Working with nature: Biodiversity Guidance for Lafarge sites

WWF

LAFARGE

Conservation Partner

Working with Nature: Biodiversity Guidance for Lafarge Sites

Bruno Lafont
Chief Executive Officer
Lafarge

"We have long been committed to building a more sustainable world and this philosophy is demonstrated in our values. We must set an example in our operations and take a responsible approach to reduce our impact on the environment.

Ecological balance is one of the key pillars of sustainable development. Our operations both affect ecosystems and rely on their regulatory services (such as climate, flood control, waste treatment) and provisioning services (such as freshwater, food and fibre). The deterioration of ecosystems comes with a great cost to society. It is incumbent on companies like Lafarge to take the lead in protecting and enhancing biodiversity and therefore contributing to the enhancement of ecosystems.

For many years Lafarge has been actively rehabilitating its quarries to restore and create new habitats. Biodiversity has been a long standing key focus area and was one of the original work streams in the Lafarge partnership with WWF. To demonstrate our commitment in this area we set public targets for biodiversity for our quarries in our 2012 Sustainability Ambitions. It is now our goal to broaden this approach within the organisation, by also looking at improving biodiversity on non quarry sites.

Produced as part of our partnership with WWF, this Biodiversity Guidance aims at providing our managers with the steps needed to integrate their site, where practical, with the living environment.

We believe this will set an example for other companies within our sector to follow and help to raise awareness of the issues we all face with regard to the global decline in biodiversity.

We rely on the dedication and energy of our teams. We believe that a continuous improvement encourages all of us to move forward on such an important subject with the expertise developed through our partnership with WWF globally and locally".

Jim Leape
Director General
WWF International

"We are now consuming the world's resources 50% faster than the Earth can replenish them. If our demands on the planet continue to grow at the same rate, by the mid-2030s we will need the equivalent of two planets to maintain our lifestyles.

Fortunately, many companies now recognise the need to mainstream environmental and social issues into their core activities and business models.

It is in this context that WWF welcomes these important Biodiversity Guidelines – developed under the WWF-Lafarge partnership. We see these guidelines as an important step forward in the sustainability of all of Lafarge's operations – in its quarries, plants and offices. We are confident that when Lafarge implements these global guidelines, it will reduce its impact on the natural world, while also enhancing local biodiversity values.

Ultimately, by implementing these guidelines, Lafarge will not only benefit from improved reputation but, more importantly for us, it will also help drive a change in biodiversity performance across the construction materials sector".

Contents of this Biodiversity Guidance

Working with Nature: Biodiversity Guidance for Lafarge Sites

Executive Summary

- This document has been produced as part of the Lafarge-WWF partnership, and aims to facilitate the protection, restoration and enhancement of biodiversity across all Lafarge sites worldwide (including quarries, plants and offices). It is aimed primarily at business unit and site managers, as well as any local employee teams dealing with biodiversity issues.

- Biodiversity is the full range of life on Earth (e.g. plants, animals, fungi etc.), including at the genetic, species and ecosystem levels. Unfortunately, biodiversity is declining massively due to habitat degradation, species mortality/stress and the spread of invasive exotics.

- Biodiversity is vital for our food, fuel, fibre, climate, air, water, soil, health and enjoyment. Moreover, by conserving biodiversity, companies can gain reputation, investment, morale, stakeholder involvement, operating licences, competitive advantage and avoidance of risk.

- Biodiversity projects may face constraints including health and safety concerns, available funding, regulations, other land uses and variations across sites. However, in practice, these constraints can often be readily overcome and many "win-win" solutions are possible.

- Biodiversity improvements should aim to achieve a number of goals, all or some of which should be addressed at each Lafarge site, depending upon the particularities of each site, e.g. its size, type and stage of development, local biodiversity and local expert opinion.

- **GOAL 1: Avoid/minimise damage to important habitats**, including that caused by land clearance, induced development, cumulative impacts and changes to hydrological regimes.

- **GOAL 2: Avoid/minimise species mortality and stress**, including that caused by site traffic, excavations, water pollution, and changes to hunting, fishing and forestry practices.

- **GOAL 3: Control and remove invasive exotic species**, including any already present in the area, as well as those that could potentially be spread/introduced by site operations.

- **GOAL 4: Minimise and reverse habitat fragmentation**, including that caused by roads powerlines, pipelines, fences and quarries, especially where this impacts habitat corridors.

- **GOAL 5: Restore and/or rehabilitate damaged habitats**, to reverse any previous damage and/or to enhance biodiversity to a level beyond that which existed previously.

- **GOAL 6: Plant only appropriate local native species,** to avoid spreading invasive exotics, as well as to help conserve local plants and provide habitat for other local species.

- **GOAL 7: Make industrial areas as natural as possible**, e.g. with green roofs, pollinator gardens, nature ponds, bat/bird boxes, animal refuges and/or insect homes, as appropriate.

- In order to achieve each of these biodiversity goals, a number of practical steps need to be undertaken, most of which will be applicable to most sites, depending upon the particular local culture, regulations and pre-site history, as well as variations in the site itself.

Working with Nature: Biodiversity Guidance for Lafarge Sites

- **STEP 1: Train/organise lead local employees** (by using this guidance, the associated presentation, visits to best-practice sites and local expert training), to identify and address actual and potential biodiversity impacts as well as opportunities for enhancements.

- **STEP 2: Consult local biodiversity experts** (possibly including: university researchers, professional groups and/or trade associations), to gain essential local knowledge, and ongoing advice, to help identify and manage biodiversity impacts and improvements.

- **STEP 3: Consult and involve local stakeholders** (e.g. staff, NGOs & residents; farmers, hunters and fishermen; tourism, sport and leisure groups; and schools, scouts and other youth groups), to gain support, local knowledge, resources, manpower and legitimacy.

- **STEP 4: Consult local/national biodiversity plans/regulations** (including those produced by local/national governments and the management authorities for any local protected areas), to gain further local knowledge, and guidance on appropriate objectives.

- **STEP 5: Consult/co-ordinate with other local sites/operators** (which may have similar biodiversity impacts and/or concerns) to pool knowledge and resources, whilst minimising combined/cumulative impacts and multiplying the benefits of biodiversity enhancements.

- **STEP 6: Establish baselines and monitoring regimes** (including of important habitats, vulnerable species and invasive exotic species as well as actual or potential impacts upon them) to inform and measure the success of biodiversity-related decisions and actions.

Understanding the challenge

- **STEP 7: Consider biodiversity in decisions about new sites/operations** (including in Feasibility/Opportunity Studies and Environmental Impact Assessments) to minimise subsequent impacts as well as to increase opportunities for biodiversity enhancements.

- **STEP 8: Integrate biodiversity into existing management processes** (including in Land Management Plans and Environmental Management Systems), to help mainstream biodiversity conservation, monitoring and education into site operations and construction.

- **STEP 9: Plan on-site actions to protect, restore and enhance biodiversity** (including via Rehabilitation and/or Biodiversity Management Plans), to ensure that required actions are taken, and that they are effective, efficient, appropriate, sustained and well-organised.

- **STEP 10: Implement, sustain and modify these planned actions**, involving stakeholders and employees, adhering to relevant health and safety concerns, and adapting management to deal with any surprises, challenges or unforeseen/inappropriate outcomes.

Addressing the challenge

- **STEP 11: Educate residents, staff, visitors and others about biodiversity**, impacts and enhancements, to raise awareness, and demonstrate the effectiveness of on-site actions, (e.g. with guided visits, information boards, external presentations and leaflets/handouts).

- **STEP 12: Report results of monitoring, actions and education** (including to the Lafarge group, as well as the local community and regulators) to demonstrate and encourage biodiversity improvements, and to allow others to learn from any successes and challenges.

Communicating the challenge

Working with Nature: Biodiversity Guidance for Lafarge Sites

1. Introduction

Biodiversity is good for business. Companies, and the individuals that they employ, sell to and rely on, could not survive without the food, fuel and fibre, clean air and water, health and many other ecosystem services that biodiversity provides worldwide. Similarly, by actively protecting and enhancing biodiversity, companies can gain inward investment, operating licences, competitive advantage, reputation and morale, as well as avoidance of both reputational and regulatory risks. Moreover, due to the high importance of biodiversity, it is essential that it is addressed by Lafarge, especially given the Group's worldwide commitments to biodiversity, and sustainability in general.

Lafarge sites can cause significant harm to biodiversity, e.g. from pollution, land clearance and/or induced development. However, much of this harm can be avoided, or at least significantly reduced, and many sites can go further and actively enhance biodiversity, e.g. by rehabilitating areas to a biodiversity level beyond that which existed pre-site. Moreover, it is the purpose of this document to assist sites in reducing any negative impacts, whilst also increasing positive impacts, so that the Lafarge Group as a whole can contribute to biodiversity conservation worldwide.

Lafarge has over 1,700 active sites worldwide and this guidance is applicable to all of them, including quarries, plants and offices. The document is primarily aimed at business unit and site managers, as well as any employee teams dealing with biodiversity issues. However, it will also be of use to other employees with an interest in biodiversity. Finally, given variations across the many Lafarge sites, readers should focus on those aspects of the guidance most relevant to them.

The next chapter provides an overview of biodiversity, including why it is important and also why companies such as Lafarge should work to conserve and enhance it. Chapter 3 then addresses a number of constraints that sites may need to overcome when working on biodiversity, and Chapter 4 describes the biodiversity goals that sites should aim to achieve. Finally, Chapter 5 describes the practical steps that need to be undertaken to achieve these goals. A glossary of technical terms, as well as a list of references for further reading, are also given at the end of the document, and a list of acronyms, and case studies featured in the document, are both provided on the following page.

This document has been produced by an external environmental consultant – Dan Ward – as part of the Lafarge-WWF partnership. This work has involved wide internal and external consultation, and the author would like to thank, and acknowledge the contribution of, the following individuals:

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Acronym	Explanation of Acronym	Internet Link
BMP	Biodiversity Management Plan	
CBD	Convention on Biological Diversity	www.cbd.int
CSI	Cement Sustainability Initiative	www.wbcsdcement.org
EIA	Environmental Impact Assessment	
EMS	Environmental Management System	
FSC	Forest Stewardship Council	www.fsc.org
GRI	Global Reporting Initiative	www.globalreporting.org
IAIA	International Association for Impact Assessment	www.iaia.org
IBAT	Integrated Biodiversity Assessment Tool	www.ibatforbusiness.org
ISO	International Standards Organisation	www.iso.org
IUCN	International Union for the Conservation of Nature	www.iucn.org
SMART	Specific, Measurable, Achievable, Relevant, Time-limited	
TEEB	The Economics of Ecosystems and Biodiversity	www.teebweb.org
UNEP	United Nations Environment Programme	www.unep.org
WBCSD	World Business Council for Sustainable Development	www.wbcsd.org
WCMC	World Conservation Monitoring Centre	www.unep-wcmc.org
WHC	Wildlife Habitat Council	www.wildlifehc.org
WWF	World Wide Fund for Nature (formerly: World Wildlife Fund)	www.panda.org

Biodiversity Case Studies featured in this document:

2. Why should Lafarge sites conserve Biodiversity?

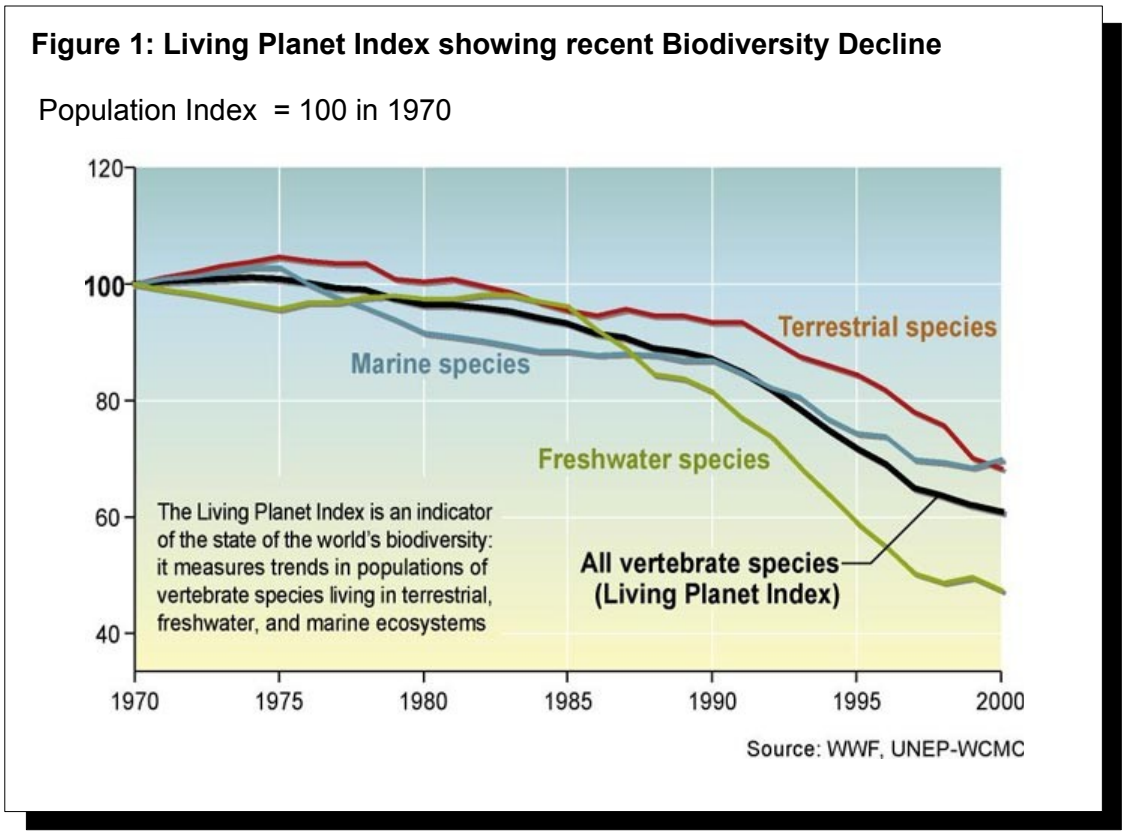
Before establishing how Lafarge sites should conserve and enhance biodiversity, it is important to clarify what is meant by biodiversity, and also why conserving and enhancing it is so essential.

2.1. An Overview of Biodiversity

Biodiversity is a technical term (short for 'biological diversity'), which refers to the full range of diversity of life on earth, including at the genetic, species and ecosystem levels. In general, it refers to similar things as the older and less technical term 'nature'. However, 'biodiversity' is a more scientifically precise term, whereas 'nature' is more tangible and meaningful for many non-experts.

Unfortunately in recent years, biodiversity has been declining massively across most of the world, with an increase in extinctions, as well as population and range declines, in individual species. This is shown graphically below in Figure 1, which displays results from the Living Planet Index, produced by WWF and UNEP-WCMC, and which is an indicator derived from over 10,000 population trends in over 2,500 species of fish, mammals, amphibians and reptiles. Moreover, similar declines have also been measured in many plants, insects and other invertebrate species.

Figure 1: Living Planet Index showing recent Biodiversity Decline



There are many human-related causes for this recent drastic decline in biodiversity worldwide. However, most of these can be grouped into four main causes: loss of natural habitats; direct mortality and stress of individual species; the introduction and spread of invasive exotic species, and; habitat fragmentation (see sections 4.1 – 4.4). In addition, climate change may pose a serious extra threat to individual species, and biodiversity as a whole, in the near future, especially in conjunction with the other pressures (e.g. habitat loss and fragmentation means that some species will no longer be able to migrate, as would be required to adapt to an increasingly warming world).

2.2. The Importance of Biodiversity

There are many reasons why biodiversity needs to be actively conserved. Firstly, biodiversity provides us with most of our **food**, **fuel** and **fibre** worldwide, either directly or indirectly. Fruit trees are mainly pollinated by wild insects. Fish need intact ecosystems in which to breed, and are our main source of protein in many areas. Agricultural pests are controlled and reduced by wild predators, and much of our food and building materials comes from natural forests, especially in newly emerging economies. Even our precious fossil fuels originally derived from ecosystems.

Secondly, biodiversity is good for our **climate**. Large forests, in particular, help absorb and store carbon dioxide, and also encourage the production of clouds that reflect more sunlight back out into space. Moreover, conserving large forests has been recognised as an effective and an efficient way to buffer and reduce the effects of global warming, at least in the short term (Stern 2006). Thirdly, biodiversity is also important for maintaining **air quality**. This has been recognised in many cities where trees are planted to help absorb pollutants. Similarly, vegetation can be essential for preventing dust storms, as has become all too apparent in many deforested/overgrazed areas.

Fourthly, large intact ecosystems are essential for the production and maintenance of clean, plentiful **water** supplies, on which our cities, agriculture and much of our industry depends. Degraded ecosystems can lead to less rainfall and/or polluted water supplies, whereas conserved and/or restored natural ecosystems can help to prevent droughts, water scarcity and siltation. Fifthly, biodiversity is also very important for generating and sustaining **soil**, which is essential for agriculture, forestry and many other human activities. For example, many organisms help to contribute to the recycling of nutrients (e.g. nitrogen) back into the soil, whilst vegetation can help to prevent soil erosion, particularly in very warm and dry, and/or very wet, parts of world.

Sixthly, biodiversity is good for our **health**. Living in or visiting natural areas can be very good for your health – both psychologically and physically – as has been known for centuries. More specific recent discoveries include that tropical deforestation has led to increases in malaria mosquitoes and thus the disease (WWF 2010), and that many new antibiotics, can and have been derived from particular species, which thus need to be conserved. Similarly, intact ecosystems can help to protect local communities from flooding, avalanches and storms. Finally, many people derive a lot of **enjoyment** from biodiversity, e.g. by undertaking leisure activities and/or living in natural areas, by photographing and/or painting nature, or simply by knowing that certain beautiful lifeforms exist.

Biodiversity = Food + Fuel + Fibre + Climate + Air + Water + Soil + Health + Enjoyment

Biodiversity thus provides us with many essential things, including food, fuel, fibre, climate, air quality, water, soil, health and enjoyment. However, more than that, biodiversity is a good indicator of wider levels of the sustainability of our development. In areas where we consume more than we renew, biodiversity suffers and declines. Conversely, in areas where we are more sensible and careful in our resource use, biodiversity flourishes. Thus we should conserve biodiversity, not only because of the things it gives us but also because by doing so we will become more sustainable as a society and thus more able to maintain and leave a viable planet for future generations to enjoy.

2.3. The Business Case for Biodiversity

Biodiversity conservation is a responsibility for us all: individuals, nations, communities, international organisations and also companies. Moreover, large international companies, such as Lafarge, have a particular responsibility to conserve biodiversity because they not only rely on, but can also potentially impact, large parts of the natural world. For example, large quarries can – if poorly managed or located – affect whole ecosystems, whereas a company such as Lafarge could not exist without the food, fuel, fibre and many other services that nature provides. Fortunately, however, companies such as Lafarge also have a lot of opportunities to assist conservation both by reducing their impacts on the natural world and by seeking to actively enhance local biodiversity.

Beyond having an opportunity and a responsibility, there are a number of reasons why Lafarge should conserve biodiversity. Firstly, many residents, regulators and customers like nature, and thus by conserving biodiversity, Lafarge will improve its **reputation**. Similarly, many investors are biodiversity-concerned and thus conservation can help attract **investment**; e.g. the ING Group will only invest in sites outside World Heritage, IUCN and Ramsar protected areas. Thirdly, many Lafarge employees also like biodiversity and thus by conserving it – and involving local staff in the process – Lafarge can increase **morale** and thus productivity. Fourthly, conserving biodiversity will likely benefit, and often includes, **stakeholder involvement**, which is a wider company priority. Fifthly, the legal requirements to conserve biodiversity that exist – and which may well increase in the future – mean that conservation is essential for being able to secure a **licence to operate**. Sixthly, by going beyond current regulation in some countries, Lafarge can help to drive up regulation across the sector and thus gain **competitive advantage** as a leader in conservation. Finally, addressing biodiversity is important to **avoid risks** to the company's reputation, inward investment and licence to operate, as well as to avoid potential fines and/or stakeholder conflicts.

By actively addressing biodiversity across all of its sites worldwide, Lafarge can gain:

Improved Reputation + **Inward Investment** + **Staff Morale** + **Stakeholder Involvement** + **Operating Licences** + **Competitive Advantage** + **Avoidance of Risks**

3. What site-level constraints need to be addressed?

It is very important that Lafarge sites work to conserve, restore and enhance biodiversity. However, before this can be achieved, some constraints may need to be overcome, as described below.

3.1. Health and Safety Concerns

Health and safety is a priority for all Lafarge sites. Health and safety concerns thus need to be addressed within any biodiversity projects. This includes, firstly, how any biodiversity actions are implemented on site (see section 5.10) – including how and whether local stakeholders are involved practically (see section 5.3) – as well as, secondly, ensuring that biodiversity objectives do not conflict with health and safety objectives (e.g. the removal of some fences to reduce habitat fragmentation may not be possible because they are essential for health and safety reasons).

In general, however, conflicts between biodiversity projects and health and safety may not be very common. Moreover, where potential conflicts do exist, compromises may be possible. For example, local school children and other stakeholders may still be involved in education and other biodiversity activities, provided that they are appropriately located, organised and supervised. Similarly, it may be possible to design some fences in a way that they allow certain local animals to pass whilst retaining their important health and safety function. Finally, in many cases, biodiversity improvements may actually contribute to the health and safety of local residents and/or employees. For example, reductions in local pollution will benefit local people as well as plants and animals.

3.2. Sufficient Available Funding

Funding is a further possible constraint for some Lafarge sites. Some biodiversity projects may require significant funding, and this will need to be allocated and planned for early to ensure that adequate resources are available. In addition, some biodiversity projects – which may be desirable from a purely biodiversity perspective – may not be possible because they are prohibitively expensive. In such cases, it may be necessary to prioritise more cost-effective and/or important biodiversity improvements, at least in the short term and/or until more funding is available in the future. In particular, where funding is limited, it is important to prioritise efforts to reduce and avoid large, significant and/or irreversible impacts on habitats and species (see sections 4.1 and 4.2).

In general, however, many biodiversity improvements may be possible at little or no extra cost. This includes, for example, where biodiversity concerns are integrated early into decisions about new sites and operations, as well as into existing management processes (see sections 5.7 and 5.8). Moreover, where some costs are involved, these may be reduced by good planning, seeking external funding (e.g. for any ecosystems services that may be provided), and/or partnering with other local sites and/or stakeholders, to share financial burdens and/or increase access to external funding, (see sections 5.3 & 5.5). In addition, in many cases, any short-term financial expenditure on biodiversity improvements will likely be more than balanced out by longer-term savings and/or rewards. For example, although using only local native plants in rehabilitation projects may increase immediate expenditure, it will likely also lead to significant long-term savings through less watering, fertilizers and pesticide use than would be needed for exotic species (see section 4.6). Similarly, adequately addressing biodiversity in general may reduce the likelihood of future fines from regulators, whilst increasing access to funding from increasingly biodiversity-concerned investors (see section 2.3). Finally, even where biodiversity conservation is expensive, it may still be very justified in terms of increasing stakeholder engagement, company reputation and staff morale, as well as reducing regulatory and reputational risks, and securing operating licences.

3.3. Other Possible Land Uses

Biodiversity conservation is not the only external land use that Lafarge sites may need to consider. In addition to the company's own activities themselves, a particular Lafarge site and surrounding area may also be important for recreation, agriculture, forestry and/or other land uses. Moreover, some of these land uses may compete with and constrain biodiversity conservation such that it is not possible to fully implement a particular biodiversity project as would be desirable from a purely biodiversity perspective. In such cases, negotiation and compromise between competing interest groups may be necessary, e.g. to allocate different areas to each land use; see Case Study 10.

In general, however, other land uses need not excessively constrain biodiversity projects and many "win-wins" are possible. For example, many areas that have been rehabilitated or protected for biodiversity are also highly valued for recreation (e.g. hiking, bird-watching and camping etc.). Similarly, by encouraging local farmers to avoid using chemical fertilizers and pesticides, and to instead encourage wild predators of potential pest species (i.e. Integrated Pest Management – see page 18), Lafarge sites will not only enhance local biodiversity but may also allow local farmers to exploit increasingly lucrative markets for organic and sustainability-sourced agricultural produce. Likewise, by encouraging local foresters to improve their practices on site and in the surrounding area (e.g. by increasing the age and species diversity of trees), biodiversity will benefit and the forestry companies may be able to gain FSC certification, which in turn will lead to access to new markets. Finally, biodiversity conservation is a very important land use in its own right, with a lot of public, regulatory and other backing (see section 2.3), such that Lafarge sites should be prepared to instigate biodiversity projects even in the face of some residual opposition from other interests.

3.4. Biodiversity Regulations

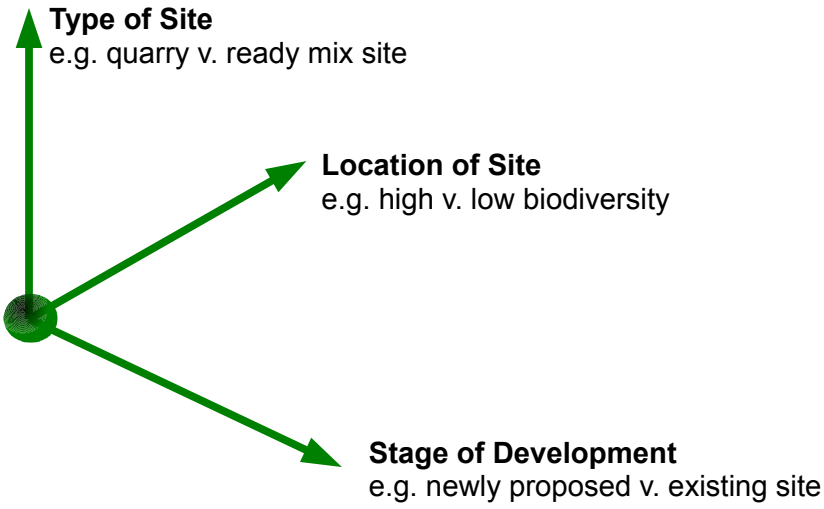
Most countries and regions of the world have strict biodiversity regulations. Moreover, although designed to conserve biodiversity, these regulations may in some particular instances prevent certain Lafarge sites from instigating some particular biodiversity initiatives. For example, many countries and regions have strict regulations governing the handling and sourcing of particular rare species, which may mean that certain initiatives aiming to introduce or plant these species may not be possible. Similarly, some regulations may stipulate that once a particular rare species is present in an area, industrial activity is no longer permitted. In such cases – and especially where biodiversity initiatives are being implemented alongside the continued operation of a site – it will be important for sites to consult carefully with local regulators before instigating a project to ensure that it is in line with regulations and will not result in any perverse outcomes (see section 5.4).

In general, however, regulations do assist biodiversity conservation and, in particular, form an important resource that sites should consult to guide and inform any biodiversity projects (see section 5.4). Moreover, in many cases the handling and/or planting of particular rare species can be permitted and need not jeopardise wider industrial activity (e.g. see Case Studies 5 and 6 on p23 and p25). Indeed, in many cases the conservation and recovery of particular rare species (e.g. IUCN Red List Species) has been a very high profile and effective way for Lafarge sites to demonstrate to regulators, local people and others their commitment to biodiversity conservation. Similarly, it is of course very important that Lafarge sites continue to strictly adhere to – and in many cases exceed – local biodiversity regulations, to increase the site's likelihood of securing future operating licences, whilst also improving stakeholder relations, access to investment and staff morale, as well as avoiding fines or other regulatory or reputational risks (see section 2.3).

3.5. Variations across Lafarge Sites

Worldwide, Lafarge currently operates over 1,700 sites, including over 700 quarries and over 1,000 plants and offices. Moreover, each of these sites varies a lot in how they impact and/or interact with biodiversity, especially given variations in: (1) the site's size and type; (2) the location of the site, including local biodiversity values, and; (3) the site's stage of development, as shown in figure 2.

Figure 2: Lafarge sites vary in 3 main ways with respect to biodiversity impacts



Variations in all three of these axes will alter the negative impacts of a Lafarge site, as well as opportunities for positive impacts on biodiversity. For example, a large quarry will have a lot more potential impacts than a small ready mix concrete plant, whilst a site in an area of high biodiversity (e.g. a pristine rainforest) will need to address a lot more biodiversity concerns than a site in an area of low biodiversity (e.g. an area of intensive agriculture). Similarly, opportunities for improving biodiversity performance will be a lot more constrained at an existing site than a newly-proposed site, which can be located, designed and managed from the outset with biodiversity concerns in mind.

Given that this guidance aims to be applicable across all Lafarge sites worldwide, site-level variations need to be taken into account, and it is thus important that the particularities of each site are considered when designing and implementing biodiversity work. This means, firstly, that for a particular site, certain aspects of this guidance will be more applicable than other elements, and the document has been designed in a modular fashion to accommodate this. Secondly, it also means that beyond consulting this guidance, site managers and others also need to consult local biodiversity experts, plans and regulations, to gain further local knowledge and guidance.

In general, however, some biodiversity improvements will be possible at all Lafarge sites, and each aspect of this guidance will be relevant to at least some sites worldwide. Moreover, although there will be variations in how biodiversity is addressed at each site, there are also some similarities across sites, as well as some common themes, particularly regarding biodiversity goals and the main steps that need to be taken to achieve them, as described in Chapters 4 and 5 respectively.

4. What should be the site-level Biodiversity Goals?

Any improvements at Lafarge sites require specific goals to be identified and worked towards. Moreover, breaking down improvements into specific tangible goals is particularly important for biodiversity improvements at Lafarge sites, given that biodiversity conservation is in fact quite a complicated topic, made up of a number of different scientific concepts and related objectives.

At the site level, Lafarge quarries, plants and offices should, firstly, aim to reduce their negative impact by addressing the four main causes of recent biodiversity decline (see section 2.1); i.e. by:

- Avoiding/minimising damage to important habitats
- Avoiding/minimising species mortality and stress
- Removing and controlling invasive exotic species
- Minimising and reversing fragmentation of habitats

Secondly, individual Lafarge sites should aim to actively enhance local biodiversity values by:

- Restoring/rehabilitating any damaged habitats
- Planting only appropriate local native species
- Making industrial areas as natural as possible

Each of these seven biodiversity goals is described in detail, and justified, in sections 4.1 to 4.7.

4.1. Minimise and avoid damage to important habitats

Habitats are the natural and physical space that an organism needs to survive. Examples include forests, grasslands, wetlands and cave/karst systems. Each such habitat supports a wide range of species, and thus a lot of biodiversity. Moreover, each species tends to be highly evolved and adapted to a particular habitat, such that if that habitat is lost it cannot easily survive elsewhere.

Unfortunately, over recent decades, a lot of important habitats have been lost due to a number of factors, including urbanisation, intensive agriculture and intensive forestry. Moreover, industrial areas – such as those operated by Lafarge – can contribute to habitat damage, including through land clearance, water/air pollution, changes to the water table, changes to hydrological regimes and induced development; i.e. whereby a development may "open up" a previously un-developed area (e.g. with new roads), thus enabling wider development (e.g. agriculture and urbanisation) and further habitat loss. Finally, there are several reasons why individual Lafarge sites should work to minimise and reduce such habitat damage, as a specific biodiversity goal, as described below.

Why should Lafarge sites avoid and minimise damage to important natural habitats?

- **It is one of the four main causes of ongoing biodiversity decline worldwide.**
- **It may be impossible, or at least very difficult and time-consuming to reverse later.**
- **Even where reversible, it is often easier and cheaper to avoid rather than reverse.**
- **It can affect many different species simultaneously, and thus a lot of biodiversity.**
- **Certain affected habitats, and/or the species they support, may be legally protected.**

There are a number of steps that need to be followed in order to avoid/minimise habitat damage, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the type, size and stage of development of the site, and local biodiversity values. However, many steps will be applicable to most sites, and each thus needs to be considered.

Case Study 1: DuJiangYan Cement Plant, Sichuan, China

The DuJiangYan Cement Plant in Sichuan Province, China was designed and constructed to minimise environmental impacts, including impacts upon local biodiversity. In particular, **important local habitat was protected** from an original proposal to construct a new road to bring limestone to the plant. This new road would have traversed the buffer zone for a protected area which includes important habitat for **Giant Pandas**, potentially opening up the area to agriculture and other **induced development**. Following consultation with WWF and others, it was decided instead to construct a state-of-the-art **6km conveyor** – complete with 3km of tunnels and 18 bridges – to avoid damaging this valuable local habitat. Moreover, further environmental features of the plant include complete water recycling, bag filters to minimise particulate emissions and the use of energy-efficient dry process technology.

Key steps in minimising and avoiding damage to important habitats:

- **Identify important habitats that might be damaged** – by consulting local experts, stakeholders and plans, as well as online tools (e.g. IBAT) and relevant local or national legislation, and establishing baseline habitat inventories (see sections 5.2 – 5.4 & 5.6).

- **Focus especially on particularly important habitats –** including: habitats in protected areas; habitats that have a very high biodiversity (e.g. mature forests), and; habitats that are important for very rare or endemic species (e.g. limestone karst areas; see IUCN 1997).

- **Focus especially on any large and/or irreversible impacts** – including clearance of large areas of mature forest, destruction of large cave systems and risks of wildfires in dry and/or forested areas (e.g. from discarded cigarettes, stored chemicals and machinery sparks).

- **Address impacts on habitats in site decisions and management** – including during any Feasibility and/or Opportunity Studies, Environmental Impact Assessments, Environmental Management Systems, Land Management and Rehabilitation Plans (see sections 5.7-5.9).

- **Avoid quarrying and other activities in very important habitats** – e.g. IUCN recognised protected areas, categories 1-4, and/or habitats particularly important for National or IUCN Red List and other rare species (e.g. specific breeding, rearing, resting and foraging areas).

- **Avoid induced development in important natural habitats** – by using existing infrastructure (e.g. roads) as much as possible, avoiding "opening up" new areas and co-ordinating with other local sites and operators to share new infrastructure, as appropriate.

- **Avoid cumulative impacts upon important habitats** – by consulting/co-ordinating with other local sites and/or operators, to reduce the combined impact of sites and/or to avoid making a habitat and/or protected area unviable, i.e. impacting it beyond a "tipping point".

- **Protect particular areas of important habitat on site** – by setting aside such areas from construction/operations, and ensuring that their protection is respected in the future; e.g. by clearly demarcating protected areas and physically excluding access, where necessary.

- **Minimise local air pollution from dust and/or chemical pollutants –** by limiting earth stripping in dry windy conditions, installing wheel-wash facilities, developing hard surface roads on-site, installing a sprinkler system, and/or filtering out/avoiding certain pollutants.

- **Minimise water pollution from sewage, fuel, erosion or chemicals** – by avoiding sewage and fuel leaks, avoiding the use of fertilizers and pesticides, filtering or recycling waste water, and replanting any exposed areas as soon as possible to prevent erosion.

- **Avoid changing the water table and hydrological regimes** – through water management and recycling, avoiding disturbing watercourses, designing/locating quarries so that they do not alter the water table, and using pumping and re-charge trenches in appropriate areas.

- **Educate and encourage other land users to conserve habitats** – including those that might be owned or managed by local farmers, forestry companies and private individuals, on site and in the surrounding area, and by promoting habitat-friendly best practices.

4.2. Minimise and avoid species mortality and stress

Individual organisms of particular species may be killed by a wide range of human activities, including: hunting, farming, fishing, forestry, land clearance, water pollution and air pollution. Moreover, even where individual organisms are not killed they may nonetheless be severely stressed by these and other activities, such that their breeding, reproduction, rearing of young, foraging for food, migration, growth and/or other essential functions are severely impaired.

Unfortunately, over recent decades, the causes, incidences and impact of species mortality and stress have increased significantly, as human populations have increased, and development has become increasingly intensive. Moreover, industrial areas – such as those operated by Lafarge – can contribute to this increasing species mortality and stress, including through: quarry traffic and excavation activities; water, light, noise and air pollution; inappropriately designed powerlines, and; altering local hunting, farming, forestry and/or fishing practices. Finally, there are a number of reasons why sites should avoid and minimise species mortality and stress, as described below.

Why should Lafarge sites avoid and minimise species mortality and stress?

- **It is one of the four main causes of ongoing biodiversity decline worldwide.**
- **It is irreversible for the individuals affected, and may impact whole populations.**
- **It may affect rare or endemic species, and thus increase the likelihood of extinctions.**
- **It may affect migratory and/or foraging species, and thus impact a wide area.**
- **It may affect species that may be legally protected (e.g. some rare species).**

There are a number of steps that need to be followed in order to avoid/minimise species mortality and stress, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the site's type, size and stage of development, and local biodiversity. However, many steps will be applicable to most sites, and each thus needs to be considered.

Case Study 2: Saint Etienne River, Reunion Island

Lafarge has an existing treatment site and a new extraction site either side of the **protected** Saint Etienne River on Reunion Island; a global **biodiversity hotspot**. In order to minimise impacts on aquatic species by **trucks travelling between the two sites** on an existing track on the riverbed, innovative and extensive research, construction and maintenance work has been undertaken. In particular, new more appropriate **culverts** have been designed and constructed (and maintained and adapted where necessary) on the existing track, to safeguard the passage of **migratory fish** and **macro-crustaceans**, including some **IUCN Red List species**. Ongoing **monitoring** is also being undertaken every 3 months – and will be sustained for the next 7 years – to ensure the effectiveness of the new measures. This work has involved **engineering consultants** specialised in hydrology and aquatic species biology, as well as consultation with local fishermen and other **local stakeholders**. Finally, by implementing an initiative recognised as the **first of its kind** on Reunion Island, Lafarge has been able to enhance its **reputation**, **stakeholder relations** and **licence to operate.**

Macrobrachium lepidactylus

Key steps in minimising and avoiding species mortality and stress:

- **Identify vulnerable species and potential impacts upon them** – by consulting local experts, stakeholders and plans/regulations, as well as on-line sources of information (e.g. IBAT), and also establishing baseline species inventories (see sections 5.2 – 5.4 and 5.6).
- **Focus particularly on rare, endemic and/or previously unknown species** – as these will be disproportionately affected by any impacts, and may be vulnerable to national or even global extinction, especially in tropical areas and/or recognised Biodiversity Hotspots.
- **Integrate species protection into site decisions/management** – including in Feasibility and Opportunity Studies, Environmental Impact Assessments, Environmental Management Systems, and Rehabilitation/Biodiversity/Land Management Plans (see section 5.7–5.9).
- **Avoid industrial activity in sensitive areas and/or at sensitive times –** e.g. breeding, nesting, resting and/or foraging areas/times for National or IUCN red list species, by clearly demarcating such areas, and physically excluding workers and operations, as appropriate.
- **Minimise the likelihood of road kills by site traffic, on and off site** – by using conveyors instead of trucks for quarried materials, enforcing appropriate driving standards, and providing underpasses/bridges for vulnerable animals (e.g. amphibians, rare mammals).
- **Transplant small vulnerable plants at risk from site operations** – for use in subsequent or ongoing rehabilitation projects, and/or actions to make industrial areas more natural (see sections 4.5-4.7), including adequate top-soil and appropriate replanting to ensure survival.
- **Prevent powerlines from electrocuting large local birds** – by using downward-pointing insulators, insulator caps and/or tubing, and/or spacing powerlines at least 140cm apart and 60cm from a likely perch, (see: www.nabu.de/vogelschutz/caution_electrocution.pdf)
- **Reduce on-site noise pollution and/or vibrations** – by using appropriate traffic routing, placing rubber linings on chutes, optimising blasting design, restricting vehicle speeds, minimising height from which material is dropped, and maintaining plant machinery.
- **Avoid increasing fishing, hunting or logging pressures** – by: encouraging sustainable best practice in the local area; enforcing local fishing, hunting and forestry regulations; sustainably managing resources on site, and; avoiding “opening up” areas with new roads.
- **Avoid killing non-target species with pesticides/herbicides** – by using (and encouraging local farmers to use) integrated pest management instead of chemicals, or only using chemicals specific to the target species, with a low/no toxicity for other species.
- **Prevent lights confusing/killing birds, bats and/or insects** – by removing or turning off non-essential lighting, and using downward-pointing lamp designs for essential lighting.
- **Avoid increasing conflict with large animals/predators** – by discouraging induced development (including agriculture), and not opening up new areas with new roads etc.
- **Discourage local birds from flying into any large clear windows** – by turning off office lights at night, using small and/or patterned windows, and/or installing bird silhouettes.

4.3. Remove and control invasive exotic species

Invasive exotic species are species that are not native to a particular country and/or region and which can spread uncontrollably at the expense of local native species. Particular well-known examples include rabbits introduced into Australia from Europe, possums introduced into New Zealand from Australia, and Water Hyacinth introduced worldwide from Brazil. Such species are problematic when introduced into a new area because they may not have any natural predators and/or diseases there, and because local native species may not have encountered such organisms before, and thus have not had a chance to evolve particular defences against them. Moreover, almost all countries in the world now suffer from invasive exotic plants and/or animals.

Unfortunately, over recent decades, the problem of invasive exotic species has been increasing, as the movement of people and goods (and thus the accidental or deliberate introduction of invasive exotics) has increased. Moreover, the problems caused by invasive exotic species introduced previously has often increased over time as such species can be very difficult to control or eradicate. In addition, industrial sites – such as those operated by Lafarge – can contribute to this growing problem of invasive exotics, including by: clearing land and creating habitat edges (where exotics can more easily invade) and; inadvertently spreading exotic seeds on vehicles and/or machinery. Finally, there are a number of reasons why Lafarge sites should remove and control invasive exotics species, introduced by the site and/or existing previously, as described below.

Why should Lafarge sites remove and control invasive exotic species?

- **They are one of the four main causes of biodiversity decline worldwide.**
- **They will spread further, and their impact will increase, if left unchecked.**
- **They can undermine attempts to enhance local biodiversity, if left unchecked.**
- **They can easily spread to other sites, and thus have an impact over a wide area.**
- **There may be legal requirements to control and/or remove certain such species.**

There are a number of steps that need to be followed in order to remove/control invasive exotic species, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the site's type, size and stage of development, and local biodiversity values. However, many steps will be applicable to most sites, and each thus needs to be considered.

Case Study 3: Baltimore Cement Terminal, Maryland, US

Part of the work of the Baltimore Cement Terminal wildlife team (which comprises all of the site's six employees) has involved removal of two **invasive exotic plants** from the four hectare site. Blackberry has been physically removed and phragmites (Common Reed) has been eradicated by both **physical removal** and **herbicide use**. Subsequent **monitoring** has shown that these measures have been effective, with no subsequent phragmites re-growth, and with **native species now re-colonising** the cleared areas. Moreover, the removal of the exotic plants, combined with wider biodiversity work on site (including maintaining bat and bird boxes) has been **certified** by the Wildlife Habitat Council (WHC).

Phragmites Australis (Common Reed)

Key steps in removing and controlling invasive exotic species:

- **Identify invasive exotics and how to control them –** by consulting experts, regulations, plans and the Global Invasive Species Database, & monitoring (see sections 5.2, 5.4, 5.6).
- **Address the need to control invasive exotics early in the site life-cycle** – including in Feasibility/Opportunity Studies and Environmental Impact Assessments (see section 5.7).
- **Address invasive exotic species during site planning** – including Land Management Plans, Biodiversity Management Plans and Rehabilitation Plans (see section 5.9).
- **Plant only local native species as part of rehabilitation and other actions** – to avoid spreading/introducing exotic species, as well as to conserve local species (see section 4.6).
- **Integrate the control of invasive exotic species into existing management** – including Environmental Management Systems and quarry extraction activities (see section 5.8).
- **Clean and control machinery and vehicles used on site** – including those used by contractors, visitors and local people, to prevent the spread of exotic seeds and plants.
- **Replant any exposed areas with natives as soon as possible** – to prevent invasion by exotic species, which will otherwise be encouraged by any newly-exposed areas.
- **Avoid habitat fragmentation and creating new habitat edges** – which can facilitate invasions by exotics (see section 4.4); e.g. by avoiding unnecessary roads and fences.
- **Use control measures appropriate for particular species** – e.g. fences, physical removal and/or humane species-specific traps or poisons, in line with local expert advice.
- **Focus control of invasive exotics particularly along roads** – given that these will likely be the main route by which invasive exotics spread into and throughout an area of habitat.
- **Pay particular attention to any water-borne exotics** – e.g. fish and aquatic plants, given that these can spread particularly easily and can be very difficult to subsequently remove.
- **Regularly monitor and rapidly address invasive exotics** – to prevent recurrent future invasions, and to respond in a timely fashion to problems, to prevent them getting worse.
- **Sustain control/removal activities into the long term** – to prevent recurrent invasions, given that there may be a large seed bank and/or inward migration from surrounding areas.
- **Partner with local sites/operators** – to form part of a wider programme of control/removal measures, which will be more effective/sustainable than isolated projects (see section 5.5).
- **Educate local employees/visitors about invasive exotics** – so that they recognise such species and take steps to avoid unintentionally spreading them on site (see section 5.11).

4.4. Minimise and reverse habitat fragmentation

Habitat fragmentation is when an area of habitat is broken up by human activity into a number of smaller isolated sections. Such fragmentation is problematic for five main reasons: (1) because it creates more habitat edges, which are more exposed to the weather, and more easily invaded by exotic species (see section 4.3); (2) because a single large area of habitat will be able to support more biodiversity than several smaller isolated areas of the same combined area; (3) because the movement of certain animals (e.g. to forage for food) may be impaired; (4) because isolated areas of habitat will be less resilient to change than a single larger area, and; (5) because connected areas of habitat are important to allow species to migrate in response to ongoing climate change.

Unfortunately, over recent decades, habitat fragmentation has been increasing and this has contributed to declines in biodiversity. This has been particularly the case where previously unspoilt habitats have been opened up for new development. Moreover, industrial areas, such as those operated by Lafarge, can contribute to habitat fragmentation, including by constructing new access roads, powerlines, pipelines and fences, as well as by clearing land for quarries, offices and industrial plants, especially where this affects important habitat corridors. Finally, there are a number of reasons why sites should minimise/reverse habitat fragmentation, as described below.

Why should Lafarge sites minimise and reverse habitat fragmentation?

- **It is one of the four main causes of ongoing biodiversity declines worldwide.**
- **It may impact a wide area, e.g. by severing a link between two adjoining areas.**
- **It may simultaneously affect a wide range of species, and thus a lot of biodiversity.**
- **It may greatly reduce the level of biodiversity supported by a particular habitat.**
- **It can have significant effects on particular species, leading to population declines.**

There are a number of steps that need to be followed to minimise/reverse habitat fragmentation, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the site's type, size and stage of development, as well as local biodiversity values. However, many steps will be applicable to most sites, and thus each needs to be considered.

Case Study 4: Etangs de Villepey Concrete Mixing Plant, France

A Lafarge Concrete Mixing Plant used to be located directly adjacent to the Etangs de Villepey Lakes in southern France contributing to **isolating and preventing the expansion of** this biodiversity-rich coastal wetland and protected area. Following requests from the Coastal Preservation Agency, it was decided that the concrete mixing plant would be moved to a **more appropriate location.** This involved dismantling the site and creating a new site with state-of-the-art environmental specifications on a nearby industrial estate (Puget-sur-Argens). Moreover, the **access roads were removed** for the original site and re-vegetated, and new top soil and local native plants were brought in. As a result, the natural area has been expanded, and is now **more connected** with other local habitat areas.

Key steps in minimising and reversing habitat fragmentation:

- **Identify existing and potential causes of habitat fragmentation** – by consulting local experts, stakeholders and plans/regulations, and/or surveying habitats and causes of fragmentation, on-site and in the immediate surrounding area (see sections 5.2-5.4 & 5.6).
- **Address possible habitat fragmentation early in the life-cycle** – including in Feasibility Studies, Opportunity Studies and Environmental Impact Assessments (see section 4.7), and by being prepared to alter site location and/or design to minimise habitat fragmentation.
- **Include avoidance of habitat fragmentation in planning** – including in any Biodiversity Management Plans, Rehabilitation Plans and Land Management Plans (see section 4.9), to ensure that fragmentation is addressed early, efficiently and effectively in site management.
- **Avoid habitat fragmentation by sites** – by locating and designing, and if necessary removing, sites to minimise habitat fragmentation, and also rehabilitating quarries "as you go" immediately after operations, to minimise the size of the area cleared at any one time.
- **Avoid habitat fragmentation by roads** – by avoiding/removing unnecessary roads, using existing roads as much as possible, constructing any essential roads along already degraded routes, and providing underpasses/nature bridges to allow large animals to pass.
- **Avoid habitat fragmentation by fences** – by avoiding/removing unnecessary fences, placing essential fences along already degraded routes (e.g. roads) and making essential fences as permeable as possible for animals (e.g. with crossings/increased mesh size).
- **Avoid habitat fragmentation by pipelines** – by avoiding/removing unnecessary pipelines, placing essential pipelines underground and/or along already degraded routes (e.g. roads), and providing underpasses or bridges to allow large animals to move between areas.
- **Avoid habitat fragmentation by powerlines** – by avoiding/removing unnecessary powerlines, placing essential powerlines along already degraded routes or underground, and using designs/construction methods that minimise fragmentation, where possible.
- **Protect existing local/regional habitat corridors –** from being severed by site operations, construction and/or ancillary infrastructure (e.g. roads, powerlines, fences, pipelines etc.); including: riverbanks, continuous strips of vegetation and animal migratory/foraging routes.
- **Identify and create new local habitat corridors** – including during rehabilitation projects (see section 4.5), and by replanting habitat gaps and degraded areas with native vegetation so that they can easily be crossed by target species (e.g. National/IUCN Red List species).
- **Consult and co-ordinate with local sites and/or other operators** – to rationalise, and if necessary, combine operations and sites, to reduce the overall fragmentation of habitats caused by the combined and/or cumulative impacts of several local sites (see section 5.5).
- **Educate local residents, staff and visitors** – about avoiding habitat fragmentation and increasing the connectivity in existing habitats, both on-site and in the surrounding area, using work undertaken on site as an education tool, where possible (see section 5.11).

4.5. Restore and/or rehabilitate damaged habitats

Habitat restoration is the precise recreation of a habitat to a state that existed immediately prior to any damage caused by site construction or operations. Habitat rehabilitation, on the other hand, is a broader term referring to the improvement of damaged habitats to a state that may or may not have existed pre-site. Habitat rehabilitation may thus be less than, equal to or more than habitat restoration, depending upon the particular actions and outcomes involved at a particular site.

Habitat damage should be avoided and reduced as much as possible, especially where this impacts important habitats (see section 4.1). However, some damage may be unavoidable during site operations or construction (e.g. land clearance involved in quarrying and plant construction). Moreover, habitats may have been damaged in previous decades when environmental standards were less stringent than today and/or when the site was under previous management.

In such situations, the choice between habitat restoration and rehabilitation will depend upon the particular history of the site as well as local biodiversity values. In areas where local biodiversity values and pre-site habitat quality were very high (e.g. a pristine forest), sites should strive to restore the pre-site habitat as much as possible. Conversely, in areas where local biodiversity values and pre-site habitat quality were relatively low (e.g. in an area of intensive agriculture), sites have the opportunity to go beyond restoration and to rehabilitate habitats to a state beyond that which existed pre-site. Moreover, it may be the case that quarrying and other activities actually create valuable habitats (e.g. quarry lakes, cliffs and/or karst landforms), which can be integrated into habitat rehabilitation, as appropriate. Finally, there are a number of reasons why Lafarge sites should restore and/or rehabilitate damaged habitats, as a biodiversity goal, as described below.

Why should Lafarge sites restore and/or rehabilitate any damaged habitats?

- **This is often the main opportunity available for sites to enhance local biodiversity.**
- **This is an increasing legal requirement, and also a priority for the Lafarge Group.**
- **Sites have a responsibility to reverse damage that they have previously caused.**

There are a number of steps that need to be followed in order to restore/rehabilitate damaged habitats, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the site's type, size and stage of development, as well as local biodiversity. However, many steps will be applicable to most sites, and each thus needs to be considered.

Case Study 5: Bamburi quarries, Kenya

The ex-quarries of the Bamburi Cement Plant have been successfully restored over the last 30 years into **coastal forest**, **wetland** and **grassland**. Moreover, the restoration project has become economically self-sustaining (e.g. through sustainable tourism, forestry, aquaculture, biofuels and livestock raising) and has also been recognised, both nationally and internationally, for its biodiversity achievements. Over 350 local native species have been successfully planted at the site, including **30 IUCN Red List species** as well as species that are important for local wildlife and sustainable development (e.g. hardwood trees for carving). The area has now become a refuge for many local animal species (e.g. giraffes and buffalo), with part of the site managed as a **nature reserve.** Finally, education projects have showcased achievements and increased local involvement.

Key steps involved in habitat restoration/rehabilitation:

- **Plan habitat rehabilitation early** – ideally at the outset of the site, ensuring that: adequate funds are allocated; that sites are located, planned and managed with rehabilitation in mind, and that; rehabilitation plans address post-rehabilitation management (see section 5.9).
- **Base restoration/rehabilitation upon good monitoring** – including an inventory of the existing habitat on site as well as – ideally – a baseline of the type and quality of habitat that existed prior to the site, even if this was several decades previously (see section 5.6).
- **Employ ongoing rehabilitation/restoration** – as much as possible rehabilitate "as you go" e.g. rehabilitate degraded habitats as soon as possible after construction and – especially – during quarry operations, to minimise habitat loss, erosion and invasion by exotic species.
- **Consult local experts, stakeholders, regulations and plans** – so that rehabilitation is made appropriate for surrounding ecosystems and communities, especially into the long term (e.g. post-closure), and to gain wide and sustained support (see sections 5.2 – 5.4).
- **Partner with other local sites and/or operators** – to increase the biodiversity value of a particular habitat rehabilitation project as part of a wider programme of several rehabilitation projects across the local area, rather than a single isolated project (see section 5.5).
- **Connect the rehabilitated area to surrounding habitats** – (e.g. by creating new habitat corridors), to increase the value of the rehabilitation for particular species (e.g. small animals), which may not easily migrate into, or make use of, an isolated area of habitat.
- **Actively remove and control invasive exotic species** – to ensure that the rehabilitation project does not inadvertently encourage the spread of such species, and also because any invasive exotics already present may otherwise undermine the project (see section 4.3).
- **Plant only appropriate local native species** – to make the rehabilitation as self-sufficient and natural as possible, as well as to help preserve particular rare local plants, and also to provide native vegetation that may be essential for other local species (see section 4.6).
- **Plant in as natural and as diverse a way as possible** – to mimic the pre-site habitat (for restoration), maximise the biodiversity benefit (for rehabilitation), minimise erosion and increase nitrogen fixation, making full use of natural regeneration and local rescued plants.
- **Aim to re-establish key local, and possibly rare, species** – by designing habitat restoration in a way that is attractive and sufficient for those species (see section 3.4).
- **Incorporate habitats created by quarrying into rehabilitation** – including quarry lakes, karst landforms and cliffs, as appropriate for local biodiversity, and following local advice.
- **Monitor and, if necessary, revise projects over time** – given that there may be some surprises and challenges, and thus to allow for learning and adaptive management.
- **Educate local residents, visitors and staff** – to ensure wide understanding of, and involvement in, the planning and implementation of rehabilitation/restoration projects.

4.6. Plant only appropriate local native species

Local native plants are those that have evolved over thousands, or even millions, of years to be adapted to a particular local region. Moreover, many parts of the world contain a number of local native plant species. In addition, some of these species are now rare, either because they only ever existed in quite a small area or because human activity has decreased their population size and range through habitat loss, direct mortality and/or the spread of exotics (see sections 4.1-4.3).

Unfortunately, although many individual gardeners and local governments plant a wide range of species, many or even most of the species planted in private and civic gardens are exotic species. Moreover, even where native plants are used these may not be from local stock or be the particular native species most adapted to local habitats. In addition, industrial areas have often contributed to this problem by not planting only appropriate local native species in rehabilitation projects and aesthetic plantings. Finally, there are a number of reasons why individual Lafarge sites should plant only appropriate local native species, as a biodiversity goal, as described in detail below.

Why should Lafarge sites plant only appropriate local native species?

- **To avoid exacerbating the problem of invasive exotic species (see section 4.3).**
- **To help to conserve, and educate people about, local (and often rare) plant species.**
- **To provide habitat for other species that may depend upon particular local plants.**
- **To reduce the need for subsequent waterings, fertilizers and pesticide use.**
- **To enhance local biodiversity in a very effective, tangible and obvious way.**

There are a number of steps that need to be followed in order to plant only appropriate local native species, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the site's type, size and stage of development, and local biodiversity values. However, many steps will be applicable to most sites, and each thus needs to be considered.

Case Study 6: Yepes-Ciruelos Quarry, central Spain

The rehabilitation of the Yepes-Ciruelos quarry in Castilla-La Mancha, Spain has involved the planting of local native species (including an **IUCN Red List species**) appropriate for the local semi-arid environment and limestone soils. Appropriate species and planting methods were identified and implemented through a **partnership with the botanical department** of the University of Castilla-La Mancha, and local native species planted on-site have been showcased in a **visitor garden** as well as in other educational and communication activities. The plantings themselves have involved research and experimentation culminating in an innovative **automatic watering technique** which, along with protection from rabbit grazing, has drastically increased the survivability of new seedlings. Extensive monitoring of the site – including the Long Term Biodiversity Index – has been used to help establish management strategies as well as to assess the ongoing performance of the restoration project. Finally, **plants already present on site,** including some rescued during operations, were used as sources of seeds and seedlings.

Key steps in planting only appropriate local native species:

- **Identify appropriate local native species to be planted** – including how they should be planted, by consulting local biodiversity experts, stakeholders and plans, and surveying the site and surrounding area for native species already present (see sections 5.2-5.4 & 5.6).
- **Carefully consult local regulations and regulators** – to ensure that the handling/planting of any rare local plants is in line with local legislation and will not jeopardise the wider activity of the site, especially where planted alongside ongoing operations (see section 3.4).
- **Use on-site green areas and plants rescued from operations** – as sources of, and reservoirs for, local species to be used for plantings, so as to integrate plantings with, and increase the effectiveness of, wider biodiversity projects, and decrease negative impacts.
- **Source additional plants and seeds from reputable local suppliers** – to ensure that they are indeed local native species, and that their sourcing has not damaged natural areas (e.g. through inappropriate transplanting of local plants and/or damaging seed collection).
- **If necessary, create an on-site native plant nursery** – to provide local native species for plantings, where such seeds/seedlings are not locally available in sufficient numbers or at low enough cost, and particularly for large subsequent plantings (see Case Study 12; p35).
- **Plant seeds/seedlings in as natural and diverse way as possible** – to maximise initial survivability as well as the self-sufficiency of subsequent vegetation, and to provide a natural habitat for other local species (e.g. with appropriate soil, shade and protection etc.)
- **Involve local stakeholders in the planting of local species** – as it is a good opportunity to involve stakeholders, and is often valued by the stakeholders themselves, particularly as they may later re-visit a planted area to see the benefits of their work (see section 5.3).
- **Accompany plantings with removal/control of any invasive exotics** – to ensure that local native species can prosper and are not crowded out by exotics, and because planting activities themselves may inadvertently spread invasive exotic seeds (see section 4.3).
- **Showcase local native species planted on site in education activities** – to demonstrate real biodiversity enhancements, and also to raise awareness about the existence, and importance of, local native plant species amongst the local community (see section 5.11).
- **Provide appropriate watering and protection from grazing** – especially for small seedlings, and in areas where there is a high concentration of grazing animals and/or where planting very exposed or dry areas, where soil moisture may be initially inadequate.
- **Partner with other local sites, operators and others** – to share local knowledge, expertise, capacity and access to/sources of appropriate local native plants as well as to encourage others to plant local native species, and thus multiply benefits (see section 5.5).
- **Monitor and, if necessary, repeat or adapt plantings** – to ensure their long-term success, particularly when planting large areas, and when experience is limited, and given that initial survivability can be low, e.g. due to unpredictable weather or invasive exotics.

4.7. Make industrial areas as natural as possible

Many industrial areas are very unnatural places, with little natural and/or native vegetation and few opportunities for animals, birds and other organisms to survive. In some cases this is necessary, including for health and safety reasons, and/or due to the requirements of particular plant and/or quarry designs etc. However, in many cases it is possible to make industrial areas more natural. Moreover, this applies to smaller ready mix sites and offices as much as larger plants and quarries.

There are a number of ways to make industrial areas more natural, depending upon their size, type and stage of development, and local biodiversity values. Specific examples include green roofs, window boxes, raptor perches, pollinator gardens, bird/bat boxes, animal refuges, wildlife ponds and insect homes, as appropriate for the local biodiversity and geography as well as the particular constraints and opportunities of each site. Moreover, there are a number of reasons why Lafarge sites should make industrial areas more natural, in these and/or other ways, as described below.

Why should Lafarge sites make industrial areas as natural as possible?

- **To increase the quantity and quality of habitat available in the local area.**
- **To improve the aesthetic look of a site, as well as heat and noise insulation.**
- **To increase opportunities for actively enhancing local biodiversity values.**
- **To integrate the site more effectively into the particular local environment.**
- **To help compensate for biodiversity damage caused during site construction.**

There are a number of steps that need to be followed in order to make industrial areas as natural as possible, as described on the following page. Some of these steps will only be applicable to certain sites, depending upon the site's type, size and stage of development, and local biodiversity. However, many steps will be applicable to most sites, and each thus needs to be considered.

Case Study 7: Norfolk Ready Mix Sites, eastern England, UK

The four sites that make up the Norfolk Ready Mix Sector in eastern England, UK, have **together co-ordinated** a number of biodiversity projects. These have included a **wildflower garden** (to attract pollinating insects) and **bird feeders**, installed at the main office at Costessey near Norwich, and 9 installed **bird boxes** – including some made from waste wooden pallets – and further wildflower planting, across the four Ready Mix sites. **Monitoring** is also being undertaken, and initial **results show an increase** in the number and species of pollinating insects as well as birds (including blue tits, great tits and **chaffinches**) using the bird boxes. In addition, biodiversity **education work** has been undertaken, including with **staff** and **local school children**, and plans have been made to extend biodiversity work in future to include **bat boxes**, as well as boxes for more bird species (e.g. **kestrels** and **woodpeckers**). Finally, this work has allowed Lafarge to **improve its reputation** locally – including with regulators and customers – as well as to **develop best practice** that is now being shared internally with other Lafarge Ready Mix sites across the UK.

Key steps in making industrial areas as natural as possible:

- **Identify possible locations and improvements** – by consulting local experts, stakeholders, plans and other sites; by establishing a baseline inventory of the site, and; by inviting local employees to be proactive in suggesting improvements (see section 5.1-5.6).
- **Ensure that actions are well-planned before being implemented** – to ensure that they are appropriate, effective and efficient, and that opportunities are not missed, including details of their maintenance, as well as who is responsible for them (see section 5.9).
- **Construct "Green Roofs" on offices and other appropriate buildings** – to increase natural vegetation and local wildlife habitat, absorb rainwater, and to improve the heat insulation and appearance of buildings; for more information see: www.greenroofs.com
- **Create new areas of natural habitat in appropriate areas** – e.g. on visual berms, around settling ponds and in unused areas, to create nature ponds, wild meadows and wild woods, as appropriate for the local climate, and using local native species (see sections 4.5 – 4.6).
- **Install window boxes with appropriate local native plants** – in offices and other buildings, to increase the amount of local vegetation as well as to improve staff morale and the appearance of buildings, ensuring that they are regularly watered (see section 4.6).
- **Create nesting and resting sites for birds and bats, as appropriate** – including old and/or dead trees, caves, raptor perches, structures on buildings and/or nest boxes, and maintain them over time; for more information see: www.en.wikipedia.org/wiki/Nest_box
- **Create "insect homes", as appropriate for local species** – including wood piles, old and/or dead trees and logs, dead vegetation, specific geographic features (e.g. sunny embankments for solitary bees/wasps) and specially-designed boxes and other structures.
- **Create refuges, as appropriate for local native animals** – including artificial burrows, brush piles, dead trees, basking logs, vegetation for specific animals, artificial shelters for some mammals and/or reptiles, and ponds for amphibians and other aquatic animals
- **Plant outside staff areas with local native species and habitat** – including car parks, rest areas, picnic areas, driveways, entrances, meeting points; planting in as natural and as diverse way as possible, and as appropriate for the local geography (see section 4.5-4.6).
- **Plant local native trees around industrial buildings, where possible** – to improve the aesthetics of the site, reduce noise pollution and increase the amount of local vegetation, whilst taking into account important health and safety concerns, and access requirements.
- **Monitor, and if necessary revise, actions undertaken to improve sites** – to ensure that they are sustained over time, and successful in making the site more natural, given possible unforeseen consequences and the need for learning and adaptive management.

5. What steps are needed to achieve these goals?

Biodiversity improvements at Lafarge sites need to aim to achieve a number of biodiversity goals, as described in Chapter 4. Moreover, in order to achieve these goals, a number of steps are required, some of which will be specific to particular goals. However, there are many generic steps, common to most goals, and relevant to many sites, depending upon their size, type and location.

The main generic steps needed to achieve the biodiversity goals are listed below, and described in greater detail in the remainder of this document, more or less in the order that they should be carried out. For example, it is important that any biodiversity actions are well-planned before they are implemented, and it is also important that adequate consultation and baseline monitoring is carried out before making any decisions or plans to benefit biodiversity. However, it may also be possible to carry out some steps in parallel. For example, in some cases, education projects and reporting may be carried out whilst wider biodiversity actions are still being implemented.

It should be noted that each of the steps will need to be adapted to the particularities of each individual site. For example, larger sites and/or sites located in particularly sensitive areas will need to do more for each step than smaller sites and/or sites located in less sensitive areas. Similarly, the potential to consider biodiversity in decisions about any new sites or operations will be much greater in newly-proposed sites than in existing sites. However, many of the steps will be relevant to many Lafarge sites, and each thus needs to be considered in detail. Finally, an overall "check-matrix" is provided on the next page to relate each step back to the seven biodiversity goals.

Overall "Check-Matrix" for Biodiversity Goals and Steps

Each of the **biodiversity goals** described in chapter 4 can be addressed by a variety of **steps**, as described in this chapter. This "check-matrix" provides a useful cross-reference tool to record which steps a site is using to address which goals, and to highlight where further work could be done.

Put a cross in each box where a particular step is being used to address a specific goal. Areas left blank might then be usefully targeted for future improvements in efforts to conserve/enhance biodiversity at each site.

Steps taken to achieve each biodiversity goal	Biodiversity Goals: Avoid damage to important habitats	Avoid species mortality and stress	Remove/control invasive exotics	Reverse/reduce habitat fragmentation	Rehabilitate any damaged habitats	Plant only appropriate local species	Make industrial areas more natural
Train and Organise Lead Local Employees	☐	☐	☐	☐	☐	☐	☐
Consult and Involve Local Biodiversity Experts	☐	☐	☐	☐	☐	☐	☐
Involve Local Stakeholders in Plans and Actions	☐	☐	☐	☐	☐	☐	☐
Consult Local/National Plans and Regulations	☐	☐	☐	☐	☐	☐	☐
Partner with other Local Sites and/or Operators	☐	☐	☐	☐	☐	☐	☐
Establish Baselines and Monitoring Regimes	☐	☐	☐	☐	☐	☐	☐
Consider Biodiversity in Decisions about Sites	☐	☐	☐	☐	☐	☐	☐
Integrate Biodiversity into Management Processes	☐	☐	☐	☐	☐	☐	☐
Plan Actions to Conserve/Enhance Biodiversity	☐	☐	☐	☐	☐	☐	☐
Implement, Sustain and Modify Planned Actions	☐	☐	☐	☐	☐	☐	☐
Educate Visitors, Staff, Residents and others	☐	☐	☐	☐	☐	☐	☐
Report Results of Monitoring/Actions/Education	☐	☐	☐	☐	☐	☐	☐

5.1. Train and organise lead employees to deal with biodiversity

Training and organising lead local employees to deal with biodiversity is an essential first step for most biodiversity improvements. This is for a number of reasons. Firstly, lead local staff may not be sufficiently aware of biodiversity or know how to conserve it. Secondly, lead local staff will be the ones taking most of the decisions, making most of the plans, and organising most of the actions and monitoring to benefit biodiversity, and they thus need to be trained and organised to enable them to do so. Thirdly, training and organising lead local staff to deal with biodiversity has often been found to be the key step which drives subsequent improvements (see case study 8 below).

There are a number of ways in which lead local staff can be trained to deal with biodiversity. Firstly, this guidance document can be made available to them. Secondly, employees can be encouraged to visit or partner with nearby "best practice" sites (operated by Lafarge and/or other companies) to learn how other sites have appropriately addressed biodiversity (see section 5.5). Thirdly, local biodiversity experts can be requested to provide relevant biodiversity training (see section 5.2), and fourthly, any local/national biodiversity plans and regulations can be made available to staff (see section 5.4). Finally, there is a wide range of biodiversity literature – much of which is available online – which can help key individual employees improve their awareness and knowledge of biodiversity (for example: see the "Key References" section at the end of this guidance document).

Beyond training lead employees, it is also important that they be appointed and/or organised to deal with biodiversity. For example, in some sites and/or business units, staff have been formally appointed as "biodiversity officers" with responsibility for co-ordinating specific biodiversity improvements. Similarly, in other sites and/or business units, staff have been encouraged to take the initiative themselves and to form spontaneous "staff biodiversity teams" – with their own responsibility for deciding the composition of the group, as well as what its aims and objectives should be. Such teams may or may not include the site manager and/or local stakeholders, as appropriate. Finally, it is often the case that some individual employees already have some interest in, and/or experience of dealing with, biodiversity, and these individuals should be identified and encouraged to contribute to biodiversity teams and/or specific actions, also as appropriate.

In general, lead employees should be organised/trained to deal with the site's biodiversity goals (see chapter 4 and check-matrix, p30). In addition, lead employees should be trained/organised to:

- identify, involve and manage appropriate local stakeholders (see section 5.3)
- establish biodiversity baselines and monitoring regimes (see section 5.6)
- consider biodiversity in site decisions and management processes (see sections 5.7-5.8)
- plan and implement specific actions to benefit biodiversity (see sections 5.9-5.10)
- conduct appropriate biodiversity education and reporting (see sections 5.11-5.12)

Case Study 8: Hudson Aggregates Pit, Alberta, Canada

An enthusiastic and productive **wildlife habitat team** has been created to oversee and implement biodiversity enhancements at the Hudson Aggregates Pit near the town of Lethbridge, Alberta, Canada. The team comprises three site employees along with five employees from **other Lafarge sites** in the southern Alberta region. Moreover, the knowledge and effectiveness of the team has been increased through **advice and training** received from the Alberta Conservation Association and professors at Lethbridge College. The team's WHC-certified work has included creating raptor perches and brush piles to enhance habitat for native raptors including the **Prairie Merlin,** as well as removing invasive exotic plants, transplanting and sowing native species and conducting education projects with a local school and other local stakeholders.

5.2. Consult local experts about biodiversity and possible impacts

Due to the variations across sites (see section 3.5), international, and even national, level guidance will be inherently limited in its ability to guide local biodiversity improvements. In particular, local biodiversity experts will need to be consulted and involved to gain sufficient local knowledge and expertise. In addition, such consultation of local experts will be important over time to help deal with, and adapt to, changing situations and surprises, which may not have been foreseen at the initial planning stages. Moreover, biodiversity experts can also help sites avoid "reinventing the wheel", by providing insights from similar local projects that may have already been undertaken.

Local biodiversity experts may include university researchers, local or national government officers, experts from professional biodiversity groups (e.g. the Wildlife Habitat Council in North America and local Wildlife Trusts in the UK) and trade associations, and local environmental consultants, and particularly those with a historical link to the site. Moreover, and especially at large sites and/or sites located in sensitive biodiversity areas, it may be necessary to include several experts, given that each individual expert may have a specialised focus (e.g. reptiles, plants etc.), and that a large biodiversity project will likely benefit from a range of expert advice (see: Case Study 9 below).

Consulting and involving local biodiversity experts may involve some costs, e.g. for travel, time and other expenses. However, some local expert assistance may be available at little or no cost. Moreover, even where costs are involved these will likely be more than balanced out by the costs saved from avoiding inefficient and/or inappropriate biodiversity actions that may be taken if local biodiversity experts are not sufficiently involved in biodiversity improvements (see section 2.3).

Expert advice should be sought early, and ideally before taking, or even planning, any biodiversity-related actions or decisions. Moreover, local biodiversity experts should be involved in addressing each of the biodiversity goals (see Chapter 4 and check-matrix on page 30). This is because, even following adequate training (see section 5.1), lead employees are unlikely to have sufficient knowledge and expertise to fully address these goals without external expert assistance. Moreover, local experts may need to be consulted about individual steps to achieve these goals, including:

- How best to conduct monitoring of species, habitats and impacts? (see section 5.6)
- How best to consider biodiversity in decisions about sites or operations? (see section 5.7)
- How best to integrate biodiversity into existing management processes? (see section 5.8)
- How best to plan and implement actions to benefit biodiversity? (see sections 5.9 and 5.10)
- How best to conduct biodiversity education activities on site? (see section 5.11)

Case Study 9: Belmont Quarry, Beaujolais, France

The managers of Belmont Quarry in central western France have formed a number of partnerships with expert groups, including the **consultancy** MICA Environment, which has advised on ongoing habitat rehabilitation and water management, and the **local nature group** NATURAMA, which has advised on and conducted monitoring of birds and other animal species, and which is also advising on appropriate habitat management for these species. In addition, the quarry has a long-standing partnership with a **local museum** to investigate and showcase animal/plant fossils found on site. These expert partnerships have been essential for biodiversity and wider environmental improvements and education at the quarry, and the **variety of experts** have helped to address a variety of issues.

5.3. Involve local stakeholders in biodiversity plans and actions

Involving local stakeholders in site management is a priority for the Lafarge Group. In addition, stakeholder involvement is particularly important for biodiversity projects, firstly because local stakeholders may have additional expertise and local knowledge to bring to a project (see section 5.2), secondly because local stakeholders may have an interest in and/or be affected by biodiversity projects, and thirdly because local stakeholders may be able to bring additional capacity, resources and legitimacy to a project (e.g. manpower, funding and 3rd party verification). Finally, biodiversity projects are an opportunity to increase stakeholder involvement more generally.

Local stakeholders that may have an interest in and/or be affected by biodiversity projects at a particular site – and which thus should be involved and/or consulted – may include: local residents; local employees; local schools/students; local scouts and other youth groups; local governments; management authorities for any local protected areas; hiking, cycling and/or bird-watching groups; local NGOs, and; hunting, fishing and/or farming groups. Moreover, it is often necessary to involve a range of local stakeholders given that each will have their own priorities, expertise and needs, and that a biodiversity project will likely benefit from a wide range of local stakeholder input.

Local stakeholders should be involved early and regularly, and certainly before any biodiversity-related decisions or plans are made. The precise way that stakeholders may be involved, however, will vary a lot from site to site, depending upon the size, type and location of the site – including the local culture – as well as the particular local stakeholders involved. Examples of possible methods for involving stakeholders include: focus groups, public meetings, advisory panels and interviews.

Involving stakeholders need not be expensive and can in fact lead to considerable savings, e.g. through access to funding and manpower, and by ensuring that actions are appropriate and effective, and thus less likely to have to be revised. However, successful stakeholder involvement may require considerable time and training, both of which thus need to be allowed and planned for during site development (e.g. see: IFC 2007). In particular, efforts will need to be made to manage expectations, some of which may conflict with those of other stakeholders and/or be unrealistic.

In general, local stakeholders should be consulted about each of the seven biodiversity goals (see chapter 4 and the check-matrix on page 30). In addition, local stakeholders can be involved in:

- Establishing biodiversity baselines and ongoing monitoring regimes (see section 5.6)
- Addressing biodiversity in site decisions and management processes (see section 5.7-5.8)
- Planning and implementing on-site projects to benefit biodiversity (see sections 5.9-5.10)
- Educating local people, staff and visitors about biodiversity (see section 5.11)
- Verifying and endorsing any site-level biodiversity reporting (see section 5.12)

Case Study 10: Limay Quarry, central France

The rehabilitation of the Limay Quarry in France has involved a **wide variety of stakeholders**, with a **variety of needs and expectations**. A local conservation group stressed the need to preserve some specific biotopes for local fauna, local farmers stressed the need to recreate farmland, and local community groups called for some recreational use of the area. Through an **extensive consultation and planning process**, a **compromise** was found whereby much of the site was made accessible for walkers, whilst some level parts were made available for farming, and some cliffs and a wild area were preserved as habitat for birds.

5.4. Consult local/national biodiversity regulations and plans

There are often many biodiversity-related regulations at the local, regional and national level. These may cover: species that need to be protected (often Red List species); areas of habitat that need to be protected (e.g. IUCN recognised protected areas); invasive exotic species that need to be controlled and/or removed; sources of habitat damage and species mortality that are prohibited (e.g. some pesticides and chemical pollutants), and; legal requirements for site rehabilitation, environmental impact assessments, and/or stakeholder involvement. Moreover, it is important that Lafarge sites consult and adhere to any such regulations, firstly because they have been designed to protect biodiversity and, secondly, so as to avoid fines and other regulatory and/or reputational risks (see section 2.3). Such regulations, however, are often a minimum requirement, and many sites often can and should go further, following the guidance in this document, as well as local advice from biodiversity experts, stakeholders and plans (see sections 5.2-5.3 and below).

Beyond regulations, many countries and regions have biodiversity plans or strategies, and the requirements of the Convention on Biological Diversity and other initiatives will likely increase the number and scope of such plans in the future. In addition, protected areas also increasingly have biodiversity plans with relevance for any nearby industrial sites. Moreover, such plans are a useful resource that sites should make use of when making their own biodiversity-related decisions or plans. This may include providing useful and important information about particular priority species and/or habitats that need to be conserved, as well as invasive exotic species that need to be controlled and removed, and how this should be achieved. Moreover, it is important that any site-level biodiversity projects are made compatible with local, regional and national biodiversity plans, to avoid contradicting wider objectives and instead contribute to wider conservation programmes.

Biodiversity regulations and plans should be consulted early, before any biodiversity-related decisions are made. Moreover, in general, biodiversity plans and regulations should be scrutinised for any relevant guidance and information on the site biodiversity goals (see chapter 4 and check-matrix on page 30). In addition, biodiversity regulations and plans might be able to help inform:

- Which local stakeholders and experts should be consulted (see sections 5.2-5.3)
- The establishment of biodiversity baselines and monitoring regimes (see section 5.6)
- The consideration of biodiversity in decisions about new sites/operations (see section 5.7)
- The integration of biodiversity into existing management processes (see section 5.8)
- The planning and implementation of projects to benefit biodiversity (see sections 5.9-5.10)
- The education of local people, staff and visitors about biodiversity (see section 5.11)
- The reporting of on-site biodiversity levels, impacts and improvements (see section 5.12)

Case Study 11: Sonadih and Arasmeta Cement Plants, India

Biodiversity improvements around the Sonadih and Arasmeta Cement Plants in India have been designed and implemented in line with, and to contribute to, **local biodiversity plans**. In particular 25,000 tree saplings have been planted, and another 45,000 will soon be planted, in areas surrounding and neighbouring the two plants, as part of the **"Green Chhattisgarh"** programme of the **local authority**, which seeks to preserve the unique natural heritage of the state of Chhattisgarh through large scale tree-planting. The Lafarge cement plants have bought saplings, supervised their planting and maintained the plots of land, following advice from the **Institute of Forestry Management** and several specialised **NGOs,** and in line with the wider tree planting programme. The species chosen are robust with a long expected life span (e.g. teak and tamarind), as well as fruit trees (e.g. mango and jackfruit). Moreover, the two Lafarge sites decided to implement the plantings in partnership with local communities, particularly school children, in order to **raise their awareness** of environmental issues.

5.5. Consult and co-ordinate with other local sites and/or operators

An individual Lafarge site will often be located close to other Lafarge sites and/or sites managed by other operators. Moreover, these sites/operators may have similar impacts on and/or concerns about biodiversity, and thus can be an important source of local information, skills and expertise as well as offering an opportunity to co-ordinate biodiversity work, to both reduce combined negative impacts as well as to magnify the benefit of any biodiversity enhancements. In particular, other sites/operators will need to be consulted/co-ordinated with to avoid the possibility of cumulative impacts (e.g. several sites together making a particular habitat and/or protected area unviable), and also to magnify the benefits of any rehabilitation and/or education projects (e.g. a local network of rehabilitated habitats will benefit a particular species much more than a single isolated project).

Other local sites/operators may be directly consulted and/or co-ordinated with, particularly where a direct relationship already exists. In addition, local stakeholders and/or expert groups may themselves already have relationships with other sites/operators, and may thus be able to facilitate consultation and co-ordination efforts, even where no direct relationship already exists. Such consultation may be relatively informal, with other sites/operators just becoming an additional stakeholder and/or expert adviser in ongoing consultation efforts (see sections 5.2-5.3). Conversely, some Lafarge sites may form formal partnerships with other sites/operators to co-ordinate biodiversity-related decisions, plans and/or actions at each site as part of a single wider biodiversity programme across many sites, to combine resources, aims and outcomes. Finally, Lafarge sites may instigate forums to discuss biodiversity with several sites/operators together.

Other local sites and/or operators should be consulted and/or co-ordinated with early, including before any biodiversity-related decisions or plans have been made. In addition, other local sites and/or operators should be consulted about each of the site-level biodiversity goals (see chapter 4 and the check-matrix on page 30). Moreover, consultation/co-ordination with other local sites/operators should address each of the steps required to achieve these goals, including:

- How should decisions about new sites/operations address biodiversity? (see section 5.7)
- How can biodiversity be integrated into ongoing management processes? (see section 5.8)
- How can biodiversity baselines and monitoring regimes be established? (see section 5.6)
- What on-site biodiversity projects should be planned/implemented? (see sections 5.9-5.10)
- How should residents, staff and visitors be educated about biodiversity? (see section 5.11)
- How can resources and skills be pooled across sites to benefit local biodiversity?
- How can any possible cumulative effects upon biodiversity be avoided and reduced?

Case Study 12: Volos Quarry Tree Nursery, Greece

Lafarge sites in Greece have **co-ordinated efforts** to address the needs of quarry rehabilitation and plantings. In particular, a tree nursery originally created in 1992 to provide saplings for rehabilitating the Volos limestone quarry is now used to supply typical Mediterranean trees, and trees that are suited to the local dry climate, to **all of Lafarge's quarries and other facilities in Greece**. At present, the tree nursery provides around 30,000 saplings each year for rehabilitation projects across the country, in addition to ornamental species used in plantings around industrial facilities. The costs of the tree nursery come to around €45,000 per year. However, by **co-ordinating tree supplies** in this way, costs have undoubtedly been saved compared with if each site sourced trees independently.

5.6. Establish biodiversity baselines and monitoring regimes

A baseline inventory is essential to inform biodiversity-related decisions, management and projects, and also to have a baseline against which subsequent monitoring, and thus performance, can be compared. Similarly, ongoing monitoring is important to be able to track performance over time, and thus to inform adaptive management as well as education and reporting activities. Conversely, without monitoring, wider biodiversity work will likely be inefficient, ineffective and inappropriate. The choice of monitoring methods used, however, will depend upon the habitats, species and impacts monitored, as well as available expertise, funding, manpower and knowledge.

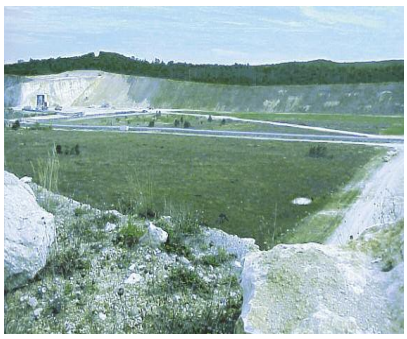
A baseline biodiversity inventory should be established as early as possible in the life-cycle of a site, and certainly before any biodiversity-related decisions or plans are made (see sections 5.7 and 5.9). This inventory should be as wide as possible, encompassing all – or at least the most sensitive – habitats and species present on site, as well as actual and potential impacts upon them. Ideally such a baseline will be established at the outset of a site, so as to be able to gauge the overall impact of the site. This may be relatively straightforward for newly-proposed and/or recently constructed sites, including as part of EIAs. However, for sites that have existed for several decades and/or have changed ownership or management, it may require consulting external sources of information and/or surveying other local areas of habitat, where these are likely to represent a similar habitat to that which existed pre-site. Finally, biodiversity baselines may need to be established over 12-15 months, given large seasonal variations in species and impacts.

Once a baseline has been established, ongoing monitoring needs to be conducted. This will likely have a more restricted focus than the biodiversity inventory itself and should focus, in particular, on measuring progress towards SMART targets set in site biodiversity plans (see section 5.9). In addition, any species or habitats identified as being at risk from the site, along with impacts upon them, as well as any invasive exotic species present, should also be monitored. Similarly, ongoing monitoring may also replicate some monitoring already undertaken in the wider local area and/or at other local sites, so that results can be compared and fed into wider conservation programmes. Finally, such monitoring needs to be sustained over time, including after projects and post-closure.

Monitoring needs to be well-planned and should ideally be informed, verified and endorsed by an independent local expert to ensure that it is effective, appropriate and credible (see section 5.2). In addition, monitoring should be integrated into existing site management and made as cost-effective as possible. For example, employees can be encouraged to record any particular species or threats observed during their day-to-day work. Similarly, full use should be made of available external resources, including via the internet (e.g. IBAT and the Global Invasive Species Database) as well as the knowledge, manpower, funding and other resources available from local stakeholders (see section 5.3). In particular, local schools, universities and youth groups can be encouraged and invited to conduct biodiversity monitoring on-site, thus benefiting the site as well as their own studies and projects. For more info on monitoring see: WorldBank 1998 and Hill 2005.

Case Study 13: Mannersdorf Quarry, Austria

Alongside ongoing restoration measures (including tree and shrub planting and the creation of animal refuges), an **extensive biodiversity monitoring** regime has been developed and implemented at the Mannersdorf Quarry in Austria, involving an initial **biodiversity inventory** followed with subsequent **regular observations**. This monitoring has been undertaken as part of a partnership agreement with **WWF Austria**, and has helped to measure and enhance local biodiversity as well as to reduce the impact of quarrying activities on local flora and fauna. The initial inventory revealed the existence of numerous protected species, and the work culminated in producing the "**Long Term Biodiversity Index**", which has subsequently been trialled at several other Lafarge sites.



5.7. Consider biodiversity in decisions about new sites/operations

Considering biodiversity in decisions about new sites and/or operations is very important. This is because once sites have been constructed, and/or new operations have begun, considerable biodiversity damage may have already occurred, which may be very difficult or even impossible to reverse later, even with well-funded and well-planned rehabilitation projects (see section 4.5). In addition, the particular design and/or location of new sites and/or operations may greatly affect the extent to which sites can actively enhance biodiversity in the future. Fortunately, however, it is often very possible to avoid, or at least reduce, impacts upon biodiversity – as well as to increase opportunities for enhancing biodiversity – in decisions about new sites and operations, provided that biodiversity concerns are adequately considered. For example, quarries in general, and extraction operations in particular, can be located away from particularly sensitive or important natural areas. Similarly, industrial plants can be designed to minimise pollution and other impacts.

Biodiversity concerns need to be addressed as early as possible in the life-cycle of a site, including during any feasibility/opportunity studies, when significant investments have not yet been made and when it is thus still possible to make significant changes to the design and/or location of a site. Similarly, it is important that impacts to the surrounding area as well as to the site itself are considered, along with the impacts of any induced development and/or cumulative effects. In addition, IUCN protected areas need to be fully respected, given that IUCN and WWF recommend that no extractive industry take place in IUCN protected area categories 1 to 4 (see: IUCN 2000).

Once a decision has been made to proceed with a particular new site, an EIA will be required, which should include determining precise levels of local biodiversity and any potential impacts upon them. Similarly, such an EIA will also be required for a significant new operation, e.g. significant extensions to existing quarries. Guidance on how to conduct EIAs is available from the Cement Sustainability Initiative (see CSI 2005). In addition, recent guidance on how to address biodiversity in EIAs has been produced by the Convention on Biological Diversity (see CBD 2005), given that it has been recognised that EIAs often do not adequately address biodiversity concerns.

In general, decisions about new sites and/or operations should address the seven biodiversity goals (see chapter 4 and the check-matrix on page 30). In addition, such decisions should also:

- Involve consulting local experts, stakeholders, plans and regulations (see sections 5.2-5.4)
- Involve consulting and/or co-ordinating with other local sites/operators (see section 5.5)
- Be informed by, and include establishing, a baseline biodiversity inventory (see section 5.6)
- Consider the need to plan and allocate resources for biodiversity projects (see section 5.9)
- Consider the need for biodiversity training and education on site (see sections 5.1 and 5.11)

Case Study 14: Rivercourt Quarry, northern France

At the Rivercourt Quarry in northern France it was **decided to forego quarrying** in part of the site to safeguard the **mature lowland forest** growing there; a rare habitat in the largely agricultural surrounding area, and one which would take a **very long time to restore.** Subsequent monitoring has revealed that the safeguarded habitat is important for local bats, birds and other animal species. Moreover, the decision to forego quarrying in this area was in addition to wider efforts to address biodiversity, including extensive rehabilitation of the quarried area.

5.8. Integrate biodiversity into existing management processes

In order to "mainstream" biodiversity concerns, it is important that they are integrated into existing on-site management processes. Moreover, by doing so, it is possible to make biodiversity improvements both more effective and more efficient. For example, a lot of biodiversity monitoring (e.g. the presence or absence of particular species) can be carried out by site staff during normal operational activities, thus reducing the need for costly or time-consuming extra work. Similarly, by changing the way that particular operations are undertaken, it is possible to both significantly reduce negative impacts (e.g. actively preventing chemical, fuel and/or sewage leaks) as well as to actively implement certain biodiversity enhancements (e.g. rehabilitating quarries "as you go", during the excavation processes). Finally, it is also possible to conduct a lot of biodiversity educational activities with staff, local people and any visitors as part of existing procedures (e.g. alongside health and safety briefings and/or as part of ongoing meetings with local residents).

Many Lafarge sites already have an Environmental Management System (EMS). Moreover, it is important that more sites set up their own EMS, and that existing EMSs adhere as much as possible to international standards (e.g. ISO 14001). In addition, efforts should be made to fully integrate biodiversity into an EMS (e.g. by including all biodiversity impacts in the "Impacts and Aspects Register"), given that it has been recognised that EMSs often do not adequately address biodiversity (see: IUCN 2006). Finally, beyond having an adequate EMS, it is also important that biodiversity concerns are integrated into wider management, including Land Management Plans.

In general, existing management processes for site operations should address each of the site biodiversity goals (see chapter 4, and the check-matrix on page 30). Moreover, this should include the direct impact of the site as well as the indirect impact of site workers (whilst working or living on site), along with the effect of any changes in the behaviour of local people caused by the site (e.g. induced changes in local hunting, fishing, forestry and/or farming practices). In addition, any off-site biodiversity impacts from site traffic (e.g. lorries used to transport quarried material to plants) should also be addressed. Finally, it is also important that existing management processes:

- Include organising and training lead employees to deal with biodiversity (see section 5.1)
- Involve consulting local experts, stakeholders, plans and regulations (see sections 5.2-5.4)
- Involve consulting and/or co-ordinating with other local sites/operators (see section 5.5)
- Are informed by, and contribute to, ongoing biodiversity monitoring (see section 5.6)
- Involve planning and implementing projects to benefit biodiversity (see sections 5.9-5.10)
- Involve educating residents, employees and visitors about biodiversity (see section 5.11)
- Contribute to, and take responsibility for, biodiversity reporting (see section 5.12)

Case Study 15: Brax gravel quarry, south-west France

At the Brax quarry in France, biodiversity concerns have been successfully **integrated into ongoing management processess**, to safeguard an existing colony of sand martins and to create appropriate conditions for rare **European Bee-eaters**, as well as to enhance wider biodiversity. This has involved: **limiting the active quarrying area** as much as possible (to less than 3ha); integrating **ongoing rehabilitation** (including planting local native species) with extraction activities; **avoiding extracting overburden** during the **presence of Bee-eaters** (May to early September), and; **integrating biodiversity concerns** into the site's Environmental Management System (**ISO 14001 certified**). In addition, an island has been rehabilitated for Common Terns, and reeds are transplanted within the site. This biodiversity work has involved ongoing **monitoring**, consultation of local **experts** and **stakeholders**, and **training** of local staff. Results include the establishment of a **growing colony** of Bee-eaters on site (up to 6 breeding pairs in 2012), and an increase in biodiversity awareness amongst local operators. Finally, a **long-term management plan** has recently been created, aiming to preserve the area primarily for wild birds.

5.9. Plan actions to protect, restore and enhance biodiversity

Beyond integrating biodiversity concerns into site decision-making and existing management processes it is also important that specific actions are planned to protect, restore and enhance biodiversity. Ideally, this planning should be formalised within a site Biodiversity Management Plan, especially in sensitive areas; e.g. sites located in protected areas and/or containing rare species or habitats. Similarly, any habitat rehabilitation undertaken at quarries should be formalised within a Rehabilitation Plan, which is a group-level priority and also a legal requirement in many countries.

Actions to protect, restore and enhance biodiversity should be planned as early as possible in the life-cycle of a site, and certainly well in advance of any such actions being undertaken, so as to ensure that these actions are as appropriate, effective and efficient as possible. Similarly, it is important that site biodiversity plans contain SMART targets (e.g. specific increases in numbers of a species, or the extent or diversity of a habitat, by a particular date). This is important to focus, and provide the rationale for, biodiversity actions, whilst also providing the targets against which biodiversity projects will be monitored and reported on in the future (see sections 5.6 and 5.12).

In addition to being timely and targeted, biodiversity plans also need to address the scope of any actions, including the precise area to be affected as well as the timescale of the project. In particular, it is important that the longer-term context is considered (including post-closure) as well as any impacts from, or upon, the wider local environment. Similarly, it is important that plans address the funding, manpower and other resources required, to ensure that these resources are available and allocated, and that they are used as effectively and efficiently as possible. This will need to include identifying the particular individuals responsible for specific biodiversity actions.

Biodiversity plans should also identify and address possible constraints and obstacles, which may include health and safety concerns, available funding, other land uses and biodiversity regulations (see chapter 3), given that such constraints often do exist and thus need to be anticipated and planned for. Similarly, biodiversity plans should include formal commitments to sustain, monitor, revise and report on actions over time, and the whole plan itself needs to be endorsed at a high company level, as well as by key stakeholders, to ensure adequate internal and external support.

In general, the process to produce a biodiversity plan should include considering each of the goals described in chapter 4 (see check-matrix, p30) and selecting those goals, or aspects of goals, most relevant to the site in question. In addition, planning biodiversity actions should also involve:

- Consulting local experts, stakeholders, plans and regulations (see sections 5.2 – 5.4)
- Consulting and/or co-ordinating with other local sites and operators (see section 5.5)
- Addressing threats and opportunities identified in a biodiversity inventory (see section 5.6)

Case Study 16: Freedom Pit, Delevan, New York, US

A comprehensive and detailed **Wildlife Management Plan** has been developed, and is now being implemented at Freedom Pit in New York State, USA, **integrated into wider rehabilitation work** of the quarried area. The plan is based around four discrete projects to: (1) re-introduce the globally **endangered Karner Blue butterfly**; (2) restore a natural stream; (3) establish an oak-chestnut forest, and (4) convert settling ponds into wetlands. All four projects have **specific objectives** and methods (e.g. planting native species, trial butterfly re-introductions and removing exotic species), and are subject to **ongoing monitoring** and evaluation. Moreover, the plan as a whole has been based upon a comprehensive **species and habitat inventory** of the site, as well as local expert advice. Finally, the implementation of the plan is being overseen by a wildlife team, comprised of site personnel, NGO and local government experts, the work of which has been informed and certified by WHC.

5.10. Implement, sustain and modify planned biodiversity actions

Once specific biodiversity actions have been adequately planned (see section 5.9), they need to be implemented, sustained and, if necessary, modified. This is, firstly, to help reduce any negative impacts from the site upon biodiversity, secondly, to help increase local benefits for biodiversity, and, thirdly, to ensure that any biodiversity projects are actually effective into the long term.

Where possible the implementation of biodiversity actions should involve local schools, residents, employees and/or other stakeholders. This is, firstly, because such stakeholders may be able to offer manpower, and other resources, to assist with project implementation, and also, secondly, because the implementation of projects may be particularly attractive and/or interesting to particular stakeholders, and thus may be a good opportunity to increase stakeholder involvement more generally in biodiversity work, as well as site management as a whole (see section 5.3). In addition, local experts should also be involved, to inform and guide project implementation, as well as to provide independent verification and endorsement, and thus credibility (see section 5.2). Finally, it is also of course very important that any health and safety concerns are fully addressed.

Once actions have been implemented, they also need to be sustained into the long term. This is important to avoid any short-term successes fading in the long term, and resulting in little or no long term improvements, as is unfortunately the case with many biodiversity projects implemented by many different organisations. One key way to help ensure that projects are sustained is to form and foster a dedicated group of employees, local residents and other stakeholders such that biodiversity projects have a life of their own beyond the role of one individual or the involvement of Lafarge in a site (see section 5.1). Similarly, the momentum for a project can be increased by aiming for and communicating early successes, to thus motivate those involved (see section 5.12). Finally, it is important that projects are planned from the outset with the long-term context in mind.

Beyond being sustained, specific actions may also need to be modified over time, to take account of any challenges/unforeseen consequences. This is particularly the case with biodiversity actions, given the inherent complexities in biodiversity, as well as the wide variety of human activities that may influence specific impacts and enhancements. For example: some biodiversity actions may result in the inadvertent spread of an invasive exotic species, which will then need to be removed (see section 4.3), whilst; some vegetation may not survive long after the initial planting, and may thus need to be replanted (see section 4.6), and; some efforts to physically protect sensitive areas from damage may be insufficient, and will thus need to be increased (see sections 4.1-4.2).

In general, biodiversity actions should be implemented, sustained and modified to address the biodiversity goals (see chapter 4 and check-matrix on p30), and they should also follow previously-made plans, and be informed by, and subject to, ongoing monitoring (see section 5.4, 5.6 & 5.9).

Case Study 17: WWF International Offices, Gland, Switzerland

Since the renovation of the WWF International offices in 1997 a **nature garden** has been created in the area immediately surrounding the office building, **involving office employees** and following the **advice of a local biodiversity expert**. This has involved planting native flowers, shrubs and trees, avoiding pesticide and herbicide use and in general keeping human interference to a minimum. Key features include a **wildlife pond**, **native grasslands** important for local insects and **rare indigenous fruit trees**. In addition, a botanical **inventory** and herbarium have been kept, local and migratory birds are observed and **guided visits** are given to visitors to showcase the biodiversity improvements. Finally, 20 bird nest boxes have been installed, 60 shrubs and trees have been **labelled**, and in all 100 different species have been planted.

5.11. Educate visitors, residents, staff and others about biodiversity

Educational activities are an important component of many biodiversity programmes. This is because many people still have a low awareness of biodiversity and/or do not know enough about how to go about conserving it. Moreover, increasing the awareness of biodiversity, and knowledge of biodiversity conservation, has been found to be one of the most effective ways of addressing biodiversity declines, at least in the longer-term. Similarly, educational activities are also a good opportunity for industrial sites – such as those operated by Lafarge – to showcase their biodiversity enhancements, and they can thus help to improve local stakeholder, and wider public, relations.

Biodiversity education activities at Lafarge sites should convey a number of messages, including: *What is biodiversity and why is it declining?* (see section 2.1); *Why is biodiversity important to companies and individuals?* (see sections 2.2 and 2.3), and; *What should be done to conserve biodiversity?* (see chapter 4). Moreover, these messages should be adapted to the local situation as much as possible, for example: highlighting locally important species and habitats, as well as the local importance of biodiversity (e.g. for tourism, farming and fishing etc.); mentioning any particular actions or decisions taken on site to benefit biodiversity, and; identifying any particular local threats to biodiversity (e.g. specific invasive exotic species and/or over-hunting etc.). These messages can be aimed at a number of audiences, including: employees, residents, visitors, local schools, youth groups, suppliers and on-site vendors. In addition, it should be noted that some of these audiences can themselves benefit from education activities (e.g. credits for student courses and badges for scout groups etc.), which can help to encourage interest in biodiversity education.

There are many different ways in which educational activities can be undertaken at a particular site, depending upon its size, type and stage of development, as well as local biodiversity values, local culture and the target audience(s). Some specific examples include: presentations by site personnel; on-site nature trails; educational boards erected around the site; leaflets disseminated by hand, by post or by the internet, and; organised site visits (e.g. to see rehabilitation and/or other biodiversity projects). Where possible such measures should be made active to engage audiences (e.g. games/activities for children). Moreover, efforts should be made to monitor the effectiveness of education projects (e.g. numbers of people educated and/or before and after questionnaires). Finally, a Lafarge biodiversity education leaflet has been produced and is available for all sites.

In general, educational activities should address each of the site biodiversity goals (see chapter 4 and check-matrix on page 30). In addition, biodiversity educational activities should also:

- Involve local experts, stakeholders and other sites/operators (see sections 5.2, 5.3 & 5.5)
- Include details and the results of biodiversity monitoring/actions (see section 5.6, 5.9-5.10)
- Explain how biodiversity is considered in site decisions/management (see sections 5.7-5.8)

Case Study 18: Churchville Quarry, Maryland, US

Churchville Quarry in Maryland, US, has implemented a variety of WHC-certified biodiversity education measures including **guided tours** of habitat improvements and a **community newsletter** for visitors to promote awareness of habitat enhancements on site. In addition, the quarry has an agreement with a local **Girl Scouts troop**, to provide opportunities for community service projects, earning badges and gaining knowledge about the environment, which has included creating a pollinator garden and learning about the **Monarch Butterfly**. Similarly, students from a **local high school** are actively involved in monitoring and advising on the location of bird boxes on site, helping the students achieve curriculum goals. Finally, education projects have involved a **project evaluation form** for participating educators, which has provided useful feedback to help adjust and improve subsequent education projects undertaken on site.

5.12. Report results of biodiversity monitoring, actions and education

Biodiversity reporting involves sharing the results of monitoring, actions and education activities with both internal and external audiences. This can be by a variety of means (e.g. internet, intranet and/or print media) and should include sharing details of any setbacks as well as successes. In addition, biodiversity reporting should be made as timely, detailed and transparent as possible. Finally, reports should be verified and endorsed by independent experts and high-level company managers, to ensure that they are legitimate, influential, and disseminated as widely as possible.

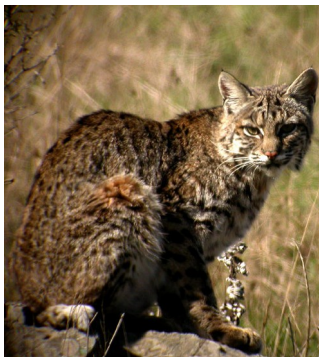
Such biodiversity reporting is important for a number of reasons. Firstly, people tend to work better and quicker if they know that the results of their work will soon be shared with others, and thus committing to reporting can help to motivate and organise biodiversity projects. Secondly, by reporting results, Lafarge sites can allow others – both internally and externally – to learn from their efforts in biodiversity monitoring, improvements and education; potentially multiplying the impact of any successes (e.g. by encouraging others to copy biodiversity improvements that have worked), whilst also allowing other biodiversity projects – including at other Lafarge sites – to learn from, and thus avoid repeating, any mistakes that have been made. Thirdly, conducting transparent reporting may also be a condition of financial or other support for biodiversity projects at a particular site, from local stakeholders and/or the wider Lafarge Group. Finally, the Lafarge Group as a whole has a number of biodiversity reporting commitments (e.g. GRI/CSI reporting on *"% of sites with quarry rehabilitation plans in place"* and *"Number of active sites that address biodiversity"*), and reports from individual sites can help to contribute to, and inform, this group-level reporting.

Biodiversity reporting need not be excessively onerous, and provided that biodiversity monitoring, improvements and education have been implemented as recommended in this guidance, it should merely involve collating information and results that already exist. Moreover, biodiversity reports can be relatively short, and can often be submitted and/or disseminated by the internet and/or intranet to avoid the need for the costly and/or time-consuming production of printed versions.

Biodiversity reports, however, do need to include as much relevant information as possible, including whether and how efforts have been made to address site-level biodiversity goals (see chapter 4 and check-matrix on page 30). In addition, biodiversity reports should include details of:

- Any on-site biodiversity monitoring, actions and education (see sections 5.6, 5.9-5.11)
- How biodiversity is considered in site decisions and management (see sections 5.7-5.8)
- Local experts, stakeholders, sites and plans that have been consulted (sections 5.2-5.5)

Case Study 19: Honey Island Quarry, Louisiana, US



Butterfly counts have been undertaken in the grassland areas of Honey Island Quarry for over 30 years by local volunteers. When the site was acquired by Lafarge in 2008 this ongoing monitoring was incorporated into site operations. Moreover, **the results of this monitoring are submitted** to the North American Butterfly Association's online database to help further the understanding of butterfly distribution, and thus conservation, at a national level. On-site butterfly counts are collected five times a year from March to September, and a **pollinator garden** project was begun in spring of 2010, to designate a landscaped area to attract pollinator species. Finally, wider WHC-certified biodiversity work on site includes safeguarding a wetland area from disturbance, leaving the grassland unmowed and **monitoring** a variety of animal species including American alligator, pileated woodpecker, armadillo and **bobcat.**

Glossary of Terms

Useful Term	Definition
Baseline Inventory	Assessing the presence of something (e.g. biodiversity) prior to an activity
Biodiversity	The natural variation of lifeforms within a particular area
Biodiversity Guidance	A document on how biodiversity performance can be improved
Biodiversity Hotspot	A region of the world recognised as having very high biodiversity importance
Brush Pile	A stack of old cut vegetation left as habitat and refuge for animals
Consultation	To ask a person or a group of people for their input into a decision or plan
Cumulative Impact	When the combined impacts from several sites exceed a tipping point
Diversity	A measure of how different things are (e.g. species and habitats)
Ecosystem	A biological community and its physical environment
Ecosystem Service	The benefit of an ecosystem for people (e.g. through flood-alleviation)
Edge Effect	When habitats are degraded (e.g. by exotics or weather) at exposed edges
Endemic Species	A species that is only found in a particular region or country
Genes	The hereditary material of lifeforms, consisting of DNA
Green Roof	A roof area of a building that has been turned into a natural habitat
Habitat	The natural and physical space that an organism needs to survive
Habitat Corridor	A narrow strip of habitat linking two or more habitat areas together
Habitat Fragmentation	When habitat is broken up into smaller isolated parts by human activity
Habitat Rehabilitation	When habitat is improved to a state that may or may not have existed before
Habitat Restoration	When habitat is returned to its previous state, prior to being damaged
Hydrological Regime	The level and flow of water in rivers, streams, reservoirs and wetlands
Induced Development	Development in the surrounding area that occurs as a result of a site
Insect Home	An artificial installation created for certain insects to live and/or breed in
Integrated Pest Management	Controlling pests by encouraging predators rather than using chemicals
Invasive Exotic Species	A non-native species that can spread uncontrollably in a certain area
IUCN Red List Species	A species recognised by IUCN as being threatened with global extinction
Karst Landform	A geographical feature where water flows into the ground/rises in a spring
Lafarge Site	A quarry, industrial plant, office or other installation operated by Lafarge
National Red List Species	A species recognised by a country as threatened with national extinction
Native Species	A species naturally present in a particular country/region (opposite: Exotic)
Ongoing Monitoring	The monitoring of something (e.g. biodiversity) over a length of time
Raptor Perch	A wooden stand erected for birds of prey to rest on whilst they watch for prey
Species	A group of organisms which can interbreed to produce viable off-spring
Stakeholder	A person or group who have an interest in a certain activity or decision
Water Table	The level underground below which the ground is saturated with water

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WWF International

Avenue du Mont-Blanc
1196 Gland, Switzerland
+ 41 22 364 9111

www.panda.org

LAFARGE

61 rue des Belles-Feuilles, BP 40
75782 PARIS Cedex 16, France
+33 1 44 34 11 11

www.lafarge.com

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