu  
Country: Japan  
Page 24



3 Company: EDF  
Country: France (Pyrénées)  
Page 12



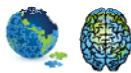
8 Company: Holcim  
Country: India  
Page 22



7 Company: Hitachi Group  
Country: Japan  
Page 20



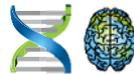
1 Company: Arcelor Mittal  
Country: Liberia  
Page 8



12 Company: Mondi  
Country: South Africa  
Page 30



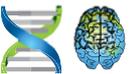
23 Company: Veolia  
Country: Malaysia  
Page 56



2 Company: Chevron  
Country: Australia  
Page 10



14 Company: POSCO  
Country: South Korea  
Page 34



21 Company: UPM  
Country: Worldwide  
Page 52

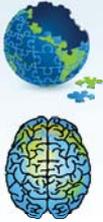


25 CSI WBCSD  
Country: Costa Rica  
Japan, USA, Australia  
Page 60





# Mining in Liberia – Conserving Biodiversity with the Local Community



## The business case

Business impacts on ecosystems can be profound if they are not managed with extreme care. ArcelorMittal has implemented a biodiversity compensation program at its new iron ore mining operations in Liberia’s remote Nimba mountain range, one of the few remaining West African wet-zone forests and home to many unique species of flora and fauna.

ArcelorMittal’s challenge, therefore, was to establish iron ore extracting operations that would also minimize the impact on these special habitats or fragile local livelihoods.

## The issue

ArcelorMittal is the world’s leading steel and mining company, with a presence in more than 60 countries and a workforce of some 260,000 employees. The Group has a world class mining business, with a global portfolio of over 20 mines in operation and under development, and is the world’s 4th largest iron ore producer. In 2011, ArcelorMittal had revenues of US\$ 94 billion and crude steel production of 91.9 million tonnes, representing approximately 6% of world steel output. With operations in over 22 countries, spanning four continents, ArcelorMittal commits to operating in a responsible way with respect to the health, safety and well-being of its employees, contractors and the communities in which it operates. It is also committed to the sustainable management of the environment.

ArcelorMittal’s Liberian mines are set in Nimba County, close to both mountain and lowland rainforest. The great majority of the West African rainforest has now gone, and 40% of what remains is in Liberia. Within this

rainforest a variety of rare and unusual habitat types may be found, and the mountains of Nimba contain good examples of these. Isolated here are several endemic species and a profusion of birds, reptiles, amphibians and insects. Parts of Nimba are generally considered to be in the top five biodiversity hotspots of Africa. In addition to the rich biodiversity of the wet-zone forests, where the iron ore is found, these forests are also an important habitat for small mammals that are an integral part of the diet for local people.

## The response

The company has two main objectives.

- 1 To compensate for the permanent alterations to the environment caused by mining;
- 2 To focus on biodiversity as the environmental issue under greatest threat, and to use this as the catalyst to slow its decline.

To achieve this, ArcelorMittal aims to use some of the wealth derived from the extraction of the area’s mineral resources to establish more sustainable management practices for the region’s natural capital.

The first step was to build a solid basis for informed decision-making, which meant carrying out a large-scale ecological study over several years in both wet and dry seasons.

ArcelorMittal assembled a large team of specialists and partners from Liberia and other neighboring countries, including the Liberian Forestry Development Authority, Conservation International, Fauna and Flora International, Afrique Nature, Sylvatrop, Wild Chimpanzee Foundation, and Action pour la Conservation de la Biodiversité en Côte d’Ivoire, to study the current state of biodiversity in the region. The company worked in teams, with consultants and specialists from a number of universities, research institutes and museums, to develop as broad an understanding as possible of both the flora and the fauna of the forests.

Apart from the difficulties of working in remote areas of rainforest in different seasons, the main challenge was to clarify the focus for the research, both in terms of taxa (taxonomic group of any rank, such as a species, family or class) and geography.

Managing public perceptions is difficult in the mining industry. It was widely considered that mining would either “destroy the forest” through mismanagement, or that ArcelorMittal would provide the capital for widespread jobs and development throughout the region. Gaining trust and a sense of proportion among stakeholders has taken several years to achieve.

### The results

The ecological studies confirmed high levels of biodiversity in the forests close to the mine sites. ArcelorMittal has had the opportunity not only to mitigate damage from mining, but also to start reversing a trend of long-term degradation and decline caused by a history of logging, agriculture and previous mining operations. The company is now working to mitigate its impacts on the mining-affected ecosystems, and consequently people’s livelihoods, at every stage of the development project, leveraging the multi-stakeholder consultation that it is leading. This is the objective of the biodiversity conservation program that has been run by ArcelorMittal since mid-2011.

One of the results of the initial stages of the program was the establishment of an energetic local stakeholder group, which brought together the different government organizations and NGOs working in the area with community representatives. This group helped the government make conservation a priority in this area, rather than commercial logging. This was achieved by making a formal proposal to the government to drop plans to designate part of the forest for commercial activity, and to begin a strategy of developing community-based conservation. The group also helped ArcelorMittal design its offset program to compensate for the land lost to mining. The result was a commitment by ArcelorMittal to an annual budget of at least half a million dollars per year, during its four-year mining start-up phase, to be dedicated entirely to the biodiversity conservation program.

The aim of this program is to develop activities that enable the communities using the forests to derive benefits from conservation, rather than from the traditional and sometimes more destructive use of forests. Support is being given to raising the awareness



of forest values among the communities, and to establishing effective forest management practices for community forest-user groups. The program is also working to increase the uptake of more effective agricultural practices, and is supporting the setting-up of conservation agreements and capacity building initiatives in local organizations, with a view to creating a long-term financing mechanism for further conservation activities. In the first year, three memoranda of understanding have been signed with government, community groups and NGOs. These form the basis of the program’s interventions and activities. The emphasis is on helping participants determine their long-term needs, and providing support and assistance.

These actions towards biodiversity conservation are helping the company demonstrate to government authorities that it puts Liberia’s future and its development high among its priorities. ArcelorMittal’s support for the biodiversity conservation program is also a key part of the compensation process for local communities that rely on the existing ecosystems for a number of services that it provides.

ArcelorMittal has long-term mining plans for the area. For this reason, the company has taken its responsibility seriously and identified a significant opportunity to have long-term impact, as well as to make a demonstrable contribution to the sustainable development of Nimba. Although it is too early to assess its success, ArcelorMittal’s biodiversity conservation program is already a well-established part of Nimba forest conservation activities.

#### FURTHER INFORMATION

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# Quarantine Management on Barrow Island



Barrow Island euros



## The business case

The eradication of non-indigenous species (NIS) can require many millions of dollars and years to achieve. Globally, non-indigenous species are one of the greatest environmental challenges of the 21<sup>st</sup> century, because they can cause significant biodiversity loss and degradation of ecosystem function, which in turn can erode economic potential in agriculture, forestry, fisheries and other business sectors. Recognizing these risks, as well as the vast range of environmental, health, social and cultural benefits that are derived from biodiversity conservation, Chevron strives to avoid or reduce the negative impacts that its operations may pose to sensitive species, habitats and ecosystems.

## The issue

In 2009, the Chevron-operated Gorgon Project received approval for the development of the Greater Gorgon Area gas fields, Australia's largest known offshore gas resource. The project is being constructed on Barrow Island, which was set aside as a Class A Nature Reserve in 1910 and which is home to a variety of rare native flora and fauna. It is home to 24 endemic species of mammal, reptile, bird and subterranean fauna. Species of high conservation value include the Barrow Island subspecies of the black-flanked rock-wallaby, boodie, spectacled hare-wallaby, euro, golden bandicoot and the white-winged fairy wren, among others (Department of Environment and Conservation (DEC), 2012). The level of mobilization of personnel, along with the enormous amount of goods, materials and equipment being transported from the

mainland, has meant there is a great challenge in preventing the introduction of non-indigenous species to Barrow Island. The Western Australian government acknowledged this great challenge, referring to the threat of introducing NIS as a potentially "fatal flaw" of the original development proposal (according to a 2003 report by the Australian Environmental Protection Authority).

## The response

Chevron developed a robust Quarantine Management System (QMS), with "zero tolerance" for introductions. The QMS was the result of a comprehensive process that included benchmarking against international quarantine programs, the creation of an independent Quarantine Expert Panel, and extensive consultation with community and government stakeholders. The detailed analysis of threats, pathways and preventive barriers, design of surveillance for early detection of NIS, and contingency planning for incident response and eradication, resulted in a QMS that is considered by the Western Australian Environmental Protection Authority "likely to be world's best practice" (according to a 2009 report by the Australian Environmental Protection Authority).

As the world's largest non-government quarantine initiative, the QMS sets new standards to address quarantine management at pre-border (before goods and personnel reach the island) locations, at the border (on arrival at Barrow Island) and at post-border (outside the development site) locations. It also calls for the implementation of design and procedural innovations, including:

- Unique quarantine designs for buildings, containers and trailers, to reduce the risk of contamination and facilitate cleaning and inspection.
- Shrink wrapping non-containerized / crated cargo, to prevent cross-contamination during transit and storage.

The QMS is now enshrined in the government conditions of approval for the Gorgon Project, which require ongoing involvement of an independent Quarantine Expert Panel and the presence of officers from the Western Australian Department of Environment and

Conservation (DEC) on Barrow Island, to monitor and report on performance.

### The results

From the commencement of the Gorgon Project in September 2009, quarantine screening has been completed on more than 180,000 passengers and over 660,000 metric tons of freight. In addition, more than 26,000 employees have received quarantine training specific to their role. One hundred and thirty audits have been completed, to ensure contractors are meeting quarantine obligations and more than 200 quarantine compliant vessels successfully mobilized. All this activity has occurred with zero introduction of non-indigenous species to Barrow Island, or its surrounding waters.

Two dedicated supply bases and two dedicated marine facilities have been established at mainland locations to implement quarantine cleaning, treatment, inspection and storage measures. A fleet of quarantine-compliant road transport vehicles, dedicated marine vessels and aircraft are used to transport people and material to and from Barrow Island. Despite the volume of traffic, there are no known feral animals present on Barrow Island and it is the largest island off the Australian coast that is not infested by the black rat.

The QMS has set the benchmark for offshore island petroleum operations in Australia and, arguably, worldwide. Chevron's custodianship of Barrow Island has been recognized internationally as an example of successful coexistence of industrial activities and biodiversity conservation. Indeed, Barrow Island is now considered a model of environmental management for offshore islands and has already been used as an example by the New Zealand government to establish successful quarantine programs elsewhere. After 45 years of oil production (and principally due to the successful quarantine program), Barrow Island remains one of the most important reserves for mammal conservation in Australia. It supports some species now extinct on Australia's mainland.



Washing quarantine compliant cargo prior to transport, to eliminate wind-borne insects and seeds



Drill rig wrapped after cleaning, to maintain quarantine compliance during transport to Barrow Island

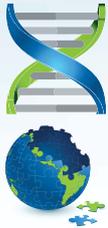
#### FURTHER INFORMATION

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Photo credit EDF- Laurent Vautrin

## Hydropower and Raptor Conservation



### The business case

Since the 1950s, EDF has operated a series of facilities across the entire Pyrenees mountain chain to generate electricity from hydropower, in compliance with tight requirements for human safety, as well as security of assets. The hydropower facilities operated by EDF are fully integrated into the environment, supplying clean and renewable electricity without greenhouse gas emissions. Because of the environmental challenges associated with the operation of its facilities located largely in protected natural areas, the company is particularly careful to manage the potential impacts of its infrastructure and operations on avifauna. EDF works in close collaboration with the French Bird Protection League (LPO, Ligue pour la Protection des Oiseaux) to help the company enhance impact analysis and implement mitigation measures, especially for the lammergeier, or bearded vulture (*Gypaetus barbatus*), and the Egyptian vulture (*Neophron percnopterus*).

### The issue

The EDF Group is an integrated energy company active in generation, transmission and distribution, and energy supply and trading, and is the leading electricity producer in Europe. In France, it has mainly nuclear and hydraulic production facilities where 95% of the electricity output is CO<sub>2</sub>-free.

In the Pyrenees mountain chain in France, EDF operates 101 hydropower plants, 11 of which are located in the midst of areas of high sensitivity for the reproduction of the lammergeier, or bearded vulture (*Gypaetus barbatus*), and five others less than one kilometer away from an area of high biodiversity sensitivity.

A species emblematic of mountainous environments, the lammergeier has been identified as a species of priority interest in Europe, due, in part, to the low number of breeding pairs and the alarming decline of their reproductive success. The birds are especially vulnerable because of their low reproductive rate; they do not start to breed until the age of 7, and only then do so once a year, at most. While the species used to be widespread in all mountain chains of Southern Europe, the distribution area of the lammergeier has been shrinking drastically since the early 19<sup>th</sup> century and is now classified as the most endangered raptor species in Europe, where its population is estimated at less than 140 pairs, three-quarters of which live in the Pyrenees. Successive conservation and reintroduction programs for this species have been implemented since 1986.

Various monitoring programs of the raptors by the LPO have shown that helicopter flights in the vicinity of nesting grounds during the breeding period are a major factor of disturbance and can lead to increased risks of egg predation and failure to reproduce, as frightened birds abandon their brood (an important finding for EDF, since the company uses helicopters for maintenance). The partnership agreement that was forged by EDF to address these threats to this bird species involves regional authorities, including the Regional Department of Environment, Planning and Housing in Aquitaine (Direction Régionale de l'Environnement de l'Aménagement et du Logement – DREAL), and the Bird Protection League (LPO, coordinator of the Lammergeier National Action Plan on behalf of the Ministry of Sustainable Development), jointly with EDF in the Pyrenees Mountains.

### The response

The goal of the initiative is to assess the impact of the operation of EDF's hydroelectric structures on endangered raptors, and to implement impact mitigation

measures. State authorities (DREAL), the LPO and EDF have committed to collaborating in each of the following areas:

- Identification of sites that present a conflict between habitat use by the raptors and EDF hydropower generation;
- Analysis of potential impacts from EDF's hydropower operations and identification of relevant impact mitigation measures;
- Access to and sharing of data;
- Information for, and training of EDF employees about the issues of raptor preservation;
- Establishment and coordination of a joint network of local "raptor operators" and EDF representatives for each site under study.

For five specific sites, the following areas for collaboration have been agreed:

- Preservation of the breeding grounds of the relevant bird(s) of prey;
- Concerted approach on impact mitigation measures;
- Information and training of EDF personnel about the issues of preservation of the relevant bird(s) of prey;
- Appointment of a local "raptor operator" at each site under study, in order to facilitate exchanges with the EDF correspondent for the relevant site;
- Objective cost estimates and feasibility study on mitigation measures and review of their funding.

State authorities and the LPO provide EDF with technical assistance to implement the mitigation measures, and will support EDF's approach to find co-funding to add to its existing funds (EU funding, public or private funds).

One of the challenges encountered was the conflict between maintenance work requiring helicopter transport and the season when the vultures are most sensitive to disturbances. Adjustments in maintenance practices have been required to allow for this. Another key issue has been raising the awareness of the operators and personnel of the potential impact of their work throughout the breeding sites, since many operational

activities can impact on the species (for example, routine operations, such as maintenance of water intakes in the mountain, or other maintenance operations often requiring helicopter flights). Exchange of information on the birds' reproductive status, behavior and nest location, which is an essential element of this awareness-raising, can be constrained because such information is generally confidential.

### The results

A major outcome of this project is the recognition of the need for operators to take into consideration the areas where, and periods when, the vultures are most sensitive when planning management operations, since any disturbance can jeopardize the bird's reproduction. EDF has modified its helicopter transport schedule, in order to avoid flying over highly sensitive areas during the breeding and nesting period. Thus, in the Pyrenees, 11 breeding grounds of high sensitivity for the lammergeier are now protected, thanks to measures implemented by EDF.

The outcome is particularly positive when considering the low number of breeding pairs remaining in the Pyrenees Mountains. The preservation measures initiated by EDF cover 11 nesting sites, accounting for over one-third of the total lammergeier population in the Pyrenees Mountains. A long-term monitoring program for the species is also now planned, to track the status of the species over time.

The major lesson learned from this partnership is that it is possible to reconcile highly diversified challenges such as raptor protection with hydropower generation, but that it requires a strong commitment and engagement of all stakeholders (government, associations, power producers), and that such engagement needs to be sustained over time.

#### FURTHER INFORMATION

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# Using Power Line Management to Control Invasive Species



Figure 1 Pictures illustrating management options



## The business case

EDP has 70,000 km of overhead power lines, of which 8,300 km are inside protected areas for nature conservation. All of these lines have a security corridor where vegetation management practices are in place to guarantee the safety of the electricity grid.

During the development of a *Guide for Good Management Practices in the Safety Corridor of Power Lines*, EDP realized that invasive exotic plant species such as acacia were a problem due to their negative impacts on both ecosystems and also the maintenance costs of safety corridors. These costs increased approximately four-fold in regions where power lines cross areas with these exotic species when compared with the average costs of vegetation management. EDP developed a revised management approach that both reduces the investment costs of management control and contributes to a reduction of the degradation of native ecosystems.

## The issue

EDP – Energias de Portugal's core business is electricity generation and electricity and gas distribution and commercialization. Operating in 11 different countries, including Portugal, Spain, Brazil and the United States, EDP is the third largest player worldwide in renewable energy generation. With more than 12,000 employees, the company's 2011 total revenues were approximately €15 billion.

Vegetation management practices are in place on EDP's power lines to guarantee the safety of the electricity grid. Controlling exotic invasive species such as acacia was considered by EDP and a range of stakeholders to be a challenging issue, due to the high cost but low efficacy of the control techniques. These species of concern are fast-growing and compete with the native species for available resources. Reducing the extent of acacia growth is, therefore, a high priority for biodiversity conservation in Portugal.

For EDP, the higher vegetation management costs result from the increased frequency of vegetation management, because the active control of acacia is only carried out within the margins of the safety corridor, allowing the species to reinvade it from the adjacent areas not managed by EDP.

## The response

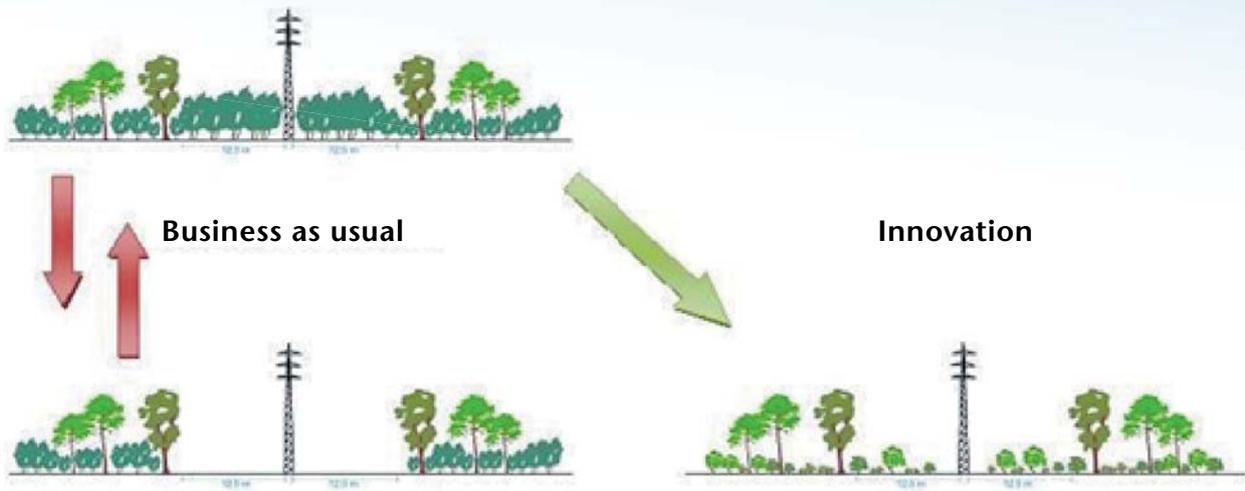
In 2009, the Portuguese Regulator approved an EDP project to design and test a *Guide for Good Management Practices in the Safety Corridor of Power Lines* inside protected areas. The goal was to minimize the impacts on biodiversity through good management practices, tested in several environmental conditions and habitats, and to do it with the approval of national authorities for nature conservation, as well as land owners. A standardized guide would facilitate the licensing and management approaches of contractors, with the ultimate goal of improving local biodiversity.

The initial partnership was established between EDP and the NGO FloraSul for the development of the project actions during the period 2009 - 2011. The innovation processes tested by EDP focused on the selective removal of only the vegetation posing security concerns, and otherwise keeping the native vegetation intact.

## The results

Figures 1 and 2 show that for effective control of these exotic invasive species, some changes to the standard vegetation management practices had to be considered: According to the business-as-usual approach, when acacia was observed in the safety corridor (picture A), it was removed along with all other vegetation (picture

Figure 2 Diagram illustrating two management options



B), without considering the invasive species outside the safety boundaries of the corridor. EDP's innovative approach included the management control of acacia outside the limits of the safety corridor (in cooperation with other stakeholders) and vegetation is cleared selectively, in order to protect native species (picture C).

Some 50 pilot studies were conducted, and more than 240 hectares were subject to testing the five different techniques to eradicate the *Acacia dealbata*, allowing for the observation of the most effective technical solutions for the management of this species, as well as the validation of indicators and monitoring procedures. The results of these data collection initiatives also facilitated the establishment of a comprehensive benchmark for technical information on good management practices.

More than 22 stakeholder groups were involved in the project, which reinforced the quality of the outputs. The interest demonstrated among the different stakeholders also led to the establishment of other formal partnerships with the National Forests Authority, National Parks Service and two universities. A vast number of informal partnerships with other stakeholders were also established, which was one of the major achievements of the project. The Guide was concluded at the end of 2011. A training module is now under development and over the course of 2012 will be used to train approximately 400 people in the new vegetation management techniques.

Prevention is paramount when it comes to vegetation management, so it is important for EDP to identify the locations where invasive species are already spreading within the electricity grid, before the species gets a foothold. It is also essential that the area for intervention be mapped and that this be followed promptly by the identification of stakeholders interested in tackling the same problem.

The safety corridor managed by EDP is used as a link between several stakeholders, promoting coordinated action, increasing the success of the operation and reducing the total cost for all the partners.

During the control process, the regeneration of local native species of shrubs and trees is protected and, in some cases, new native species are planted in order to promote the re-establishment of native vegetation cover. This not only helps reduce biodiversity loss, but also contributes to erosion control and a decrease in wildfires.

EDP concluded that the initial cost of removing acacia in a specific area is greater than the standard maintenance costs, but in the longer term, the approach outlined in the Guide is more cost-effective. The new maintenance approach also offers the possibility of working collaboratively with other interested stakeholders, reducing the investment costs of management and control of this species.

#### FURTHER INFORMATION

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# Use of Organic Synthetic Polymers in Morocco to Improve Reforestation



## The business case

More and more projects are being established that involve the planting of native trees. Some trees can be difficult to transplant successfully, which has led to the demand for solutions to first cultivate seedlings and then transplant the trees in a cost-effective way. Evonik has developed STOCKOSORB®, an organic synthetic polymer that increases the usable water holding capacity of soils and potting mixes on a long-term basis. It is currently being used successfully in agroforestry to enhance the survival rates of transplanted trees and to speed up tree development.

For Evonik, the driver was to investigate whether STOCKOSORB would work in the challenging growth conditions in Morocco, where aridity and poor soil structure limit the successful establishment of young trees, especially Argan trees, which are very difficult to transplant in a successful way. Evonik had to go beyond just providing a commercial product to safeguard the survival of these trees; the company also had to study and develop application rates, planting and application techniques and learn how to run these kinds of projects by partnering with local experts.

## The issue

Evonik, the creative industrial group from Germany, is a world leader in specialty chemicals. Company activities focus on health, nutrition, resource efficiency and globalization. In 2010, about 80% of the group's chemicals sales came from activities where it ranks among the market leaders. Evonik is active in over 100 countries around the world. In fiscal year 2010, more than 34,000 employees generated sales of around €13.3 billion and an operating profit (EBITDA) of about €2.4 billion.

The Argan tree is endemic to Morocco, where its ecological formation covers an area of about 800,000 hectares. The tree has adapted ecologically and now thrives in this harsh environment that includes low rainfall, high temperatures and relatively poor soils. Thus, the Argan forest in Morocco is unique in this region dominated by desert landscapes. The root networks of the trees, and their role in capturing and holding soil moisture can help decrease soil erosion and thus combat desertification. These ecological values of the Argan trees, along with the agroforestry and pastoral values and the traditional uses of the trees by local communities, led to UNESCO establishing the Argan forest as a Biosphere Reserve A in 1998.

The Argan tree is a multi-purpose species: animals eat the leaves, and its fruit contains a valuable oil with a high concentration of unsaturated fatty acids that is used in nutrition and cosmetics, a growing market. The by-products of the oil production (pulp, nuts, cake) also have a variety of uses; for example, the cake can be used as fodder for goats. Its thorny branches are used as fences; the wood is used for construction and as fuel (firewood and charcoal).

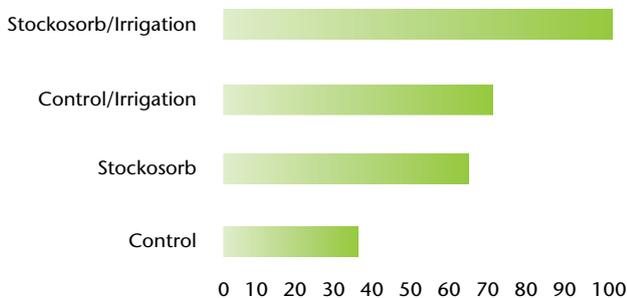
The tree has been used by local people for centuries. However, the land area with Argan trees has shrunk by 50% over the last 100 years. This reduction is typically attributable to intensified land use, and in particular, water-consuming cultivation, such as citrus trees. Despite the significance of their various uses, research to date has shown that it is very difficult to grow Argan trees in nurseries and to successfully transplant seedlings. The survival rates are generally very low, which is proving to be a limiting factor in reforestation activities.

## The response

Together with the Institut Agronomique et Veterinaire Hassan II in Agadir, Morocco, and local partners, Evonik investigated how STOCKOSORB® can improve the survival of Argan seedlings. The project concept was to improve the effectiveness of reforestation with Argan trees in Morocco through the application of STOCKOSORB®, a super-absorber for water retention and release in substrates and soils. In 2009, Evonik did preliminary tests to define the best application rate and application method. The soil was pre-hydrated and mixed with STOCKOSORB® and then Argan seedlings were planted.

## The results

The results demonstrated that by using STOCKOSORB® – even without irrigation - the survival rates increased by 29% to 50%, thus far more effective reforestation rates were reached by pairing Argan trees with STOCKOSORB®



**Figure 1** Survival rates of transplants in % after 5 months, in Taksbit, Morocco, where 337 trees were planted

In the control group, 35%-68% of the trees were dying shortly after planting. This meant that after a certain period trees would need to be replanted, which increases the cost of reforestation. By using STOCKOSORB® with irrigation in this region, a survival rate of more than 90% could be achieved.

The trial also showed that irrigation, which is often performed manually, can be omitted, because STOCKOSORB®-treated trees that had not been watered showed similar or better survival rates compared to the irrigated control group without STOCKOSORB®. This

is a very important finding because of the scarcity of water in the area. It shows that by using the polymer and eliminating the irrigation, companies can save 360 liters of water per tree per year, which also reduces water transportation and pumping costs, as well as labor costs.

The project was helped by the fact that the local population is very familiar with Argan cultivation, so there was a high level of participation in their area. This also improved the acceptance of the project, as the local cooperative undertook all the planting and irrigation. Evonik also learned that juvenile Argan trees are particularly sensitive to drought, thus higher rates of STOCKOSORB® application are required to ensure their survival.



### FURTHER INFORMATION

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# Innovation and Biodiversity Conservation



## The business case

As a company that is reliant on forest products, Fibria is committed to developing its business in a sustainable way. More than 35% of the land the company owns is dedicated to conservation purposes. The company is thus aware of the role it plays in the conservation of biodiversity hotspots, particularly in the biomes where its operations are concentrated, namely the Brazilian Atlantic Rainforest, the Cerrado and the Pampas.

## The issue

In recent years, Fibria has established itself as a Brazilian company engaged in sustainable forest management, capable of creating value from renewable resources. With 19,000 employees, the company operates in 254 municipalities in seven states within Brazil. Fibria owns 975,000 hectares of land, of which 352,000 hectares (36%) are dedicated to conservation purposes. The wood is used for pulp production, supplying global demand for high-quality products from certified planted forests. The company's main markets are Europe (42%), North America (25%) and Asia (23%).

Biodiversity degradation is an increasingly widespread phenomenon throughout the world. For years, development processes were incompatible with nature conservation. As humankind gets closer to an ecological tipping point, there is growing onus on business to lead the necessary change. Fibria is an important player in the global pulp market, and because of this, is concerned with biodiversity conservation in Brazil. Fibria's forest plantations are located in three hotspots for conservation: the Brazilian Atlantic Rainforest, the Cerrado and the Pampas. Efforts taken to reduce loss in such endangered biomes are important, but the question remains: how to achieve impacts at scale in the

necessary timeframe and at a cost that is feasible. Fibria is developing biodiversity conservation initiatives and projects to address this challenge.

## The response

Fibria directs its conservation actions in eight thematic areas: wildlife protection, conservation areas, restoration, landscape management, participation in conservation forums, environmental education, biodiversity-community projects, terrestrial and marine monitoring. Its projects and initiatives align with the Aichi Targets, but on a more local scale the company's goals are to:

- Improve forest management in order to reduce negative impacts of operations and increase positive impacts;
- Have a net positive impact by increasing diversity of habitats for species and protecting high conservation value areas;
- Protect endemic, endangered and rare species;
- Mainstream biodiversity conservation in its practices through environmental education and biodiversity-related community projects.

In the past two years, Fibria has run restoration activities over 5,000 hectares of natural habitat, employing innovative forest management practices to maximize ecosystem regeneration: 1) Fibria has sought to mix species of rapid growth with "diversity" species, which aims to enhance ecological function in forest units; 2) Fibria assesses the area for recovery potential, to inform intervention required, and therefore provide estimates of associated costs; 3) Fibria handles succession monitoring, to evaluate the progress of the restoration process. This is the first time these techniques have been used at such a large scale. The lessons learned from its restoration program in the north of Espírito Santo State, South of Bahia and Vale do Paraíba in São Paulo State, which aims to recover 40,000 hectares by 2025, will bring new insights to both landscape management and restoration.

The Sustainable Forest Mosaics initiative is one of Fibria's most important projects. Taking the landscape as a unit of management, the collaboration between companies and non-governmental organizations

(Kimberly Clark, Veracel, Fibria, Suzano and the Instituto BioAtlântica, Conservation International and The Nature Conservancy) represents an opportunity to test collaborative biodiversity conservation. Projects are being combined and optimized to generate more effective and longer-lasting environmental results. Environmental units for biodiversity monitoring were created and the methodology was converged, to drive actions from the different companies toward a common goal. Priority areas for restoration were also identified. Fibria's experience in this initiative will help it to be used in other regions.

"Biodiversity-community" is another thematic area that takes advantage of collaboration. By involving community members, the company generates awareness of biodiversity conservation while helping to reduce degrading pressure. By tying these two concepts together, as shown in the Brazilian Parrot Project outlined below, permanent results are more likely to be achieved.

Addressing these thematic areas requires innovation, which can be difficult to integrate with traditional management tools. Measuring its performance in the traditional way will only tell part of the story. Fibria is working on improving its management capabilities, by evaluating the potential use of ecosystem services valuation techniques in-house. It is working towards the integration of ecosystem service valuation into the decision-making process, which Fibria believes will improve its business model.

## The results

A "biodiversity-community" project, the Brazilian Parrot (*Amazona aestiva*) Project in the state of São Paulo, helped to decrease bird-trafficking. In three years, working alongside the local community, the proportion of nests that were disturbed fell from 95% to 11%. Artificial nests were installed with the help of a bird expert. Environmental education initiatives were developed, with the aim of raising community awareness of this issue, and of increasing the company's capacity to address the problem collaboratively.

As a result, disturbance of nests began to decrease. The concept of using artificial nests was adopted by

the community. Residents installed nests near their houses and now watch over these, which is important in avoiding raids on nests. Fibria's private natural heritage reserves (RPPN) and other preservation areas also play important roles. In 2011, a nature reserve in the state of São Paulo owned by Fibria was considered relevant by ICMBio (the government agency responsible for biodiversity programs) in conserving the southern muriqui (*Brachyteles arachnoides*), a species of spider monkey that is endemic to Brazil. Fibria maintains a partnership with the Pró-Muriqui Association to study this species and provide information on conservation measures to be taken.

Regarding biodiversity monitoring, the number of species identified in Fibria's areas is constantly increasing, revealing the biodiversity importance of landscape mosaics, where forest plantations alternate with native forests.

Owning close to a million hectares of land in Brazil, and after more than 10 years developing biodiversity conservation projects, it has become clear that more environmentally and cost-effective projects are needed. In order to maximize the scale and effectiveness of conservation initiatives, Fibria has decided to set aside 36% of its areas for conservation purposes. As part of this process, it has established a target of restoring 40,000 hectares of degraded land to native forest by 2025, as well as implementing procedures to reduce the operational impacts on biodiversity.

In order to scale-up its conservation initiatives, Fibria is determined to work alongside partners and stakeholders, including communities, with a broad biodiversity conservation planning process and allied initiatives. The Sustainable Forest Mosaics is a prime example of a multi-stakeholder project that should be replicated more broadly. The move toward valuation of ecosystem services that allows for the communication and promotion of biodiversity conservation is promising, but it must evolve as part of a process that influences decision-making.

### FURTHER INFORMATION

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On-board example

## Ballast Water Purification System



### The business case

When the ballast water from ships is discharged, it can negatively impact upon marine ecosystems locally and more widely. To address this problem, the International Maritime Organization (IMO) stipulates that by 2017 all ships must have a ballast water management system on board that meets the agreed standard of ballast water quality. To address this challenge, Hitachi is working to develop a product that treats ballast water in a way that meets the specified international water quality standards and that is also environmentally sensitive. This has provided an opportunity for Hitachi to develop and sell a new product to meet this new and increasing demand, while also providing a solution that helps to conserve marine biodiversity.

### The issue

Founded in 1910, Hitachi Group's main business areas include information and telecommunication systems, power systems, social infrastructure and industrial systems, electronic systems and equipment, construction machinery, high functioning materials and components, automotive systems, components and devices, digital media and consumer products, and financial services. The company had consolidated net sales of 9,665,883 million yen and 323,540 employees in financial year 2011.

Ballast water is sea water that is used to stabilize hull balance when unloading cargo. Sea water contains plankton, bacteria, viruses, mud and sand from the port where the ballast water is taken on. When ballast water that was captured at one port is discharged at another

port, and with it the plankton and other suspended material, it can negatively impact upon marine ecosystems locally and more widely. In recognition of this issue, and in response to water quality standards set by the IMO, Hitachi undertook to develop a new ballast water treatment system that complies with water standards and functions effectively, without harming the marine environment where it is used.

### The response

In 2005, Hitachi began collaborative research with another heavy industry company into the technology for purifying ballast water. The ballast water purification system developed by Hitachi uses a coagulant to bring plankton and bacteria together so that they can then be extracted using magnets (Figures 1 and 2). This system does not cause any environmental damage when it is discharged immediately after purification. Moreover, this method eliminates the remains of dead marine life from the ballast water, making it easier to clean the ship when it is in dock for repairs or inspection.

In developing this product, Hitachi worked with a shipping company that installed the purification system on one of its ships and then tested the system while the vessel was operational and at sea.

### The results

In March 2010, the ClearBallast non-sterilization system developed by Hitachi Plant Technologies became the first system to obtain approval from the Japanese government under the "Guidelines for Approval of Ballast Water Management Systems (G8)" laid down by the IMO. The ClearBallast's coagulation and magnetic separation method is attracting wide attention as an environmentally friendly water purification technology:

- In the biological toxicity tests conducted according to the IMO convention, the water treated by Hitachi's system was confirmed to have no impact on organisms, even if it is discharged without being diluted;
- The system does not use chemicals that are harmful to biodiversity, nor are any harmful by-products generated through the use of the chemicals;
- There are no oxidants included in the additive agents

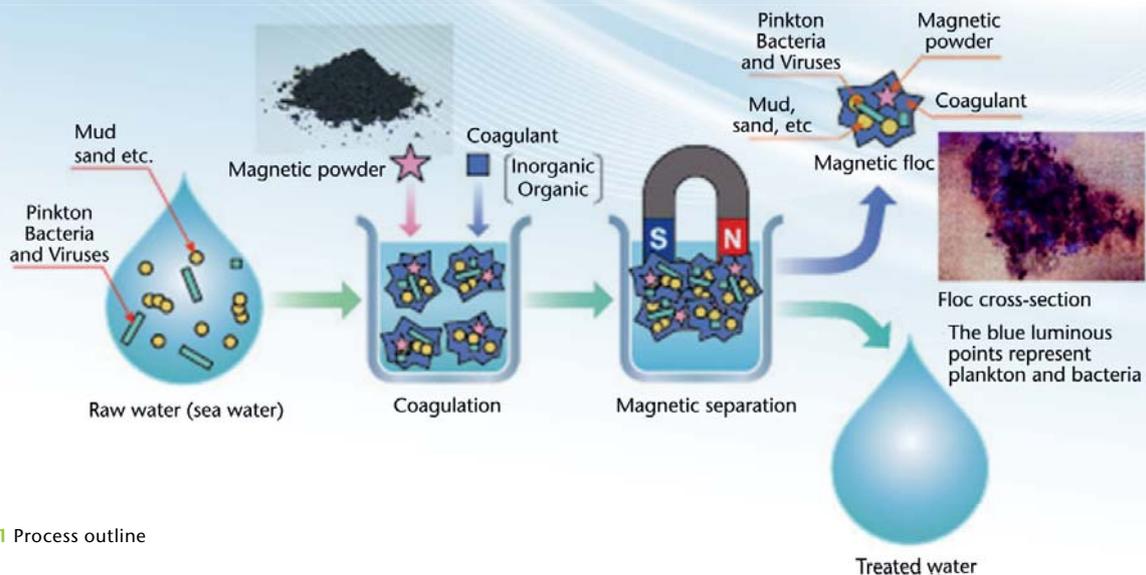


Figure 1 Process outline

used in the system, thus damage to the coatings inside the ballast tank and pipes is not a cause for concern;

- As the ballast water is purified at intake, no treatment is required when discharging the water.

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generated through the use of the chemicals;

- There are no oxidants included in the additive agents used in the system, thus damage to the coatings inside the ballast tank and pipes is not a cause for concern;
- As the ballast water is purified at intake, no treatment is required when discharging the water.

Hitachi is using its expertise to help tackle environmental problems, as well as explore new business opportunities. Keeping track of new global agreements and conventions is an important way to conceive new products that will be needed in the future. An example of this is the IMO rule that all new ships from 2012 must have a ballast water management system on board that meets water quality standards; the rule will apply to all ships from 2017. This provided an opportunity for Hitachi to develop and sell a new product to meet this new and increasing demand, while also providing a solution that helps to conserve marine biodiversity.

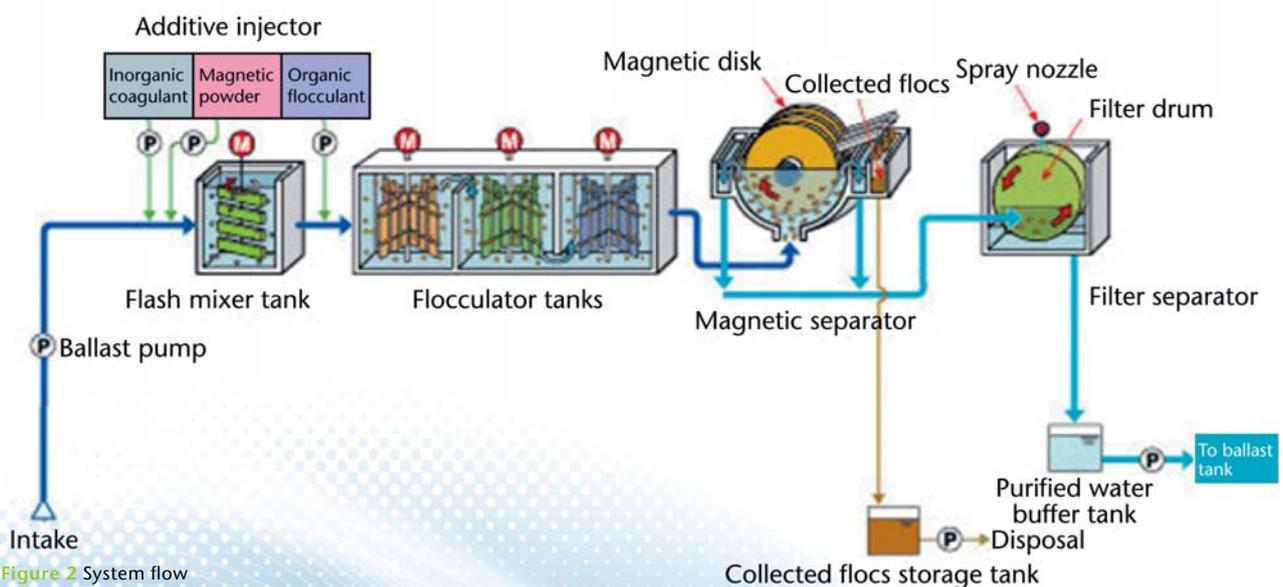


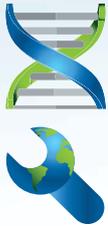
Figure 2 System flow

FURTHER INFORMATION

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# Sustaining the Ecosystem for Water, Wildlife and Community in India



## The business case

Ambuja Cement undertakes rehabilitation activities at all its sites, with the objective of mitigating the impacts from the withdrawal of limestone and water from the area, both of which are required for cement manufacturing. The Ambujanagar plant in Gujarat, located between the Arabian Sea and the Gir Protected Area, restores its mines and surrounding areas to the degree that it has enhanced the region's biodiversity and also helped to address water scarcity and salinity problems in the region. These outcomes have helped the company to strengthen relations with local stakeholders, including villagers and local authorities.

## The issue

Ambuja Cement, a group company of Holcim, is a leading supplier of cement, aggregates and ready-mixed concrete in India. Ambuja employs approximately 4,500 people. The company operates the Ambujanagar cement plant in the Kodinar region of Gujarat, India. The facility has three closed and rehabilitated quarries and six active quarries. To ensure the future availability of the key raw material required for cement (limestone), the plant will be aiming to enhance capacity at some of its other active mines. The Ambujanagar facility is located between the Arabian Sea and the Gir Sanctuary and National Park, which together are a designated protected area. The Gir National Park provides crucial habitat for the last surviving population of the Asiatic lion.

There have been critical problems of freshwater availability in the state of Gujarat since 1970. The area where the cement plant is located is in a Coastal

Regulation Zone. Owing to over-withdrawal of freshwater and intensive land-use in the Kodinar region, there has been marked depletion of the water table and an associated serious increase in water salinity from the ingress of seawater into the water table.

## The response

Considering the ecological sensitivities of the region and needs of the surrounding communities, Ambuja undertook a holistic view of the situation while planning rehabilitation activities in consultation with local communities, natural resource management experts, non-governmental organizations and local authorities.

Ambuja has also adopted a landscape approach in addressing impacts of the quarrying activities. The scope of the rehabilitation activities, has thus been widened to include areas outside the quarries and has focused on the following key issues:

- **Capturing and preserving freshwater:** The Ambuja Cement Foundation, the corporate social responsibility wing of the company, has implemented several measures to improve water management in the area, primarily through rainwater harvesting, and converting the mined-out pits into artificial lakes and wetlands. 165 dams and small barriers have been built to reduce the loss of water through shallow rivers and streams. Other water resource management measures include interlinking rivers and streams, construction of percolation wells, renovation and deepening of ponds and runoff diversion systems.
- **Quarry rehabilitation through tree planting:** As a part of its restoration project, different tree species have been planted as part of the Van Vihar project, the Eco Park Project and the mini Gir project, in the mined-out areas and surrounding zone. Small patches of land are earmarked to grow medicinal plants and fodder-yielding plants. The company is also planning *Jatropha* plantations, which will serve as a source of bio-fuel in coming years.
- **Conserving the flora and fauna of Gir:** Under the "Mini Gir project", a large number of tree species native to the Gir Forest are being planted in the reclaimed mines. The company has also supported

the conservation of the Asiatic lion (*Panthera leo persica*), an endangered species.

- **Protecting coastal zones through mangrove development:** Since 2009, the company's Ambujanagar cement plant and Surat limestone grinding unit have been working with the Gujarat Ecology Commission to develop a mangrove area near Surat. State authorities have given 150 hectares of land to the company for the development of mangrove along the Gujarat Coast through the planting of three native tree species.
- **Sustaining local livelihoods:** Local people are employed in rehabilitation activities such as pit preparation, watering, tree planting, nursery development and construction of water harvesting structures. Simultaneously, to create awareness of medicinal plants, a medicinal herb garden managed by local people has also been developed nearby. Some former pits are reclaimed with fodder cultivation in partnership with local villages, in order to provide feed for cattle. The water management and mangrove plantation projects have also improved the livelihoods of local people by helping to increase agricultural crop yields and fishing yields.

## The results

The water management program has raised the water table by eight meters, controlled the water salinity problem (Fig. 1) and made quality freshwater easily available to the communities.

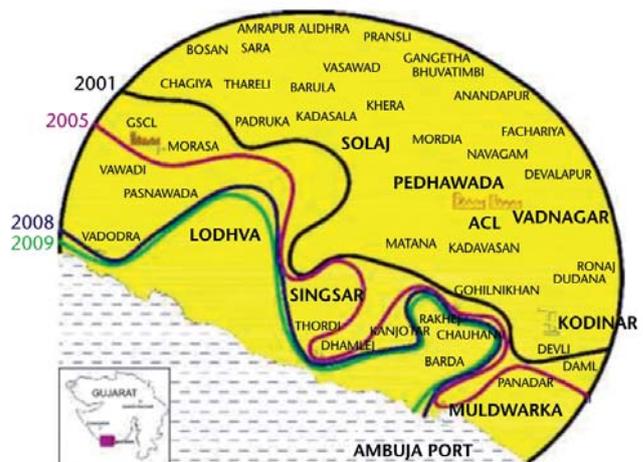
Wells, previously dry for at least seven months a year, now contain water all year round, which has made it possible for local farmers to grow two to three crops per year. Other significant results of the project include:

- By March 2012 the company had rehabilitated approximately 330 hectares of area and planted nearly 275,000 trees. It had also completed some special projects, such as the Mini Gir project, where barren and degraded land near the Gir forest has been planted with native trees;
- Local employment opportunities have been generated through all activities and initiatives with

benefits for the livelihoods of local people;

- Artificially created water reservoirs have enhanced the wildlife of the area, becoming breeding grounds and visiting spots for a large number of migratory birds;
- The fish population has increased and Muger crocodiles (*Crocodylus palustris*) have also been recorded;
- A planting density of 3,000 plants per hectare has been maintained in the mangrove plantation project, which will provide multiple benefits, such as flood protection, supporting marine life and climate regulation.

In 2011, Ambuja Cement achieved its target of becoming water positive. This approach has helped the company strengthen relationships with all local stakeholders, which has guaranteed its license to operate in the future. The Government of Gujarat is exploring implementing similar water harvesting models elsewhere in the state on a large scale, with advice from the Ambuja Cement Foundation. This project has helped to demonstrate the importance of taking into account the needs of the local communities and how they may be affected by the state of the environment and its resources.



**Figure 1** Salinity regression track, 2001-2009. Tracking by Ground Water and Mineral Investigation Consultancy Centre (GWMICC, Jaipur)

### FURTHER INFORMATION

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# Assessing the Ecological Impacts of Heavy Machinery



## The business case

Testing heavy construction machinery, by nature, impacts the environment. Understanding the actual impact this has on biodiversity and ecosystem services is a priority for Komatsu. When the Japan Ministry of Environment started using the *Japan Biodiversity Outlook Report* to inform its efforts to maintain and enhance biodiversity in Japan, Komatsu, along with other Japanese companies, wanted to contribute. The company decided to develop an approach to assess its impacts, and began by pilot-testing it on one of their sites. The motivation for undertaking the project was to find out how much damage the testing activities and development of the test field was having on the environment because the company was considering the development of a new test field area. The ultimate aim is to take measures to reduce impacts for future testing.

hectares. Kyushu is the southernmost and the third largest of four major islands in Japan, all of which are situated in a temperate zone.



The test field area is vital to ensuring the quality of Komatsu's products, in particular hydraulic excavators, bulldozers and dump trucks. Testing is intensive and includes, for example, 1,000 hours of running the equipment on the land to simulate tough work conditions such as mining simulation work, drain construction and road construction. In addition to the physical impacts on the site, testing also inevitably causes considerable vibration and noise disturbance. Komatsu's undertaking of this project was motivated by the need to understand and manage the ecological impacts of the testing activities.

## The issue

Komatsu is a global company working in the area of heavy equipment production and sales in the industrial and manufacturing sectors. The company has an annual revenue of US\$ 24.1 billion (consolidated figure for FY2011), employs over 44,000 people worldwide and operates and distributes in Japan, the US, Brazil, the UK, Germany, Russia, Italy, Czech Republic, Sweden, Indonesia, Thailand, India and China.

The initial biodiversity assessment took place in the testing field in Kyushu, Japan, an area covering 114

## The response

The impact of heavy machinery on the land is inevitable, and for Komatsu, making and selling equipment will remain the priority. Thus the challenge for the company was to think beyond the basic choice between either business-as-usual, or returning the test field back to mountains, and instead consider other alternatives. After participating in seminars and discussions with experts, the company decided to develop a standardized method for the assessment of company impacts.

Specifically, the project set out to determine the biodiversity and ecosystem-related impacts of heavy

machinery operations on the test field area and whether the development of a new test field area under consideration was acceptable. The ultimate aim is to take measures to reduce these impacts for future testing, which would also contribute to efforts of the Japan Ministry of Environment, as described in the *Japan Biodiversity Outlook Report* (JBO). The JBO's aim is to assess the current status of biodiversity loss, so that the government can implement appropriate policies. The assessment covers Japan's total land and marine areas, and includes a comprehensive monitoring of 30 indicators to assess the status of seven different ecosystems.

Six biodiversity experts carried out four assessments throughout the year (one per season). Using a range of monitoring techniques (e.g. direct observation, hand collection, sweeping, camera traps using infrared sensors, bait traps, etc.), they monitored a broad range of species in the field, including insects, plants, mammals, birds and amphibians. Endangered species are found mostly around the downstream basin of the test field area.

Staff members carrying out the testing also helped to create Satoyama, a 1.28-hectare mixed habitat ideal for insects, plants and birds, by clearing the underbrush and engaging in tree-thinning. In order to continue to protect the biodiversity in the test field area, manuals developed by specialists indicating the kind of protection activities appropriate for the area are now being distributed to employees.

## The results

The assessment demonstrated that despite the company's activities, a significant number of species were found on the site – over 800 species of flora and fauna were identified, including some endangered species. The same one-year assessment is being carried out for a potential new 15-hectare test field area currently under consideration, and the results to date indicate that the impact of company activities is lower than for the original pilot. The new test field area is adjacent to the current test field area and it consists of reforested *Cryptomeria* and *Hinoki cypress*.

From a company perspective, this project demonstrated that employee and senior management buy-in is

critical in order to make a project a success. The project highlighted the importance of balancing the company's innovation drive with ensuring that production and operations do not impact on the natural environment upon which it relies. Raising awareness among employees about the company's impacts, and about its impact mitigation measures, are important parts of achieving that balance. Komatsu recognizes that it is at the beginning of a steep learning curve, and will continue to develop and refine strategies that mitigate company impacts on the natural environments in which it operates.



### FURTHER INFORMATION

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## Responsible Sourcing of Argan Oil



### The business case

Respecting, protecting and valuing biodiversity are the cornerstones of L'Oréal's worldwide policy of sustainable sourcing. In fact, L'Oréal was among the first companies worldwide to commit to operating in full respect of the principles of the Convention on Biological Diversity.

L'Oréal believes that:

- Biodiversity and ecosystems, when diverse and resilient, offer vast potential for innovation (e.g. novel raw materials, bio-inspired processes) and are highly valued by consumers, especially when located in biodiversity-rich countries;
- Sustainable sourcing of biodiversity is a powerful lever for social inclusion in its operations areas, by creating shared value along supply chains;

- The notion of "shared value" extends beyond direct financial contribution or compensation, and can include knowledge transfer, training or logistical support.

The development of any product innovation by L'Oréal must be preceded by a thorough sourcing investigation in the country from which the products are derived, especially where ingredients are sourced directly from nature. This policy led L'Oréal to formalize and document best practices designed to improve the livelihoods of local people involved in extracting the raw natural materials, while also ensuring the cosmetic market is supplied with high-quality products.

### The issue

L'Oréal is a world leading cosmetics company, originally created in 1909 in Paris, France, that recorded €20.3 billion in consolidated sales in 2011. It employs 68,900 people in 130 countries and operates 42 factories and 63 warehouses around the world. In 2011, the company invested approximately €721 million in product research. The company's brand portfolio of 27 global brands encompasses five areas of expertise: hair care, hair color, skincare, make up and fragrances.

The Argan tree (*Argania spinosa* (L.) Skeels) is endemic to southern Morocco, largely found on the Sous plain bordering the Sahara desert. It is the second largest forest ecosystem in Morocco, covering about 2% of the country's surface and providing habitat for a wide variety of wildlife species. The Argan forest

ecosystem, threatened by over-exploitation, soil erosion, desertification and changes in agricultural practices, is experiencing an estimated annual decline of 1%. The forest acts as a natural barrier against the advance of the desert and is instrumental in preventing erosion and protecting water resources. As a result, UNESCO classified the Argan forest as a biosphere reserve in 1998. The Argan forest also plays a very strong socioeconomic role, as it represents a major source of income for about 6% of the rural population and up to 90% of the economy in areas of native Argan stands. Argan oil is extracted locally from the kernels of the fruit, which are picked by hand by women from local communities.

### The response

The program for the sustainable sourcing of Argan oil was set up with the objective of ensuring a fair return

to local communities and traceability and quality of raw materials. The program also sought to ensure that Argan oil extraction poses no harm to local biodiversity. An important objective was to agree patent use of raw materials, so that novel uses of the oil were distinguished from traditional uses, and thus access by indigenous communities to Argan oil was not disrupted. L'Oréal actively sought to encourage the local community to seek the autonomy to play a role in the cultivation and extraction of Argan oil.

In Morocco, in close partnership with its supplier BASF and Yamana, a non-governmental organization, L'Oréal established a pioneering tripartite approach to foster corporate social responsibility in the Argan supply chain.

As well as improving quality of life for female workers and their families, the program is contributing to the overall economic and social development of the area. Women in this rural area have increased their financial autonomy, reinforced their decision-making power and improved their social status. Today there are more than 200 women working in six production cooperatives, one extraction and oil facility and 15 preparation cooperatives. The program has also increased community awareness of the value of the Argan ecosystem and provided incentives for its conservation.

### The results

This project only covers approximately 1% of the Argan forest ecosystem, and there is a range of other industrial operations in the area. It is therefore difficult to isolate and assess the overall impact of this program on the conservation of forest biodiversity. However, a more efficient development of cosmetic products from Argan tree leaves and from the cake oil, the observance of strict harvesting guidelines, and the enhanced traceability of raw materials, have led to reduced damage to the Argan trees and better use of local natural resources more generally.

In addition to government efforts to protect the Argan forest ecosystem, the increased market value of products produced from Argan trees has fostered community involvement and ownership of the resource, as well as dramatic changes in behavior. Argan wood is no longer used as charcoal, thus ensuring the conservation of the Argan forest ecosystem.

Finally, the project has helped to secure the recognition and respect of traditional knowledge and has ensured that local communities have ongoing access to the resource. The working conditions of women in the cooperatives have improved through fairer wages and through the establishment of management tools (i.e. technical guides and training). Furthermore, the development of commercial activities related to Argan products with other clients has increased the capacity and revenue building of the cooperatives. This project has allowed the company to develop a new expertise in community-based natural resource management.

Implementing this project has demonstrated that ongoing collaboration with cooperatives is required for compliance with social and environmental practices to be achieved over the long term.

The project has been used as an example of how to establish standards for responsible sourcing of natural ingredients. The development of similar projects using other natural ingredients is already following a similar model as that developed for Argan oil. The program has shown that expectations from stakeholders at the international and local levels can differ. The program also serves as a useful demonstration of the challenges in reconciling the timeframe required for changes in local practices and customs, with the shorter term priorities of an international cosmetic market.

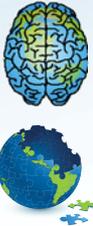


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# Protecting Ecosystems while Testing Tires



## The business case

In order to ensure customer satisfaction and safety, Michelin must evaluate the performance of its products on test tracks. Its *Centre d'Expériences Michelin Almería* (CEMA) experimentation center in Almería, southern Spain, set up in 1973, occupies 4,500 hectares in a beautiful desert area with the lowest rainfall in Europe. Michelin decided to integrate preservation of this area as a core objective of its presence in the region, proving that technology and ecology can go hand-in-hand.

## The issue

Michelin has been constantly innovating to facilitate the mobility of people and goods by developing, manufacturing and selling tires while demonstrating respect for customers, people, shareholders, the environment and facts. In 2011, the company had 115,000 employees and 69 production facilities in 18 countries and produced 184 million tires, sold close to 10 million maps and guides, and helped calculate itineraries through the ViaMichelin website for more than 400 million visits. Marketing and sales operate in more than 170 countries, for a 2011 net sales result of €20.7 billion and a share on the global tire market of 14.8%.

When creating a tire, the model needs to “roll” to ensure that the tire can perform in all conditions. These rolling experiments can be carried out in rolling machines, or on tracks with real vehicles: for this, the CEMA was created to hold controlled trials. Almería has very specific meteorological conditions; in particular, it rains less than 200 millimeters a year. This allows tires to be tested in extreme conditions and therefore ensures better work conditions for experiments. Each year, on more than 100 kilometers of tracks, CEMA's 250 vehicles drive more than 20 million kilometers.

Almería's specific meteorological conditions, while useful to Michelin's experimentations, also led to an exceptional natural environment known as the Cabo de Gata, an old volcanic area on which plants and animals had to adapt to the lack of water. The CEMA, mostly on the mountain and hilly area, is directly impacted by the environmental importance of the area.

## The response

Michelin's objective for the CEMA test site was to build and use an efficient test center while preserving the ecosystems of the site, by incorporating environmental preservation objectives into the daily life of the center and of the trials. Furthermore, when the Andalusia government decided to protect the area (both maritime and terrestrial) through the creation in 1987 of the *Cabo de Gata Parque Natural*, Michelin also decided to work with park authorities to share good practices and ensure the preservation of the area.

As a Michelin site, the CEMA is integrated in the Michelin Environmental Management System, and has been certified ISO 14001 since 2005. However, due to the particular settings of Almería, these internal regulations go further than the company's usual set of environmental objectives.

Following the creation of the *Cabo de Gata Parque Natural* in 1987, Michelin's property was divided into two large areas: 1) 3,000 hectares regrouping the industrial activity with the tracks and the center, which is outside the Park; 2) 1,500 hectares inside the Park, but which remains the property of Michelin. Michelin's role is to protect, preserve, and minimize the impacts in both areas.

Concretely, on test tracks construction and maintenance engineering, directives were voluntarily elaborated to include: green barriers in slopes, channeling pipes for rainwater, filtration tanks directing rainwater toward the water table, spraying the grounds. To reduce erosion and desertification – a frequent problem in the area – Michelin: gave proper attention to protected plant species growing in the CEMA; planted shrubs and more than 16,000 trees of 11 different species for reforestation; carried out 200 hectares of earthwork on sloping grounds to slow down the water and prevent gullies, and

built graded terraces in areas of water confluence.

### The results

Almeria has become one of the most important experimentation centers in Europe, and the research activity is functioning as well as planned. Impacts of the activity are minimized as much as possible. The CEMA will benefit from the company's research projects aimed to reduce emissions and waste. The environmental aspect of the CEMA is internally recognized and supported by the employees, and preservation of the area is effectively an objective of the management. Michelin's work in Almeria to preserve biodiversity is regularly recognized by the government and the academic world.

Working hand-in-hand with local authorities – even before the formal convention in 1995 – helped Michelin recognize the important balance between industrial and environmental activities. Since the CEMA has been voluntarily involved in environmental preservation ever since the beginning of its activities in Almeria, the authorities also value Michelin's understanding of the area and respect its expertise.



#### FURTHER INFORMATION

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# Discovering the Ecosystem Value of Ecological Networks in Developed Landscapes



Rhino in front of Mondi plantation



## The business case

High-yielding commercial forestry plantations provide the sustainable raw material for Mondi's pulp mill in South Africa. The implementation of Forest Stewardship Council – FSC™ – certification and New Generation Plantation (NGP) principles have minimized the impact of these plantations on biodiversity and freshwater systems, but careful mitigation of these impacts is required. Ecological networks are proving to be an important mitigation factor. As part of a commitment to land and freshwater stewardship, Mondi is demonstrating responsible practices to its stakeholders because securing access to sustainable fiber is fundamental to its business.

## The issue

Mondi is an international paper and packaging group with operations across 28 countries. The Group's key operations are located in central Europe, Russia and South Africa. Mondi is fully integrated across the paper and packaging process, from the growing of wood and the manufacture of pulp and paper (including recycled paper), to the conversion of packaging papers into corrugated packaging, industrial bags and coatings.

Mondi's ecological networks are composed of remnant natural land set aside for the mitigation of any negative effects of intensive land use. These networks consist of large-scale, interconnecting linkages (corridors or stepping-stone patches) and nodes (mini or true nature reserves) that together play an important role in conserving ecological connectivity across the landscape. The networks also create refugia in which organisms can

survive. They help to reduce the isolation of populations or even individuals, thus allowing for gene flow, reducing founder effects (the loss of genetic variation that occurs when a new population is established by a very small number of individuals). Ecological networks also facilitate the recolonization of areas after localized species extinctions. This reduction of isolation and fragmentation helps to prevent ecological degradation in the long term, thereby mitigating further biodiversity loss in a production landscape.

Securing access to sustainable fiber is fundamental to Mondi's business and the responsible management of 307,000 hectares of FSC™ certified land in South Africa, of which 203,000 hectares are commercial forestry plantations, is a company priority. Much of the non-commercial land comprises remnants of natural ecosystems (e.g. wetlands, riparian habitats, grasslands and indigenous forests) that have been set aside. The importance of these remnants to sustaining biodiversity, and for commercial production within the production landscape, is paramount.

Many of the Aichi biodiversity targets can be addressed using ecological networks. For example, these networks can help to ensure ecological function and reduce the effects of habitat fragmentation and they can also provide opportunities to address the underlying causes of biodiversity loss by putting people working in the production landscape in contact with biodiversity. In the production landscape, particularly agricultural and forestry landscapes, ecological networks can contribute to the sustainability of both biodiversity and the crop being produced, at local and regional scales. They can also be used to protect specific natural resources or ecosystem services against pressures; for example, water loss, climate change and alien invasive species, and they can serve to protect individual threatened species.

Despite the substantial potential commercial and biodiversity value of ecological networks, remarkably few have actually been established and managed, with the notable exceptions of the Pan European Ecological Network (PEEN), the Greenways in China and the ecological networks within the commercial timber plantations of South Africa. Research is emerging that demonstrates the add-on conservation value that

ecological networks provide for neighboring protected areas, but further research into the ecological function and processes within the networks is required.

### The response

Mondi has been engaged in supporting the science research into the effective design and management of ecological networks, which is making a significant contribution to land and freshwater stewardship. Mondi's cooperation with researchers at Stellenbosch University on the topic of biodiversity issues in ecological networks spans almost two decades of studies and field experiments on Mondi's land. More recently, three years of intensive research by a team of scientists based at the university has revealed ways in which these networks help to meet a range of the Aichi Targets.

### The results

Contact between people and nature is essential to foster a sense of ownership and respect for biodiversity. South Africa is a country renowned for its large mammal biodiversity, yet many of the poorer and socially disadvantaged people never come into contact with living animals. Some of Mondi's plantations in the northern part of the KwaZulu Natal province are home to a range of large game, including rhino, buffalo, zebra and elephant. This creates opportunities for local forestry

workers to observe these charismatic large mammals. Furthermore, in a country where ecotourism is targeted at the higher income groups, allowing the general public access to these ecological networks will enable more people to experience these animals. The networks also provide opportunities for traditional use of grasslands and wetlands, for purposes such as reed and grass harvesting (to make baskets and thatching) or cattle grazing, allowing the local communities to use land that would normally be closed off to them.

After four years of extensive research in to the value, functioning, design and management of Mondi's ecological networks and the adjacent protected or high conservation areas, the *Mondi Ecological Network Programme* team, based in the Department of Conservation Ecology and Entomology at Stellenbosch University, has developed a multi-taxon database with 29,000 records. This research has been on plants, large mammals, birds and the hyper-sensitive and resource-dependant arthropods. Their conclusions are that ecological networks are effective at conserving biodiversity and ecosystem function, provided they are well designed and managed, to provide good quality habitat. Measuring ecological networks against their ability to contribute to or meet Aichi Targets is a proving to be a very useful way of illustrating the real values of ecological networks in a production landscape.



Giraffes within an Ecological Network on the edge of a Mondi SQF plantation block. Photo credit: Samways /Pyke

#### FURTHER INFORMATION

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## Integrating Biodiversity Conservation into the Forest Management Model



### The business case

Forests represent the primary source of raw material for Portucel Soporcel, and the company firmly believes that well-managed forests and plantations can positively contribute the ecosystem integrity of its forest land.

The company's objectives have been to develop new approaches to forest management that streamline best practices, include concepts for biodiversity conservation and support forest certification requirements. This prompted the development of a systematic methodology to preserve ecosystems, and more specifically to map out zones of special conservation interest, and create action plans to monitor them.

The company's efforts have proven to be valuable in several areas, including, most importantly, contributing to the company's forest certification objectives and adding overall value to the company.

### The issue

The Portucel Soporcel Group manages approximately 120,000 hectares of forest comprised of eucalyptus plantations (around 72%) and also cork oak, pines, other conifers and broad-leaved species, as well as several patches of natural and semi-natural habitats. The diversity and significance of natural values in these areas means that Portucel Soporcel needed a strategy that systematically evaluates, plans and monitors the

conservation value and ecosystem integrity of its forests and plantations.

### The response

With the support of environmental non-governmental organizations and the engagement of multiple stakeholders, the company has been implementing its strategy through afforestation and reforestation projects. The methodologies behind these projects were developed in working groups, which was a valuable way to share expertise and knowledge, even if they were quite time- and resource-intensive.

The process began with an assessment of the natural values of the forests. This included a pre-evaluation of potential impacts and a full survey of habitats, flora and fauna. The result of this effort was the complete mapping of zones of particular conservation value. Based on this mapping exercise and with consideration of the conservation status of different habitats and species, Portucel Soporcel then defined action plans to guide the forest project team and ground staff through the implementation phase and to support the subsequent establishment of relevant monitoring programs.

Examples of practical measures that have been supporting the implementation of the forest strategies include:

- Planting of selected genotypes based on long-term knowledge of their behavior and adaptation to soil type and climate;
- Stakeholder consultation on International Union for Conservation of Nature (IUCN) Red Listed species, a comprehensive inventory of the global conservation status of biological species;
- Identification and preservation of existing valuable habitats and natural/semi-natural vegetation within the plantations;
- Creation of protective buffer zones around water courses or other essential habitat components;
- Preservation and enhancement of wildlife corridors and other connectivity features;
- Promotion of structural diversity through a mosaic

of species, clones, age classes, habitats and naturally or artificially created habitat transition zones (or discontinuity strips);

- Observance of seasonal transitions for optimum alignment with the biological cycles of flora and fauna of concern, in order to minimize negative soil and water impacts and strengthen natural resistance to pests and diseases.

### The results

By the end of 2011, 50% of the company's forest land was covered by a Conservation Action Plan. Approximately 10% of the whole estate, representing about 12,000 hectares, was classified as a "zone of conservation interest".

Management units within these zones of conservation include 43 distinct habitat types that are representative of the protected habitats in the National Network of Protected Areas and the Natura 2000 network for Portugal. Eight of these 43 habitat types are considered priority habitats, including temporary Mediterranean ponds, endemic juniper forests and alluvial forests of ash and alder. Other habitats include dehesas (wooded pastures) with evergreen oak, Mediterranean sclerophyllous forests of cork oak and holm oak, and riparian forests with willow and poplar galleries.

The integration of biodiversity conservation into Portucel Soporcel's forest management model and the development of conservation actions plans has proven to be very valuable; for example, in better understanding the company's biodiversity impact in sensitive areas, raising awareness among employees, protecting areas of special natural value and improving forest plantation management. The focus on biodiversity conservation has also contributed to the achievement of the company's forest certification objectives and has added overall value to the company.



#### FURTHER INFORMATION

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Figure 1: Steel slag marine structure

## Restoring Korean Coastal Ecosystems with the Byproducts of Steelworks



### The business case

Eastern and southern coastal areas of South Korea have been damaged multiple times since the early 1970s. The ocean's ecology has been threatened with declines in marine fauna, leading to a reduction in income from fishing. POSCO has been working with the Research Institute of Science and Technology (RIST) for more than 10 years to restore the marine environment using steel slag, an environmentally safe by-product of its iron and steel-making processes. A successful marine forestation project was implemented for the coast of Geomun Island, near Yeosu, the location of the 2012 EXPO in Korea. Successive projects have achieved great support from local fisheries and the government.

### The issue

POSCO is a world-leading steel company. In 2011, the company achieved KRW 39.2 trillion in sales and KRW 4.2 trillion in operating income. POSCO's global workforce consists of 17,533 employees and its distribution networks support the markets on six continents. POSCO started the construction of an integrated steel mill with an annual capacity of 3 million metric tons in Indonesia, an emerging economy with great growth potential, and has been carrying out similar projects in India and Brazil as well.

Since the first occurrence of reef degradation (i.e. whitening phenomenon) off the coasts of Korea in 1970, the damage has rapidly spread to the eastern coast, southern coast and Jeju Island. Disappearing algae has led to the reduction of fish, abalone and sea

cucumber. The seawater's self-purification capability has declined, further threatening the ocean's ecology as well as fish productivity. Joining the efforts of the Korean government and the National Institute to restore the marine environment, POSCO explored the idea of using iron and steel-making slag to promote marine forestation in damaged areas. Steel slag is an environmentally safe by-product of steel-making and has been widely used in construction, civil engineering and soil fertilization.

### The response

POSCO established a set of strategies and worked with the Research Institute of Industrial Science and Technology (RIST) to restore marine habitat using steel slag. After years of researching, POSCO and RIST developed a steel slag marine structure (fig. 1), Triton, which is made from material with a high proportion of the mineral elements (in particular, iron and calcium) that benefit the marine environment. The Triton fish shelter therefore provides ideal conditions for the growth of seaweed and other sea organisms. Research conducted at the site revealed a seven-fold increase in biomass 18 months after sea forestation by Triton. This was facilitated by the ionized iron, which accelerates the germination and growth of algae spores, while calcium purifies contaminated sediment and water quality.

In November 2000, 179 Triton reefs were installed in 8-13 meter deep fisheries in the coastal area of Geomun Island, to help restore the damaged local marine ecosystem. In 2007, a 0.5 hectare wide slag sea forest was formed in the coastal areas of Pyeongsan, Namhae and Chungjin, Pohang, in cooperation with the Ministry of Maritime Affairs & Fisheries.

POSCO has continued to restore the coastal area of Tongyung and Uljin as a part of a marine afforestation project with the government, and plans to help restore the coast of Jeju Island, one of the most important nature conservation areas in South Korea. In addition, in 2010, POSCO signed a Memorandum of Understanding with the Ministry for Food, Agriculture, Forestry and Fisheries to create an ocean forest to help adapt to climate change and enhance the green growth of business.

Finally, the company has been working with Bogor Agriculture University since 2011 to apply the

technologies of marine forestation to the coast of Indonesia.

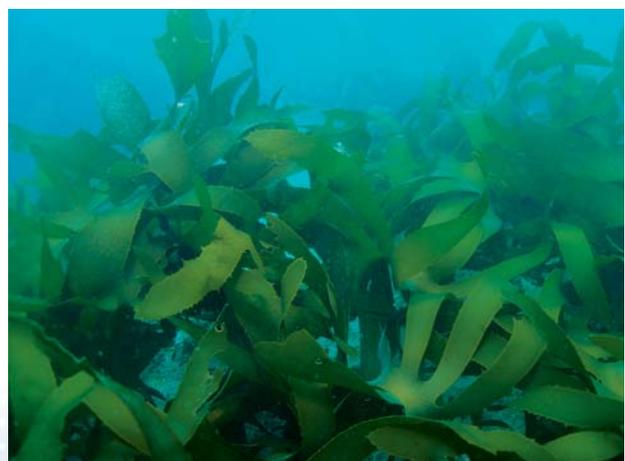
### The results

The company built steel-slag sea forests in over ten coastal areas in the East and South Seas that have proved to be highly effective in terms of enhancing the marine environment for biodiversity. The slag sea forest built in the coastal area of Geomun Island now supports a dense carpet of brown algae. In the coastal area of Pyeongsan, where these sea forests now stand, there has been a dramatic increase in the volume of fish caught in just 18 months, with biomass more than 10 times that in surrounding areas. The number of species of algae around the Ecklonia cava has increased 2.5 times. The area of habitat for shellfish and sea cucumbers has increased too.

A corresponding study carried out by the RIST shows that the marine forests with the Triton structure captured carbon dioxide through slag carbonization and algae photosynthesis at a rate of 0.1 to 0.5 metric tons of CO<sub>2</sub> per year per metric ton of Triton. Finally, the restoration of the marine ecosystem has contributed to the increase of fish productivity and therefore the local economy. Through this initiative, POSCO is showing how by-products from the steel industry can be used in a way that yields positive outcomes for the environment, for communities and for the business itself.



POSCO-Triton reef example



Geomun Island

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## The Environmental Profit & Loss Account



### The business case

PUMA understands the importance of healthy ecosystems to the future of its business and also recognizes that it has to be accountable, ethical and responsible to the environment. Towards the end of 2009, the company embarked on a journey to develop an enterprise and supply chain-wide view of its environmental impacts in monetary terms, so that it could take these impacts into account strategically and embed them in its business decision-making processes. All business operations and supply chains depend on nature for services, such as freshwater, clean air, healthy biodiversity and productive land. PUMA's Environmental Profit and Loss Account (E P&L) is the first attempt to measure the immense value of these services to a business, and the true costs of business impacts on nature, thereby positioning itself to address challenges proactively to minimize risk, hedge against uncertainty, and identify new opportunities to enhance the sustainability of its products.

### The issue

PUMA is a leading sports lifestyle company. It designs and develops footwear, apparel and accessories. PUMA believes that the current economic model, which originated in the industrial revolution, is no longer viable and must give way to a new business paradigm that works with nature, rather than against it. Business

should account for and, ultimately, pay for the cost to nature of doing business. Currently these costs do not hit the financial bottom line, but could easily do so in the future, for example, as a result of new government policy and regulations, environmental activism, consumer demand, growing scarcity of raw materials, or as a direct consequence of escalating environmental degradation.

### The response

PUMA's objective is to identify the true costs of business impacts on nature by placing a monetary value on environmental impacts across its entire supply chain.

The Environmental Profit and Loss Account (E P&L) measures and values both reductions in ecosystem services and increases in environmental impacts that occur as a result of PUMA's operational and supply chain activities.

A comprehensive international search for an existing methodology revealed significant progress in the academic field of environmental economics and ecosystem valuation, many applications in the public sector, and some promising work in the private sector. However, in 2009, no single methodology was found that could deliver the enterprise and supply chain-wide view, of environmental externalities that PUMA sought. Through a tender process, PUMA chose PricewaterhouseCoopers (PwC) and Trucost to support the development of such a methodology, drawing specifically on the environmental economists, non-market valuation specialists and sustainability reporting experts in PwC's Sustainability and Climate Change team, and experts in supply chain metrics and environmental valuation from Trucost.

### The results

Table 1 sets out for the first time in monetary terms the changes in human welfare that result from PUMA's environmental impacts. The top half of the table splits the total impact of €145 million between that attributable to its own operations and each tier of its supply chain. The latter half of the table shows where the impacts occur by key regions and segments.

EUR million	Water use	GHGs	Land use	Other air pollution	Waste	TOTAL	% of total
	33%	33%	25%	7%	2%	100%	
<b>TOTAL</b>	<b>47</b>	<b>47</b>	<b>37</b>	<b>11</b>	<b>3</b>	<b>145</b>	<b>100%</b>
PUMA operations	<1	7	<1	1	<1	8	6%
Tier 1	1	9	<1	1	2	13	9%
Tier 2	4	7	<1	2	1	14	9%
Tier 3	17	7	<1	3	<1	27	19%
Tier 4	25	17	37	4	<1	83	57%
<b>Regional analysis</b>							
Europe / Middle East / Africa	4	8	1	1	<1	14	10%
Americas	2	10	20	3	<1	35	24%
Asia / Pacific	41	29	16	7	3	96	66%
<b>Segments</b>							
Footwear	25	28	34	7	2	96	66%
Apparel	18	14	3	3	1	39	27%
Accessories	4	5	<1	1	<1	10	7%

Table 1 PUMA's E P&L break-down



PUMA's E P&L in the supply chain

PUMA's first-ever 2010 E P&L provided for the first time a view of the environmental impact of producing and selling products. It is difficult to place the overall impact of €145 million in a broader context, as no other business has yet publicly disclosed similar information. However, at €145 million each year, the scale of the impacts is undeniable.

By converting non-financial impacts into monetary terms reflecting impacts on the environment and the concomitant negative effects on society, the E P&L shows which of PUMA's environmental impacts are the greatest and where these impacts occur.

- At €47 million each, its greatest impacts were from the use of water and the generation of greenhouse gas emissions.
- The conversion of land for agriculture for key raw materials such as leather, cotton and rubber was the third most significant impact at €37 million.
- Other air pollution, affecting acid rain and smog, and the impacts of waste were less significant at €11 million and €3 million respectively.

Understanding externalities across operations and supply chains involves identifying where the most material impacts arise, which is crucial when determining where to focus sustainability efforts.

From a narrow business perspective, externalities might be seen as a short-term benefit: Why pay for costs if you don't have to? But they can also be a strong indicator of emerging risk. Government policy, environmental activism, community unrest and the direct consequences of environmental degradation are all means by which the external costs of production can be internalized, often unpredictably and with dramatic consequences for affected companies. Understanding the size and nature of externalities in the supply chain can thus give an early view of potential risks, enabling a business to respond strategically and in good time, and by so doing, protect or enhance shareholder value.

Equally, companies that are able to identify and understand their dependence on natural resources along the value chain are well placed to manage underlying

risk from rising raw material costs, and scarcity of supply issues. Companies are already facing increasing input costs as a result of a changing climate and declining water availability. Through the E P&L, PUMA is positioning itself to address these challenges proactively to minimize risk, hedge against uncertainty, and identify new opportunities to enhance the sustainability of its products.

Today's consumers are largely unaware that negative production externalities are not internalized and that this is why products are cheaper than they should otherwise be; basically, pricing today does not reflect the true environmental cost of production. In the future, an increased ability for consumers to understand the negative environmental impacts associated with production may well influence their purchasing choices. This provides not only a complex challenge for companies, but also a strong impetus, as the world enters a new age of responsible consumerism, one best navigated from a position of knowledge, and best addressed with transparency rather than obfuscation and denial.

The E P&L is:

- **A strategic tool**, highlighting areas of focus for sustainability efforts, while inspiring others to follow;
- **A risk management tool**, allowing the company to identify potential supply chain risks before they crystallize;
- **A transparency tool**, enabling a new and "disruptive" form of disclosure and bringing clarity and openness into dealings with a wide group of stakeholders.

#### FURTHER INFORMATION

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## Converting Wastelands to Green Oases



### The business case

The Reliance Industries Jamnagar oil refinery in Gujarat State on the west coast of India is the largest single location for refining operations globally. The refinery has been running since it was first commissioned in 1999, with its second refinery being commissioned in 2003 when the company acquired additional land for its new operations at the site. The state government requires that around 9% of acquired land be allocated as a "green belt" (i.e. no infrastructure development), but Reliance felt there was a strong business case to allocate an additional percentage of land for this purpose as a way to increase the biodiversity potential of the land.



### The issue

This Gujarat coastline is a semi arid region with no perennial water sources and high wind velocity causing soil erosion. The entire Jamnagar complex, consisting of manufacturing and allied facilities such as utilities and off-sites, port facilities and a township for the employees, occupies more than 3,035 hectares. The land surrounding the refinery at the start of the project was barren, with high salinity and very high pH basaltic rocky and sandy soil. The area has low rainfall (300-500 millimeters per year) providing little irrigation water, and has frequent storms and cyclones that blow away the topsoil.

### The response

As a first step, Reliance decided to work towards avoidance of impacts, began work on a project plan, and set up a horticulture department within the

refinery. After allocating 26 km periphery of land for the biodiversity enhancement project, the first focus was on planting tree species that would provide crops, employment, soil retention, biodiversity, and a green working environment around the refinery, as well as act as wind-breakers. The department then reduced the salinity and pH of the soil using gypsum and elemental sulphur.

Then came the question of irrigation. The government stipulated that the company should not use underground water for irrigation, so Reliance used drip irrigation techniques, reducing water requirements by half. A further 30% of this water was then saved, using black polythene mulching around the planted trees to reduce evaporation of irrigation water. To support irrigation requirements, farm ponds and storm water pond drainage systems were set up for rainwater harvesting.

The majority of land was planted with fruit trees, with teak and other forest trees grown to absorb industrial effluent and casuarina trees to act as wind-breakers. A total of 5.7 million trees were planted on the biodiversity project land, and a further 1.8 million trees on the refinery grounds and in its township. Along the coastline in the actual refinery area, over 1 million mangroves have been planted to improve the coastal ecosystem and aesthetic interest of the area for people arriving at the refinery from the sea.

The main benefits of the actions carried out to enhance biodiversity were:

- Treated effluent water from the refinery could be absorbed by teak trees planted on the land, rather than disposing of the discharged water from the refinery;
- Previously barren land that could not be used for other productive purposes was used for the development of fruit plantations that would increase local biodiversity in a self-financing way;
- Improving biodiversity was a step towards the company's social responsibility agenda in providing employment and livelihoods for villagers around the site;
- The Chairman's vision was to create a non-polluting, eco-friendly and aesthetically pleasing workplace for employees;



- Biomass generated as waste from the plantations could be used as a renewable energy source in the refinery.
- Creating nurseries for raising grafts provided new varieties for farmers.

### The results

Approximately 200 species have been planted and small-scale vermi-composting set up, which have both greatly improved soil fertility. Plantation managers are seeking a gradual transition to organic cultivation, which would eliminate the use of chemical fertilizers and pesticides. These efforts, and the irrigation techniques used, support the success of the agricultural crops in this arid subtropical area. It is also estimated that 5.67 million metric tons of CO<sub>2</sub> per annum is being sequestered by the trees. The project has also generated employment opportunities in the mango plantation for approximately 430 local people. It has also resulted in the development of the largest export-oriented mango orchard in Asia. Enrichment of ecosystems is evidenced by flow of migratory birds and other fauna observed in the area.

The majority of the plantations were completed within eight years of the start of the project. The trees were planted to provide fruit that can be sold and to ensure the biodiversity enhancement of the area in a financially self-sustaining manner. The project provides an example of optimal utilization of land for commercial crops and

efficient usage of scarce water resources. Waste water discharge from the refinery has also been addressed, through the planting of the teak trees. Thus the project helped in creating a zero waste water discharge refinery.

Based on this success, a similar project has been initiated at Nagothane Manufacturing Division near Raigad in the State of Maharashtra, where 550 hectares of land have been enhanced through revegetation with 1.8 million trees and better water management techniques. Reliance aims to share its learnings with other companies in India and in similar climates, and its R&D will further enhance the biodiversity of the area through better planting techniques, soil fertility enhancement, and water management.



#### FURTHER INFORMATION

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## Achieving the Goal of Net Positive Impact on Biodiversity



### The business case

Rio Tinto has exploration projects, new operations and existing sites across the globe where biodiversity conservation issues combined with local community issues present significant challenges. Rio Tinto needs to demonstrate to government and others that it has a process that allows for the pursuit of economic development through resource extraction, while conserving, and even promoting conservation value in the regions in which it has been given license to operate.

### The issue

Rio Tinto is a world leader in finding, mining and processing the Earth's mineral resources. Its interests are diverse both in geography and product, working in some of the world's most difficult terrains and climates. Most of Rio Tinto's assets are in Australia and North America, but it also operates in Europe, South America, Asia and Africa. Its businesses include open pit and underground mines, mills, refineries and smelters, as well as a number of research and service facilities.

For Rio Tinto, achieving a net positive impact (NPI) means ensuring that its presence in a region ultimately has positive effects on biodiversity, outweighing the inevitable disturbances and impacts associated with mining and mineral processing. Rio Tinto's biodiversity target is to achieve an NPI on biodiversity by the time it closes its operations, with a goal to have an NPI as early as possible during the life of the operation.

Rio Tinto aims to find and develop high-value, long-term and low-cost mineral resources. Increasingly, this is being challenged by a growing number of environmental issues, such as climate change, water scarcity and biodiversity conservation. Impacts on biodiversity make mining and processing projects

sensitive for governments, local communities, investors, non-governmental organizations (NGOs) and employees. As the global population moves towards 9 billion by 2050, competition for land-based resources is increasing. Recent development and exploration experiences within the Group have demonstrated that biodiversity conservation issues can present material risk for Rio Tinto. For example:

- QIT Madagascar Minerals (QMM) – Madagascar: The QMM project was required to establish avoidance zones (representing 8% of the overall ilmenite deposit) in order to gain access to the larger resource;
- Oyu Tolgoi – Mongolia: This developing project is required to meet specific biodiversity offset and no-net-loss requirements under the International Finance Corporation's Performance Standard 6 on biodiversity;
- Simandou – Guinea: Community and biodiversity management solutions need to be found regarding Pic de Fon chimpanzee populations on and adjacent to the mining lease.

The growing focus on exploration in developing countries means that there is potential for land-use conflict to become an increasingly significant issue for Rio Tinto.

### The response

Rio Tinto has adopted a biodiversity strategy and NPI goal to address a number of key business risks, including managing the growing issue of land-use conflict and access to resources, as well as meeting its site closure obligations. The strategy and NPI goal provide Rio Tinto with both a performance target – achieving regional conservation gains – as well as a number of bespoke tools, required to help balance the potentially conflicting actions of resource extraction and biodiversity conservation.

The Biodiversity Strategy was adopted in 2004 to manage the threats and opportunities presented by biodiversity and ecosystem service issues. To support the strategy, a series of methodologies and tools has been developed with the input of biodiversity stakeholders, such as Flora and Fauna International, Birdlife International, IUCN, The Biodiversity Consultancy

and Hardner & Gullison – to help Rio Tinto operations identify, plan for and manage biodiversity programs based on the needs of that business, as well as the biodiversity values of the regions in which they operate. Some key tools include:

- **The Group-wide biodiversity values assessment**

This accounts for the biodiversity values of Rio Tinto's land holdings and surrounding areas, and assesses an operation's biodiversity values based on:

- Land in proximity to biodiversity-rich habitats.
- Species of conservation significance.
- Additional site-specific biodiversity values and/or threats.
- The external conservation context.

Operations are classified into "very high", "high" "medium" and "low" biodiversity value groupings. The most recent assessment in 2011 considered 85 operations across the globe, of which 38 were assessed as having very high or high biodiversity values, 33 with moderate values and 14 with low values. Rio Tinto can now map the biodiversity risk profile Group-wide. This enables the company to focus resources and support to operations in the areas of highest biodiversity risk and opportunity.

- **The biodiversity action planning tool**

The Biodiversity Action Plan is the primary way that Rio Tinto evaluates and plans for its NPI programs at an operational level. A step by step process, the Biodiversity Action Plan enables Rio Tinto operations to identify the important biological features both on and off site, understand the impacts and risks that its activities might have on those features, and develop a plan to avoid, mitigate and offset those impacts. The tool links proven conservation management practices with existing operational environmental management systems. It was developed in partnership with Fauna & Flora International (FFI) and rolled out to the Group in 2009.

- **The offset design tool (still in development)**

The use of offsets to compensate for biodiversity loss is now practiced widely and is required by legislation in a number of countries where Rio Tinto operates.

Biodiversity offsets will help Rio Tinto achieve the goal of net positive impact, while meeting legal requirements and maximizing conservation gains.

Rio Tinto is currently piloting offset methodologies at QMM (Madagascar) and Simandou (Guinea), Pilbara Iron (Western Australia) and Oyu Tolgoi (Mongolia).

## The results

The development and implementation of Rio Tinto's biodiversity strategy and NPI commitment has been responsible for the company's number 1 ranking on a number of global performance indicators, including the United Nations Environment Programme Finance Initiative's Natural Capital Initiative global benchmarking project. In addition, Rio Tinto is well-positioned with regard to emerging legislative and policy lender performance standards for biodiversity management and offsetting. This is particularly the case with the new International Finance Corporation's Performance Standard 6 on biodiversity and the Australian Federal Government Environment Protection and Biodiversity Conservation offset requirements.

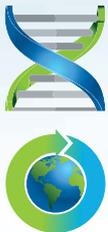
The most significant lesson learned to date relates to the complexity and timescales of successful implementation of the biodiversity strategy and NPI programs on the ground at Rio Tinto projects and operations. The delivery of long-term, viable offsets is a key issue at all sites implementing the biodiversity strategy. In many cases, the solutions needed to achieve successful offset outcomes must be developed from scratch and involve innovative thinking at a site-specific scale. Shortages of appropriate technical resources and expertise, both inside and outside the Group, are a critical issue in moving forward with Rio Tinto biodiversity strategy implementation.

### FURTHER INFORMATION

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# Corrib Paves the Way – A Response that Bears Re-Peating



## The business case

In keeping with a commitment to reinstate land affected by construction for the benefit of natural habitats and wildlife, Shell has found new ways to implement habitat restoration measures and allow heavy equipment to cross soft peatland without compromising its hydrological functions.

## The issue

Shell is a global group of energy and petrochemicals companies with around 90,000 employees in more than 80 countries and territories. Its aim is to meet the energy needs of society in ways that are economically, socially and environmentally viable, now and in the future.

The Corrib natural gas field is located 83 kilometers off the coast of Ireland's County Mayo in the Atlantic Ocean. Gas from the field will be extracted from seabed wells and fed through an offshore pipeline to the landfall. From there, an onshore pipeline will lead to the Bellanaboy Bridge gas reception terminal, approximately nine kilometers inland.

In the early days of consultation with the National Parks and Wildlife Service, the national agency for natural heritage on the Corrib development, Shell committed to reinstate the area affected by construction for the benefit of the natural habitats and wildlife. In keeping with this commitment, Shell needed new solutions to allow heavy equipment to cross the soft peatland without compromising its hydrological functions. If damaged and compacted, peat dries out and degenerates, which releases large amounts of carbon dioxide. Damage can also result in erosion, with damage or even loss of habitat and vegetation cover, also reducing available foraging and refuge for wildlife.

## The response

To mitigate environmental impacts and address the concerns of the local community and Irish planning

board, the final route of the pipeline was modified (Fig. 1). Approximately five kilometers of the pipeline will now run through a tunnel under Sruwaddacon Bay, a sensitive area protected under the EU Habitats Directive and the EU Birds Directive. This will minimize the environmental impact on this important area for overwintering water birds and migrating salmon. The remaining approximately four kilometers of pipeline will be routed through peatland, including 190 meters of blanket bog, that is globally acknowledged as a precious natural resource providing ecological, economic and protective functions. The remaining peatland through which the pipeline will run has already been modified by commercial forestry, but has the potential to be rehabilitated through this project.

The solution is to excavate a wide trench (60 meters) in the peat and replace the excavated peat with a layer of stone, which will also function as a road during construction. A peat and stone matrix will form the basis of the stone road and act as a hydraulic impedance layer between the stone road and the underlying mineral soils. Another trench will then be prepared in the "stone road" into which the pipeline is laid and protected. After construction, the "stone road" will be covered with the original peat and revegetated in a combination of reinstatement, restoration and habitat creation/enhancement measures.

As part of additional impact mitigation, the site for the reception terminal has been built on already modified land that is of low ecological value due to years of artificial drainage, the application of fertilizer and the introduction/planting of non-native species. The terminal sits on land previously used for grassland research and commercial forestry, and is screened by mature trees to reduce the visual impacts.

The design also includes a number of measures to prevent the re-positioned peat from drying out, including the installation of peat plugs to act as vertical barriers within the stone fill, to prevent the road from acting as a drain. A detailed management and monitoring program will ensure these protective measures are effective.

Extensive and long-term surveys, some going back more than ten years, have provided good information on the usage of the area by species of fauna. Likewise, detailed

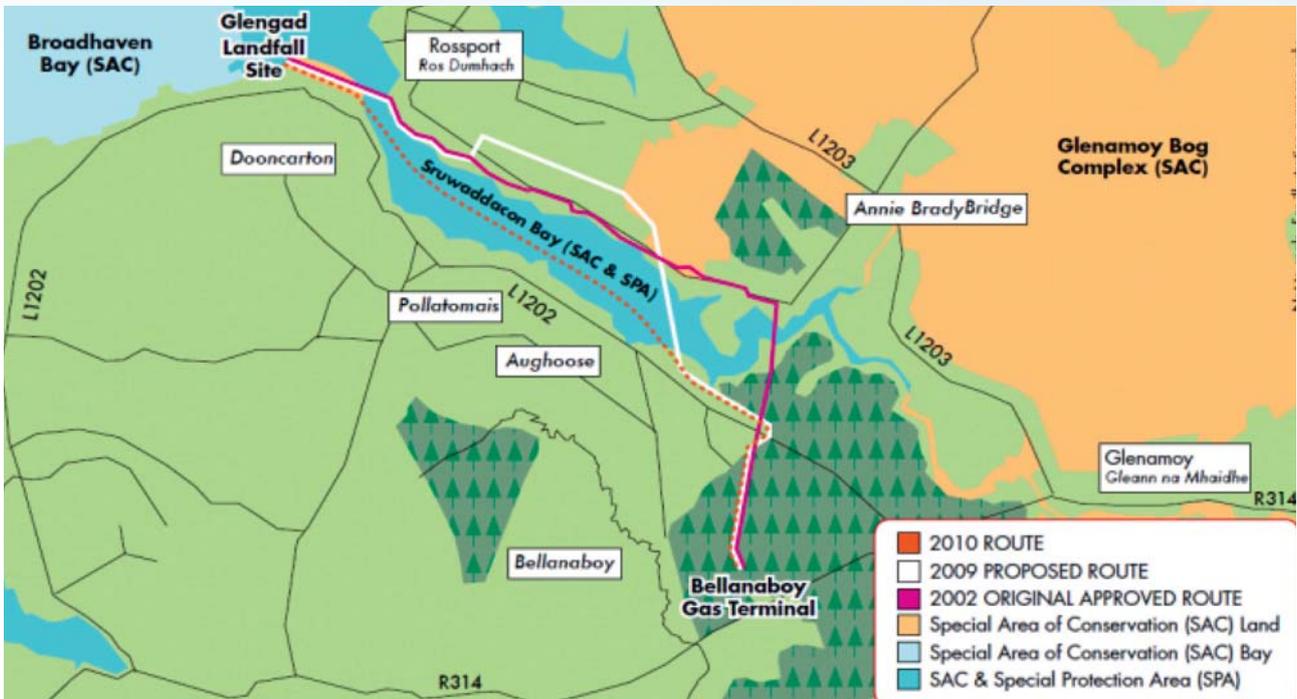


Figure 1: Onshore pipeline route map

baseline information is available on the habitats, including the vegetation structure through which the pipeline will be routed. In addition to ecological surveys and the resulting data gathered, research and trials have been undertaken on the physical environment to demonstrate that the permeability of reworked peat in the peat stone matrix will form an effective impedance layer.

A specialist vegetation working group, consisting of experts in peatland vegetation and its rehabilitation, from industry, academia and professional consultancy, has been established to develop the revegetation plans. In practical terms, the difficulties lie in the detailed planning of a major construction program in peatlands. Many of the challenges are associated with soft ground engineering, water management, the storage of peat, and, in particular, the storage and maintenance of vegetated peat for extended periods.

### The results

Construction of the tunnel under Sruwaddacon Bay will commence in late 2012. The stone road construction is underway with peat being stored, and reinstatement is scheduled for 2014.

Faced with the re-routing of a gas pipeline through peatlands, Shell has found a viable solution to protect and minimize the impact on peat habitats in the areas through which the pipeline will be routed, and the solution may actually have a positive impact on previously modified local areas in terms of biodiversity.

It has been important for Shell to develop solutions in consultation both with the local community, as well as with the statutory bodies responsible for the protection and conservation of natural heritage. This has resulted in innovations in pipeline construction and installation methods in peatlands.

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## Oil Sands Reclamation Progress



### The business case

Energy development disturbs land – there is no way around it. However, the land is not lost forever. Increasing stakeholder expectations surrounding reclamation, in addition to regulatory requirements, support the need for accelerated progress and the development of new reclamation strategies and technologies. Suncor Energy is building on the expertise gained in the surface reclamation of a pond, along with new and developing innovations for managing tailings, to speed up the reclamation of existing tailings ponds. Reclamation progress supports its corporate reputation and enhances the company's social license to operate.

### The issue

Suncor is Canada's premier integrated energy company. Suncor combines a leading position in oil sands with complementary operations in refining and marketing, natural gas production and conventional oil production internationally and off the East Coast of Canada. Suncor's oil sands business unit operates in the Athabasca region of Alberta, located in the Canadian boreal forest. Suncor has assets and operations in Canada, Norway, the United Kingdom, the United States, Syria and Libya. In 2011, Suncor had revenues of more than US\$ 39 billion, total production of 546 million barrels of oil equivalent per day and over 13,000 employees. Suncor pursues a "triple bottom line vision" of sustainable development – it maintains that energy development should occur in a way that provides economic prosperity, promotes social well-being and preserves a healthy environment. As part of Suncor's ongoing commitment to environmental stewardship, the company committed to a series of

strategic environmental performance goals. The target year for these planned improvements is 2015, with a base year of 2007. Doubling reclamation of disturbed land area by 2015 is one of the company's four strategic environmental performance goals. This goal drives continuous improvements in reducing the environmental footprint related to the company's operations.

In order to address the obvious environmental impacts of oil sands mining, the company is committed to ultimately returning all lands disturbed by mining and in situ operations to a natural state, as close to pre-disturbance conditions as possible. Reclamation is not only a regulatory requirement, it is also a key stakeholder expectation that impacts corporate reputation. Oil sands tailings – left over material from mining sites produced during the extraction process that separates bitumen from the oil sands – represent a significant reclamation challenge. Settling or tailings ponds are large engineered dam and dyke systems, designed to contain and settle the water, sand, fine clays silts, residual bitumen and other by-products. When tailings are released into a pond, the heaviest material – mostly sand – settles to the bottom, while water rises to the top. The middle layer, the mature fine tailings (MFT), is made up of fine clay particles suspended in water. Some of these particles settle, but much remains suspended. The challenge is that MFT does not settle within a reasonable timeframe. As a result, Suncor has needed more, and larger, oil sands tailings ponds over the years.

### The response

Prior to the construction of a new mine or in situ facility, Suncor develops a conceptual reclamation plan in consultation with local stakeholders and government regulators. It develops plans for land preparation and ultimate reclamation with respect to land impacted by the in situ operations as well. The Alberta government must approve detailed reclamation plans for all new projects prior to the commencement of construction. Reclamation is a carefully monitored process, with distinct components:

- Transformation of oil sands tailings ponds into solid material that can support vegetation, wildlife and landscape restoration, which includes landform design and soil placement;

- Revegetation in a way that the reclaimed landscape can support vegetation and wildlife as self-sustaining ecosystems.



Summer 2007

### The results

In 2010, Suncor became the first oil sands company to have a tailings pond with a trafficable surface that is solid enough to be actively revegetated and reclaimed. Progressive reclamation is underway and involves monitoring, seeding, fertilizing, tree planting, seed collecting, and topsoil salvaging and replacing. These activities are ultimately transforming the company's 220-hectare Pond 1, established in the 1960s and now named Wapisiw Lookout, into a mixed wood forest and a small wetland, capable of supporting a variety of plants and wildlife.

Reclamation began in 2007 and continues to date. In 2010 alone, over 630,000 native shrubs and trees were planted on the site. So far, 6 tree species, 13 shrub species, 23 riparian and aquatic plant species, and 6 native bunchgrasses have been planted on Wapisiw Lookout. The *Revegetation Manual* (Alberta Environment, 2010) and *Riparian Classification and Reclamation Guide* (Riparian Guide, Geographic Dynamics Corp., 2009) guided the majority of species selection. For example, reclamation planners examined the expected soil moisture and soil nutrient levels across Wapisiw Lookout and assigned "site types" to the different moisture/nutrient regimes. The *Revegetation Manual* provides a list of appropriate tree and shrub species based on the site type for the reclamation

planners to choose from, and recommendations on densities depending on the end land-use type (i.e. forestry, wildlife habitat). The Riparian Guide has a species selection tool that assists reclamation planners in selecting appropriate riparian species for a site, based on predicted soil moisture regimes and salinity regimes in the soils in and around the wetland. Furthermore, some additional aquatic plants were chosen by reclamation staff for the open water portion of the wetland, given their knowledge of common wetland plants that grow in natural wetlands in the region. Additionally, some plants valued by Aboriginal peoples that were not recommended in the guide, but can be found in similar areas in nature, were chosen by reclamation staff for Wapisiw Lookout (i.e. Ratroot, Bog cranberry).



August 2010

In 2010, Suncor erected eight tree swallow boxes, six bat boxes and eight cavity nesting duck boxes around the wetland on Wapisiw Lookout, to improve habitat diversity for wildlife that use wetland and riparian areas. The boxes were built by the Fort McMurray Scouts. A total of 26 bird species, including six of provincial concern (i.e. American kestrel, barn swallow, green-winged teal, northern harrier, northern pintail and sandhill crane), and one bear were detected during formal wildlife monitoring of Wapisiw Wetland during four days in July and September 2011, suggesting there may be more species using the area. A presence/absence study on a bat early colonization suggests that bats are using the bat boxes, potentially as temporary accommodation en route to their main colonies nearby. Suncor plans to expand the

program and investigate species behavior and population size in the near future using acoustic monitoring and cameras. Amphibians were also detected, actively calling in the morning and evenings in spring 2011 around the wetland on Wapisiw Lookout. Based on 2012 data, Suncor also knows that Canadian toads and boreal chorus frogs are using the wetland. Ratroot (*Acorus americanus*) is an aquatic plant that is valued by Aboriginal peoples and is native to wetlands, lakes and streams in the region. It is widely used by Aboriginal peoples as a multi-purpose medicine and is viewed as one of their most culturally significant species. Suncor is funding a research program focused on developing propagation and planting techniques to introduce this species into reclaimed areas. So far, ratroot establishment has been very successful, and is abundant in many parts of the wetland.

Suncor is using the expertise gained to accelerate the reclamation of existing tailings ponds. The achievement also provides a knowledge base and a living example that the entire oil sands industry can build on in the future. And for the first time, Suncor, and the industry, can see a future where it may not need many tailings ponds at all.

By combining research on innovative reclamation methodologies and multi-stakeholder consultations during all stages of its operations, the company is aiming to increase acceptance of its operations and to consequently maintain its social license to operate. The Suncor reclamation team collaborated with foresters, engineers, soil scientists, biologists, traditional land-use experts and others, to transform the sand into forest and wetland. Suncor also worked closely with the nearby communities, government, provincial regulatory agencies, Aboriginal groups in the Wood Buffalo region, and other key stakeholders, to make sure they were aware of the company's activities to reclaim the surface of the pond and to ensure that Suncor was aware of any concerns they may have about the process.

Oil sands reclamation techniques are constantly evolving and improving. Suncor is investing more than US\$ 1.2 billion dollars in the construction of infrastructure to implement its TRO™ tailings management process. The process is expected to significantly improve the speed of tailings reclamation. Its implementation involves converting fluid fine tailings more rapidly into a solid landscape suitable for reclamation. TRO™ technology

development, regulatory approval and commercial implementation have already enabled Suncor to cancel plans for five additional tailings ponds at its existing mine operations. In the years ahead, Suncor expects to reduce the number of tailings ponds at its present oil sands mine site from eight to just one, shrinking the total land covered by the ponds by approximately 80%.

Suncor is a founding member of COSIA, Canada's Oil Sands Innovation Alliance (COSIA), which is focused on accelerating the pace of environmental performance in Canada's oil sands, through collaborative action and innovation. Land and tailings are two COSIA environmental priority areas. Suncor is sharing technology specific to its TRO™ process and other reclamation approaches through this alliance.



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Cover crops between the vines prevent erosion

# Preserving Fertile Soils and Water Systems for Future Farming



## The business case

Syngenta is developing and disseminating Best Management Practices (BMPs) for land and water use that minimize soil erosion and sustain crop productivity. By protecting the valuable topsoil through BMPs, farmers can benefit from fertile soils that continue to be productive. BMPs have also been developed for water quality and efficient water use. These are measures that can easily be deployed on the farm to safeguard the water quality of nearby streams and rivers. BMPs that reduce runoff and erosion can integrate the needs for enhanced environmental protection and improved agricultural productivity. If not carefully managed, runoff and soil erosion threaten not only the productivity of soils, but also the region's water resources, and the company's efforts have reduced soil erosion by up to 75% in some areas, an achievement that is enhancing the company's license to operate, innovate and grow.

## The issue

Land and water are two of the largest limiting factors in food production and environmental quality. With population growth, increasing urbanization, deforestation, soil erosion and water contamination, the pressure on agricultural ecosystems is increasing at an alarming rate. In 1950, one hectare of land was used to feed two people. By 2030, it will have to feed five. Food demand is already outstripping supply in some regions. Farmers are therefore looking for ways to work more productively and sustainably with the land and water available. Syngenta is

developing solutions to help farmers grow more food while ensuring that natural resources are managed sustainably.

Syngenta is one of the world's leading companies, with more than 26,000 employees in some 90 countries dedicated to the purpose: bringing plant potential to life. Through its world-class science, Syngenta aims to deliver integrated sustainable solutions that will transform the way crops are grown around the globe.

Growers are under pressure to increase production. But soil erosion and water contamination can compromise farmland productivity. Around 12 million hectares of agricultural land are lost to soil erosion every year.<sup>1</sup> An area large enough to feed Europe has already been so severely degraded that it cannot produce food, according to the United Nations Environment Programme.<sup>2</sup>

Runoff drives soil erosion. When large volumes of water run off the surface of land, soil, nutrients, and chemical residues wash into waterways, causing sedimentation and nutrient enrichment, and impacting vulnerable ecosystems. Much of this soil is lost as a result of conventional tillage used for weed control. By breaking up and turning the soil, tillage leaves it more vulnerable to erosion and soil is more easily washed off the fields by heavy rain.

Runoff needs to be minimized by introducing practices that improve the structure of the soil and enable water to be absorbed more effectively. Reducing soil erosion helps reduce sedimentation in waterways and keeps valuable soil nutrients as well as fertilizers and other crop inputs in the fields where they belong.

Maintaining the topsoil is especially important because although the layer can be as shallow as 5-20 cm it is a highly fertile and diverse ecological system, undetectable to the human eye. Micro- and Macro-organisms recycle the remains of plants, animals and pesticides and help soil develop over time. At rates of just 0.2 mm a year this process is very slow and makes it an invaluable resource. It provides nutrient and water supply to plants which in turn provide food and clothing for humans, feed for animals, timber for buildings and various other important ecosystem services.

<sup>1</sup> International Fund for Agricultural Development and Global Environment Facility. Agricultural Ecosystems: Facts & trends, World Business Council for Sustainable Development (WBCSD) and International Union for Conservation of Nature (IUCN), July 2008.

<sup>2</sup> [www.unep.org](http://www.unep.org)



Stream before and after growing buffers to prevent soil erosion and reduce run-off. Photo credit: Trees Forever [www.treesforever.com](http://www.treesforever.com)

## The response

The main objective was to develop Best Management Practices (BMPs) that minimize soil erosion and sustain crop productivity. By protecting the valuable topsoil through BMPs such as conservation tillage and the responsible use of pesticides and fertilizers, farmers can benefit from fertile soils that continue to be productive. BMPs have also been developed for water quality and efficient water use; for instance, planting strips of vegetation around fields to act as natural buffers that stop soil and chemical residue run-off to reach waterways. These are measures that can easily be deployed on the farm to safeguard the water quality of nearby streams and rivers.

It is crucial that the BMPs be demonstrated on farms so that farmers, local decision-makers and interest groups can see the importance and effectiveness of BMPs within the agricultural landscape. Demonstration events are important educational tools to raise awareness and transfer knowledge about agricultural technologies and environmental conservation measures.

But demonstrations alone have a limited impact without key supporting factors, such as practical diagnostic and advisory tools that help farmers choose the most appropriate BMPs for their land. Farmers need support and advice on where to plant crops, how to manage buffer vegetation, optimize input use and reduce run-off.

Syngenta has developed a practical tool that simplifies the diagnosis of runoff and erosion risks into different

scenarios. The tool then provides a set of recommended BMPs to address each scenario. It uses a “dashboard” approach, combining key factors, such as distance to surface water, slope and soil permeability and erodibility to determine the local runoff and erosion risk. This way the farmer can easily make a diagnosis in the field, understand its risk profile, and get clear suggestions on how to better manage the land.

The formation of partnerships is important to developing BMPs, particularly in reaching consensus on what works in practice. In order to attain consensus and achieve wider acceptance, Syngenta collaborates with other manufacturers and non-industry partners, for example on the TOPPS-prowadis project, funded by the European Crop Protection Association initiative has been developed to promote best-practice management for the use and application of pesticides in order to protect water resources.

As circumstances can differ considerably from one farm to another, developing BMPs that are valid and implementable across a range of farms is a challenge. Not only do the conditions differ depending on the crops grown, but also on the type of soil, weather conditions, geographical position of the land, and a number of other complex factors, all of which are a part of an agricultural ecosystem. Successful implementation depends on the economic viability of the BMPs. The best BMPs will optimize farm profitability by increasing productivity and protecting ecosystem services.

## The results

BMPs that reduce runoff and erosion can integrate the needs for enhanced environmental protection and improved agricultural productivity. This has been demonstrated in a soil and water conservation site in Hungary near Lake Balaton – the largest lake in Central Europe. The lake is renowned for its beauty and wildlife; its surrounding hilly landscape is covered with rich brown forest soil. This arable landscape is, however, prone to soil erosion, particularly, rills, narrow and shallow slits in topsoil, which develop when soil is weakened by excessive tillage and exposed to intense rainstorms. This project is one of several in the SOWAP Project a soil and water protection initiative with a range of partners from Hungary, Belgium and the UK, co-sponsored by an EU-Life+ program and Syngenta.

If not carefully managed, runoff and soil erosion threaten not only the productivity of these soils, but also the region's water resources. The project is providing practical solutions by demonstrating how to integrate the protection of natural resources with their productive use in the Lake Balaton region. For example, vegetative buffers in fields and conservation tillage both protect soil resources, reducing soil erosion by more than 75%.

Similar results were demonstrated in the ProTerra practical research project, a collaboration on perennial Mediterranean crops sponsored by Syngenta. By planting cover crops between rows of vines and olive trees on pilot farm plots in France, Portugal and Spain, soil erosion was reduced by up to 90% due to the reduced erodibility and improved permeability of the soil.

Syngenta's engagement in efficient land and water use programs has shown that best management practices that optimize crop productivity and soil and water conservation can effectively be implemented on the farm. The wide adoption of such measures requires the inclusion of landscape planning and soil management in comprehensive national and local policy agendas. Based on government monitoring of land use practice, more soil and waterbody protection measures need to be implemented, benefitting the ecosystems and all business sectors depending on their services. Policy makers need to acknowledge that each farm is unique. Effective policies need to allow for local adaptation to integrate

the management of soil, water and biodiversity resources of the fields, by combining agricultural technologies and conservation measures. Above all, policies need to account for the economic viability of the farm. The outcome of good policies will support the optimization of farm profitability by increasing productivity and protecting ecosystem services



Lake Balaton: Vegetative buffers and conservation tillage reduce erosion and run-off

### FURTHER INFORMATION

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# An International Approach to Biodiversity Conservation



## The business case

Forests provide UPM with the company's main raw materials: wood and wood fiber. The company is using forest certification schemes, such as Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI) and Programme for the Enhancement of Forest Certification (PEFC), for its sustainable forest management, but realizes that many consumers do not recognize the forest certification logos or know what they mean, and even when they do recognize the logos, most do not understand the concept of sustainable forest management.

The UPM biodiversity program was developed to meet these challenges directly and to differentiate UPM from other companies with the same accreditation. This approach also helps to promote sustainability issues on all levels of the company. The clear commitment to biodiversity conservation has helped UPM enter markets, maintaining old, and reaching new customers and stakeholders.

## The issue

UPM is the biggest producer of magazine and label paper in the world. In 2011, UPM's sales exceed €10 billion. It has production plants in 16 countries and employs approximately 24,000 people worldwide. UPM shares are listed on the NASDAQ OMX Helsinki stock exchange. UPM owns and manages forests and forestry plantations

in Finland, Uruguay, the US and the UK – totaling 2 million hectares. All areas and operations are certified under one or more of the main forest certification schemes and ISO 14001.

Biodiversity issues have been perceived by many stakeholders as wholly contrary to normal commercial forestry management, but the development of sustainable forest management and its validation through forest certification means that biodiversity conservation can be embedded into sustainable forest management practices.

Sustainable forest management is a complex concept and difficult to communicate to stakeholders and the public. For example, forest certification schemes were developed primarily to promote, regulate and validate sustainable forest management in the world's tropical forests; however, the vast majority of the world's timber and wood supply is from the northern Boreal forests and increasingly from fast growth plantations. Furthermore, forest management practices can vary significantly from region to region, creating diverse business environments and business practices. Consumer expectations can also vary widely depending on the region, and legal specifications and frameworks may be very different from country to country.

## The response

The UPM global biodiversity program provides a cohesive international focus in all the countries where UPM owns or manages forests and plantations. It is centered on six major themes (see box below) that have common significance around the world; each theme is interpreted by the UPM national environment manager in each country. This focus enables UPM to communicate clearly and simply on biodiversity issues, so that forest certification becomes a tool in the wider process of sustainable forest management and not just the end point.

UPM's objective for the Global Biodiversity program is to:

- Embed biodiversity conservation into sustainable forest management practices;
- Communicate the importance of sustainable forest management internally and externally;

Key element	Global target
Native tree species	Maintain and promote native tree species and their natural composition
Deadwood	Manage deadwood quality and quantity to enhance biodiversity
Valuable habitats	Protect valuable habitats and manage them for their biodiversity value
Forest structure	Manage variations in forest structure at landscape and stand level
Water resources	Maintain open water bodies and wetlands, secure high water quality
Natural forests	Implement plans for remnants of natural forests

- Differentiate UPM from other similar companies;
- Maintain and increase biodiversity on UPM land.

Created in 2006, UPM's biodiversity program identified six key elements that are important for forest biodiversity:

A global target has been set for each key element and will be implemented through country-level targets and local action plans. The global targets were implemented on a national level by revising the environmental objectives and targets within the ISO 14001 management system, including specific guidance and instruction for forest management and wood sourcing.

## The results

The biodiversity program has facilitated a number of biodiversity projects, including:

- A three-year project to enhance the habitats (ponds and surroundings) of Great Crested Newt, *Triturus cristatus*, a species protected by the EU species directive;
- A black grouse conservation project run in many locations in the UK;
- The promotion of a native tree species in Uruguay, the Yatay Palm, on company-managed lands;
- Eight years monitoring beetles inhabiting a group of long-term retention trees in Finland.

There were three significant challenges associated with the implementation of this project:

- 1 Standardizing the approach, the key elements and the targets across such a wide geographic area;
- 2 Countering the scepticism that what was perceived as a single approach to biodiversity was required or would work;

- 3 Oversight of the change throughout UPM in different locations and with very different local communication and biodiversity challenges.

UPM's biodiversity program:

- Raised the profile of biodiversity and sustainability in general within UPM;
- Improved biodiversity sustainability communication internally and externally;
- Clarified the value of UPM's environmental reputation with customers;
- Demonstrated UPM's commitment to biodiversity and created a "safe space" for dialogue with critical environmental organizations. Also demonstrated its knowledge and understanding of biodiversity issues;
- Enabled operational UPM managers to understand what the priority biodiversity issues are;
- Reduced pressure against the company lands for forest protection;
- Showed promising monitoring results of the development of biodiversity;
- Showed that while biodiversity loss is a global issue and requires attention at the global level, solutions have to be driven at the local and regional perspective, to ensure realistic approaches and credible targets.

Critical to the success of UPM's approach was the involvement of local experts with their local knowledge to accomplish the overall global objectives. UPM is now engaging with the International Union for Conservation of Nature (IUCN) to continue to develop and support the biodiversity program.

### FURTHER INFORMATION

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# Protecting, Conserving and Valuing Biodiversity in Brazil



## The business case

As an important landowner, it is critical for mining company Vale to extend its responsibility to all the lands it owns, even those that are not meant for mining, as part of its corporate environmental and social responsibility. Vale is therefore engaged in biodiversity conservation initiatives throughout the world and in particular in Brazil, where the hotspot Atlantic Forest is at stake. The initiatives carried out in protected areas aim to enhance and optimize the company's contribution to flora and fauna conservation. From these initiatives, especially the ecosystem services valuation, Vale demonstrates that the costs of maintaining protected areas are actually investments in conservation and maintenance of natural capital. The conservation activities undertaken by the company show that the private sector can act as a protagonist and partner in protecting natural areas and conserving in situ biodiversity. For Vale, this is part of its corporate environmental and social responsibility program and is also aimed at securing its license to operate.

## The issue

Vale, an international player in the field of mining, is the world's largest producer and exporter of iron ore and iron pellets and the second largest diversified mining company in the world. It operates in research,

production and trade of iron, nickel, potassium, manganese, copper concentrate and coal, among other products. Headquartered in Brazil, it operates in several locations on five continents. Vale employs over 180,000 people around the world, including direct employees and contractors.

Vale is committed to reducing its impacts and promoting the sustainability of its operations. It has, for example, incorporated specific requirements for biodiversity management into its Environmental Management System. In 2012, Vale developed a biodiversity norm, proposing the establishment of corporate guidelines and requirements for biodiversity management. These guidelines integrate species and ecosystems conservation into the planning and execution of Vale operations, products and services, to achieve standards of excellence identified for each theme and to promote the sustainable use of natural resources and ecosystem services. However, the company's responsibility is not limited to its mining operations; it also includes the land it owns, as well as their adjacent areas. Vale must therefore protect and restore the land as part of its corporate responsibility, and to strengthen its license to operate in the countries where it is established.

## The response

As part of its commitment to conserving biodiversity, Vale protects almost 13,700 km<sup>2</sup> of natural habitats – nearly 1.4 million hectares – distributed across Brazil and other countries. These areas include sites owned by the company and official conservation units protected in partnership with local government authorities. More specifically, Vale in Brazil carries out protection actions in 56 protected areas (amounting to 12,428 km<sup>2</sup>) – 17 of which are owned by Vale.

The actions carried out by Vale in protected areas can include one or more of the following activities: fire prevention and fire fighting; control of poaching, fishing and collection of other biotic components; and development of scientific research to improve knowledge of local biodiversity. In areas where Vale helps to protect the natural environment through partnerships, the actions are usually aimed at fire prevention and fire fighting, which may or may not be complemented by other activities.

The areas protected by Vale including the Reserva Natural Vale (Vale Natural Reserve), a protected area owned by the company covering some 230 km<sup>2</sup> and located in Espírito Santo state. It is an area of extreme biological importance for Atlantic Forest biodiversity conservation, and was set up by the Brazilian Environmental Ministry as part of the UNESCO Brazilian Discovery Coast World Natural Heritage.

To contribute to a better understanding of local biodiversity, Vale is carrying out research, in partnership with other organizations. These projects have included mapping of flora and fauna, demographic and ecological studies, research into forest dynamics, structure of vegetation, and climate change impacts. In parallel with these research studies, technologies and procedures have been developed for the recovery of degraded areas, the production of seedlings, and environmental education activities.

In 2012, Vale is creating a Center for Research and Education in Biodiversity Conservation, to consolidate the actions developed in Reserva Natural Vale. The center proposes to develop actions for education (technical and scientific courses for undergraduate, graduate and academic extension programs) and research, in partnership with research institutions and non-governmental organizations from Brazil and abroad. Research themes include ecology and conservation of plants and animals; forest management; ecological restoration; formation of multiple-use forests; and carbon storage and climate change.

In the Iron Quadrangle Region of Minas Gerais state, Vale maintains 12 private reserves, totaling almost 70 km<sup>2</sup>. These reserves are located in important biodiversity conservation areas in the transition zone between the Atlantic Forest and Cerrado (the Brazilian savanna). Vale currently has proposals to create five new conservation areas and to expand two other existing reserves, representing an increase of 50 km<sup>2</sup> on existing areas dedicated to conserving biodiversity. These projects are currently being evaluated by government agencies. In 2011, in partnership with Conservation International-Brazil, Vale developed a plan for the integrated management of its private reserves, that proposes a strategy for integration of the management of Vale's protected areas, aiming to maximize synergies and

interactions between conservation units and surrounding areas.

Also in 2011, Vale started projects for the valuation of its protected areas in Espírito Santo and Minas Gerais states. These studies considered the value of existence and the value of use (direct and indirect uses), including the valuation of ecosystem services provided by the areas. The components analyzed included: pollination, soil, water, microclimate, carbon and scientific value (generation of scientific knowledge).

### The results

The initiatives carried out in protected areas aimed to enhance and optimize their contribution to flora and fauna conservation. From these initiatives, especially the ecosystem services valuation, Vale demonstrates that the costs of maintaining protected areas are actually investments in the conservation and maintenance of natural capital.

Vale has learned that ecosystem services valuation is not a trivial exercise. For it to be worthwhile, it is essential to know and understand why ecosystems valuation is necessary and to choose the best methodology for each situation, in combination with the best available knowledge about the area of study.

Vale is using the results of ecosystem services valuation to show that its protected areas are valuable investments in conservation and are essential to the maintenance of natural resources (products) and other ecosystem services. Those protected areas owned by Vale are currently considered by Vale's financial sector to be a cost rather than an investment. It is Vale's goal to have its protected area assets assessed financially, in a similar way to other operating assets, such as mining and industrial infrastructure, but as natural assets.

The conservation activities undertaken by the company show that the private sector can act as a protagonist and partner in protecting natural areas and conserving in situ biodiversity. For Vale, this is part of its corporate environmental and social responsibility program, and is also aimed at securing its license to operate.

#### FURTHER INFORMATION

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# Biodiversity Survey and Ecological Management in Malaysia



## The business case

Veolia Water Dungun (VWD) Water Treatment Plant is located in a 400-hectare site that includes more than 300 hectares of natural habitats, including jungle forest, meadows, and fruit tree gardens. Moreover, the site is located next to the virgin coastal lowland “Bukit Bauk” Forest Reserve. The extent of the VWD treatment plant site, and its location near an undisturbed area, explains its high potential in terms of contribution to local biodiversity.

Water abstracted from the Dungun River is first directed to an off-river storage basin. It is then withdrawn from the off-river basin and directed to the water treatment plant. This mode of production allows for regulated water abstraction from the Dungun River over the year, and also minimizes water abstraction by using collected rainwater. Through the protection of the local biodiversity that underpins ecosystem services, VWD contributes to a better control of operational risks and expenditures linked to its water production activity at the site.

## The issue

Veolia Water is the world leading operator of water services. In 2002, Veolia Water Malaysia signed a 20-year contract with PETRONAS for the operation and management of its Water Treatment Plant in Dungun. It has a capacity of 230,000 m<sup>3</sup>/day and supplies Petronas

Petrochemical Industrial Complex, located 32 kilometers South of Dungun.

In April 2009, a biodiversity assessment was carried out internally on the Dungun site based on a new methodology designed by Veolia Environnement and an ecological consultancy. This study highlighted major biodiversity values, risks and the associated areas for action that formed the basis of the Biodiversity Action Plan established by VWD.

As part of this action plan, and due to the high biodiversity of local ecosystems, Veolia was advised to refer to local biodiversity experts to inventory species and ecosystems of interest, assess actual impacts of operations, and provide guidelines on how to conserve and enhance local biodiversity.

The main natural habitats of the site are represented by:

- An off-river water storage site that is a combination of a natural and manmade lake;
- A forest that was originally similar to the virgin forest of Bukit Bauk, but has been fragmented by the construction of the site and former commercial timber activities;
- A primary forest including Dipterocarpaceae, Euphorbiaceae, Fabaceae, and Lauraceae, and a secondary forest formed with pioneer tree species, mostly represented by a family of Euphorbiaceae;
- Meadows composed primarily of grass, and other non-woody plants, as a feature of the ecological succession occurring between the forest and the more disturbed area of the plant.

## The response

Veolia Water Asia-Pacific partnered with the University of Malaysia Terengganu (UMT) to conduct a biodiversity survey of the surroundings of the Dungun site. The survey was conducted between August 2010 and January 2011 by representatives from the Department of Biological Sciences, UMT in order to 1) better understand local biodiversity and the ecological aspects for which actions are most needed, and 2) provide better-informed management recommendations and guidelines on the maintenance of natural habitats at the site, so as to:

- Protect the identified species and habitats of special interest;
- Combat invasive species identified (if any);
- Enhance, restore and/or rehabilitate local ecosystems if needed;
- Raise awareness of employees and local partners on biodiversity;
- Train landscaping and maintenance contractors on ecological practices;
- Communicate to the villagers and with the local schools.

The flora survey was conducted in four sites around the premises, including the water intake area, forested areas of the off-river storage, the cultivated herbs garden and meadows and documented trees, shrubs, woody and non-woody plants. The fauna survey was conducted in the meadow area, focusing on small mammals, bats, birds and dragonflies, while aquatic insects were surveyed in the off-river storage water body. Two groups of microbes, free-living amoeba and total coliforms were also surveyed for this study in water of the intake area and off-river storage.

### The results

The survey identified 310 species of flora, 74 species of fauna, four species of free-living amoeba and four species of coliforms within the VWD area. These results will serve as a baseline reference for biodiversity monitoring in VWD in the future.

Overall, no critically endangered species of plant or animal was found in VWD, although several species of particular interest were recorded by the team, including the *Nepenthes ampullaria*, a carnivorous plant that was recently reported as providing habitat for one of the smallest frogs in the world, *Microhyla nepenthicola*, a species endemic to Malaysia that was discovered in 2010 in the Matang Range of Sarawak (West Malaysia), Borneo.

Based on the fauna and flora present at the VWD site, the surveyors determined that the site's main activities are unlikely to have a negative impact on local biodiversity.

These results show that the good health of the ecosystem and the quality of the water at the off-river storage are linked, which was confirmed by water sampling results

within the intake area. Suggested actions to enhance the ecological features of the site include:

- Prevention of illegal encroachment from villagers looking for valuable forest resources, such as medicinal trees, as well as hunting and fishing;
- Maintenance of access to the natural areas and water bodies for bird and bats coming from the "Bukit Bauk" Forest Reserve;
- Planting more indigenous plants and fruit trees to attract insects and birds;
- Removing identified invasive plants;
- Further developing the herb garden, to educate the public about local medicinal plants.

The Biodiversity Survey helped Veolia Water Dungun better understand the importance of biodiversity at the site and the related ecosystem services it delivers. For example, the mode of water production in the area was only seen through its role in regulating and minimizing the quantity of water abstracted from the river. Thanks to the biodiversity survey, the better quality of the water in the off-river storage was confirmed, and the importance of ecosystem services in maintaining this quality was highlighted.

These biodiversity survey results encouraged VWD to enhance its ecological management practice at the site, not only to protect its natural heritage, but also to contribute to the maintenance of the ecosystem services that help regulate water quality.

As the water quality determines the level of treatment necessary at the plant, functional ecosystems have a direct impact on business operations. Through the protection of the local biodiversity that underpins ecosystem services, VWD contributes to a better control of operational risks and expenditures linked to its water production activity at the site.



#### FURTHER INFORMATION

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# Measuring and Monitoring Ecosystem Services



Protected habitat



## The business case

Weyerhaeuser believes that its management practices maintain or improve the ecosystem services associated with the forests it manages. Its timberlands business recently adopted a commitment to test this hypothesis, undertaking a process to categorize ecosystem services and designing metrics that can be tracked annually to measure progress against this commitment. Some of these ecosystem services already produce products and services with market value; some may provide opportunities for additional revenue or marketing potential; and some, although not measurable in dollars, will illustrate the range of values that accompany its managed forests. In all three cases, collecting and tracking this information should also help to translate these benefits into value for Weyerhaeuser customers, communities and other interested stakeholders.

## The issue

Weyerhaeuser Company, one of the world's largest forest products companies, was incorporated in 1900. Weyerhaeuser owns or manages 8.22 million hectares of forest land, and its 2011 sales were US\$ 6 billion. Weyerhaeuser employs 12,800 people in 11 countries and has corporate headquarters in Federal Way, Washington. The company grows and harvest trees, manufactures wood products and builds homes and residential developments. Weyerhaeuser also produces

cellulose fiber products (pulp) used in personal care products, newspapers and printing papers, and board used for packaging. Last year the company launched a new business, Weyerhaeuser Solutions, to leverage expertise to help clients with innovative forest solutions, including alternative energy resources, biomass feedstock, renewable forest products and ecosystem services. In 2010, Weyerhaeuser revised its company vision to strengthen its connection with the three pillars of sustainability: performance, people, planet. As part of this process, each Weyerhaeuser business aligned its targets with these three pillars. One of the stated targets is a business goal to maintain or enhance the ecosystem services provided by timberlands.

## The response

In 2011, Weyerhaeuser convened a team representing a cross section of Weyerhaeuser scientists, operational managers and staff, to determine a plan to measure and report against a set of ecosystem service metrics. The team used the WBCSD Ecosystem Services Review (ESR) framework adopted from the Millennium Ecosystem Assessment (MA) terminology. Following an initial brainstorming session, the team categorized ecosystem services according to the four MA services: provisioning, regulation, cultural and supporting, and searched for relevant indicators that could be tracked annually, using published literature and ecosystem service reports and tools, as well as data gathered through internal reporting. The process was supported at all levels of the company. The commitment has been made to measure and report on these services annually, beginning in 2013, allowing the company to gain valuable insight into the benefits provided by company lands.

For certain types of ecosystem services, changes are difficult to quantify and measure in any meaningful way. In addition, because these data will be reported publicly, the final reporting unit had to be readily available, which for some ecosystem services was not possible. To address this, in addition to reporting against 18 annual ecosystem service metrics, Weyerhaeuser decided to report against a separate class of ecosystem services. These "snapshot" services are excluded from the annual data collection because either only qualitative information is available



Honey production

at present, (thus the reporting unit is not sufficiently precise), or the service has been recently discontinued. These services are nonetheless important reflections of the value provided by Weyerhaeuser timberlands. These include: oxygen production, natural pollination, genetic resources, biochemical provision (taxol production), water purification, pest resistance and sense of place (traditional grazing and traditional hunting).

### The results

Weyerhaeuser will report annually against the 18 selected ecosystem services: five supporting, eight provisioning, two regulating, and three cultural. Much of the data are already gathered internally, but have never been reported publicly before. The company anticipates that by increasing transparency, its customers, communities and other interested stakeholders, will have a greater understanding of the broad range of ecosystem services that can be provided across its natural resource management landscape.

Since this is a multi-year process, Weyerhaeuser anticipates that further lessons will be learned as it reports against ecosystem metrics. The company aims to understand how accurately the metrics it has chosen will actually reflect the current state and trends of the ecosystem services provided by its timberlands. The company anticipates continuous improvement in its measurement and reporting process, as it obtains external and internal feedback.



Water regulation



Gravesites

#### FURTHER INFORMATION

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# Restoring and Creating Biodiversity Value to Address Environmental Impacts



## About the Cement Sustainability Initiative



The WBCSD's Cement Sustainability Initiative (CSI) is a global effort by 25 leading cement producers with operations in more than 100 countries, to address key sustainability issues voluntarily, proactively, and over an extended time period. Collectively, these companies account for around 30% of the world's cement production and range in size from very large multinationals to smaller local producers. All CSI members have integrated sustainable development into their business strategies and operations as they seek strong financial performance with an equally strong commitment to social and environmental responsibility.

### Case studies on effective quarry rehabilitation

#### The issue

Extracting limestone, the primary raw material required to produce cement, can have significant local impacts on the landscape, ecosystems and communities around quarries. Effective management and well-planned rehabilitation strategies help to restore or even create value in these quarries.

CSI member companies recognize their responsibility to effectively manage and rehabilitate both the quarry site they operate, and, wherever necessary, the surrounding area during and upon completion of operations.

The motivation for business to engage in rehabilitation activities in the first place lies in the belief that the development and implementation of a progressive and

practical quarry rehabilitation plan will deliver significant environmental and social benefits that can outweigh the long-term rehabilitation costs to the cement companies. This plan has to be supported by a good management team, a strong commitment to corporate responsibility and with a clear goal of maintaining the company's reputation.

#### The response

With the aim of transforming worked-out quarries into actual assets for communities and the wider environment, CSI member companies undertook significant work to improve biodiversity and amenity value through quarry rehabilitation.

2011 saw the publication of the WBCSD-CSI Guidelines on Quarry Rehabilitation, which aims to: (1) ensure CSI members have a common understanding of the key performance indicators on quarry rehabilitation; (2) support the process of quarry rehabilitation; and (3) achieve consistent reporting across members.

It is for each company to mandate and apply the guidelines within its operations, as appropriate to the context. The guidelines are designed to complement rather than replace, existing successful rehabilitation practices.

#### Case studies featured in the Guidelines

The CSI Guidelines feature 30 operational case studies covering a wide range of quarry types and local habitats around the world. While quarry rehabilitation, in a broader approach, addresses more than just biodiversity issues, the cases studies outlined here focus mainly on biodiversity.

#### Species restoration in a tropical dry forest in Costa Rica

Opened in 1980 and used by CEMEX since 1999, the Colorado cement production site has a total surface of 290 hectares. The site is surrounded by a tropical dry forest that is highly fragmented by human activities, especially cattle-raising and overexploitation of high value wood.

CEMEX's management approach for the site first focused on the rehabilitation of the exploited areas through

reforestation. This changed in 2008, following a decision to dedicate 100 hectares to an ecosystem restoration project, and with the adoption of a Biodiversity Action Plan. Between 1999 and 2005, CEMEX planted 6,000 trees to reforest 12 hectares of the clay quarry and rehabilitated 50 hectares through natural regeneration.

In 2009, 100 hectares were mapped and a biological survey was conducted by various experts, under the coordination of FUNDACA, a local conservation organization, identifying nearly 450 species from diverse taxonomic groups. A biodiversity database was also designed and developed, in order to record all the species inventoried in the field.

#### **Protecting and expanding the habitats of rare plants through biotechnology in Japan**

Chichibu Taiheiyo Cement Corporation's Minowa Quarry, located in Chichibu City, Saitama Prefecture, Japan, has been working to protect and nurture rare species of native plants since 1972. In addition to creating a botanical garden at the quarry for the preservation of rare plants, the company is continuing to repopulate former excavation sites with these plants by scattering seeds and planting cuttings. These activities have been carried out in collaboration with local government authorities and stakeholders.

The company also seized the opportunity to create a reserve collection of rare plants through the establishment of a tissue culture collection. This resource helps to ensure the persistence of plant species, in the event that they are threatened by disease or pest infestation, for example.

#### **Turning an old pit into an aquatic heaven with enhanced biodiversity in the US**

An old limestone pit belonging to Titan America's Roanoke Cement Company (RCC) in Virginia, USA, has been turned into a pond filled by groundwater inflows and rainfall. Through water-level control, and thus flood prevention, the lake meets the habitat requirements for environmentally sensitive trout. Working with Trout Unlimited, a national organization dedicated to conserving, protecting and restoring North America's trout and salmon fisheries, 350 rainbow trout were

released into the pond. The initiative demonstrated that this fish can survive in the pond throughout the year, subject to water conditions, by staying in the cooler, deeper parts of the lake. A variety of species now occupy the various habitats within the pond, including several different species of dragonfly that require water for breeding. Dragonflies are especially important indicators for gauging the health of a trout pond. The restored trout pond provides an excellent habitat for dragonflies, as well as other species, such as butterflies and grasshoppers. The trout pond also attracts native birds by providing freshwater, food and nesting materials. In 2011, RCC won the "Best Quarry" Reclamation Award for the restoration of its old limestone quarry from the Virginia Division of Mining, Minerals, and Energy. Further, RCC has now restored adjacent areas, in line with its ongoing commitment to enhancing biodiversity and demonstrating land stewardship.

#### **Storm water management in Australia**

The Heidelberg Cement Glasshouse quarry in Australia's northern region produces between 400,000 and 600,000 metric tons of aggregate a year. Due to the sub-tropical climate, the installation of a storm water management system to control high levels of run-off is a vital part of the quarry's best practice guidelines. In addition, work has been carried out to minimize the amount of soil exposed, with the replanting of native vegetation as necessary. Sediment control measures, such as settling ponds, have also been installed. The storm water management system is regularly reviewed to ensure it remains effective, and landscaping work is creating new habitats for species such as eucalyptus and acacia, as well as the peregrine falcon.

#### **FURTHER INFORMATION**

Full details of all the case studies  
[www.wbcscement.org/qrgcasestudies](http://www.wbcscement.org/qrgcasestudies)

#### **FURTHER INFORMATION**

Cement Sustainability Initiative  
[www.wbcscement.org](http://www.wbcscement.org)

# Appendix

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Industry	Company	Project Name	Country	Aichi Strategic Goal		Page n°
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## About the World Business Council for Sustainable Development (WBCSD)

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The WBCSD provides a forum for its 200 member companies – who represent all business sectors, all continents and a combined revenue of more than \$7 trillion – to share best practices on sustainable development issues and to develop innovative tools that change the status quo. The Council also benefits from a network of 60 national and regional business councils and partner organizations, a majority of which are based in developing countries.

[www.wbcd.org](http://www.wbcd.org)

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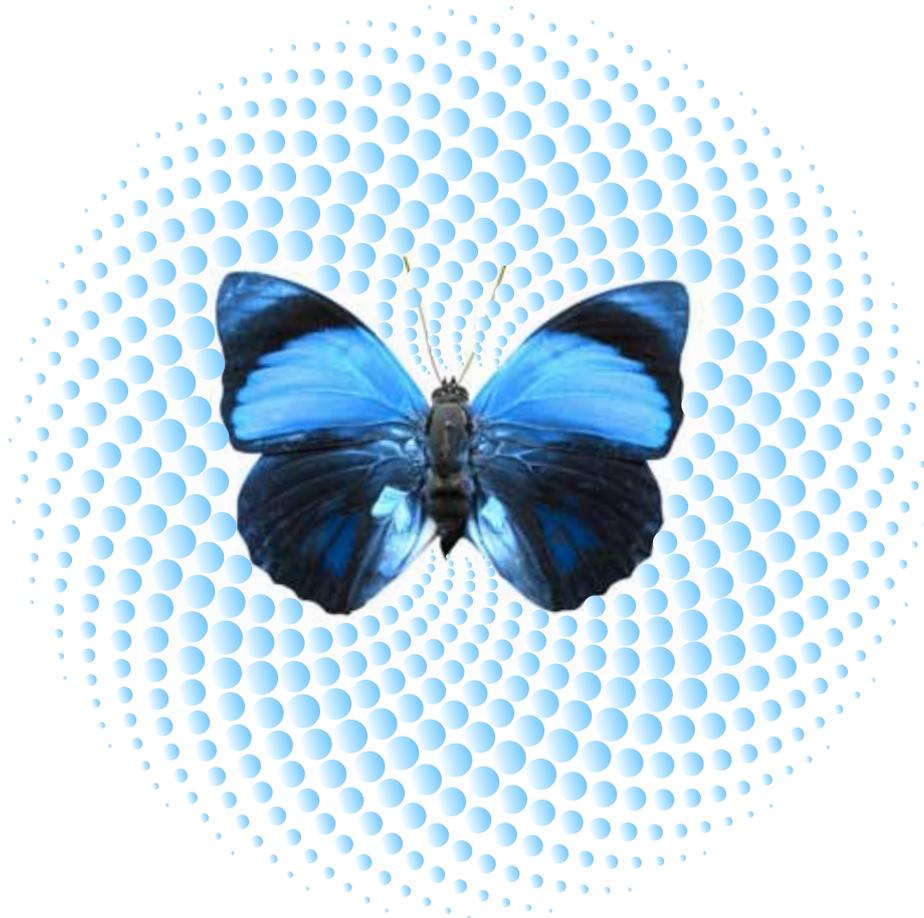
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