



# BIODIVERSITY REVIEW

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The priceless role of the natural world



BRUNO LAFONT  
Chairman and  
CEO of Lafarge

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**t**he United Nations has declared 2010 International Year of Biodiversity in order to highlight and alert us to these issues. Scientists have confirmed that the biological diversity of our planet is on the decline and preserving ecosystems is a major challenge for the world's future.

We have long been committed to building a more sustainable world. It reflects our values and is based on a clear duty: we must set an example in our operations and take a responsible approach, which means being transparent and communicating with interest groups and communities around the quarries that we operate. Our involvement with local communities has enabled us to develop strong listening and consultation skills. This has helped us enhance our scientific approach to protecting nature with time-honored knowledge. We have now made significant progress. We are able to integrate the quarry into its natural environment, to create habitats for flowers and wildlife and preserve species.

Our aim now is to be recognized around the world as a responsible, competent and efficient contributor to biodiversity progress. This ambition relies on global and local partnerships, particularly with WWF International, on dedicated and motivated teams, on our dynamism and our shared desire to progress and learn.

CENTER PAGES

THE THREE LIVES OF A QUARRY



> From drafting a site's redevelopment plan  
to its rehabilitation, via the period of operation.

  
BRUNO LAFONT

> The rehabilitated Caversham quarry, UK.



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Lafarge operates 730 quarries around the world // 450 million tons of rocks are mined  
// 64% of quarries have been assessed according to criteria established by WWF //  
79% of quarries have a rehabilitation plan // 35% of quarries located in sensitive areas  
have a biodiversity development program



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> Anneville quarry, Normandy, France.

A biodiversity roadmap

Launched in 2007, the Sustainable Development Ambitions 2012 confirm Lafarge's commitment to sustainable development by setting precise targets. The section devoted to biodiversity protection in particular sets out how to assess the ecological value of all of the 730 quarries operated by the Group around the world, according to criteria approved by WWF.

It also recommends establishing biodiversity development plans at sites that are home to rare plant or animal species or located in protected areas, in collaboration with local environmental associations.



OLIVIER LUNEAU  
Group Senior Vice President Sustainable Development and Public Affairs

Protecting biodiversity has been a long-term preoccupation for us, at the heart of our sustainable development strategy. But it has really come into its own since 2000, when a partnership was signed with WWF. We then formally committed to producing rehabilitation plans for all our operational quarries.

Our teams have taken a very professional approach and we now have a level of maturity where we have measurable targets. We identify risks and implement our policy in collaboration with stakeholders. We constantly measure its relevance using our key performance indicators."

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Species are currently becoming extinct at a staggering rate. This emergency requires the involvement of scientists, public institutions and economic players, Biodiversity losses recorded since the 1980's is who must rapidly take sustainable development criteria into account. partly due to human activity.

JEAN-PAUL JEANRENAUD  
WWF International's Corporate Relations Director

“There are particularly sensitive areas where there should be no industrial activity and companies must learn to respect these restrictions. In other areas, it is perfectly possible to protect biodiversity while carrying out industrial activity. But this requires a specific approach, discipline and investments. A responsible approach may have an initial cost, but in the end being a good neighbor, being a company that respects natural environments, brings rewards.”



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Biological diversity:  
tackling the emergency

The United Nations has declared 2010 International Year of Biodiversity to alert world opinion to the dangers which now threaten the survival of many plant and animal species. Biodiversity commonly refers to the variety of living species on our planet. Species are currently disappearing at an alarming rate, however. “Opinion is unanimous among specialists: We are witnessing an erosion, a sharp decline in biodiversity,” says Jean-Marie Pelt, Honorary Biology Professor at the University of Metz and President of the Institut Européen d’Écologie (European Institute of Ecology). “Depending on the species, the rate of extinction is between 50 to 1,000 times greater than the expected rate of extinction. That is rapid erosion – and it is getting faster.”

Staggering rate of extinction. In 2005, the “Millennium Ecosystem Assessment” report estimated that 12% of birds, 25% of mammals and 32% of amphibians would be extinct by 2100. Many scientists now believe that the planet is experiencing its sixth major extinction crisis. A crisis caused mainly by the action of humans on their environment. France’s Centre National de la Recherche Scientifique (National Center for Scientific Research or CNRS)

has identified four major interrelated causes responsible for this massive extinction: intensive exploitation of resources (hunting, fishing, etc.); invasions or proliferations of species (in particular certain algae and micro-organisms); global warming, mainly caused by greenhouse gas emissions into the atmosphere; and the destruction or degradation of ecosystems (urbanization, deforestation, soil and water pollution, unsustainable abstraction of water, etc.). Although the extinction of living species can sometimes be caused by natural regulation, its current pace is extremely fast, and the knock-on effects for the planet of this decline in biodiversity are devastating: every species which dies out endangers the balance of an entire ecosystem, with the risk of causing further extinction and disrupting natural phenomena which appeared unchangeable.

Practices under scrutiny. Humans have often mistreated natural environments. Deforestation, use of agricultural chemicals combined with intensive farming and also the drying out of wetlands have caused immense damage. “The soil is an ecosystem,” emphasizes Jean-Paul Jeanrenaud, WWF International’s Corporate Relations Director. “If it is kept in good condition, it will be productive forever and always provide food. However, if we destroy the natural flora and fauna which nourish its fertility, still more external intervention will be needed, which will become more and more expensive. And eventually the soil will become sterile. It will become simply a means to hold the plants upright.”

The ecosystems of marshes, which were long thought to be unproductive, have also suffered from human activity. “When we talked about wetlands in the past, we were talking about marshland,” says Arnaud Colson, Sustain-

In order to protect biodiversity in its former quarries, Lafarge has developed several partnerships over the years. This has given the Group a deeper knowl- Sharing knowledge is an essential aspect of under- edge of the living world and ecological diagnostic tools. standing and preserving plant and animal life.



© DR Medaheup Lafarge

> The rehabilitated Meknès quarry, Morocco.



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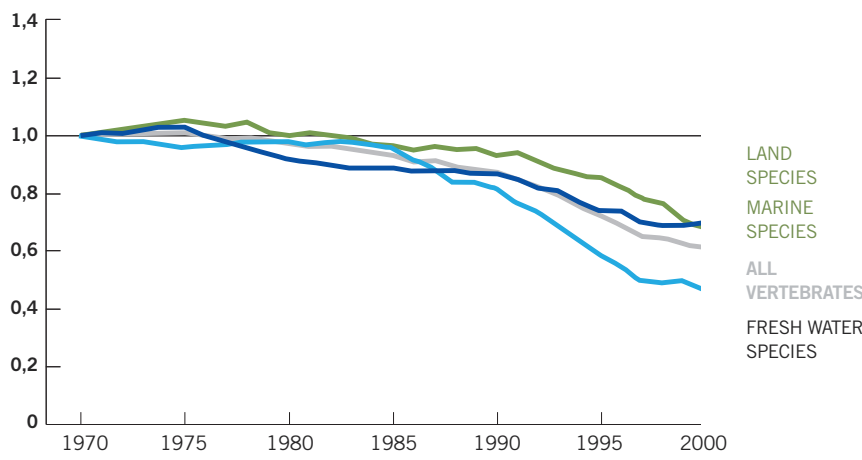
LIFE ON EARTH, A FRAGILE BALANCE

Biodiversity is everywhere, on land and in the water. It covers all forms of life, from micro-organisms to plants and animals. The survival and reproduction of living species relies on

a range of interactions which are known jointly as an ecosystem. This interdependence makes nature extremely vulnerable to an accelerated extinction of species.

able Development and Public Affairs Director with the Aggregates & Concrete Business in France. “Marshland had a very negative connotation: it attracted mosquitoes and illness and spread disease. We now know that marshland is an ecologically rich wetland precisely because it is home to numerous species, including mosquitoes, which are part of the food chain for birds and amphibians. We also know that it provides a key ecosystem service: water purification.” One thing is clear, surveying the damage caused by irresponsible practices. “Protecting the environment is simply common sense,” emphasizes Jean-Paul Jeanrenaud (WWF International). “Without ecology, there is no economy: we can’t do business on a dead planet.” Given the urgency, public institutions, NGOs, scientists and also industrial companies must act to take the necessary measures to protect species and their habitats. The establishment of partnerships and shared initiatives now appears vital to carry out concerted action and draw on the expertise required to measure the impact of human activities. “Not only can industry reconcile business and environmental preservation, but it must,” concludes Jean-Marie Pelt. “It must incorporate all sustainable development issues. On the face of it, there is no unsurmountable incompatibility, provided we adapt to a different model and develop suitable technologies.”


LIVING PLANT INDEX  
(Index 1 in 1970)



The Living Planet Index is an indicator of biodiversity around the world. It reveals a decline since the 1980's, which accelerated after 1990.



THE KEY STAGES OF LAFARGE'S POLICY TO PROMOTE BIODIVERSITY

1970	1979	1980	1987	1992
Since the early 1970's, Lafarge has taken environmental challenges into account at its sites, particularly quarries. The Group then adopted several measures anticipating regulations, including in France and Kenya.		During the 1980's Lafarge forged many partnerships, both official and informal, with local naturalist groups to address specific objectives, e.g. an ornithologist coming to count birds at a quarry, a botanist listing species of interest at a site, etc.	The Brundtland Report, from the United Nations World Commission on Environment and Development, created a new concept: "Sustainable development is a method of development which meets the needs of the present without compromising the ability of future generations to meet their own needs."	The first United Nations Environment Summit was held in Rio de Janeiro (Brazil). In particular, it resulted in the signing of the Convention on Biological Diversity.

The European Community adopted the Birds Directive to protect wild species. In the same year, the Berne Convention on the Conservation of European Wildlife and Natural Habitats was signed by the European community and 44 other countries.



PIERRE DE PRÉMARE  
Vice President Environment and Public Affairs for Lafarge Quarries

“There was a real change in the international mood. Previously, industrial companies were considered to be major destroyers of nature. In many countries,

the Group is now beginning to forge relationships of trust with environmental associations and scientists. As the WBCSD emphasizes, preserving the environment also needs companies to be involved.”



ARNAUD COLSON  
Sustainable Development and Public Affairs Director with the Aggregates & Concrete Business, France

“In the 1980's, we realized that throughout the “Glorious Thirty” (1945-1975), reconstruction of our various countries after the Second World War had been carried out under environmentally suspect conditions.

The urgency of reconstruction and relatively flexible regulations encouraged ecologically damaging industrial procedures. Today we realize that, as well as being beneficial for the environment, the principles of sustainable development are also beneficial in terms of profitability.”

Biodiversity and quarries: from local initiatives to a partnership approach

**Extracting mineral raw materials is vital to the manufacturing of building materials.** Limestone and clay are used in the composition of cement, gypsum is found naturally, while aggregates are crushed up rocks. Lafarge now operates 730 quarries around the world, from which 450 million tons of rock are mined. On these sites, which are free of agriculture and urbanization, there is an opportunity to create special zones to provide homes for various plant and animal species. To do this, it is necessary to develop responsible operating procedures and recreate ecological spaces on the site of former quarries. Lafarge has gradually established a partnership policy in order to measure and control the environmental impact of its quarries.

**Early rewards of rehabilitation.** From the 1970's and throughout the 1980's, the coming together of quarry sites and groups of naturalists occurred at a local level, sporadically and most often informally. But in the mid-1990's, a new milestone was reached and the approach became more widespread. This represented the first step towards defining an overall policy for preserving natural environments and endangered species. “In 1995, Lafarge was the first industrial company to sign a contract with the Muséum National d'Histoire Naturelle in France,” recalls Arnaud Colson, Sustainable Development and Public Affairs Director with the Aggregates and Concrete Business in France. “This had never been done before. The partnership involved drawing up scientific inventories at our sites, with total transparency, and working on rehabilitation projects. It was very exciting as we made numerous discoveries on a scientific level, as well as overcoming a number of our prejudices.” It was during this period that we developed the notion of progressive and coordinated redevelopment applicable to all the Group's quarries, while actions carried out previously, based on local initiatives, had suffered as a result of being highly disparate.

**Initiating a sectoral dynamic.** In 1995, Lafarge joined the World Business Council for Sustainable Development (WBCSD), a group of 200 companies committed to pushing forward sustainable development issues. The WBCSD's

1995	1999	2000	2007	2009
	Members of the World Business Council for Sustainable Development (WBCSD), Lafarge and Holcim set up the Cement Sustainability Initiative. This innovative sectoral initiative now includes 23 cement manufacturers from around the world, who work together on reducing the ecological impacts of their activities.		Lafarge's Sustainable Development Ambitions 2012 plan set specific targets for reducing the environmental footprint of the Group's activities.	At the Presque Isle quarry in the United States, Lafarge launched its first study to analyze and assess the value of services provided by ecosystems on one of its sites.

Lafarge signed its first partnership in France with the Muséum National d'Histoire Naturelle (National History Museum). The studies carried out contributed to developing expert knowledge of life in quarries.

WWF and Lafarge signed a partnership. This completely new association between an industrial company and a non-governmental organization involved in protecting the environment set a precedent.



HALLER PARK, AN EXCEPTIONAL SITE

The redevelopment into a nature park of the former quarry at the Bamburi cement plant, near Mombasa, Kenya, began in the early 1970's. Out of the 422 plant species which were reintroduced or appeared spontaneously in the

redeveloped forest ecosystems, wetlands and prairies of the former quarry, 364 have survived, 30 of which are on the red list of endangered species drawn up by the International Union for Conservation of Nature (IUCN). The beauty

of the site, which has been renamed Haller Park, and its successful ecological integration, as well as the visitor numbers and economic activity it generates, have made this rehabilitation a symbolic achievement.

stated objective is to design and promote industrial processes with a neutral, or even positive, environmental footprint. In the cement manufacturing sector, that kind of objective requires a great deal of time and radical transformations. But, by making clear and public commitments, Lafarge initiated a real dynamic at a sectoral level. Lafarge contributes to the working group on biodiversity and is also an active council member on issues of energy, climate change and water. “Lafarge is committed to numerous programs,” emphasizes James Griffith, Ecosystems Director with the WBCSD, “particularly via its joint founding of the Cement Sustainability Initiative (CSI).” The program now represents 23 cement manufacturers, accounting for 40% of global production. By sharing their experience and implementing best practice and joint innovations, its members strive to make a concerted reduction in the environmental impact of their activities.

**A completely new approach.** By signing a global partnership with WWF International in 2000, the Group initiated a completely new kind of association, in the worlds of business and NGOs alike. The approach to environmental issues developed by the Group, and more specifically its initiatives to promote biodiversity, have created a precedent, both in the cement sector and in industry as a whole. “It was an experiment for us: can we work with a very big company,

with a significant environmental footprint, and can we exercise real influence?” recalls Jean-Paul Jeanrenaud (WWF International). “Few companies adopt this type of approach, open to discussion and debate.” The collaboration did not develop without a few teething pains, but the partnership – which has been renewed twice, in 2004 and 2009 – has contributed a lot to the cement sector and more broadly to relations between industry and environmental NGOs. “The new awareness among industrial companies required strong and visible action. That was the first major success of our collaboration,” concludes Jean-Paul Jeanrenaud. Using the tools developed with its partners, from the smallest local groups to WWF International, Lafarge has worked to improve its knowledge of the environment and, in sensitive areas, to set up biodiversity management programs, especially through the rehabilitation of its quarries. The Group's operational Business Units (BUs) have been invited to identify the risks and opportunities their business represents to local biodiversity. And at the end of a site's operation, ecologically and economically viable areas are created. “The contribution made by these partnerships is essential for Lafarge,” emphasizes Pierre de Prémare. “Without an external perspective on our actions, our initiatives and ways of improving them, we would be sole judge and jury of our work.” As a result of these collaborations, Lafarge has identified innovative methods of redeveloping its quarries, which have since proved their effectiveness.





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#### SETTING AN EXAMPLE ONE SITE, THREE REHABILITATIONS

**SOUTH PIT QUARRY, NEAR CALGARY, CANADA, WAS MINED FROM 1970 TO 1998.** Its redevelopment, in collaboration with numerous local partners, involved creating three distinct areas: the residential

district of Chaparral, the Blue Devil golf course and the Lafarge Meadows park. This nature area includes wetlands with dense vegetation, in which many bird species nest. The lakes have also been designed to drain

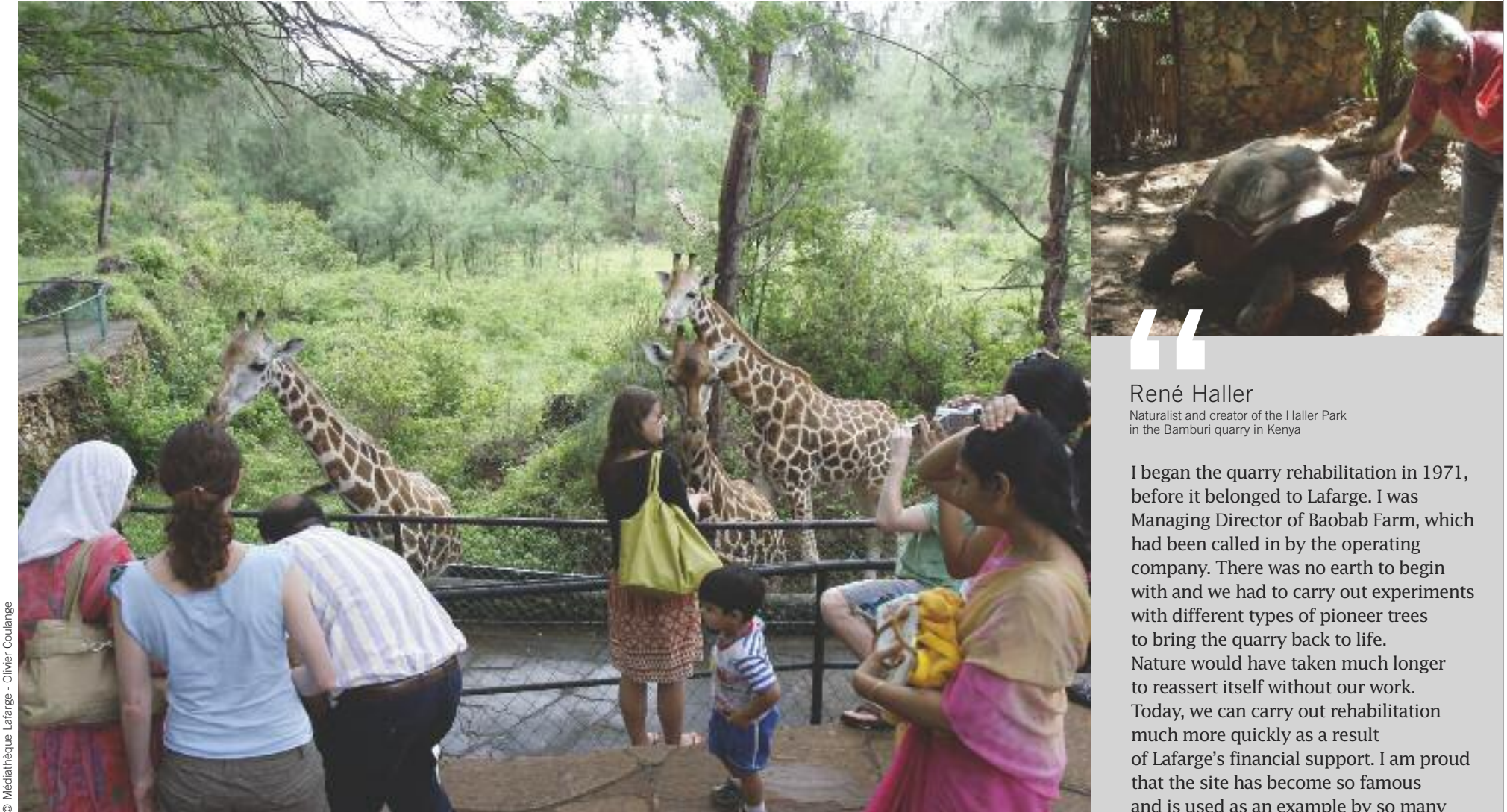
any overflow from the neighboring river and the city of Calgary's storm-water basins. The Group's environmental initiatives in the region were awarded the Alberta Emerald Prize in June 2009.



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# 1. Rehabilitation – an opportunity for biodiversity?

Lafarge has drawn on its experience and best practice to formulate its policy for preserving natural environments. Redevelopment plans, which are necessarily made to measure, are designed in accordance with the sensitivity of the natural environment and drafted according to precise rules.



René Haller

Naturalist and creator of the Haller Park in the Bamburi quarry in Kenya

I began the quarry rehabilitation in 1971, before it belonged to Lafarge. I was Managing Director of Baobab Farm, which had been called in by the operating company. There was no earth to begin with and we had to carry out experiments with different types of pioneer trees to bring the quarry back to life. Nature would have taken much longer to reassert itself without our work. Today, we can carry out rehabilitation much more quickly as a result of Lafarge's financial support. I am proud that the site has become so famous and is used as an example by so many quarries around the world."

## A comprehensive framework for a practical policy

On December 27, 2009, in a column of the Spanish daily newspaper *El País*, the famous Peruvian writer Mario Vargas Llosa suggested naming Owen and Mzee, a hippopotamus and a tortoise, as personalities of the year. The story of this unusual couple is so exemplary it sounds like a fable. In December 2004, when a tidal wave laid waste to the Kenyan coasts, a baby hippo swept away by the waters finally washed up on the shore near Mombasa. Found by employees of neighboring Haller Park, he soon chose his adoptive

mother: Mzee, a 130-year-old Aldabra tortoise. For months, she taught him everything she knew: swimming, eating, looking for places to sleep... Vargas Llosa ended his column by calling on belligerent humans to follow this wise example of solidarity and harmony. Five years later, Owen and Mzee still spend their days happily at Haller Park. The park, created on the site of the former quarry at Lafarge's Bamburi cement plant, near Mombasa, has become a sanctuary for biodiversity and is a model of how to manage quarry redevelopment, used as an example all round the world. But the rehabilitation of a quarry into a viable natural site is a long-term program. It takes years to make it a success and should therefore be started early.

#### A responsible approach

That is why, today, every new quarry opened by Lafarge must have a rehabilitation plan in place before it even begins operations. The question of credibility comes before anything else.

"We have a motto which is: 'The redevelopments of today are the quarries of the future'," explains Pierre de Prémare. "To continue to operate quarries, we need to show what we have done elsewhere, how we have created viable natural environments, managed forests for 25 years, and worked in close collaboration with partners and local communities." Nowadays, obtaining an operating permit can take several years. The company's ability to make its business acceptable is an essential factor in whether or not the permit is granted. And making a quarry acceptable has a lot to do with, once mining is over, returning a site containing a coherent natural environment and significant biodiversity. In some cases, the biodiversity recreated through rehabilitation can even prove to be richer than what was there before.





Juan Mota, PROFESSOR AT THE UNIVERSITY OF ALMERIA (SPAIN)

“The Sorbas quarry in the Gypsum Division is located in the middle of an arid area of southern Spain. The habitats there are very fragile and several of the multitudes of endemic species are endangered. Since gypsum production is vital to the Andalusian economy, we need to find a way of reconciling mining and respect for nature. Our research group has been working with mining companies for ten years to tackle this challenge. Two conditions must be met for our initiative to succeed. The first is to protect the areas with a high ecological value by creating a network of preserved spaces.

We have opted for a network rather than little islands, since species that develop in outcrops of gypsum can be very different, although they

might be only 10km apart. The second condition is the implementation of a biodiversity restoration plan. When I say ‘restoration’, I mean ‘return of the environment to its original state’. We had to overcome some ingrained opinions in this respect since, when it comes to nature preservation, greenery always has priority over desert. But here, on poor gypsum soils suffering from water shortages, we were not going to create a beautiful forest! We had to respect nature and save ecosystems. To do that we needed small bushes dotted about, no more than 50cm high. It took time to make companies understand this. We also faced a scientific and technological problem. We didn’t really know enough about the bio-geographical origin of the species and didn’t know how to help them propagate. In order to assemble enough plant varieties to restore a large surface area, we had to do a lot of research and set up a nursery. Lafarge has helped us with this. Several hectares have now been partially restored. It is a historic step and a good example to follow, although our work is not over.”



1. Preparation of the soil before planting seedlings grown in a nursery. 2. Collecting native seeds in the surrounding environment. 3. Planting seedlings after cultivating them in a nursery.



Rebecca D’Cruz, ENVIRONMENTAL CONSULTANT-AONYX, MEMBER OF THE INTERNATIONAL BIODIVERSITY PANEL, FORMER MEMBER OF THE RAMSAR CONVENTION ON WETLANDS.

“We have learned a great deal from the Group’s experience on quarry rehabilitation. Practical examples and the methods developed to manage relations with local stakeholders show a clear commitment to walking the talk. It is essential, particularly where wetlands are concerned, to pursue these efforts and raise the awareness of local communities, by incorporating them into the rehabilitation process.”



Dallen Wong, SENIOR MANAGER OF INDUSTRY FOR QUARRIES, LAND AND PROPERTIES, LAFARGE CEMENT MALAYSIA

“We have three quarries in Malaysia. We had no rehabilitation plan before Lafarge arrived in 2004. The Group supplied us with a very clear technical manual setting out the methodology and the various stages in drawing up a rehabilitation plan. However, we did have to adapt these principles to the specific local situation. After two years’ work with all parties concerned, we have finalized the rehabilitation master plan for the Langkawi Plant with the agreement of all stakeholders, particularly the Department of Environment and the Land Office. Now, we are preparing the similar rehabilitation master plan for the other two quarries in Malaysia, i.e. Rawang Plant and Kanthan Plant.”

Mohamad Sayuti Bin Seapai, HEAD OF THE DEPARTMENT OF ENVIRONMENT (DOE) IN JAS KEDAH, MALAYSIA

“Proposing a rehabilitation plan is now one of the prerequisites for obtaining a permit to operate a quarry in our country. We work with Lafarge, notably by offering our advice to help it comply with Malaysian environmental regulations. The Group has always observed the rules and recommendations and we have good relations with its teams.”



Starting the rehabilitation process early makes it possible to assemble local stakeholders and determine the priorities and objectives of the project with them. As well as the fact that research into the site’s sensitivity may lead, where relevant, to adapting the operational plan to particular local characteristics. “We consider biodiversity throughout the whole lifecycle of a quarry, during the planning, operational and rehabilitation phases,” explains David Park, Quarry Restoration Manager with Lafarge UK. “During the planning phase, we look at measures which can be taken to limit the impact of operations on the ground. This may involve setting aside particularly sensitive areas or moving some species by creating suitable habitats outside the operational footprint of the site.”

#### Stages in the rehabilitation plan

The standards established in collaboration with WWF International were set out in the Sustainable Development Ambitions 2012 plan. They define the rules for drawing up a redevelopment plan. “We put a comprehensive management system in place, involving four-stages: analysis, scheduling, action and review,” explains Pierre de Prémare. “The system, which was formalized in 2009, ensures that all our initiatives are in line with our recommendations on biodiversity. It now needs to be gradually rolled out to all sites.” The first stage entails analyzing all the Group’s sites and identifying their level of sensitivity. “If the environment is deemed to be sensitive, we incorporate a biodiversity management plan into the quarry’s operations,” emphasizes Arnaud Colson. In 2009, more than 64% of Lafarge’s sites had been assessed according to criteria validated by WWF International. By the end of 2010, 100% of quarries will have been covered. “Once we know how sensitive a site is, we analyze it according to what we are able to propose as a rehabilitation plan, drawing on lessons learned in the past and habitats successfully created elsewhere,” says Pierre de Prémare.

#### A long-term investment

A detailed map is then produced of the redevelopment plan, presenting an overview of the site after rehabilitation and stating the final use of the site, the types of environment recreated and any infrastructure developed. A schedule then sets out the successive stages in recovery of the land. Finally, the necessary funds are supplied each



A NURSERY IN GREECE. In Volos, in the Thessaly region, the Lafarge cement plant’s former limestone quarry is now home to many different species of trees. The site was in operation from 1971 to 1999 and its redevelopment began in 1978. A nursery was even created for young trees adapted to the

poor soil and Mediterranean climate. Today, the site provides a wide range of plant species to be used in the rehabilitation of other Lafarge quarries in Greece. A new economic activity has been created and genetic diversity is respected through the selection of species adapted to sites.

year to ensure the plan can be carried out. The cost of rehabilitation varies enormously depending on the type of site. “Making sites compliant with the plan is an investment,” says David Park. “Especially in the UK, where we are bound through agreements to manage our sites for five years after operations cease. For particular sites in or close to sensitive areas that are home to a wide variety of plant or animal species, this timescale may extend to as long as 25 years.” That is the case with Dry Rigg in North Yorkshire, in the United Kingdom. The sensitive site is located in a national park and lies adjacent to an area designated a Site of Special Scientific Interest. Lafarge has created a habitat favorable to local wildlife there, as an extension of the designated area.

#### Applying the same standards all around the world

Environmental regulations vary considerably depending on the region of the world. Lafarge, which has high standards in this field, may be put at a competitive disadvantage in regions where environmental rules are not very strict or not very well enforced. “We believe that we can only carry out our business when a minimum of joint rules

have been established, particularly in relation to the environment,” comments Pierre de Prémare. “When this is not the case, we have discussions with the authorities so that they can develop a framework.” The final redevelopment plan takes into account the points of view put across by local stakeholders (owners, neighbors, authorities and interest groups). It is not set in stone and may change. “A quarry’s life involves redevelopment work every year,” adds Pierre de Prémare. “This approach is now part of our standards, even if it is not always applied everywhere. Rehabilitation must be part of the day-to-day running of a site.” Collecting comments from local partners and quarry employees also helps to identify areas of improvement.

#### Chance encounters

“We also try to respond to the arrival of new species we weren’t expecting,” says David Park. “And if necessary we modify the redevelopment plan to accommodate them.” In France, for example, staff noticed that two bird species, the bank swallow and the European bee-eater, were nesting in stockpiles of materials. So since then, some storage areas have been especially reserved for these colonies of migrating birds for the duration of their stay. “Sometimes we also have chance encounters,” says Thierry Supiot, Aggregates Excavation Manager, Northern France. “Like the Monday morning when the teams at Sandrancourt quarry in France found a doe that had fallen down a hole several meters deep. The bulldozers made her a ramp so that she could climb out safe and sound.”



AFTER LIMESTONE, OLIVE OIL. The 70,000 trees planted since 2003 on the site of the former quarry at Lafarge Morocco’s Meknes cement plant include 12,000 olive trees. The first olives were harvested in November 2009. The olive oil produced, which will increase in quantity each year, will be sold to fund social initiatives to benefit local communities.

Sample of 644 quarries in operation	Group
Site in a protected area or home to a protected species (red list) (data collected on a reduced sample)	23%
Site close to a local or national protected area	28%
Site close to an international protected area (Natura 2000, Ramsar, etc.)	12%
Sites close to or inside a protected area	51%
Quarries offering an opportunity to strengthen natural habitats or with educational possibilities	31%
Sites having official partnerships with NGOs	14%



A quarry is a phase in the life of the land. Here we illustrate three stages using examples of a range of soft and solid rocks. Mining of minerals

temporary reduction in biodiversity. But this virtuous circle needs to begin well in advance of operations. We look at the challenges before, during and after operations and at the solutions offered by Lafarge to develop the diversity of quarries' ecological heritage.

## THE CHALLENGE

- extract raw materials and create a new landscape

## THE LAFARGE APPROACH

- analyze and reduce the impact of mining on the natural environment
- consult with stakeholders and local communities
- draft and implement a concerted redevelopment plan guaranteeing the future use of the land and integration into the landscape while also encouraging biodiversity

## THE CHALLENGE

- draft and implement a quarry redevelopment plan

## THE LAFARGE APPROACH

- draw up an inventory of plant and animal species, plus ecosystems
- avoid sensitive areas
- rehabilitate as extraction operations progress
- respect existing commitments

## THE CHALLENGE

- allow nature to regain control by encouraging biodiversity

## THE LAFARGE APPROACH

- create suitable habitats: wet grassland, sandbars, nesting boxes, banks for bank swallows, screes (for lizards and reptiles), fissures (for orchids), willow plantations (for denitrification), rock faces (for birds of prey), ponds (for amphibians), pastures and crops, acidophilous and calcicole grasslands, heathlands, shellers (for amphibians and fish)
- develop the rehabilitation plan to incorporate any opportunities
- respect the local environment
- assess the scientific value of the redevelopment through regular surveys

**DRAGONFLIES**  
The wetlands recreated by quarries provide them with a safe environment in which to flourish: they are home to two-thirds of French species, including several rare species such as migrant spreadwings and southern darters.



**BALD EAGLES**  
The Bald Eagle, the symbol of the United States, hunts in American quarries and nests in some, including Presque Isle (Michigan).



**REPTILES**  
Numerous species flourish among the warm and peaceful stones: lizards, vipers, etc. The proximity of wetlands means that grass snakes are often found, or rarer species such as the European pond turtle: its rounded gray shell allows it to blend into the river stones where it likes to soak up the warm sunshine.



**WATER LILIES**  
Indicators of water quality, beds of water lilies and pondweeds occupy banks less than two meters deep. They make excellent shelters for the development of aquatic life: soft-water crustacea, insect larvae, fish and amphibians.



**AMPHIBIANS**  
More than half of amphibian species in France have been identified on our solid and soft rock sites, some rare like the Natterjack toad, the Midwife toad or the Yellow-bellied toad. Quarry environments and their redevelopment are therefore vital for these animals, providing them with numerous possibilities for life.



**HEATHLANDS**  
Increasingly endangered in valleys, these can be reproduced in open spaces with a large number of related species, such as viburnum, hawthorn and dogwood. This is the first stage in establishing a spontaneous forest.



**ORCHIDS** Many pioneer species, such as sometimes rare orchids grow on the siliceous limestone terraces and grasslands. Some environments restored in this way are now listed. The quarries in Brittany, France, are home to 20% of the region's flora.



**ORYX**  
A native of East Africa, it owes its survival to the implementation of protective measures.



**BANK SWALLOW**  
This is one of the pioneer species which significantly benefit from gravel pits and sand pits. As for the kingfisher, soft rock quarries provide it with an important substitute environment.



**TROPICAL SAVANNA OF UGANDA**  
Restoration of the pre-existing savanna was one of the rehabilitation targets of the Dura quarry in Uganda, which is located in a national park. The environment will provide food suitable for the elephants that frequent the site.





**SETTING AN EXAMPLE THE OKKE AGREEMENT**

**WHEN LAFARGE WANTED TO EXTEND THE BOUNDARY OF THE OKKE QUARRY, IN SOUTH KOREA, TO THE BAEKDUDAEGAN MOUNTAIN RANGE,** the plan sparked fierce opposition from local groups. Baekdudaegan is a territory with very rich biodiversity. It also has great symbolic, even spiritual, value for the local population. In 2004, Lafarge formed a partnership with the Baekdudaegan conservation company to develop a joint ecological project. Based on a gradual rehabilitation plan, in addition to preserving ecosystems and water supplies, it addresses a number of safety and pollution issues (dust, noise, etc.). This comprehensive approach, along with the Group's past achievements in this field, won the trust of local partners.

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**SETTING AN EXAMPLE REINVENTING MAGHERAMORNE**

**FOLLOWING THE ACQUISITION OF BLUE CIRCLE IN 2002,** Lafarge became the owner of the cement plant and quarry in Magheramorne, Northern Ireland, a site no longer in operation. Following long consultation with local residents, interest groups, local authorities and WWF International, a rehabilitation document called "Reinventing Magheramorne" was submitted in 2006.

In 2009, the Ministry of the Environment gave it the go-ahead. The redevelopment plan includes construction of an eco-village of nearly 450 homes by the port, built according to One Planet Living specifications defined by WWF International and BioRegional, as well as a world-class leisure center which should lead to the creation of nearly 400 jobs.

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# 2. ■ Redevelopment – confrontation or collaboration?

By definition, preserving a natural environment is a long-term commitment. Yet no long-term development can be planned without taking into account its human and social context. That is why the approach to operating and rehabilitating a quarry must be developed in consultation with local communities.

## Transparency and dialog: the way forward

**a**cquisition of a sufficient level of expertise and the deployment of specific tools enable the foundations to be laid for a company-wide biodiversity protection policy. But no action in this field can be taken unilaterally. A consultation process with local stakeholders (site owner, local authorities, public institutions and interest groups) is crucial.

### A matter of public interest

To be effective, the approach must reconcile technological, economic, environmental and social considerations. "The ecological challenge for industrial companies is a matter of public interest, and we are aware that our work to preserve the environment can only be judged from outside," says Chris Ettery, Stakeholder Relations Manager with the Group Communications Department. "As a Group, we have a

methodological framework to support consultation, which can help address rehabilitation challenges in collaboration with the other parties." Experience has demonstrated that an external perspective on plans can help improve the rehabilitation process, although the level of consultation can vary depending on the local context. The framework provides many different consultation tools, including the use of formal meetings and presentations, interaction with the media and opening sites to visitors from local communities. "Our long-term objective remains to contribute positively to the communities in which we operate," says Chris Ettery. "Although there may not be unanimous support for all proposed developments, we believe in the value that is generated from maintaining dialogue with all parties. Our framework helps ensure that this approach is applied systematically."

### Conflicts and collaboration

So the dialog begins, even if it reveals disagreements. This was particularly the case in South Korea, where Lafarge's plans to mine a quarry on the Okke site sparked strong opposition from local communities and environmental groups (*see box opposite*).

But criticism put forward by local stakeholders can also lead to a project simply being abandoned. Fortunately, the relationship between the Group and local stakeholders is not always one of conflict, far from it. And close links can sometimes prove very rewarding. In Staffordshire, in the UK, an environmental group called the Staffordshire Wildlife Trust set up its offices on the same site as the Group. Members of the interest group and operators, who worked alongside each other, came to know each other and respect each other's point of view.

### Progressing with NGOs

Currently, 15% of Lafarge quarries have an official local partnership, most often with an NGO directly involved in the redevelopment plan. But most sites have more informal relations with local groups. The creation of a consultation and monitoring committee in particular enables stakeholders to be involved in the quarry redevelopment process. The number of sites where this kind of committee exists is a key indicator of the Group's sustainable development policy. "Our stakeholder group meets at least once a year to discuss the actions carried out by Lafarge on an environmental, or even social, level," says Jean-Paul Jeanrenaud, WWF International's Corporate Relations Director. Programs relating to water, CO<sub>2</sub> emissions, persistent pollutants, optimization of water resources, etc. – the Group has regular discussions with the NGO's program leaders on all these topics. "If we were totally satisfied, we wouldn't be an NGO," jokes Jean-Paul Jeanrenaud. "But we are very happy with

### 15% of Lafarge's quarries have an official local partnership to promote biodiversity

the genuine commitment shown by Lafarge and the major progress it has made. Of course, it is always possible to do better. Our task is to maintain a high level of standards by indicating shortcomings and putting forward criticism, as well as advising Lafarge in order to come up with solutions to the challenges faced."



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**François Letourneux**, PRESIDENT OF THE FRENCH COMMITTEE OF THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN) AND A MEMBER OF THE CONSULTATIVE PANEL ON BIODIVERSITY

**“**Panel members are informed of Lafarge's strategies to promote biodiversity and consulted on the methods and mechanisms implemented in relation to this policy. We meet two or three times a year, including once on the ground, at a Group site. Our work involves helping the company to develop tools applicable all around the world, to improve the way biodiversity is taken into account in its industrial activity.”





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#### SETTING AN EXAMPLE A FULL ECOLOGICAL INVENTORY

**THE FREDONIA CEMENT PRODUCTION SITE IN SOUTHERN KANSAS, IN THE UNITED STATES**, has been the subject of an in-depth environmental study since November 2008. For six hours a week throughout the year, Lafarge employees observe the plant and animal species which live in the quarry.

Date and location of sighting, scientific names and quantities are recorded. So far 380 species have been listed and most have been photographed. Many of these photos have been published online: a valuable way of raising employees' and local stakeholders' environmental awareness.

The information collected has led to special habitats being created. In 2010, for instance, two new wetlands were created, as well as a shelter for collared lizards and the pincushion cactus. Nesting areas have also been set aside for mallard ducks, wood ducks and Canada geese.



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**Santiago Sardinero**  
Botanics lecturer at the environmental sciences faculty of the University of Castilla-La Mancha in Toledo, Spain

Lafarge contacted the University of Castilla-La Mancha to assess and increase the value of biodiversity at the Yepes quarry. We analyzed the abundance and diversity of species – particularly lichens, weevils, birds, butterflies and springtails (small invertebrates) – as well as sectioning the quarry into zones of homogeneous biodiversity. We also implemented changes to promote long-term biodiversity and established an environmental education program about the quarry. This ambitious project is exemplary for the rest of Spanish mining companies in terms of biodiversity protection.”

## Assessment and training tools: proving efficiency

**t**he Lafarge Eco Systems subsidiary in Kenya was set up to manage the redeveloped quarry of Bamburi, near Mombasa. The site, whose rehabilitation began in 1971 and is continuing today in tandem with operations, is a pioneering site for biodiversity management. “Bamburi’s rehabilitation began even before most industrialized countries had legislation on this issue and with very few resources,” says Sabine Baer, Chief Operating Officer of Lafarge Eco Systems. “We now have an aquacultural farm on the site, we produce biofuel and wood and we have developed a tourist business based on the natural park founded by Rene Haller.”

The subsidiary has developed real expertise in this exemplary management model. Lafarge Eco Systems is now on track to make a profit as a result of the economic activity created around the site and its teams’ work as service providers to other Group subsidiaries, particularly in Uganda and Tanzania. Sharing Best Practice has now been extended through the use of IT tools, but above all thanks to the network of managers who can explain it. For example, Shelley Frost, Regional Environment and Public Affairs Director for Northern and Central Europe, can draw on the wide experience of the UK when creating quarry redevelopment management posts in Central Europe. “We are also organizing awareness-raising days with WWF in some Group BUs around the world,” she says.

**A specific training program**  
A redevelopment plan takes time to implement, which is why Lafarge is gradually incorporating biodiversity protection into its training programs.

“We are currently testing pilot training courses in biodiversity,” says Pierre de Prémare. Research is underway to identify relevant employees (quarry managers, excavation teams, geologists, etc.) and their specific needs. A vast internal awareness-raising and communications campaign has also been launched for the Year of Biodiversity.

**A dedicated biodiversity panel**  
In order to encourage generalization of its knowledge and guarantee the relevance of its actions, since 2006 Lafarge has been consulting a group of independent experts specializing in ecological issues and relations between nature and companies. Over the years, this relationship of exchange and consideration has helped a coherent range of management and best practice tools to emerge, as well as identifying areas for improvement in the

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**James Griffith**,  
MANAGING DIRECTOR OF  
THE WORLD BUSINESS  
COUNCIL FOR SUSTAINABLE  
DEVELOPMENT (WBCSD)

“As part of our Ecosystem Valuation Initiative (EVI), we are developing a Corporate Guide to help businesses measure and quantify their ecosystem impacts and dependence. This will allow companies to improve decision-making by explicitly accounting for both ecosystem degradation and the benefits provided by ecosystem services.

The Guide is currently being tested by 15 WBCSD member companies including Lafarge.



**Robert Johnson**, PRESIDENT  
OF NGO WILDLIFE HABITAT COUNCIL  
(WHC), MEMBER OF THE CONSULTATIVE  
PANEL ON BIODIVERSITY, USA.

“Our NGO, the Wildlife Habitat Council, helps local Lafarge managers understand biodiversity and its relationship to their standard facility operations. We help train employees at the company’s sites to incorporate environmental themes into their operations. We encourage the Group to inform the local community of Lafarge’s interest in and commitment to biodiversity conservation. Our NGO provides a third-party certification for the efforts by a company like Lafarge that assures credibility and transparency for their initiatives at

the facility level. I’m a member of the Lafarge Biodiversity Advisory panel and have a clear picture of biodiversity management at Group level.”



#### REDEVELOPMENT PLAN IN CHINA

The Nanshan quarry in Chongqing province, currently operated by Lafarge Shui On Cement, is one of the first Group sites in China to be subject to a redevelopment plan. The 3D model shown here is taken from the rehabilitation plan.



**Annelisa Grigg**,  
CONSULTANT FOR NGO FAUNA  
& FLORA INTERNATIONAL, MEMBER  
OF THE CONSULTATIVE PANEL ON  
BIODIVERSITY, UK

“The panel was consulted regarding the Dura quarry in Uganda. While the site itself is not sensitive, it is located on the edge of a national park and its operations may cause disturbance to the surrounding habitats. Our role has been to assess its impact. We also provided Lafarge with local contacts to initiate a collaboration. Lafarge is now working with the Wildlife Conservation Society, the Ugandan authorities and the park’s management to develop a project with minimal environmental impact.”



**Mark Metcalf**, ENVIRONMENTAL COORDINATOR  
AT THE FREDONIA SITE, USA

“Our biodiversity work has increased employees’ awareness of these issues. They have a clearer idea of the importance of the Group’s environmental policy and feel involved in protecting biodiversity. And this work also makes them feel proud to work for Lafarge. This enhances our employees’ satisfaction as well as the Group’s image. Our biodiversity management programs therefore provide the company with real added value.”



#### REHABILITATION PLAN IN BRAZIL

An employee at the Arcos quarry, whose redevelopment plan is currently being studied.

**Sabine Baer**, CHIEF OPERATING OFFICER,  
LAFARGE ECOSYSTEMS

Group’s approach. Made up of members of interest groups, well-known scientists or consultants, the consultative panel on biodiversity offers an external perspective on Lafarge’s activities. It advises Lafarge on biodiversity priorities and management methods. The valuable information provided by its members on developments in major environmental challenges benefits the whole Group. And helps push forward initiatives promoting natural environments.

#### Assessing the impact of rehabilitations

Having defined the criteria for ecological studies of quarries before extraction, Lafarge and WWF are in the process of setting up a system for assessing biodiversity in rehabilitated quarries. The Long-term Biodiversity Index (LBI) will make it possible to measure what effects the quarry rehabilitation policy has on the development of plant and animal species. “The LBI is the first measurement tool for assessing our impact on biodiversity,” says Pierre de Prémare. “Its purpose is to help quarry operations and redevelopment managers to routinely estimate the effectiveness of their biodiversity preservation work. At the end of the assessment, the site is given a rating between one (low ecological value) and seven

“To rehabilitate the parts of the Bamburi quarry (Kenya) which are no longer in operation, the main pioneering species of tree we use is called *Casuarina* (or *Filao*, or ironwood in French Polynesia). It can grow without earth in symbiosis with microorganisms present in the ground, which enables it to absorb nitrogen from the air. When its needles fall to the ground, they create organic matter and, in due course, humus. After five years, we remove some of the *Casuarina* and replace them with indigenous species from the East African coastal forests. After seven to ten years, the rehabilitation program is complete, and we move onto management, sustainable utilization for education and recreation, and biodiversity monitoring.”

(exceptional ecological value). The number of species recorded on the site and their rarity are both taken into account.” The index, which is still in the experimental stage, has been calculated for around ten quarries. It was applied for the first time in Mannersdorf under the supervision of WWF Austria (see box below). In France, studies have been conducted at several sites including the alluvial quarry at Saint-Ouen on the banks of the river Loire. Its LBI indicates that it is of slightly more ecological interest than surrounding sites. It provides shelter for 52 species of birds and 20 odonates (dragonflies) in 12 types of natural habitat, as well as the Natterjack toad and the Edible frog, which reproduce there.

In Spain, Professor Sardinero from the University of Castilla-La Mancha, is implementing this assessment process in the Yepes quarry (see p. 17). The method involves dividing the quarry into homogeneous zones, in which species are analyzed according to their rarity and the surface area they occupy. The method will be applied at several sites, to verify its relevance and reproducibility, before it is used to study more sensitive areas in various regions around the world.



#### SETTING AN EXAMPLE A FULL-SCALE TEST

**FOLLOWING REHABILITATION OF THE MANNERSDORF QUARRY, IN AUSTRIA**, the slopes and scree were made gentler and planted with trees. Shelters for animals were also built. Several species have moved into the redeveloped areas over the years. A biodiversity analysis conducted at the site

in partnership with WWF revealed the presence of numerous protected plant and animal species. Once this experiment was complete, a new measurement tool, the Long-term Biodiversity Index (LBI), was drawn up in 2003 to supervise and coordinate the changing ecology of redeveloped quarries.

#### THE CONSULTATIVE PANEL ON BIODIVERSITY

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**JEAN-PAUL JEANRENAUD**  
(WWF International).

##### SPONSOR

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**SETTING AN EXAMPLE** **SAVING AN ENDANGERED SPECIES**

**PROSTRATE ROCKET IS A RARE AND ENDANGERED PLANT IN THE BRASSICACEAE FAMILY.** At the end of the 1990's, when work at the Guerville quarry (France) was coming to an end, the site's chalky soil was the only place in the Ile-de-France where it was found. Lafarge therefore decided to adapt the site's redevelopment process. In order to create ecological conditions favorable to growth of the prostrate rocket, scientists from the Paris region's Conservatoire Botanique National (National Botanical Conservatory) established a rescue protocol involving studying genetic diversity, selecting the most well-adapted plants and conserving seeds in order to recolonize other areas. The plan was approved by the Conseil National de Protection de la Nature (National Council for Nature Protection). Due to the presence of the prostrate rocket, the former quarry became one of the Natura 2000 European network of natural sites. The same process was followed in Brittany with the Brest Conservatoire Botanique National and has recently been exported to Greece by the same conservatory and the University of Patras.

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# 4.

How can we protect and nurture services provided by ecosystems? Natural environments carry out a wide range of functions benefiting human life and activities. Recent research seeks to assess the market value of these services. This approach encourages awareness of a development method which incorporates ecological principles.

## The priceless role of the natural world



DR Mediabrique Lafarge

> Prostrate rocket.

**a**ir and water purification, photosynthesis, flood routing, crop pollination, etc. – the way an ecosystem functions relies on a wide variety of perpetual interaction, which we are rarely aware of. Except when this natural clockwork is disrupted. And the consequences of damage to ecosystems can be significant, including from an economic perspective (collapse of agricultural production, shortage of natural resources, etc.). New York's water supply is an interesting example of this. In the 1990's, City Hall, having observed a deterioration in the water drawn up, planned to build a potable water treatment plant. However, it was decided that a study should first be carried out into the reasons

for the water's deterioration. The conclusion revealed that exploitation of ecosystems in the catchment area, particularly forests, had deprived the water of the natural filter provided by the trees and roots. This led to an irrefutable comparison: recreating and protecting the original conditions which purified the water would cost six to eight times less than constructing and maintaining a treatment facility. Inspired by this logic, several studies were launched to estimate the market value of services provided by nature free of charge. For instance, according to a study carried out in 2008 by the European Commission, the value in coffee production of pollination by bees is estimated at 278 euros per hectare cultivated per annum. In 1997, Professor Robert Costanza's team at the University of Vermont, in the United States, went further, calculating the total economic value of services provided by ecosystems on a global level: 33,000 billion US dollars per annum. The TEEB (The Economics of Ecosystems and Biodiversity) study currently being conducted by Indian economist Pavan Sukhdev as part of the Convention on Biological Diversity, also relates to an economic assessment of ecosystems. It is clearly complicated to calculate the value of what cannot be bought – what is priceless – but these financial indicators provide an understanding of the major economic role played by ecosystems. And therefore the need, if only for the smooth running of business, to preserve them.

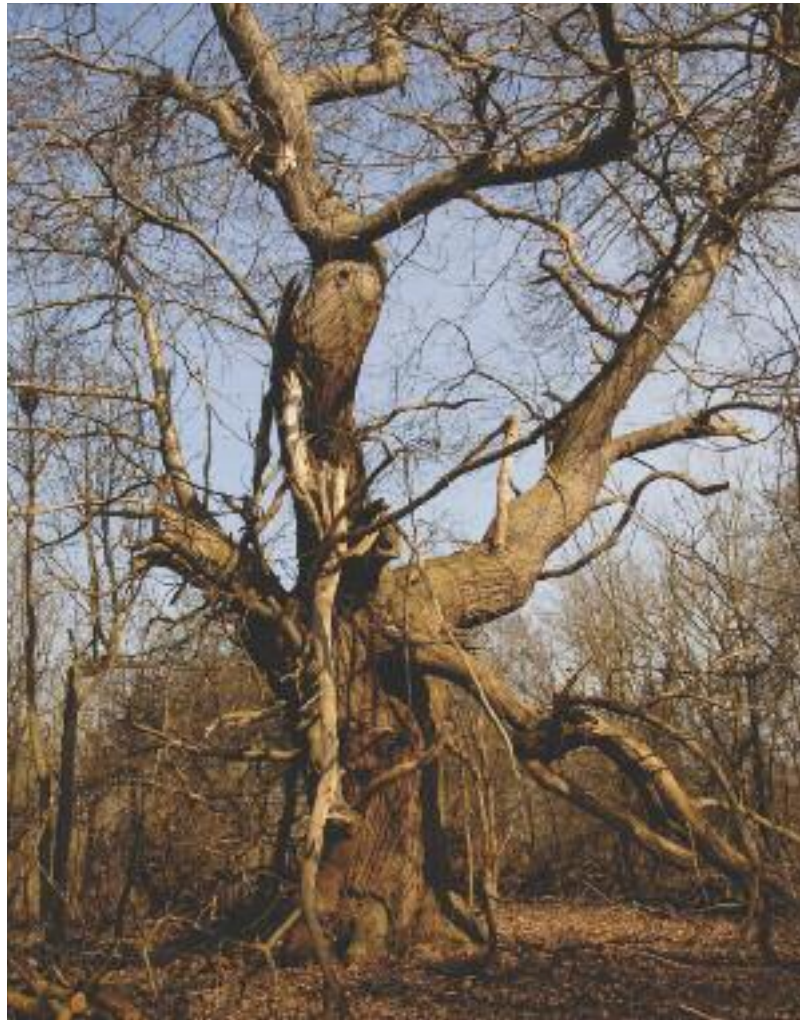
**From nature to auditing**

The Millennium Ecosystem Assessment, carried out in 2005, was the first global audit of forests, wetlands and other ecosystems. It revealed the increase in the acceleration and extent of their deterioration. The study listed around 24 services, which it divided into four main categories: supplies (food, fresh water, lumber, etc.), regulation (climate, disease, erosion, etc.), cultural services (leisure linked to ecosystems) and support (nutrients and primary products required for other services). The Millennium Ecosystem Assessment emphasizes that companies whose business depends on or is closely related to the action of ecosystems will have to face risks affecting their financial profits. While the analysis of ecosystems from the perspective of services provided by nature is quite new, Lafarge is directly committed to this issue. First, corporate environmental responsibility requires reducing or offsetting the impact of corporate activities. Second, the production of building materials is dependent on the availability of natural resources, fuel and water.



#### PRESERVING AN OLD OAK

At the Panshanger quarry (Hertfordshire, United Kingdom), a very old oak is protected due to its great age (genetic diversity).



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#### BEEES IN YEPES-CIRUELO

The quarry of Yepes-Ciruelo, near Toledo, Spain, is home to two protected endemic plant species. To allow these plants to thrive, Lafarge has reintroduced nearly a million bees to part of the site. By ensuring the pollination of numerous plant species, the bees help to restore and protect the local flora. The rehabilitated areas were given over to academic research under a partnership agreed between Lafarge and the University of Castilla-La Mancha. Professor Santiago Sardinero and his team use them to study natural recolonization in order to understand the successive emergence of plant species on redeveloped sites.



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#### WATER IN CAULDON

The former shale quarry at the Cauldon site, in the UK, was transformed into a lake to reduce the cement plant's water dependency. Until 2007, water was pumped from the River Hamps, whose upstream is designated a Site of Special Scientific Interest. As a result of the redevelopment plan, the site stopped pumping water from the river in 2009. This also reduced the risk of pollution and flooding of neighboring residential areas, and the lake has now been colonized by numerous bird species.



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#### Harve Stoeck, VICE PRESIDENT OF PUBLIC AFFAIRS AND THE ENVIRONMENT, LAFARGE IN NORTH AND LATIN AMERICA

"Natural Capital's InVest program was developed by WWF, Stanford University and The Nature Conservancy. This assessment system provides a systematic, detailed and broadly applicable understanding of environmental risks and opportunities. By testing it in Presque Isle (Michigan), WWF and Lafarge will be able to gauge its relevance and reproducibility."

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#### Jean-Marie Pelt

Honorary Biology Professor at the University of Metz and president of the Institut Européen d'Ecologie (European Institute of Ecology)

"We know that nature provides mineral, food, medicinal, textile and forestry resources, among others, but we know very little about the services provided by ecosystems. For example, the services provided by a forest cannot be measured in cubic meters of wood. A forest captures carbon, cleans the air and water, drains rainwater to the water table and supplies springs. We are directly dependent on nature. Yet a recent UN report warns that 60% of ecosystems are partially reduced, along with the services they provide."

#### An experimental study in the United States

To develop a better understanding of the mechanisms inherent in ecosystems, Lafarge is currently conducting an innovative study in Presque Isle, in the United States. "Our project to assess and promote the services provided by the natural environment has three stages," explains Harve Stoeck, Vice President Public Affairs and Environment with Lafarge's Aggregates & Concrete Business in North and Latin America. "First, environmental think-tank the World Resources Institute (WRI) will apply the ESR model for assessing services provided by ecosystems, developed with the WBCSD and the Meridian Institute, to the Presque Isle site. "This preliminary study will make it possible to identify risks, opportunities and strategies in relation to the natural environment. Then, two ecosystem estimation models, one of which was created by WWF United States, will be used to determine the potential value of services present on the site and of services likely to be developed. Finally, the think tank's teams

will produce a full report detailing the reliability, reproducibility and commercial application of these assessment models."The results will be shared with the WBCSD as part of the Ecosystem Valuation Initiative. The experience and recommendations gained will be used to orient future projects to analyze and preserve natural environments.

Identifying the different functions carried out by ecosystems and how they are interconnected is also an inspiration for research. Biomimetics, a field which is still little known, seeks to develop technologies inspired by nature (*see box below*). So protecting and developing the natural environment will no doubt also involve innovation.

#### BIOMIMETICS - AN INSPIRED SCIENCE

In the early 1990's, US biologist Janine Benyus laid the foundations for a new field of research, involving drawing inspiration from observing natural models to develop sustainable processes and products. Biomimetics involves artificially reproducing natural mechanisms for direct application in various technological fields and even the structuring of groups or societies. "The concept has been around for about 15 years," says Jean-Paul Jeanrenaud (WWF International), "and is now growing rapidly. More and more scientists believe that imitating nature will make it possible to reduce the ecological impact of our activities, as well as reducing costs and increasing profitability." Could the concretes of tomorrow be inspired by it?



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> *Centaurea niederi*, a species endemic to the Peloponnese in Greece, at the Araxos quarry.



© DR Médiathèque Lafarge

> Great crested grebe watching over its nest and carrying its baby on its back.



© DR Médiathèque Lafarge

> Water rises and a stretch of water.



© DR

> Spider in the Matozinhos quarry, Brazil.



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1. Saddle-billed stork, in Zambia.
2. Rehabilitated quarry in Bouskoura, Morocco.

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### ON THE BANKS OF THE YONNE

Misy-sur-Yonne quarry, located in the French department of Seine-et-Marne, was mined between 1950 and 1975 by the Compagnie des Sablières de la Seine. It became Lafarge's property in 1973. Rehabilitation of the site created a natural space

which stretches over 60 hectares, as well as a 20-hectare residential and leisure area. The waterway is also used by barges to transport more than three million tons of sand and gravel each year.