Biodiversity Management System

Proposal for the integrated management of biodiversity at Holcim Sites

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October 2010

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EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

EXECUTIVE SUMMARY

This document is a proposal to Holcim Ltd. to establish a Biodiversity Management System (BMS) for its worldwide operations and to implement it in a consistent and professional manner, by creating the necessary instruments and making appropriate provisions to integrate biodiversity considerations into policy, strategic and operational processes.

Holcim Ltd. is one of the world's leading cement and aggregate suppliers, operating in more than 70 countries on all continents. It operates approximately 550 active extraction sites in a wide diversity of ecosystems and habitats. Some of these harbour important species and/or are close to, or overlapping with, nationally or internationally protected areas. Although quarrying for cement and aggregate production is generally more localised and conducted on a smaller scale than mining for metals, it can still have significant direct and indirect impacts on biodiversity.

Whilst environmental issues, including some aspects of biodiversity, are already addressed in a number of Holcim policies, directives and guidelines, and biodiversity management is part of many Quarry Rehabilitation Plans, there is still a need to expand and improve the company's activities and management practices related to biodiversity issues. The active engagement of companies like Holcim is essential for effective global biodiversity conservation. At the same time, the inclusion of biodiversity concerns in policies and operational practices can have significant business benefits and will add credibility to the company's licence to operate.

The proposed BMS is the result of a formal partnership agreement entered into by IUCN and Holcim in 2007. It was developed by an Independent Expert Panel of five members, and involved visits to Holcim sites in several countries, regular discussions with Holcim experts, study of biodiversity conservation methods by other industries and consultations with external experts.

The principal purpose of the BMS is to include biodiversity systematically in all planning and operational processes (*Fig. 3*) and amend relevant existing guidelines accordingly. The proposed BMS aims to insert biodiversity concerns at three levels of the company business: (1) policy, (2) strategic planning and environmental management and (3) operational levels (*Fig. 6*). Whilst the BMS report covers the first two levels, the 3rd level will be addressed in the proposed management handbooks and guidelines to be prepared by Holcim.

A fundamental element of the BMS is the categorisation of each site according to its biodiversity importance and the likelihood of impacts on biodiversity as a result of activities pursued by Holcim. Plotting of these two factors in Biodiversity Risk Matrix (*Table 2*) can help managers understand the expected level of biodiversity management that will be required at a particular site.

The BMS includes steps and recommendations for biodiversity management activities at each phase in the life cycle of a development, from planning through operations and eventual closure:

- **Planning Phase**: In the early planning of a new development (*Opportunity Study*), the focus is on a first quick desk-study assessment of possible risks originating from high

biodiversity values and their appropriate inclusion in the Holcim risk management process. In the more advanced planning (*Feasibility Study*), the biodiversity issues will have to be analysed in greater detail, together with a first evaluation of possible mitigation measures, including the possibility of biodiversity enhancements (*Fig 8*).

- **Impact Assessment**: Building on the findings of the planning phase, the biodiversity investigations of the formal impact assessment should ensure a full inventory of the key biodiversity elements of a site, covering ecosystems, habitats, vertebrates and higher plants. If seasonality is an issue, biodiversity data collection should stretch over a full annual cycle. A key output of the impact study is a comprehensive set of recommendations for alleviating biodiversity impacts through appropriate mitigation measures (*Fig. 8*) and for possible positive biodiversity enhancement initiatives. These will subsequently serve as the basis for biodiversity management during the Operational Phase. In addition, the impact assessment should contain suggestions for the biodiversity monitoring that should be initiated as part of environmental management.

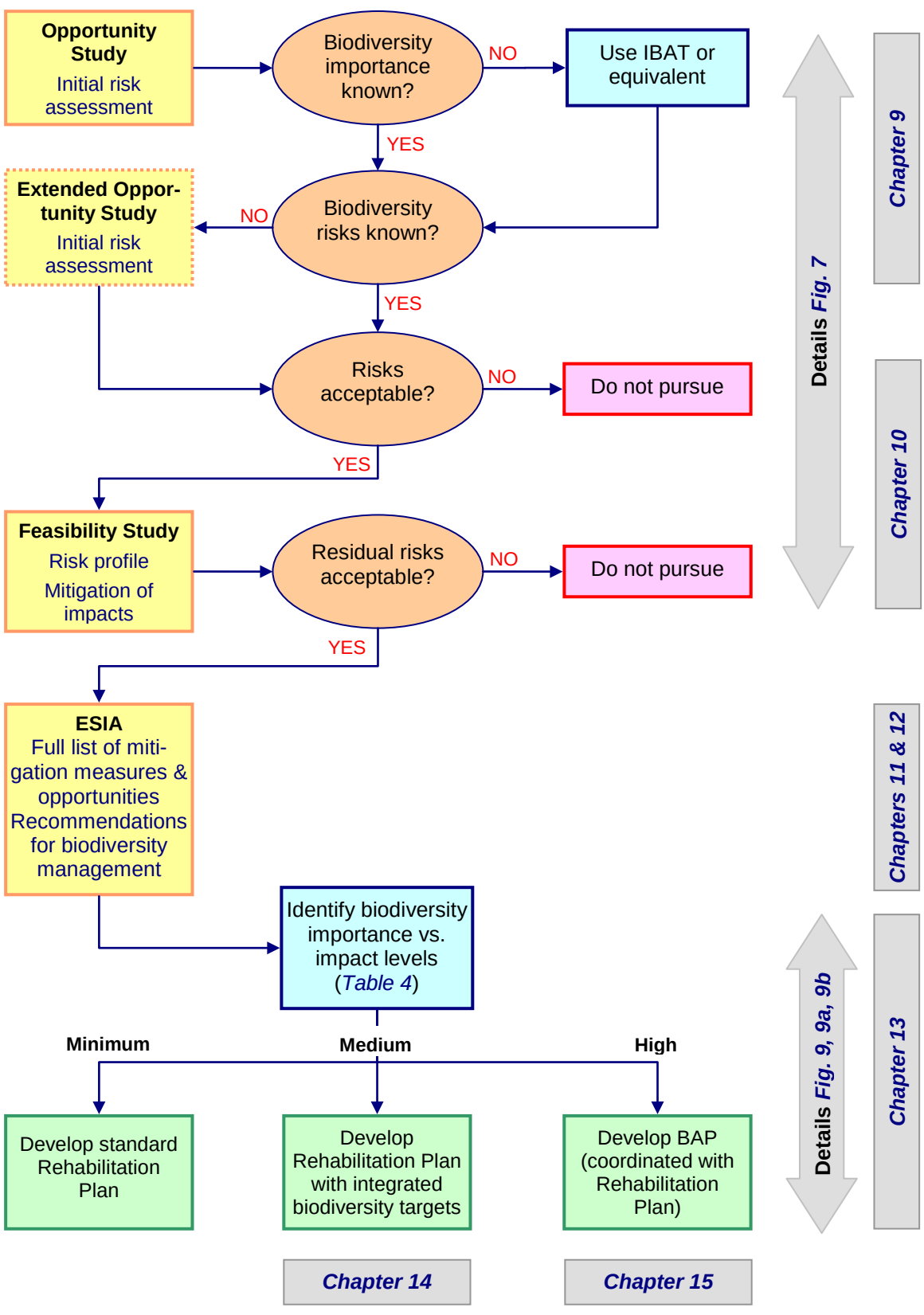
- **Operational Phase**: Throughout the life cycle of an extraction (or a large production) site, some form of biodiversity management should be undertaken. In most cases, the level and intensity of the biodiversity management will depend on the site's position on the Biodiversity Risk Matrix, i.e. the importance of its biodiversity *versus* the risk of impacts on biodiversity from operations (*Table 4*). Since the development of *Rehabilitation Plans* is mandatory for all extraction sites, the standard method of biodiversity management is the inclusion of biodiversity components in these plans. In cases of a site with high biodiversity importance and a high risk of impact, a separate *Biodiversity Action Plan* is being proposed. It should be linked with other (local, national) formal biodiversity plans that may cover the general area and be implemented in partnership with local agencies and/or nongovernmental organisations. All biodiversity management should be conducted on the basis of clearly defined targets, which may be biodiversity- or community-defined.

- **Monitoring and Evaluation**: Plausible management of biodiversity should be underpinned by a professional programme of monitoring and evaluation. The starting point for this program (baseline data) would be the biodiversity inventories (three levels from basic to advanced). Likewise, the monitoring should be conducted on one of three levels of intensity, depending on the biodiversity importance and the biodiversity management to be pursued. Regular, basic-level monitoring should be carried out by local staff, while higher-level monitoring will require expert assistance. The purpose of the monitoring is to assess the effectiveness of biodiversity management and ultimately to measure impact on biodiversity (*Table 5*).

Besides a strong commitment from top leadership, special management processes will be required for the effective implementation of the BMS, including the development of internal skills at corporate and local levels, and the establishment of formal links with external partners and experts. The adjustment of relevant guidelines and directives, as well as the development of handbooks to assist implementation, are equally fundamental.

The proposal recommends a phased introduction of the BMS into corporate and local management processes. While the adaptation of internal planning and management guidelines is an essential preparatory step, the operationalisation in the field should be first tested in selected pilot sites and/or countries in order to assess the need for possible further adjustments. On global introduction of the system, priority should be given (1) to the full-scale application of the BMS to any new developments according to *Fig. 0* and (2) for "retrofitting" it to existing operations, especially to active extraction sites (*Fig. 13 and 13a*).

Figure 0: **Overview flowchart - Application of the BMS on new sites**



KEY RECOMMENDATIONS

Throughout the document, a wide range of explicit and implicit recommendations towards achieving the goal of the BMS are presented. The most important of these are summarised below.

Policy and principles

➔ Holcim should adopt the following major ***policies*** and integrate them into its existing policies on environmental protection and sustainability:

- Recognising the global importance of biodiversity resources and being aware of both the company's dependence on and impact upon these resources, Holcim should seek to manage its landholdings to achieve better outcomes for the conservation and sustainable use of biodiversity.
- Holcim should be committed to good stewardship of its land and work with partners, customers, relevant constituencies and other stakeholders to support their activities aimed at the same goals.
- Holcim's decisions and plans should reflect due consideration of biodiversity risks and opportunities associated with its business, recognising that, in doing so, this would create long-term added value both for the company's business and as a global citizen.

➔ The policy should be supported by (the recommended) ***Policy*** and ***Implementation Principles***, which should govern all biodiversity activities.

➔ Biodiversity issues and targets should be included in Holcim's ***CSR planning*** and reporting.

➔ Existing ***guidelines*** and ***directives*** for planning and operational processes that could have an impact on, or be impacted by, biodiversity issues should be amended so that the major provisions of the BMS are properly reflected. In cases where no appropriate guidelines exist (BAPs), these should be newly developed.

➔ ***Corporate standards*** for the inclusion of biodiversity concerns in all planning and operational processes and for the management of biodiversity should be used worldwide, even if those standards would exceed local regulatory requirements.

➔ An assessment of hazards *for biodiversity* of Holcim activities (including those arising from social and community conditions), and the resulting risks to operations and reputation of the company, should be integrated into corporate ***risk management***.

➔ All biodiversity management should be guided by defined ***long-term goals*** and ***operational targets***.

➔ All sites with ongoing or recently completed biodiversity management should have one-to-five selected ***biodiversity performance*** indicators measured and reported annually as part of the Plant Environmental Profile (PEP). An aggregate indicator should be derived for reporting on national and global corporate performance.

➔ Sites of the highest biodiversity importance category (cat 1 & 2; ➔ *Table*) and/or sites with significant biodiversity management programmes should asses the ***outcome of***

biodiversity management at least once every three years by means of a qualitative Rapid Biodiversity Survey. The results should be reported in the Holcim Sustainability and CSR Report.

➔ As a longer-term, high-level goal, Holcim should work towards the concept of "***no net biodiversity loss***" and form a task force to develop a suitable measure for such a corporate biodiversity outcome indicator.

➔ A declared goal of Holcim biodiversity management should be to maintain not only important species, but also the general ***diversity of ecosystems and habitats***, thus also helping to stem the slow, but ongoing, decline of many common and widespread species.

➔ In areas with a high level of local biodiversity conservation planning, Holcim should investigate – in partnership with regional planning and environmental authorities, conservation NGOs and possibly the relevant industry forum – the strategic opportunity of combining the long-term planning for ***access to mineral resources*** and for attaining biodiversity conservation targets on a landscape scale.

Planning and operations

➔ For any site explored in Opportunity Studies, key ***biodiversity values*** and major ***risks to biodiversity*** should be determined.

➔ For sites evaluated further in a Feasibility Study, a comprehensive list of ***important biodiversity values***, expected risks, mitigation options and possible opportunities for biodiversity enhancement should be compiled.

➔ Mitigation of biodiversity impacts should take place on the lowest possible intervention level of the ***mitigation hierarchy***.

➔ Opportunities for ***biodiversity enhancement*** should be considered as part of the mitigation measures, but only in areas where past land uses have modified or reduced the original biodiversity.

➔ All ESIAs, irrespective of local requirements and regulations, should include a ***full biodiversity assessment*** according to defined Holcim global standards.

➔ Linkages to biodiversity issues should be made in ***social investigations*** during the planning phase or the ESIA process, on the basis of a defined content list.

➔ All Rehabilitation Plans should have a ***biodiversity management component***, the level of which depends on the site's biodiversity risk level. Sites with high biodiversity risks should have a full BAP with defined biodiversity objectives in a time frame.

➔ Rehabilitation of high biodiversity importance sites should be guided primarily by ***biodiversity outcome targets***, while higher priority can be given to different land-use targets that may be defined by local stakeholders in areas with lower biodiversity values.

➔ For landholdings no longer needed (discontinued projects, closed sites) with actual or potential importance for biodiversity, a ***dedication for conservation purposes*** should be considered, such as a longer-term biodiversity management programme in partnership with a local NGO or government agency, the creation of a nature reserve, the establishment of a conservation easement or another sustainable community usage.

- ➔ Biodiversity aspects should be included in the ***due diligence*** process when the possible acquisition of a plant or an entire company is being investigated.

- ➔ When evaluating or planning biodiversity management measures and the achievement of biodiversity benefits, these should always be considered in the broader ***landscape context***, as well as with a social perspective as to how post-closure land-use choices could provide economic or recreational opportunities for local stakeholders without compromising biodiversity targets that may have been set.

- ➔ Holcim should plan on a phased ***roll-out of the BMS***, initially concentrating on active extraction sites and preferably with a defined target date by which the system should be operational worldwide. As part of this, a one-to-two-year pilot testing in four-to-five countries should be carried out before full global implementation.

- ➔ A minimum level of ***consistent biodiversity management*** for all existing extraction sites and other large sites greater than five hectares should be reached by a set target date. For sites fulfilling the relevant criteria, this should include the completion of a central HGRS database, biodiversity inventory levels 1 & 2, biodiversity components for Rehabilitation Plans and BAP, and biodiversity monitoring levels 1 & 2.

Management

- ➔ For a successful implementation of the BMS, greater ***capacity*** and ***expertise*** to deal with biodiversity issues should be established on various levels within Holcim:
  - Establishment of a small, high-level Biodiversity Advisory Committee reporting to HGRS with a majority of external expert members
  - Creation of a suitable internal discussion platform for staff involved in biodiversity management
  - Recruitment of one or two biodiversity experts to HGRS with relevant conservation experience
  - Addition of defined biodiversity-related functions to relevant national and site staff
  - Formation of advisory and/or management partnerships with local or national NGOs or consulting agencies
  - Strategic partnership with a global NGO with biodiversity expertise

- ➔ The introduction of the BMS should be accompanied by suitably designed ***training programmes*** for Holcim staff at different management levels, in line with the tasks and functions assigned to them in the operation of the BMS.

- ➔ Generic Terms of Reference will be required for the appropriate ***inclusion of biodiversity*** considerations into the relevant planning documents.

- ➔ ***Protocols*** should be developed for any tasks requiring the collection, compilation and evaluation of ***data***, so that this process can be managed consistently.

- ➔ Specific ***biodiversity risk descriptors*** should be developed for the Holcim BRM.

- ➔ In all planning and operational processes, proper ***financial provisions*** should be made for the consistent implementation of the BMS.

1. BIODIVERSITY

1.1 Definition

The Convention on Biological Diversity (CBD), which was developed and signed by 157 governments at the 1992 Earth Summit and today has 193 Parties, defines biodiversity in the following manner:

"Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

Building on the language of the International Council on Mining and Metals (ICMM)[1], the following adapted definition is used for the purpose of the Holcim Biodiversity Management System (BMS):

> *Biodiversity is the variety and variability of life on Earth. It encompasses the differences within and among all living organisms at their different levels of biological organisation – genes, species, populations, communities, habitats and ecosystems – as well as their interactions.*
>
> *Biodiversity and the ecological processes which it enables and maintains are the basis of innumerable ecosystem services essential for the survival of every individual, as well as for the functioning of society and its economic activities.*

1.2 Biodiversity and ecosystem services

Biodiversity may be viewed as a description of the world's biosphere. Its interaction with the physical part of our world – soil, rocks, water, air – and the energy from the sun are the ingredients of life on our planet. A well-balanced yet unimaginably complex cyclic system of energy, material and information flow among the physical and living parts of the planet has developed over 2-3 billion years. Biodiversity is, at the same time, both the result of these processes and the agent that sustains them.

Biodiversity encompasses more than the diversity of animal and plant species, habitats, ecosystems and landscapes by which we define and view our biosphere; it also provides the basis for all ecological processes that sustain life on earth and human livelihoods. The variation within species also provides the basis for evolution through the adaptation of species to new and changing habitats.

These ecosystem services that all life – and all human activities – depend on are increasingly used as a key argument for urging closer attention to biodiversity, especially in the business sector which, like all parts of society, often makes free use of these services and takes their provision for granted. The efforts are spearheaded by the World Business Council for Sustainable Development (WBCSD), in which Holcim is also playing

an active role.[2,3,4] The economic values of ecosystem services are usually grouped into four categories:

Use values

1. **Direct values**: Provision of raw materials and physical products (e.g. timber, minerals, food, water, fibre, energy).
2. **Indirect values**: Ecological functions that provide essential life support and maintain and protect natural and human systems (e.g. climate regulation, watershed protection, flood regulation, water and air purification, pest control).
3. **Option values**: A premium placed on maintaining ecosystems for future possible uses that may have economic value (e.g. new industrial, agricultural or pharmaceutical applications of wild species, future tourism or recreational developments).

Non-use values

4. **Existence values**: Intrinsic values of ecosystem attributes or their component parts (e.g. sites of historic or cultural value, of aesthetic or spiritual appeal, national heritage or bequest for future generations).

Putting economic values on the ecosystem services that are sustained and enabled by biodiversity amounts to a valuation of biodiversity itself. Because biodiversity, in its widest sense, is both an enabler as well as the product of life, it provides an excellent measure for assessing the sustainability of human use of natural resources. The status of biodiversity reveals a great deal about the sustainability of human activities, including business. Conversely, economic activities can be rendered more sustainable by integrating biodiversity-related objectives into business processes.

1.3 The status of biodiversity

Threatened species

On many fronts throughout the word - in every biome at local, regional, national and global levels - biodiversity is declining. Not only are species declining, but the rate of extinction of known species is today up to 1,000 times higher than the normal background extinction rate. Intraspecific variation is also declining, as local populations become extinct or lose viability.

The deteriorating status of species, habitats and ecosystems is the result of a wide range of activities by human societies that measure their well-being mostly through economic parameters which do not (or only marginally) factor in the services provided by nature. For the poorest communities, there is no conscious choice between financial value and natural richness – their survival depends on using whatever resources they have access to. There are root causes everywhere in society, rich or poor, that work against diversity in nature, including corruption, trade inequalities, perverse incentives and ignorance.

There is a wealth of information about the status of the world's biodiversity. The starting point for most global analyses is the IUCN Red List of Threatened Species [5], universally recognised as the most comprehensive inventory of the global conservation status of plant and animal species. First conceived in 1963, the Red List has evolved from an informal compilation initiated by concerned scientists and conservationists into an ongoing worldwide assessment programme, based on scientific criteria relevant to all species and

all regions of the world, and supported by a worldwide network of professional volunteers. With its strong scientific base, the IUCN Red List, which is now a 48,000-page website containing the most comprehensive available information on each treated species and the regular analyses derived from them [6], is recognized as the most authoritative guide to the status of biological diversity. However, it still largely remains a tool for vertebrate and plant biodiversity, not for invertebrates and lower organisms (which account for more than 80% of biodiversity). This limitation could be relevant for Holcim in relation to karst ecosystems[*,7] which harbour many rare (often endemic) invertebrates.

In recognition of key contributions made by other scientific conservation organisations, such as BirdLife International and Conservation International (CI), the Red List database is today supported by the Red List Partnership. This partnership has jointly developed the Red List Indices for measuring global biodiversity trends (e.g. based on information on birds[8], for which better and more complete information is available than on any other taxa) and to assess progress towards the global 2010 biodiversity targets.

In addition to the global Red List, a great number of countries publish their own national red lists of rare and threatened species at various levels of sophistication, with an increasing trend towards the application of scientific criteria derived from IUCN's global norm.

A landmark analysis of the status of the world's biodiversity is the report published in 2005 by the Millennium Ecosystem Assessment[9], which shows that the *current* extinction rates are around 1,000 times higher than the long-term average "background" extinction rate of the past. The assessment projects that, if current environmental trends continue, this extinction rate will rise by another factor of ten in the future.

Decline of "common" and "widespread" species

While the prevailing focus on the status of threatened species is important and indeed indicates high-priority biodiversity concerns, it does not present the full picture of global biodiversity loss. Equally concerning, but less well-documented, is the steady decline of many "common" and "widespread" species. Abundance, distribution range and pattern of a species are as much an expression of biodiversity (on a genetic level) as the raw number of species itself in a given locality. A great number of species not yet rare enough to qualify for the Red List are affected by this process. In Europe, for example, while 8% of the bird species are globally threatened, another 38% are undergoing steady decline, mainly due to changing land-use patterns, especially in relation to agriculture.[10]

This often overlooked dimension of biodiversity decline, which might be as serious as the increasing number of threatened species, is particularly relevant when looking at local and regional biodiversity issues in connection with land-use activities that involve substantial, but relatively contained, transformation of habitats (as in the case of limestone mining for cement and aggregate production).

Ecosystems

Species are the basic building blocks of ecosystems. Therefore, the status of individual species, especially those characteristic for a certain habitat type, as well as the general diversity of species are often used as a first measure for the status of ecosystems.

[*] Karst is found on particularly soluble rocks, especially limestone, marble, and dolomite (carbonate rocks), but is also developed on gypsum and rock salt (evaporite rocks). Karst landscapes are characterised by sinking streams, caves, enclosed depressions, dry valleys, gorges, natural bridges, fluted rock outcrops and large springs. Karst landforms are produced by rainwater dissolving rock (a process known as dissolution), but other natural processes often intervene, such as river erosion and glaciation.

However, since ecosystems are more than the simple sum of their species, the status and health of ecosystems are more complex and difficult to assess, let alone to express in a simple quantitative manner.

Nevertheless, the most comprehensive analysis of the status of the world's ecosystems carried out to date, the Millennium Ecosystem Assessment, presents clear and ample evidence that, across the globe and in almost all ecosystem types, the status and health of ecosystems are being seriously eroded, threatening the livelihood of more and more people.[11] As ecosystems decline, so does their ability to provide the services that underpin all life and the well-being of human societies. As a direct result of habitat modification, ecosystems are losing their capacity to provision a growing human population (with rising living standards). Indirectly, as a result of the use of the natural environment as a sink for human and industrial waste, ecosystems can no longer meet the demands for the natural regulatory services on which we all depend.

For ecosystems protected primarily for biodiversity and resource conservation, a detailed global database (World Database on Protected Areas[12]), is available through the World Conservation Monitoring Centre (WCMC) of UNEP, complemented by various ongoing monitoring and assessment systems. While almost 12% of the world's land surface is now covered by about 160,000 protected areas, these areas are not sufficient for the conservation of global biodiversity (see UNEP[13]), partly because their geographic locations are not adequately representative of global biodiversity distribution, and partly because many protected areas themselves are vulnerable due to inadequate management and enforcement.

In view of this, the World Bank Group, including the IFC and IBRD, uses the term "*critical habitat*"* to cover areas of high biodiversity importance, whether they fall inside or outside protected areas. Likewise, building on the shortcomings of the established protected area system, several large conservation NGOs have collaborated to produce criteria for defining Key Biodiversity Areas (KBAs).[14] Taken together, these systems give a broader view of priority areas for *in-situ* conservation than consideration of protected areas alone.

1.4 Impacts of the mining industry on biodiversity

As is well-summarised in the comprehensive ICMM report on biodiversity[1], mining has the potential to affect biodiversity throughout the life cycle of a mining project, both directly and indirectly. However, while many biodiversity-related issues for smaller-scale mining for aggregates and cement production are similar, there are also significant differences that merit a special adaptation of biodiversity management for the cement industry, most importantly:

- In contrast to the metals sector where deposits are often rare and located in remote areas, limestone deposits are much more common and widespread, so that operations can be placed near human settlement.
- To minimise transportation costs for a relatively cheap bulk commodity, cement plants are usually located close to their markets (population and industrial centres), and are thus less likely to be in remote and undisturbed natural areas.

* "A subset of both natural and modified natural habitat that includes areas with high biodiversity value, such as habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or which are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic or cultural importance to local communities" (from IFC (2006): Performance Standard 6).

- Likewise, to keep transportation costs low, the quarries supplying cement plants with limestone, clay, shale, etc. are also usually not too distant from the cement plant (although in exceptional cases, they may be 200-300km away). Transportation can be by means of road, rail, conveyor belt or boat.
- A key biodiversity issue linked to limestone quarries, which provide 70% of the raw material for cement production, is the conservation of karst ecosystems, characterised by systems of underground streams and caves, enclosed depressions, dry valleys, gorges, prominent rock outcrops and large springs. These ecosystems harbour unique (often endemic) cave fauna and flora and generally are of high conservation priority.[15]
- Also for reasons of economy, aggregate quarries are usually located close to their markets (although notable exceptions may occur here too, such as the Aggregate Industries Glensanda quarry in Western Scotland, supplying building material to Northern Europe by sea).
- Mining of sand and gravel is often located in alluvial areas of freshwater ecosystems which, in areas of high population density, are generally classified as areas of high biodiversity conservation concern.
- Quarries for aggregate and cement production are generally smaller in size than the ones operated by the mining industry.

For the cement and aggregate industry, the key impacts (negative and positive) are:

Direct impacts:

- Conversion/destruction of habitats through land clearance for the development of production and mining sites, as well as the construction of access roads and other auxiliary infrastructures
- Alteration of habitats through mining, management and rehabilitation of quarries
- Disturbance of wildlife by noise from blasting and quarry traffic, and increased human access
- Emission of pollutants to land (e.g. deposits of cement kiln dust), air (NO_x, SO_2 and dust emissions) and water (run-off from tailings)
- Sedimentation and altered hydrology (for karst systems).

Indirect impacts:

- Contributions to climate change (which in turn has a major impact on biodiversity[16]) caused by the emissions of the cement plants, the use of energy in cement production and transportation
- Procurement processes within the company's supply chains and the products it purchases (e.g. fuel, additives, construction of new plants)
- Social and associated environmental changes that might be caused locally or regionally through Holcim's operations.

1.5 The business case for biodiversity

The inclusion of social and environmental concerns into corporate objectives has today become a standard method of business management. It is rooted in the principle of sustainable development, i.e. of integrated ecological, economic and social sustainability.

Nowadays, most global firms think in terms of a "triple bottom line," which encompasses shareholders, employees and the public at large. What are the benefits for the triple bottom line when a business engages with biodiversity issues?

Today the conservation sector generally recognises that the business sector's active engagement is essential for the success of global biodiversity conservation, just as in the management of other critical global environmental issues. Conversely, for a business with direct and indirect impacts on natural habitats and biodiversity, the inclusion of conservation concerns into policies, management and operational practices is crucial for the public legitimacy of its operation – with the business benefits of:

- securing a stable ecological operating environment, especially the ongoing availability of ecosystem services on which the company depends (such as the provision of fuel, raw materials, water and sinks for waste products);
- gaining a competitive advantage in the marketplace by demonstrating sound and ethical environmental and social performance in a society that is increasingly concerned about a company's credibility and legitimacy to operate;
- attracting and retaining investors, customers, suppliers and employees who share the company's values;
- enabling access to Socially Aware Investment funding from sources that require companies to disclose, manage and report on environmental risks, as well as funding from international lenders that subscribe to the *Equator Principles* laid down in the Performance Standards of the IFC;
- being recognised by regulatory authorities and other stakeholders for its thorough planning and reliable adherence to required mitigation and remediation;
- justifying and facilitating the renewal of site licences and mineral rights, thereby avoiding costly delays;
- avoiding future liabilities that could arise due to long-term planning that fails to take biodiversity into account;
- increasing acceptance among stakeholders around the site who are directly or indirectly affected by the company's operations; and
- demonstrating that the corporate sector can make a positive contribution to global biodiversity conservation and integrated land-use planning.

Not all of these sources of value can be translated entirely into financial value; some are long-term and difficult to quantify. They include the value of reputation with key stakeholder groups, the value of local licence to operate and brand value.

2. HOLCIM LTD

2.1 Company profile

Holcim Ltd is one of the world's leading suppliers of cement and aggregates (crushed stone, gravel and sand). It also provides ready-mix concrete and asphalt, including associated services. The Group holds majority and minority interests in more than 70 countries on all continents.

The company was founded in Switzerland in 1912 and, from 1920 onwards, started to invest in cement companies in various European countries, Egypt, Lebanon and South

Africa. After World War II, it developed a holding network in North and South America which, from 1970 onwards, was further expanded into the Asia-Pacific emerging markets and Central and Eastern Europe.

The following are Holcim's key figures for ***2009***:

Cement	No. of cement and grinding plants	154
	Production capacity	203 million tonnes
	Sales	132 million tonnes
	Employees	50,335
Aggregates	No. of plants	485
	Sales	143 million tonnes
	Employees	6,850
Other construction materials and services	No. of ready-mix concrete plants	1,457
	Sales of ready-mix concrete	42 million m^3
	No. of asphalt plants	114
	Sales of asphalt	11 million tonnes
	Employees	23,725

Holcim Ltd has a long tradition of concern for social and environmental issues and a long-standing commitment towards the goal of integrated sustainable development, which is also clearly reflected in the goals of the company's Mission Statement, namely to:

- *be recognized as an employer of first choice;*
- *selectively grow our worldwide portfolio of companies;*
- *continually demonstrate our commitment to sustainable environmental performance, and visibly play a leading role in social responsibility within our sphere of influence;*
- *maintain an active dialogue with governments, international organizations and NGOs, and be acknowledged as a valued and trusted partner.*

As an expression of its dedication to sustainable development, Holcim Ltd has been a member of the WBCSD since 1999, playing an active role in many of its programmes, especially the Cement Sustainability Initiative (CSI)[17] and the development and testing of the Corporate Ecosystem Valuation System[2,3,4]. In addition, Holcim has been named "Leader of the Industry" in the Dow Jones Sustainability Index (DJSI) from 2005 to 2008, an honour that acknowledged the company as having the best sustainability performance in the building materials industry for four consecutive years.

2.2 Holcim global landholdings

Commercially active in over 70 countries, Holcim possesses landholdings on all continents, ranging in size up to several hundred hectares. The larger portion of this land is owned by Holcim (or its national subsidiaries), while the rest is on (mostly long-term) leasehold. For the purpose of the BMS, the Holcim sites are classified as follows:

CLASSIFICATION OF HOLCIM SITES

- ***Extraction sites***: extraction of resource material – if necessary, divided into:
  - Cement production
  - Aggregate production
- ***Production sites***: cement plants, grinding and aggregate plants, ready-mix plants, asphalt, etc.
  - ***Large footprint*** production sites (> 5ha): cement plant, aggregate plants, grinding units
  - ***Small*** production sites (< 5ha): ready mix plants, asphalt
- ***Non-production sites***: shipping terminals, warehouses, office sites, others
  - ***Large footprint*** non-production sites (> 5ha): shipping terminals, warehouses, large office sites
  - ***Small*** non-production sites (< 5ha)

Extraction sites are further divided according to their ***status***:

- ***Active Site***: Site owned by Holcim, or under Holcim management control, that contains areas where mining is taking place or where site preparations have begun but production has not yet started
- ***Greenfield***: Site owned by Holcim, or under Holcim management control, where no site preparation has yet begun, but plans for extraction have been developed
- ***Dormant***: Site currently not in use, but could be activated
- ***Closed***: Permanently closed site (can also apply to ***production*** and ***non-production*** sites)

Holcim's global landholdings are concentrated around cement, aggregate and concrete production sites. Each production site usually has one or more extraction sites nearby. Generally, each cement plant will have at least one limestone quarry and one clay quarry that supply the raw material required for clinker production. Non-production sites only represent a minor portion of Holcim global landholding.

The following chart shows the most recent available data on the number of production and extraction sites per activity and region:

		Total	North America	Latin America	Europe	Africa, Middle East	Asia Pacific
Production sites (2009 annual report)	Cement (large)	154	19	26	39	13	57
	Aggregates (small to large)	485	105	24	266	5	85
	Concrete (small)	1457	198	234	598	25	402
Extraction sites (2009)	Cement	197	20	44	73	11	49
	Aggregates	350	104	24	209	5	8

2.3 Biodiversity features of Holcim sites

As part of its corporate biodiversity programme, Holcim circulated an internal Biodiversity Questionnaire to be completed by every site in conjunction with the annual Plant Environmental Profile (PEP). Already in its third stage of iterative development, the results of the questionnaire (a self-assessment carried out by the plant management) are being incorporated into a growing database on biodiversity information about Holcim landholdings. Through this ongoing annual reporting process, the biodiversity information is constantly updated and improved.

Based on the 2009 returns of all active extraction sites (547 concessions, one-third representing cement quarries, two-thirds aggregate sites) covering a total area of 138,000 ha, the following key biodiversity features have been compiled by Holcim:

- Most quarry operations are in natural ecosystems (22%) or on agricultural land (54%);
- 34% of the sites (187) report having areas of particular biodiversity value (international or national protected area, globally or nationally threatened species), either on-site, within 5 km or in areas farther away but with an ecological connection to the site;
- At least 13 mining sites lie in geologically particularly well-developed karst areas and include significant karst features (Tasmania, China, Vietnam, Indonesia, Philippines, Thailand, Bulgaria, Hungary, Serbia, Mexico, Argentina, Colombia);
- 29% of quarries have biodiversity management programmes in place;
- 19% have formal partnerships with local NGOs;
- 20% of sites report having some form of biodiversity monitoring process in place for reporting to local authorities;
- 55% have conducted a full ESIA;
- 86% of the sites have a quarry rehabilitation plan in place;
- 10% of sites report the presence of invasive species on-site or adjacent.

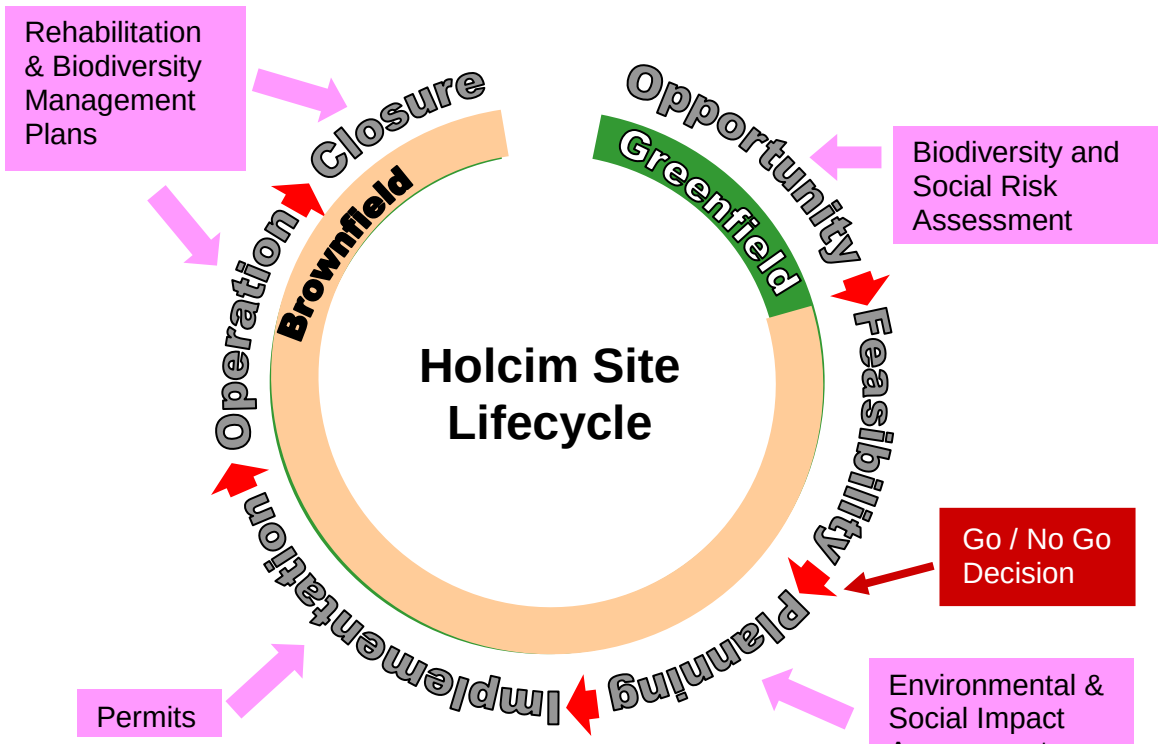
Based on the Biodiversity Importance Categories proposed in *chapter 4.5* (see for more detailed definitions), the number of sites to be assigned to each category is as follows:

Biodiversity Importance	Cat 1A & 1B	Cat 2	Cat 3	Cat 4
Unknown	"Global"	"National"	"Local"	"Low"
16	**56**	**131**	**91**	**253**

2.4 Holcim planning and operational processes

Although all extraction sites have individual histories – some stretching back over many decades, others only recently developed – there is a general underlying pattern (➔ *Fig. 1*) of (1) an investigative phase, (2) a planning/development (implementation) phase, (3) an operational phase (which can last up to 100 years) and (4) a post-operation/closure phase.

Figure 1: **Lifecycle of Holcim sites**



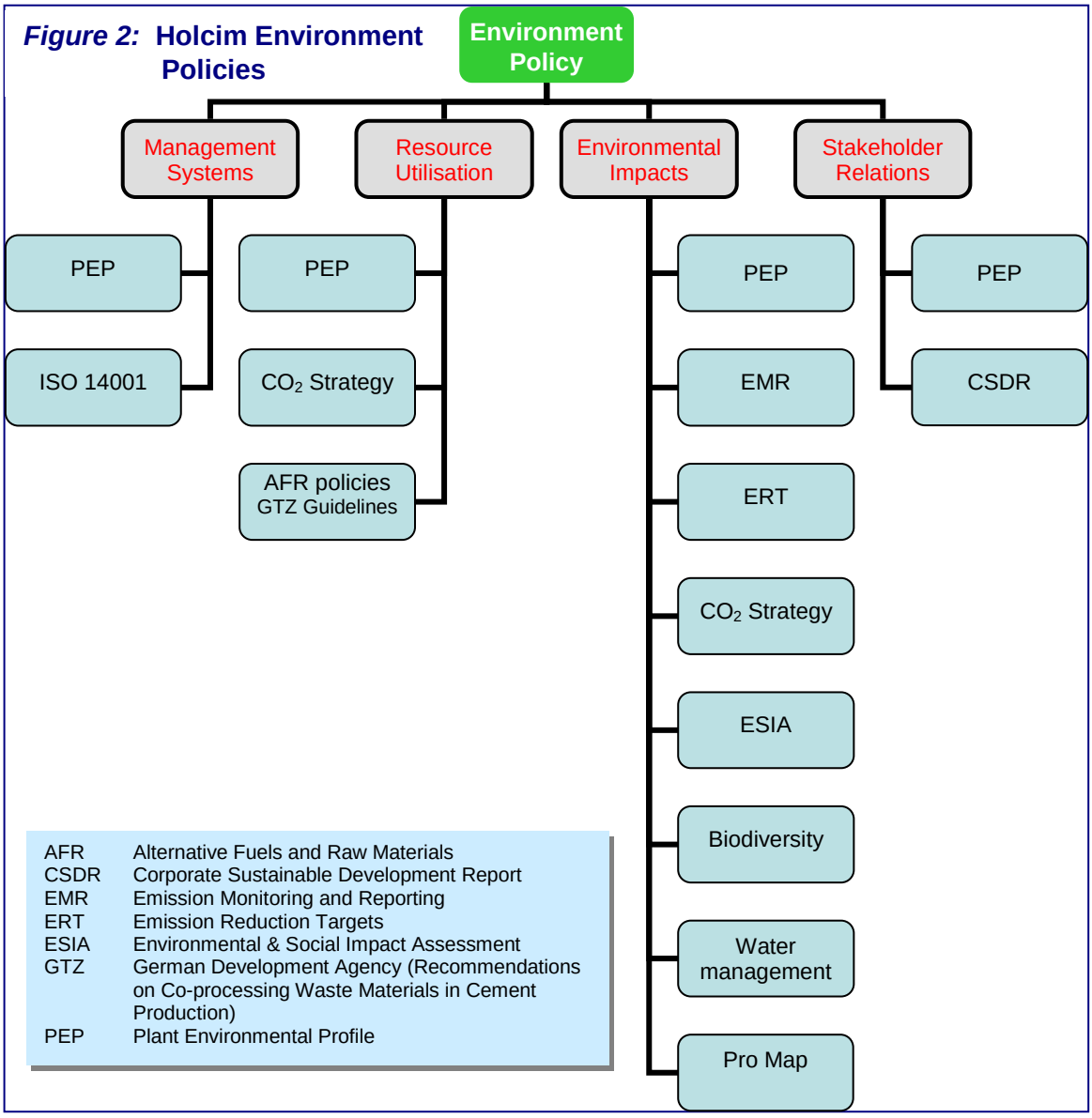
2.5 Existing environmental and social guidelines

The Holcim planning and operational processes are guided by a number of company-wide policies addressing environmental and social aspects, which are supported by directives and recommendations for their implementation. The directives are programmes mandatory for all group companies, while the recommendations are discretionary. The guidelines that are particularly relevant for biodiversity management are briefly summarised below, based on an internal Holcim document on current biodiversity management produced for the work of this panel.[18]

Environmental Policy

At the heart of Holcim's Environmental Policy is a pledge "*to continuously improve our environmental performance and provide positive contributions to our business*" and a commitment to "*sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

Figure 2: **Holcim Environment Policies**



The policy requires Holcim to apply environmental management recommendations and standards worldwide and monitor their performance. The company promotes its commitment by training and educating staff at different levels to ensure that policies and procedures are implemented effectively. Selected environmental parameters are included in business management processes, and the performance against these parameters is regularly reported.

The policy contains four pillars, Management Systems, Resource Utilization, Environmental Impacts and Stakeholder Relations (➔ *Fig. 2*:), each of which encompasses a number of specific tools (directives and recommendations falling into broad categories of measuring/monitoring, reporting and management).

Environmental and Social Impact Assessment (ESIA)

Holcim has adopted the ESIA guidelines jointly developed with the WBCSD/CSI members. They provide a basic framework for taking environmental and social concerns into account throughout the life of any quarry and cement plant, from initial planning to construction, during the operational phase and right through to eventual closure (and

restoration and re-use of the land). The guidelines identify some of the critical issues to consider in each phase, as well as proposals for addressing the most important issues. (For a more detailed assessment of the current ESIA, see *chapter 11.3*.) Topics covered in the guidelines include:

- *Site assessment*: Stakeholder mapping, land use, social structure and population, public health, biodiversity and ecosystems, cultural heritage and landscapes, alternatives;
- *Construction phase*: Environmental impacts (traffic, waste, overburden), social impacts (transitory population increase, infrastructure, health and safety);
- *Operations phase*: Social impacts, occupational health and safety, environmental impacts, monitoring and reporting;
- *Site closure*: Community involvement, future site use, rehabilitation and clean-up, employment, social structure, post-closure monitoring;
- *Mitigation*: Mitigation of social impacts, mitigation of environmental impacts, offsets;
- *Stakeholder involvement*: Levels of communication, principles of stakeholder involvement.

Quarry Rehabilitation Recommendations

As a member of the WBCSD/CSI, Holcim committed itself to developing rehabilitation plans for all operating cement-related quarries and communicating these plans to external stakeholders by 2006. To ensure that these rehabilitation plans meet both regulatory requirements and good practice standards, internal Guidelines on Quarry Rehabilitation Planning were developed and endorsed in 2004.

These Quarry Rehabilitation Recommendations form part of the Holcim standard in Raw Materials Management (RMM) and are an integral tool of the Holcim Environmental Policy. The first part of the document, the so-called *10 Principles of Quarry Rehabilitation* (➔ *chapter 13.1*), is a Holcim *directive* and is mandatory for all consolidated Group companies.

The second part of the document contains Holcim recommendations, including:

- Guidance for good practice in rehabilitation planning;
- Checklist for self-assessment of status of quarry rehabilitation planning.

ProMap

ProMap is the Holcim project management system for capital investment projects (CAPEX). For projects greater than 5 million CHF, ProMap provides one common set of procedures, guides and tools. In the early stages of the ProMap process there are three elements that pertain to environmental issues: (1) initial assessment of social and political environment, (2) analysis of legal and permitting requirements and process and (3) environmental and safety regulations. These elements are incorporated into the standardized questionnaire for the Holcim feasibility study.

Social Policies and Sustainable Development

In addition to the policies on environmental issues, Holcim has a set of instruments addressing Corporate Social Responsibility (CSR) more generally. The overarching CSR policy states:

"The principles of sustainable development (SD) – value creation, sustainable environmental performance and corporate social responsibility (CSR) – are integral to our business strategy. Social responsibility has always been a cornerstone of our commitment to SD. CSR is defined as our commitment to work as partners with all our stakeholders, building and maintaining relationships of mutual respect and trust. We aim to contribute to effectively improving the quality of life of the members of our workforce, their families and the communities around our operations. CSR further includes our relations with customers and suppliers and our efforts to provide foundations for society's future.

Our CSR engagement is based on the belief that it not only enables us to fulfil our social responsibilities but also adds value to the business and contributes to risk management. The present policy is an important element of our way of doing business and serves as guidance for our decisions and actions. It has to be integrated into our business activities and applied in our sphere of competence and influence in full alignment with specific local or regional needs.

Each Group company is to elaborate its own CSR policy and strategy that fully integrates the principles of the present corporate policy."

The policy contains six pillars (business conduct, employment practices, occupational health and safety, community involvement, customer and supplier relations, and monitoring and reporting) and is implemented through the following directives:

- ***Partnerships Directive***: partnerships among governments, business and civil society are the key to achieving progress in sustainable development, and it is essential for business to work with governments and civil society to find solutions that will be seen as legitimate and fair by all. Partnerships composed of players in different sectors combine skills, provide access to constituencies and enhance credibility of results.

- ***CSR questionnaire***: Annual reporting of the CSR questionnaire, requesting information on key aspects of CSR, is mandatory for all group companies.

- ***CSD Report***: Holcim updates its CSD Report annually and publishes the full report every two years. The report follows the Global Reporting Initiative (GRI) framework and sets priorities for future actions.

- ***Reporting of Operational Roadmap Targets (ORM)***: These are key targets for the company over a specific period of years, with the most recent versions covering 2007-2011 and 2011-2013 respectively). The targets are in six key areas, two of which relate to Sustainable Environmental Performance (SEP) and CSR. Each operating company in turn develops its own ORM to meet the overall commitment and reports the status of achieving its targets in the General Management Report.

  A biodiversity target has been approved by the Executive Committee for inclusion in the new ORM 2011-2013 and has been communicated to all senior management of the group. By 2013, 80% of all sensitive sites (as defined in the biodiversity risk matrix in *chapter 8.3*) will have a BAP in place. Monitoring of the implementation of the BAPs will be done through the yearly PEP process. This target is a group target that is transferred to country level without any modifications and is applicable to all consolidated Holcim group companies. The implementation of the BMS will be greatly facilitated by the presence of a biodiversity-related roadmap target, as this is managed at the CEO level in each operating company.

- ***Sustainable Development (SD) Priorities***: These priorities include Occupational health and safety, Climate and energy, Community involvement, Stakeholder engagement and partnerships, Sustainable construction, Resource conservation, and Sustainable product and service solutions

2.6 Current biodiversity-related activities

Since the rehabilitation of quarries has been an important topic for the cement and aggregates industry for quite a while – and has been progressively mandated by the industry's regulatory bodies – Holcim has been involved in the restoration of mining areas for many years. Normally this is an ongoing activity and an integrated part of the Environmental Management Plan (EMP) that guides the progressive development and restoration of a quarry.

While rehabilitation programmes are in most cases stipulated and regulated by local authorities and other stakeholders, and are often strongly guided by aesthetic, general landscape and/or safety concerns, biodiversity-related considerations and restoration aims have increasingly been introduced in many Holcim operations. As a result, many Holcim mining areas, in all parts of the world, have become important areas for biodiversity conservation – not only of local and regional, but in some instances of national significance. Reports about such success stories have been regularly disseminated by Holcim for many years and are today an important feature of the company's communication agenda. For example:

- ***Westport, New Zealand***: The overall goal of the rehabilitation is to restore a 100-ha mosaic of indigenous forest and wetland communities similar to that which existed prior to the arrival of European settlers. The ongoing work won a national environmental award in 2007.

- ***Palavi, Sri Lanka***: Holcim Lanka works with different expert partners, including IUCN, to conserve biodiversity through quarry rehabilitation. Biodiversity management activities with IUCN include development of a biodiversity management plan, corresponding monitoring protocols, re-establishment of natural water flows through a created wetland, and a soil erosion control programme. To complement the activities with IUCN, Holcim Lanka works with local universities to conduct annual flora and fauna assessments of the rehabilitated quarry areas, eradicate invasive species, conduct biodiversity assessments of upcoming mining areas, and relocate species from the quarrying areas.

- ***El Puente, Spain***: This aggregate quarry in an alluvial floodplain is being progressively turned into a nature reserve consisting of a mosaic of lagoons, islands and alluvial forests containing a high diversity of plant and animal species (which disappeared from the area when it was reclaimed for agriculture). Nature education facilities have also been installed for use by local school children.

- ***Obourg, Belgium***: In partnership with local representative bodies of government, university and naturalists, Holcim has constructed a biodiversity teaching centre called "La Maison de la Biodiversité" at its Obourg production and extraction site. The centre is designed to provide high-quality information and presentations on global and local biodiversity issues for school pupils and the general public, and complements an earlier visitor centre on the same site that covers the geological history of Belgium.

- ***Ripon, UK***: Aggregate Industries UK, a subsidiary of Holcim, restores ecosystems as part of its quarrying operations. In support of a request to extend an existing quarry in North Yorkshire, the company proposed to create a mix of wetlands for wildlife habitat as well as an artificial lake for recreation, following the extraction of sand and gravel from land currently used for agriculture. Stakeholders were consulted to determine their preferences. Ecosystem valuation was undertaken to assess the types and scale of economic benefits associated with wetland restoration. The study[19] showed that the value of biodiversity benefits that would be generated by the proposed wetlands (£1.4 million, the recreational benefits of the lake (£350,000 and increased flood storage capacity of the overall area (£224,000) would, after deducting restoration and opportunity costs, deliver net benefits to the local community of about £1.1 million. The value of carbon sequestration in these wetlands was found to be relatively small, while the marginal benefits associated with wetlands far exceeded the current benefits derived from agricultural production. The study further shows that the costs of ecosystem restoration and aftercare are small, compared to both the economic benefits of wetland restoration and the financial returns from sand and gravel extraction. This example illustrates that compensation for adverse environmental impacts is not only an important means for companies to maintain their license to operate, but can deliver overall improvements in ecosystem services with substantial economic benefits at modest expense.

- ***San Miguel, Guatemala***: The presence of the endangered Beaded Lizard at this site prompted Holcim to initiate and support a comprehensive research and conservation programme for the species, including the study of the species' activity pattern and habitat use through radio-telemetry and the possible establishment of a national nature reserve.

- ***St. Genevieve, US***: Partly as a result of initial local opposition from the local conservation community, the planning and development of this newest and biggest Holcim plant on a greenfield site on the right bank of the Mississippi River was strongly influenced by biodiversity conservation considerations. As a result, an entire new wetland has been created, and 2,200 acres of the 3,900 acre site have been placed under a conservation easement aiming to maintain and further enhance the area's important biodiversity features.

Many further examples of biodiversity-related site management measures could be added to these examples from almost every country in which Holcim operates[15].

3. BACKGROUND

3.1 IUCN – Holcim cooperation

This BMS is the result of a formal cooperation agreement between IUCN and Holcim. The focus of this official Agreement, signed in 2007, is *Biodiversity Conservation*, with the general purpose of "*developing robust ecosystem conservation standards for the Holcim Group, contributing to sector-wide improvements in the cement and related sectors*" and the following specific strategic objectives:

1. Review and assess the approach of the Holcim Group to biodiversity conservation management, establish a baseline, and develop a more comprehensive corporate biodiversity policy and strategy for the Holcim Group.
2. Explore, identify and develop joint initiatives of mutual interest and benefits, particularly those supporting sustainable livelihoods and biodiversity conservation.
3. Promote good practice by sharing the learning with the wider industry and conservation communities.

Two work streams were established to translate these objectives into a programme of action directed towards:

1. reviewing Holcim's approach to biodiversity management, especially in relation to its quarry operations, and advising on possible improvements and extensions of current practices; and
2. initiating joint sustainable livelihood programmes in selected countries through local partnership agreements.

In order to implement the actions of work stream 1, an Independent Expert Panel (IEP) was established, and in order to support the implementation of the joint work programme, full-time relationship managers were appointed by each organisation. In addition, a Holcim staff member was seconded to IUCN for one year, and a joint Steering Committee, meeting twice a year, was put into place for general guidance and supervision.

3.2 Independent Expert Panel

The originally identified objective of the IEP established under the IUCN-Holcim Agreement was "*to provide independent scientific advice on:*

- *Holcim's existing biodiversity management tools*
- *additional biodiversity management tools, if and as may be necessary or useful*
- *the development of its biodiversity conservation policy on the basis of various assessments and reviews contemplated under the agreement.*"

The Chair of the Panel (Christoph Imboden) and its four members (Daniel Gross, Peter-John Meynell, David Richards and Marc Stalmans) were appointed at the beginning of 2008 and assembled for their first meeting in Gland at the end of March.

Besides experience in many aspects of biodiversity conservation, the Panel members combined expert knowledge in a number of fields relevant for this assignment, such as mining geology, environmental management of mining areas, ecological impact assessment, conservation planning, sociological assessment of large development projects etc., covering all parts of the world. Additional expert advice was available to the IEP through IUCN's large network of commission members.

3.3 Development of the BMS

The proposed BMS was developed by the IEP over a two-year period, and involved visits to Holcim production facilities and quarries in various countries, regular consultations and discussions with Holcim expert staff (at Group and national levels), study of biodiversity conservation measures undertaken by related industries and companies, and Panel discussions at meetings, by conference calls and correspondence.

Country visits

Various country visits conducted between June 2008 and September 2009 by the entire Panel (Spain, Indonesia) or by up to three panel members basically had the following purpose:

- To understand the management structure and operational processes of a Holcim national company;
- To become familiar with a variety of Holcim sites (production plants and raw material quarries) and specifically learn about environmental, biodiversity and social issues affecting local operations;
- To study Holcim's practical management of biodiversity issues and responses to biodiversity-related challenges.

In addition, the IEP endeavoured to provide some informal feedback ("concluding thoughts, comments and suggestions") to local Holcim management and HGRS on biodiversity-related issues (although it was always clearly stated that these were incidental observations, not resulting from a systematic review of Holcim's operation). These visits also served as an opportunity to raise general awareness, at the country level, of the importance of biodiversity issues and the partnership with IUCN.

The countries visited were proposed by Holcim based on criteria developed by the IEP (to ensure a representative mixture of key parameters such as developed vs. developing country, geographic distribution, aggregate vs. cement operations, climate zones, greenfield development vs. ongoing operations, fully owned vs. partly owned subsidiaries):

- ***Spain*** (June 2008): Visit to one cement plant (Jerez), four cement quarries (Cantera San Isidro, Cerro del Viento and Casa Colorado, Cabral, Dos Hermanas) and one aggregate quarry (El Puente).
- ***Indonesia*** (September 2008): Visit to two cement plants and associated quarries (Narogong and Cilacap), one aggregate quarry (Maloko) and one greenfield development for a new cement plant (Tuban).
- ***Belgium*** (January 2009): Visit to several old quarries and proposed new quarry site (Antoing) in the Obourg area.

- ***Hungary*** (January and March 2009): Visits to two cement plants and quarries (Labatlan and Miskolc) and the Pilango greenfield development.
- ***United States*** (April 2009): Visits to three cement plants and associated quarries (Holly Hill, Dundee and St. Genevieve).
- ***United Kingdom*** (June 2009): Visit to three aggregate quarry operations (Bardon Hill, Holme Park, Ripon).
- ***China*** (September 2009): Visit to three Huaxin cement plants and associated quarries (Fuling, Yichang and Huangshi).

Evolution of concept

The Panel's work started from these initial ***terms of reference***:

- Design of the Holcim group site inventory
- Quarry rehabilitation planning and implementation practices
- Quality of ESIAs
- Need and viability of site-specific Biodiversity Action Plans (BAPs) as a tool to guide biodiversity conservation management over the lifetime of a quarry
- Biodiversity and ecosystem metrics and Key Performance Indicators (KPI) to enable the Group to assess and report on their biodiversity conservation performance in a credible manner
- Development of the Group's biodiversity policy and strategy

A number of expected ***outputs*** were defined, such as:

- Report on quality of rehabilitation (lessons learnt)
- Report on quality of ESIAs
- Value proposition on BAPs
- Report on opportunities and challenges for BAPs at site level
- Report on strengths and weaknesses of KPIs
- *Inputs* into various documents to be developed by HGRS (e.g. revised Rehabilitation Plans, internal protocols for quality ESIAs based on CSI Guidelines, protocol for designing BAPs, proposed Holcim KPIs and pilot testing of KPIs, work plan for the development of tools for effective policy implementation)

At its first meeting, the IEP identified the following scope and key rationales for its work:

- ***Thematic focus***: Biodiversity (incl. ecosystems and ecosystem services), as well as social aspects (regional and local communities) with a direct link to biodiversity. (The IEP was thus not addressing issues of energy use and global warming, or air, noise and dust pollution unless they had an obvious indirect effect on local biodiversity.)
- ***Risks and opportunities***: For any sites and quarries, biodiversity contains risks as well as opportunities. The IEP should therefore seek to provide guidance and recommendations on best practice for both, namely:
  - Assessment of risks and measures to avoid, minimise, mitigate or offset them;
  - Assessment of opportunities and measures to seize, enhance and maximise them.
- ***Life-cycle approach***: Biodiversity and related social risks and opportunities need to be addressed throughout the full life cycle of a site/quarry:

  - Planning documents and operational guidelines should be integrated into decision-making procedures and relate to the typical commercial life cycle of a Holcim plant/quarry, from initial opportunity assessment to closure and rehabilitation.
  - Strategically, more risks can be avoided and more opportunities can be capitalised on early in the decision-making process when more alternatives are still available.
- ***Integration with existing policies***: The recommendations on biodiversity management relating to the various life-cycle phases must be:
  - logically connected to each other;
  - rooted in an overarching biodiversity policy statement; and
  - be linked, as far as appropriate, to the company's existing policies on environmental and social issues.

Reviews and finalisation

Following completion of the first draft, a formal review process was initiated resulting in excellent feedback and suggestions from Holcim staff and various IUCN experts. Many of these were included in the report's final version. Those not included and the reasons for not adopting them were recorded as part of the report's documentation. After a final extensive feedback session with Holcim during which they presented to the Panel a first set of draft implementation documents, a number of further improvements were made to the report in order to ensure that the BMS achieves a credible overall approach to biodiversity management that is properly integrated into all stages of planning and operation.

4. GENERAL ORGANISATION OF THE BMS

4.1 Key requirements

Considering, on the one hand, the nature of Holcim's global management and local operational processes as well as available staff expertise and resources and, on the other hand, the need to demonstrate a credible approach to biodiversity conservation on its landholdings, the proposed BMS should balance the following key requirements:

- It must be plausible and sound from a scientific and conservation point of view and include the potential for measurable improvements in biodiversity management;
- it must be easy and obvious for Holcim management at the group, national and local levels to determine what has to be done in relation to each site (existing, new or disused); and
- it should not be too complex, so it can be implemented with a reasonable level of additional resources commensurate with the direct and indirect business benefits to be derived from it.

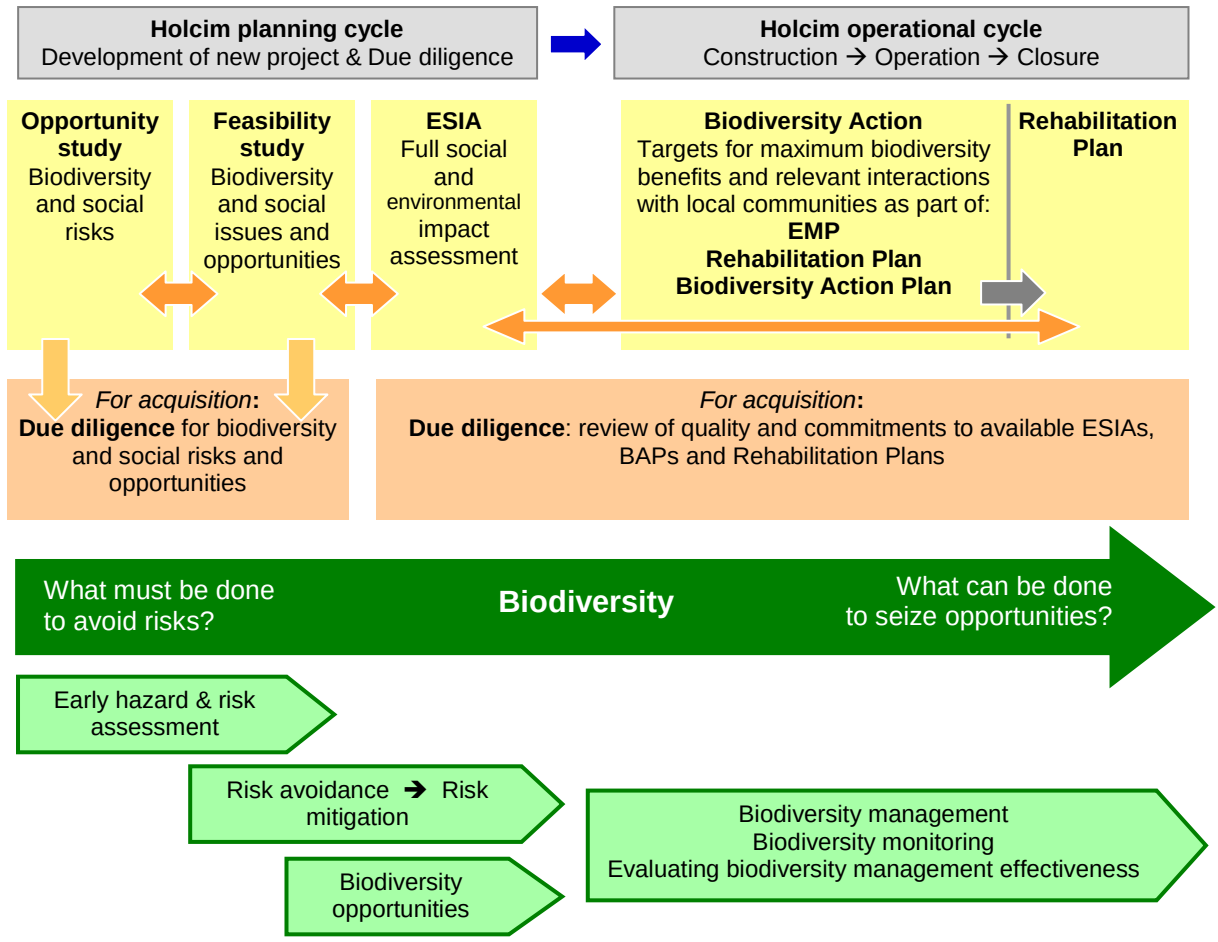
4.2 Integration into Holcim processes

While there is a general basic structure to the Holcim planning and operational processes (➔ *Fig. 3*), there are also considerable variations in the practical application of these

steps, depending on commercial considerations and/or local regulatory requirements. For example, because of the immediacy and urgency of commercial opportunities (especially in the aggregates business where quarry life cycles are shorter than in cement production), the Feasibility Study and the ESIA may be carried out almost in parallel, or a Pre-Feasibility stage may be inserted somewhere.

Nevertheless, there are still sufficient constant elements in these processes that they provide a rational base for a system to address and manage the biodiversity conservation issues that are invariably linked with land- and resource-use activities pursued by Holcim.

Figure 3: **Biodiversity and Holcim cycles**

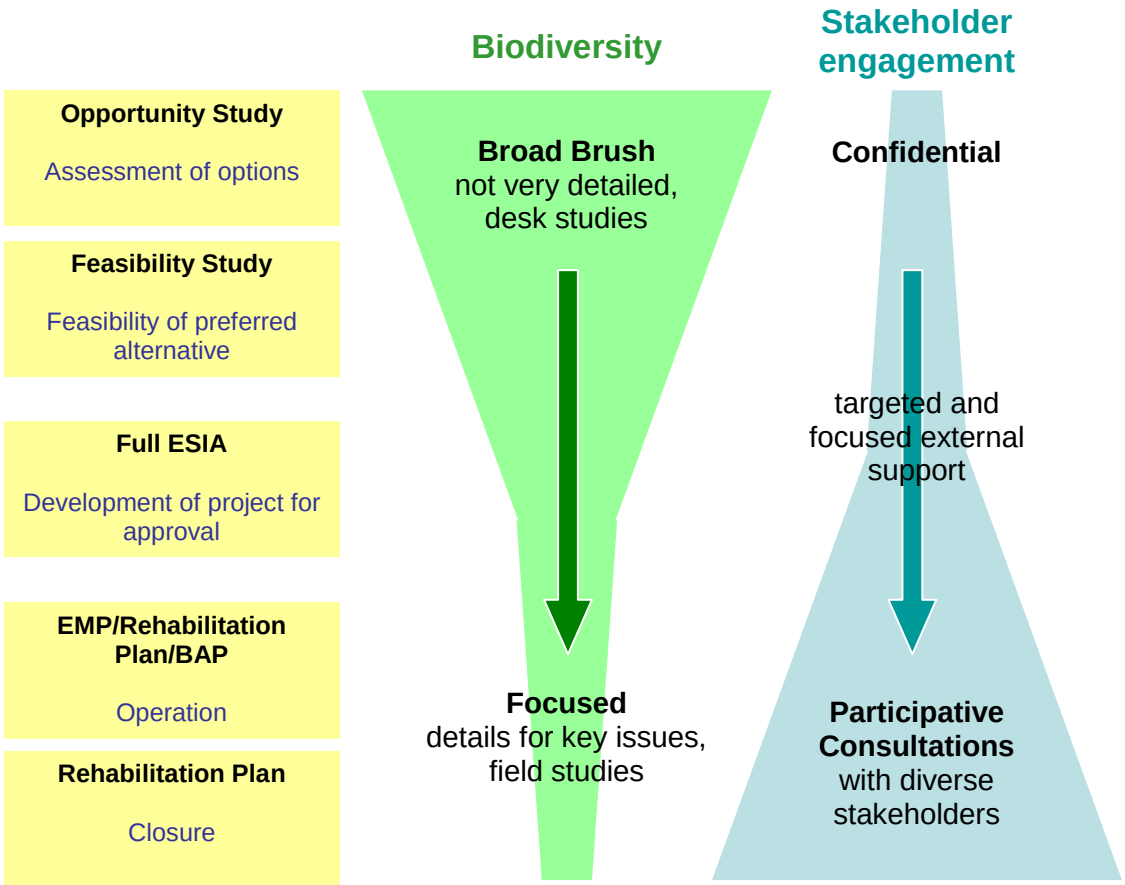


4.3 Biodiversity issues and concerns

A ruling principle of the BMS is that in the early stages of the Holcim planning cycle, biodiversity is mainly viewed from the angle of hazard and risk. As planning progresses, and the likelihood of implementation of a proposed development increases, the focus is shifted to measures of avoidance and mitigation, and if a project has been approved for implementation, growing attention is given to opportunities for biodiversity enhancement (➔ *Fig. 3*).

Likewise, there is a progression from looking at biodiversity in a quick "broad brush" manner (desk studies) to a more detailed investigation of specific issues by relevant experts through field investigations (➔ *Fig. 4*). The need for such an approach is greatly dictated by the fact that, for reasons of economic competitiveness, the early stages of planning are governed by various degrees of confidentiality. Full stakeholder engagement is only setting in during more advanced planning (ESIA) and throughout the operational phases. This should include, where relevant, consultation with biodiversity expert organisations.

Figure 4: **Progressive intensity of biodiversity work**



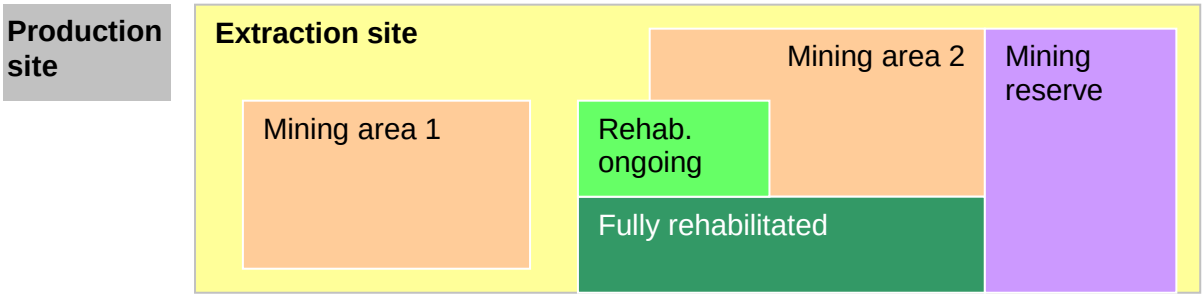
4.4 Sites included in the BMS

While Holcim landholdings consist of a wide variety of properties of different sizes, legal status and management regimes (➔ *chapter 2.2*), for reasons of practicality and biodiversity management priorities, the BMS has been designed for application to the sites listed in the box below. In addition, it is important to note that sites with a mosaic of sub-sites with different management status will be considered as a unit (➔ *Fig. 5*).

HOLCIM SITES INCLUDED IN THE BMS

- All **extraction sites** (independent of size).
- Other sites **> 5 ha owned** by Holcim (or subsidiary with Holcim management control).
- Other sites **> 5 ha leased** by Holcim (or subsidiary with Holcim management control) with ongoing commercial activities or management responsibilities.
- Other sites < 5 ha if a **special local biodiversity** situation or stakeholder interests have been identified.

Figure 5: **Sub-components of a Holcim site**



Holcim's environmental and social policies and guidelines have their origins in the cement side of the company's business but aggregate quarries constitute over 70% of the extraction sites (➔ statistics in *chapter 2.3*). The PEP and Biodiversity Questionnaire data summarised in *chapter 2.2* relate mostly to cement quarries. For the identification, evaluation and management of biodiversity risks in the Group, it is important for the aggregate extraction sites to be included in the BMS system on equal footing with the cement-related quarries.

> Although the BMS is designed to apply to all Holcim sites, i.e. including production sites and dormant or closed extraction sites, the practical application of the system, as a priority, will have to be focused on the active extraction sites.

4.5 Categorisation of sites

A fundamental element of the BMS is the categorisation of each site according to its biodiversity importance and the likelihood of impacts on biodiversity as a result of activities pursued by Holcim (mainly the mining of raw materials for cement or aggregate production). A plotting of these two factors in two-dimensional table results in the Biodiversity Risk Matrix providing a first general guidance on the type of biodiversity management that will eventually be required.

Biodiversity Importance Category (BIC)

The proposed categories and their definitions are summarised in the following box:

BIODIVERSITY IMPORTANCE CATEGORIES (BIC) *(y-axis of risk matrix ➔ Table 2)*

1a Occurrence **on site** of:
- globally threatened species (IUCN Red List)
- overlap with or adjacent to internationally recognised protected area
- globally outstanding and/or threatened ecosystem/habitat

1b Occurrence of the above **within 5km of site** or with relevant **ecological connections** to the above

2 Occurrence **on site** or **within 5km** or with relevant **ecological connection**:
- nationally threatened, rare species
- nationally protected (recognised) area, reserve, etc.
- nationally important and/or threatened ecosystem/habitat

3 Site:
- in landscape with diverse, natural ecosystems
- in modified landscape with potential for biodiversity enhancement (biodiversity island)
- with significant local value of the natural environment

4 Site in heavily modified, intensely managed landscape (incl. monoculture)

As part of the operational handbooks, more detailed guidance on definitions will have to be provided.

Biodiversity Impact Levels

The determination of the expected impact depends on two factors: (1) the likelihood that a certain activity will have an impact on ecosystems and/or species and (2) the degree to which this impact could be mitigated through targeted measures. Thus, the level of expected biodiversity impact can be deduced from the following table (*Table 1*):

Table 1: **Expected impact levels on biodiversity**

		Potential for mitigation			
		Irreversible	Difficult to mitigate	Can be mitigated by intervention	Easily reversed naturally
Likelihood of impact	Almost certain	**A**	**A**	**B**	**C**
	Likely	**A**	**B**	**C**	**D**
	Moderately likely	**A**	**B**	**C**	**D**
	Unlikely	**B**	**C**	**D**	**D**

A Very significant **B** Significant **C** Moderately significant **D** Low significance

Biodiversity Risk Matrix

Based on the categorisation of the intrinsic biodiversity importance of a site and the expected impact levels on biodiversity by an actual (or potential) Holcim operation a Biodiversity Risk Matrix can be constructed (*Table 2*):

Table 2: **Biodiversity Risk Matrix**

			Expected Impact Levels on biodiversity (from *Table 1*) Risk to biodiversity value of site (and/or surrounding area)			
			A	**B**	**C**	**D**
			*If unknown, Expected Impacts **must** be assessed in ESIA*			
Biodiversity Importance Category	**1A**	*If unknown, Biodiversity Importance **must** be assessed in Feasibility Study*	Critical	Significant	Medium	Low
	1B		Critical	Significant	Medium	Low
	2		Critical	Significant	Medium	Low
	3		Significant	Medium	Low	Low
	4		Low	Low	Low	Low

5. FRAMEWORK OF THE BMS

5.1 Purpose and goal

The ***general purpose*** and intent of the BMS is:

> As part of its ongoing environmental innovation and improvement process, to provide credibility to Holcim as a company that cares about biodiversity by:
>
> - including biodiversity conservation considerations as an integral part of its environmental management; and
> - following high standards of good land stewardship.

The ***overall goal*** of the system may be defined as:

> ***Integrated, prioritised management of biodiversity at all Holcim sites and in all activities, aimed at delivering better outcomes for the conservation and sustainable use of biodiversity.***

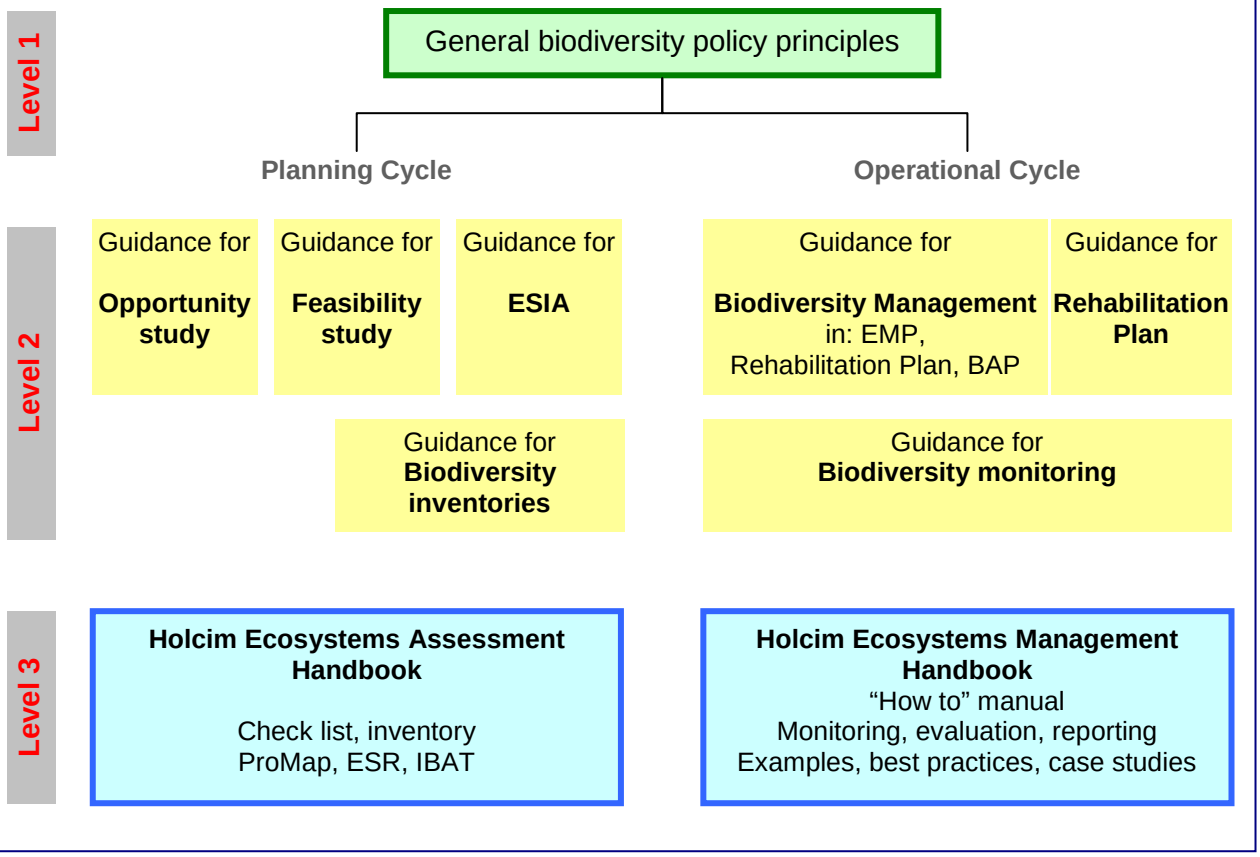
5.2 Main elements

The BMS aims at providing guidance for addressing and managing biodiversity issues during the various life-cycle stages of Holcim operations at three levels (➔ *Fig. 6*):

1. ***Policy level***: defining the overall policy principles that govern biodiversity-related activities.
2. ***Strategic planning and management level***:
   - setting out key biodiversity risks and opportunities for each of the principal planning and operational stages;
   - offering general guidance on strategic responses to them; and
   - providing guidance on how to measure progress, achievement and impact.
3. ***Implementation levels***: providing operational instructions for dealing with biodiversity issues (techniques and methods, examples, best practice, case studies).

While the BMS framework presented here deals with levels 1 and 2, operational handbooks for the planning and management phases respectively will be developed internally by Holcim, in consultation with the IEP and other experts.

Figure 6: **Structure of the BMS**



5.3 Objectives and main outcomes

As indicated in *Fig. 3 and 4* the nature of the focus on biodiversity gradually changes from earlier to later planning phases, and throughout the different stages of operation. The following table provides an overview of objectives, main outcomes and activities for the biodiversity work required in these different phases. More details about the activities under each objective are given in later chapters.

	OBJECTIVE	*MAIN OUTCOMES/ACTIVITIES*
Opportunity Study	To identify at an early stage biodiversity hazards and risks that could have a significant impact on the viability of the project	• Identify biodiversity importance of the site (BIC categories) • Identify "fatal flaws" or critical/unmanageable biodiversity risks (input for Holcim Business Risk Management System) • Provide advice on the need for a Pre-Feasibility Study • Identify biodiversity issues to be considered in Feasibility Study
Feasibility Study	To provide the biodiversity information needed for the investment decision	• Make a detailed assessment of risks to biodiversity from the project and of risks to the project arising from these • Identify and apply strategies for risk reduction, interacting with project concepts and options • Identify opportunities for possible biodiversity gains, including offsets • Develop ToR and identify required skills for ESIA • Identify biodiversity dimension of socio-economic issues • Assess costs and benefits of biodiversity management
ESIA	To make a full assessment of all impacts on biodiversity and provide mitigation measures that will be accepted by the permitting authority and that will provide the company with an effective Environmental Management Plan	• Collate baseline biodiversity information and conduct targeted biodiversity inventories where such information is missing • Establish compliance with relevant environmental regulations • Predict impacts on biodiversity over different phases of the project • Develop mitigation measures and biodiversity offsets if required (incl. social aspects) • Develop biodiversity elements of EMP (with recommendations on a possible BAP) • Identify possible biodiversity indicators and monitoring • Assess costs of implementation of the EMP and monitoring programme
Rehabilitation Plan	To satisfy regulatory, biodiversity conservation and community requirements for the rehabilitation of the impacted part of the site	• Identify regulatory requirements • Establish appropriate and desired post-closure land use and management based on stakeholder consultation • Set biodiversity- or community-led rehabilitation targets • Include minimum levels of biodiversity input (where a BAP is not applicable) • Identify opportunities for biodiversity gains (linked to BAP where in existence or planned) • Identify and implement progressive rehabilitation • Ensure long-term sustainability of the rehabilitation actions in terms of the desired management outcomes

BAP	To enable the site management to maintain or enhance the biodiversity values during the operational and post-closure phases of the project	*For selected sites*: • Establish priority for and scope of BAP in relation to biodiversity importance of site • Set biodiversity targets, if possible in relation to national or other level Biodiversity Action Plans • Define actions required to attain each of the targets • Monitor the outcome of these actions • Adapt management measures based on monitoring results • Ensure the long-term sustainability of the biodiversity management through appropriate partnerships and resourcing • Ensure the integration of the BAP with the EMS through review and updating mechanisms
Biodiversity Inventory	To know what biodiversity assets the company controls on its land and is responsible for (stewardship)	*For all sites*: • Establish biodiversity importance category *For most extraction sites*: • Carry out standard ecosystem inventory (Rapid Biodiversity Survey of ecosystems/habitats and key plant communities of site and surrounding areas) *For sites with full ESIA*: • Complete qualitative inventory of higher plants, vertebrates and invertebrates especially characteristic of the local ecosystems, including, if relevant, information on abundance and/or seasonal use
Biodiversity Monitoring	To understand and monitor the impacts of the company's activities on biodiversity and to assess the effectiveness of biodiversity management measures	*For all sites with biodiversity management*: • Monitor selected, site-specific biodiversity indicators *For selected sites*: • Carry out qualitative biodiversity monitoring (species list) at regular intervals • Carry out quantitative biodiversity monitoring (status of key species and habitats)

5.4 Minimum data requirements

Good and successful biodiversity management is only possible if the necessary data on biodiversity is available. Ultimately the quality of the biodiversity work will only be as good as the quality of the underlying knowledge and information. Since it is not always straightforward to collect the required biodiversity data, and biodiversity itself is subject to short- and long-term dynamic processes, data gathering must be an ongoing process, not only during the planning process but also later when biodiversity management is actively undertaken.

Thus, over the planning and operational phases, the level of information will be gradually increased to be more and more precise and complete. In some localities, certain information might be available at an earlier stage of the planning process than in others, but at all sites, a minimum level of biodiversity information must be available before moving on to the next stage in the life cycle of a quarry. Although more information is

always desirable, these are the *minimum* (cumulative) data requirements for the different life cycle stages:

Opportunity Study	Information needed for identifying biodiversity importance category of a site as given in *chapter 4.5*.
Feasibility Study	Information needed to assess major risks to biodiversity, i.e.: • Good overview of the major ecosystems present on the sites and their approximate distribution • List of major plants and animals characteristic for the ecosystems in question • List of vertebrates and higher plant species on international or national red lists
ESIA	• Maps of ecosystems and habitats of site and immediate surroundings • As complete a list as possible of higher plant and vertebrate species occurring on site • Information on seasonal use of site by species that will be impacted by the proposed development and/or are likely to be a target of mitigation measures • Information on local community/stakeholder use and importance of biodiversity and natural resources on and around the site
BAP	• Detailed qualitative and quantitative information on all ecosystems and/or species to be targeted by biodiversity management (Rehabilitation Plan and BAP)

6. BIODIVERSITY POLICY

6.1 General scope

Biodiversity considerations should be an integral part of the policy landscape of Holcim. While a separate policy might not be required – indeed might not make sense – concern and care for biodiversity issues should be embedded into the Holcim Environmental and CSR Policies with the general goal of pursuing an integrated approach to maintaining and safeguarding the components and ecological services of the biosphere in all of the company's operations.

A general policy statement on biodiversity should reflect the following approach to biodiversity conservation and management:

- ***Recognising the global importance of biodiversity resources and being aware of both the company's dependence on and impact upon these resources, Holcim should seek to manage its landholdings to achieve better outcomes for the conservation and sustainable use of biodiversity.***
- ***Holcim should be committed to good stewardship of its land and work with partners, customers, relevant constituencies and other stakeholders to support their activities aimed at the same goals.***
- ***Holcim's decisions and plans should reflect due consideration of biodiversity risks and opportunities associated with its business, recognising that this capacity would create long-term added value both for the company's business and as a global citizen.***

6.2 Policy Principles

Ten Policy Principles are being proposed that should govern Holcim's biodiversity activities:

1. ***Stewardship*** – Holcim should manage all its landholdings in a manner consistent with responsible care for the resources and values that they contain, including the biodiversity which they hold and represent.

2. ***Integration in decisions*** – Holcim should integrate the consideration of biodiversity issues, risks and opportunities into all decision-making, planning and operational processes.

3. ***Impact on biodiversity*** – Holcim should seek opportunities to protect, restore and enhance biodiversity on and around its sites, creating conservation outcomes that address the adverse biodiversity impacts of its activities.

4. ***Biodiversity action*** – Holcim should promote and support the conservation of species, habitats and ecosystems on its land, guided by Biodiversity Action Plans linked to other relevant programmes that might be in place at local, national and global levels.

5. ***Transparency*** – Holcim should report on biodiversity issues in an open and transparent manner and use targets to track its progress in biodiversity management.

6. ***Equity*** – Holcim should seek to achieve a balance among the differing perspectives and interests of stakeholders as they relate to biodiversity.

7. ***Landscape-scale perspective*** – Holcim should assess biodiversity risks and opportunities within the landscape in which each landholding is situated and seek to engage with other stakeholders to achieve successful conservation outcomes on a broad scale.

8. ***Knowledge*** – Holcim should base its biodiversity decisions and plans on adequate up-to-date scientific information, and make this information available to others working in the field of conservation.

9. ***Resourcing*** – Holcim should develop, contract and apply resources and expertise to the management of biodiversity objectives at a level commensurate with the scale of risks and opportunities they represent, and guarantee technical, financial and management sustainability.

10. ***Excellence*** – Holcim should strive for continuous improvements in the management of biodiversity on its landholdings, aiming to be ahead of compliance.

6.3 Implementation Principles

To supplement the Policy Principles, five Implementation Principles are being proposed:

1. ***Directives and guidelines*** – Holcim should implement its Biodiversity Policy through specific biodiversity-related principles embedded in the guidelines and directives of existing planning and operational processes.

2. ***Ecological context*** – Holcim should use approaches in restoration and conservation that build on natural environmental conditions and native biodiversity and take into account past patterns of human-induced ecological changes that might have affected a site.

3. ***Partnerships*** – Holcim should seek to form relationships with expert groups and stakeholders with an interest in the site to advise and assist in the biodiversity management and help enhance conservation outcomes.

4. ***Monitoring and evaluation*** – Holcim should develop and implement a plan to monitor and evaluate its biodiversity management on an ongoing basis and should measure its achievements by means of a biodiversity-related Key Performance Indicator.

5. ***Training and handbook*** – Holcim should provide assistance and guidance to site managers in charge of implementing biodiversity objectives through appropriate training and incentives and the provision of toolboxes and handbooks.

7. HOLCIM PLANNING PROCESS

7.1 General sequence

Holcim has developed a sequential process for identifying and evaluating projects. This sequence normally applies to extraction sites as well as production sites. The sequence consists of (➔ *Fig. 3*):

- ***Opportunity Study***: The purpose is the identification and appraisal of project ideas and investment opportunities, i.e. looking at various options and undertaking a preliminary assessment of their respective strengths and weaknesses.
- ***Feasibility Study***: The purpose is to provide commercial, technical, financial and economic information for the preferred option as a basis for the investment decision

The planning stage ends with a decision on whether to proceed with investment in a project, based on the Feasibility Study report. The impact assessment stage (➔ *chapters 11 & 12*), leading to environmental permits and an environmental management plan, will typically have been initiated before the conclusion of the Feasibility Study.

Commercial confidentiality is an important condition of the early parts of this phase; thus significant external engagement may only happen in the impact assessment phase. The extent of involvement of external parties is restricted until a decision has been made.

Within this general planning sequence, the BMS seeks to provide advice on how the identification and evaluation of risks to projects arising from biodiversity issues can be carried out at each stage of the planning process. It then recommends how biodiversity risks can be managed at a level that is commensurate with the management of other risks at the same stage.

7.2 Variations

As explained in *chapter 4.2*, significant variations in the planning process exist within the Holcim Group. For reasons of commercial opportunity, Holcim may choose to shorten the scope and duration of pre-investment studies. In doing so, it accepts that a higher level of risk of all types is carried forward through the evaluation and decision-making processes.

Aggregate Industries in the UK, for example, uses a process more aligned with UK planning law and development frameworks and reflecting the fact that life cycles of certain aggregate sites (e.g. in alluvial flood plains) are much shorter than hard rock sites. Here, the functions of the Opportunity Study and Feasibility Study are achieved through a single site-selection process that precedes ESIA and permitting.

When the viability of a project is in doubt at the end of the Opportunity Study, the decision may be made to carry out a Pre-feasibility Study. This focuses on the areas of doubt and uncertainty, which may include biodiversity risks. The use of Pre-feasibility Studies seemed more common in Holcim's past than at present. The pace and number of project

opportunities in the years preceding the economic downturn of 2008/2009 appeared to have it made impractical to carry out Pre-feasibility Studies as routine, thus making it vital that the Opportunity Study be of sufficient quality to detect critical project risks. If any such risks are missed, the cost of a full Feasibility Study may be wasted.

7.3 Existing guidelines

Holcim uses two relevant business tools to support the planning sequence. The first, ***ProMap***, a project management toolkit with numerous web-based tools for conducting elements of the pre-investment studies, is already referred to in *chapter 2.5*.

The second, Holcim's ***Business Risk Management*** (BRM) tool, is used across all aspects of Holcim's business decision making. It provides a common language for risk and a process for reducing risks to acceptable levels. All recognisable risks of the cement sector are covered by BRM, including environmental risks. However, biodiversity risks are not mentioned specifically in any documentation seen by the IEP. ProMap is identified as one place where BRM will be used.

Risks are defined by significance and likelihood, with significance defined exclusively in terms of impact on EBITDA (earnings before interest, tax, depreciation and amortisation, a measure of operating cash flow). The complexity of real business risks is analysed using a mind map of drivers for each risk, and mitigating actions are defined and registered to bring the final risk profile down to acceptable levels.

8. General Biodiversity Requirements in Planning Phase

8.1 Key biodiversity issues

During the planning phase, the most important biodiversity issue to be examined is the likelihood for the project to have adverse impacts on high-value biodiversity elements (species, habitats, ecosystem services, traditional uses). If the project is in an area where Holcim has no operating experience, there is a risk that significant biodiversity values in the area of interest may not be recognised early enough. As in some cases there might be little available information in the public domain, even desk-based early assessments may not always reveal the presence of important biodiversity issues, and the confidential and rapid timeline of the planning phase studies does not allow for extensive fieldwork to rectify this.

The significance of biodiversity elements in the area of interest can be raised if the proposed quarry is in a highly-modified landscape with a high population density – the project may be in the only area for conservation and recreation left by development.

The scale of the early planning stage – the Opportunity Study – is sufficiently large that avoidance of areas in which sensitive biodiversity issues occur may be possible without jeopardising the viability of the project. For the Feasibility Study, there are usually opportunities for mitigating adverse impacts by iterating design changes, subject, of course, to the significant issues being correctly identified in the Opportunity Study. This makes it important for alternatives to be retained as long as possible in the planning process – an alternative location, process or configuration may be the only way to avoid or minimise a significant biodiversity risk to an acceptable level.

At this stage, there could be a significant opportunity to decide the size and boundaries of the required land holding for the operation so that it facilitates future mitigation, rehabilitation and biodiversity management through the inclusion or exclusion of certain parts of the landscape. Identifying this opportunity is limited by the difficulty in bringing in external biodiversity expertise, due to the commercial imperatives of confidentiality. This is one of the reasons why the proposed recruitment of biodiversity expertise into the company's technical staff could be of great benefit to Holcim (➔ *chapter 19.4*).

8.2 Required biodiversity investigations

The focus of biodiversity investigations during planning is the identification, evaluation and management of risks to the proposed project arising from biodiversity issues. The widely-used definition of *risk* recognises that it includes the entire spectrum from threat to opportunity, but the common use of the term refers only to the threat end of this range. During the planning phase, it is important to identify threats to the project, particularly those of sufficient magnitude and/or likelihood to influence the decision to proceed with investment – so called "*Red Flag*" issues. Lower levels of threat, as well as the opportunities to add value to the project by actions on biodiversity issues, are more easily and appropriately dealt with in the impact assessment and operational phase of projects.

Given the need for speed and confidentiality, biodiversity investigations during the planning phase should concentrate on identifying all issues at the highest levels of significance. If lower-level risks are missed at this stage, this is of lesser concern, as the more detailed baseline studies of the Impact Assessment phase will pick these up. The approach must be focussed on answering the following questions:

- What biodiversity information already exists for the area of interest?
- How complete is the information in terms of taxa covered and area covered?
- How recent is the information, and what are its quality and reliability?
- Are significant (high-value) biodiversity elements (species, habitats, ecosystem services, traditional uses) covered in the information on the project area?
- Will the proposed project conflict with these high-value elements?
- What is the scope for modifying the project to ameliorate these interactions?

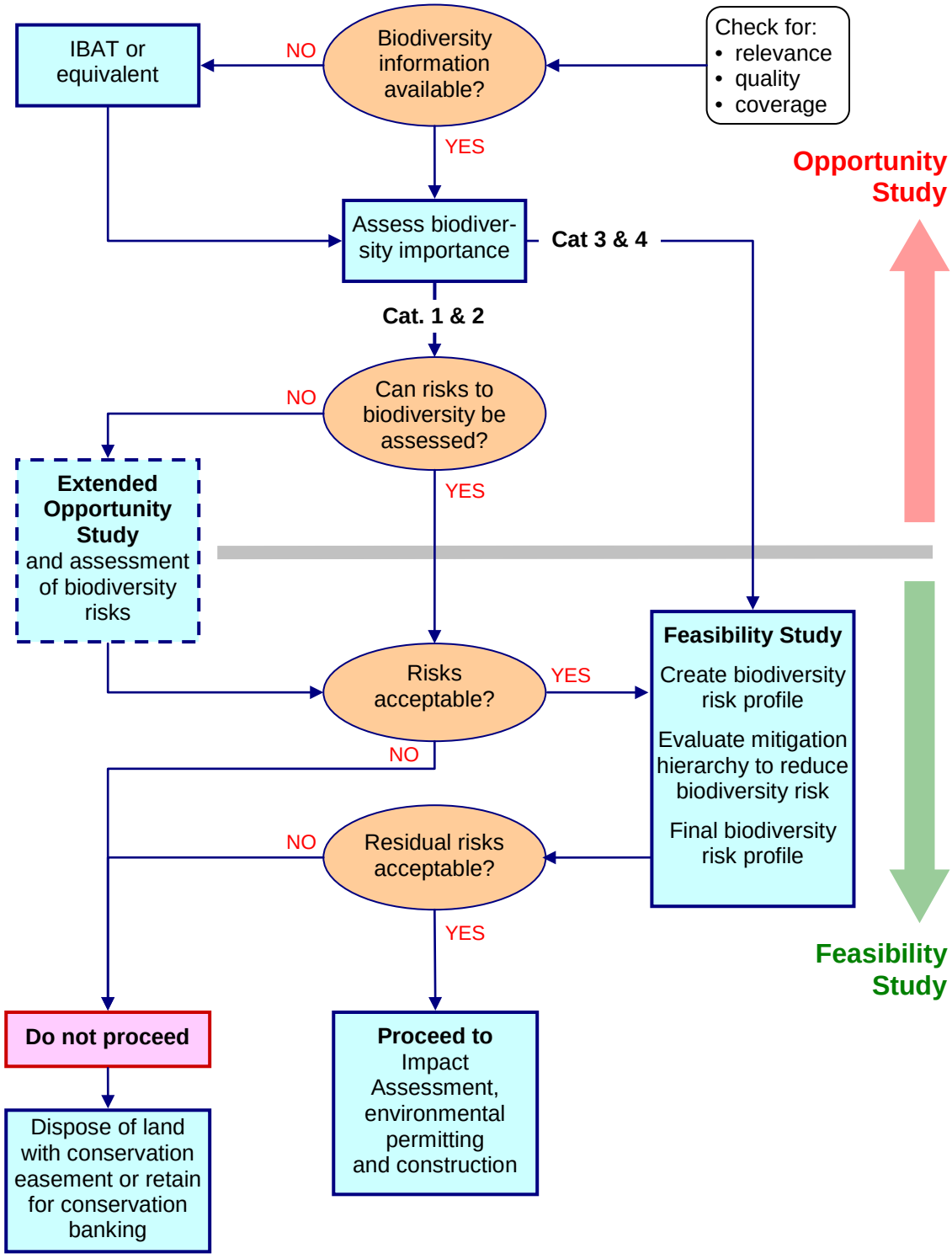
The decision tree for this work is shown in *Fig. 7*.

8.3 Biodiversity Risk Matrix

To assess the risk to biodiversity of a new development – or of an ongoing quarrying operation – a Biodiversity Risk Matrix (➔ *Table 2*) is being proposed, consisting, on the y-axis, of the biodiversity importance category (1-4) of a site and, on the x-axis, of the level of likely impact on biodiversity by the anticipated activities (➔ *chapter 4.5*)

The answers to the above key questions to be addressed in the planning phase aim at an early determination of the biodiversity risk. While the *biodiversity importance category* can/must be identified as part of the Opportunity Study, the second factor of the risk matrix, the likely *biodiversity impact level*, might only be identifiable in a provisional manner and require more detailed evaluation in the Feasibility Study.

Figure 7: **Decision tree for biodiversity in planning phase**



The essential purpose of the planning phase is to identify any critical biodiversity risks as early as possible, preferably already during the Opportunity Study. High biodiversity risks may present unacceptable outcomes for Holcim in terms of delays in securing permits or rejection of the project application, incurring reputational harm as a result of NGO or

media campaigns, loss of local community licence to operate, or others. If the BMS works as intended, early information on any such risks will give Holcim the option of choosing not to proceed and saving further expenditure and opportunity cost on unviable projects.

Furthermore, it must also be borne in mind that the cumulative effect of several biodiversity risks at a lower risk level may be as damaging as a single risk at the highest level. Similarly, the cumulative impact at the landscape level of a new operation, in addition to already existing industrial activities in the area or other planned developments, should also be considered.

In addition to a re-affirmation, or possibly a further specification, of the biodiversity risk level, the Feasibility Study should start to focus on possible measures to reduce biodiversity risk levels so that the project may become acceptable for the investment to be approved. The Holcim BRM tool can be used to manage this risk-reduction process.

8.4 Due Diligence

A lot of Holcim's growth in the past has been the result of acquisitions of national or regional companies or, in some instances, of individual plants. Holcim has internal processes in place for carefully examining the regulatory, legal and financial status of a potential asset, particularly looking for any liabilities that might be attached to it.

Among the potential social and environmental liabilities, biodiversity should be included as part of these due diligence investigations in the same manner as described here for the risk assessment during the planning of a new development. The presence of an endangered species, special rehabilitation requirements, an obvious gap between existing closure practice and Holcim standards or a pending civil suit involving biodiversity could all negatively affect economic viability. How this should be done, and to what extent, will depend on the nature of such a takeover:

- ***Unsolicited takeover:*** By necessity, the process of checking would be blind, confidential and not allow for much time. The process would be most like the *Opportunity Study* phase. In relation to biodiversity, IBAT or a similar quick desk study would be all that is possible, maybe supplemented with research on media coverage on the biodiversity performance of the operator.

- ***Agreed takeover:*** In such a case, there would normally be an official period for due diligence investigations during which access to documentation and sites is granted. If time permits a short investigation on the ground (in addition to examining whatever background material might be available), a Rapid Biodiversity Survey such as recommended for the Feasibility Study or hitherto non-assessed sites would be the most appropriate additional biodiversity investigation.

Each due diligence case is different and will likely require individual approaches to checking biodiversity liabilities (which, if possible, should also include those that may not be subject to local regulations). After the acquisition has become effective, the new site should undergo the same BMS investigations as are proposed for existing Holcim extraction and large production sites (➔ *chapter 20*).

9. BIODIVERSITY REQUIREMENTS IN OPPORTUNITY STUDY

9.1 Purpose

The objective of biodiversity investigations in the Opportunity Study is *to identify, at an early stage, biodiversity hazards and risks that could have a significant impact on the viability of the project*.

The key elements of this are the needs:

- to carry out the investigations early, so that any findings of unmanageable biodiversity risk can result in further cost savings on the project and allow resources to be applied elsewhere;
- to focus on the highest level of risk (*fatal flaws*), which are likely to be unavoidable impacts on protected species, habitats and ecosystems, or the loss of critical ecosystem services or a community natural resource base; and
- to keep open multiple options for locations of key elements of the project, since the avoidance of biodiversity risks by changing location is likely to be the most effective solution to some critical biodiversity risks that are identified.

9.2 Outcomes/activities

The main outcomes of the early examination of biodiversity issues should be:

- Classification of the proposed project site to a category of biodiversity importance (*Table 2*: Biodiversity Risk Matrix).
- Identification of so-called Red Flag issues or fatal flaws – unmanageable critical biodiversity risks. Highlighted biodiversity risks should feed into the Feasibility Study. While this list may include risks at lower than critical level, the focus of the investigations is to identify the highest level of risk.
- If the available biodiversity information is of insufficient quality and/or quantity, a recommendation for specific biodiversity investigations in an Extended Opportunity Study.

If the proposed investment should be rejected for whatever reason, any land acquired should be evaluated as a biodiversity asset. It may be suitable as an offset for unavoidable impacts at other sites, or it may have a value in conservation banking when such systems become more widely implemented. Sites that do not meet the requirements for either option for retaining the land, but which do have significant biodiversity importance (see BMS table), should be put under a conservation easement to prevent other, less-principled developers from benefiting from Holcim's high standards.

9.3 Information needs

Since the focus of the Opportunity Study is on the highest level of biodiversity risks, it will require the investigation of those biodiversity elements that have the highest levels of importance and/or protection:

- Protected areas
  - World Heritage sites
  - Ramsar sites

  - Biosphere reserves
  - IUCN protected area management categories I-IV
  - Other significant national protected areas
- Key Biodiversity Areas (KBA)
- Critical Natural Habitats (defined by the World Bank Group, ➔ *chapter 1.4*). In particular, limestone resource areas should be investigated for the presence of karst landscapes and features, especially caves.
- Ecosystems (terrestrial and aquatic) and the services they provide
- IUCN Red List species
- National priority species and national priority habitats (defined in legislation and/or National Biodiversity Strategy and Action Plan)

Information is required not only on the species and habitats themselves but also their distributions, ranges and boundaries, in order to judge the relative importance of the site for the species. If possible, aspects of seasonal importance should also be available for species – breeding areas, migration routes, summer or winter feeding grounds, etc.

For reasons of confidentiality, the information must already be publicly available so that Holcim experts, suitably trained, can access it and screen it for spatial interactions and significance without the use of third party expertise. International databases of protected areas, ecosystems, habitats and species are needed.

For areas and countries where indigenous scientific and regulatory capacity are limited and access difficult, there are frequently issues related to the currency of information – how recently the information was collected – and the quality and completeness of records. These can lead both to *false positives* (records indicating the presence of a priority species that has in fact been absent from the area for many years) and *false negatives* (incomplete surveys that may lead to an incorrect conclusion that there are no global priority species present).

There are other factors for which the existence of public databases is unlikely, but which are important elements of the context for biodiversity investigations. With the constraints of time and disclosure, it may not be possible during the Opportunity Study to collect much information on these aspects, but they should, as far as possible, be part of the scope of these early investigations (and be addressed in full in the Feasibility Study). These factors include:

- ***Ecological connection*** – through watersheds, corridors and other physical features – may have an influence on the significance of the presence of species or habitats in a project area. This must be considered when establishing boundaries for the biodiversity investigations: while a population of an endangered species may live many miles from the site, it may be connected by a river and thus potentially affected by the proposed project. Special attention is required in areas with karst formations, where ecological and hydrological connections may be particularly complex and thus require the assistance of an appropriate expert.
- ***Surrounding land and water uses*** should also be considered as part of the investigation – a forest on limestone surrounded by farmland may be more important than if the proposed quarry site was a small part of a larger forest of similar type. This analysis also needs to consider how patterns of land use have changed and are likely to continue to change. For example, the intensification of agriculture may only just have started in an area, but its likely continuation would increase the future

importance of an area not suited to farming, such as a range of limestone hills. The possibility for impact on underground water flows and springs in the neighbourhood should also be included.

- ***Critical social sensitivities or dependences*** on biodiversity resources may be a significant potential risk associated with biodiversity, and some information on these issues should be collected. This may take the form of identifying where access by local communities to the project area for ecosystem services – food, medicinal plants, spiritual activities, materials, etc. – is an important part of their economy and culture. This is especially relevant where indigenous peoples and those living traditional lifestyles are involved, even where rights are not recognised by the state. This aspect of the investigations could either be carried out by the CSR department as part of its Opportunity Study investigations, or by HGRS using CSR information as a base.

A review of the legal framework for biodiversity conservation and land use should also be included, as this may modify the seriousness of risks arising from the biodiversity investigations.

9.4 Approach

Most importantly for this phase, it will be necessary for the investigations to be rapid, so that the entire process of data collection, review and evaluation takes no more than a few weeks. However, despite this, the biodiversity investigation should have a regional scale, covering large biogeographical units such as river basins or forest ecosystems as appropriate. The possibility of transboundary impacts should be considered.

A desk study using an online web-based tool is the preferred approach. IBAT (Integrated Biodiversity Assessment Tool), which is a joint programme of work between IUCN, BirdLife International, Conservation International and UNEP-World Conservation Monitoring Centre, is the only product available at present. This would enable Holcim – through HGRS and representatives of the country company – to manage the process without the need for contact with external expertise.

As part of the geological contribution to the Opportunity Study, HGRS or geologists of national operating companies should be asked to investigate and comment on the presence of karst features or landscapes in the project areas.

The results of the investigations need to be classified using *Tables 1 & 2* (Biodiversity Risk Matrix). Any risks classified as Critical should be considered as Red Flag issues. If the project has several risks classified as Significant, the cumulative effect of these may be as important to the viability of the project as a single Critical Risk. The risks identified should be listed as an output of the Opportunity Study.

The list of risks provides input to the Feasibility Study on the biodiversity issues to be (further) addressed by this study. The risk register must also inform the scoping stage of the Impact Assessment phase, which may start in parallel with the Feasibility Study. The design of the baseline survey for the ESIA should be designed to cover the full range of issues and any identified gaps.

9.5 Extended Opportunity Study

In some cases, there may be insufficient biodiversity information to identify and classify the biodiversity risks posed by the project. Survey information may be absent, out of date, inaccessible or unreliable, as a result of which the biodiversity importance category, the level of potential impact on biodiversity or both cannot be conclusively determined. This would lead to the site(s) in question being classified as "*not known*" in either or both of the two axes of the Biodiversity Risk Matrix (*Table 2*).

If the biodiversity risk cannot be assessed, it must be a high priority to close this information gap. The implementation guidelines should particularly ensure that the absence of information does not lead to the conclusion that no Red Flag issues are present. On the contrary, it should be seen as a signal for giving high priority to initiate further investigations to spot possible "buried" risks, *before* more significant project expenditures are being incurred through a Feasibility Study and Impact Assessment - especially if there are indications that the target area is of biodiversity importance category 1 or 2 (➔ *Fig. 7*).

The risk of such an undesirable scenario can be reduced by carrying out an expert review of data availability and quality as part of the Opportunity Study. If this review leads to the classification "*not known*", the Rapid Biodiversity Survey (➔ *chapter 10.4*) should be brought forward to take place before the Opportunity Study report is completed. This extension of the Opportunity Study would require access to the site. A small additional cost at this stage could save the loss of large sunk investments later on.

The decision to carry out an Extended Opportunity Study should be automatically triggered by the classification of the site(s) in the Biodiversity Risk Matrix as "*not known*". If this decision is discretionary there might be the danger of seeking to avoid additional work and costs at this stage.

If uncertainty about the viability of the project arises from other technical, economic or commercial areas, Holcim may decide to carry out a formal Pre-Feasibility Study before deciding whether to proceed to a full Feasibility Study. If evaluation of biodiversity risk is also a concern, the Rapid Biodiversity Survey could be included in the scope of the Pre-Feasibility Study

9.6 Management implications

The major implication of the proposed inclusion of biodiversity in Holcim Opportunity Studies is the need to develop in-house capacity to carry out this work.

Because of the need to maintain confidentiality throughout, involving an external expert organisation is not usually an option at this stage. Instead, appropriate expertise might have to be newly recruited into the company or a training programme of HGRS staff may have to be initiated. As indicated above, access to a trusted biodiversity expert or experts is essential to review the adequacy of biodiversity information. If it is judged to be necessary to carry out an Extended Opportunity Study to supplement the biodiversity information, appropriate expert individuals will be needed.

HGRS will be the lead department in carrying out the Opportunity Studies, supported by representatives of the country company involved. It is important that a named individual is accountable for managing the biodiversity component of each Opportunity Study to

ensure that adequate resources are applied and that agreed processes are followed consistently.

10. BIODIVERSITY REQUIREMENTS IN FEASIBILITY STUDY

10.1 Purpose

The objective of biodiversity investigations in the Feasibility Study is *to provide all the biodiversity information needed for the investment decision*.

The key elements of this are the needs:

- to provide the biodiversity information in a form that is compatible with the identification, evaluation and management of other types of risk to the project;
- to reduce the level of biodiversity risk by agreed changes to elements of the project design (location, configuration, process, etc.); and
- to provide an early indication on possible mitigation, or even biodiversity enhancement measures.

10.2 Outcomes/activities

Complementary to what might already have been identified in the Opportunity Study, the biodiversity investigations of the Feasibility Study must lead to a detailed assessment of the risks to biodiversity from the project. The description of these risks and their classification must enable Holcim to import them into the overall Business Risk Management (BRM) tool, and manage them accordingly (➔ *chapter 8.4*).

Using strategies based on the mitigation hierarchy (➔ *Fig. 8*), the biodiversity risks will be reduced in significance and/or probability until the balance between risk and cost is thought to be right.

At this stage, opportunities for positive impacts on biodiversity should also be identified, at least on a conceptual level, requiring further elaboration and negotiation during and after the Impact Assessment phase. Examples include the management for conservation of land on the project site outside the mining and infrastructure footprint, or biodiversity offsets to compensate for unavoidable impacts.

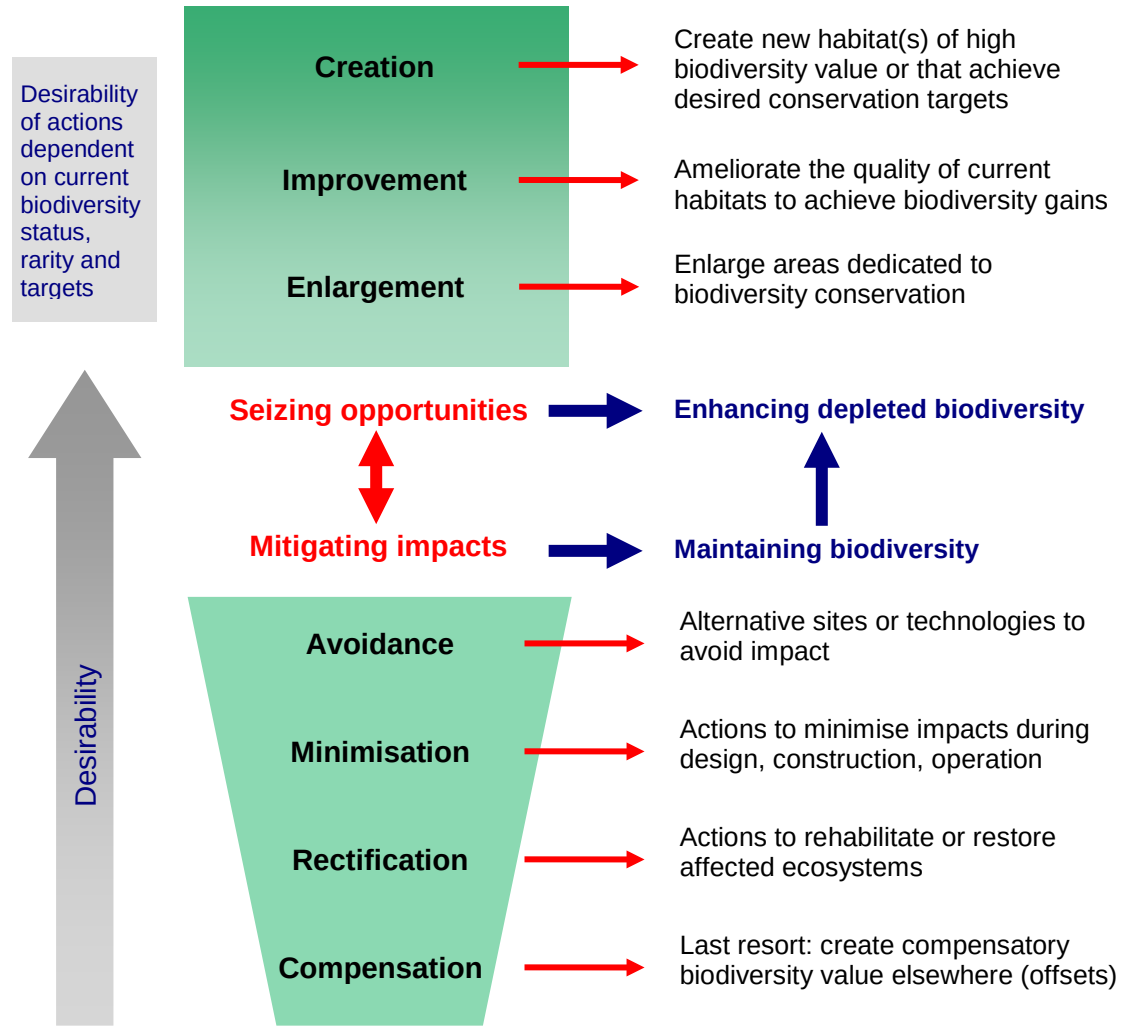
The lists of biodiversity risks and opportunities compiled during both the Opportunity and Feasibility Studies should be important inputs to the Terms of Reference and the scoping stage of the ESIA (➔ *chapter 12.4*).

During the Feasibility Study, Holcim guidelines prescribe the investigation of social and community issues, and it is desirable for biodiversity dimensions of social issues to be investigated as part of this work. Such dimensions might include community dependence on wild food and other biodiversity resources, loss of ecosystem services through interrupted access to site, etc.

As part of the iterative reduction of biodiversity risks and the conceptual identification of biodiversity opportunities, an initial assessment of the capital and operating costs of

biodiversity management should be made, and benefits, financial and non-financial, should be described.

Figure 8: **Biodiversity mitigation and enhancement measures**



Adapted from: Rio Tinto (2004)

Holcim's guide for establishing Pre-Investment Studies makes it clear that "alternative concepts for the location, technology and process" are to be defined and evaluated in the Feasibility Study process. In practice, this means options within a single site, whereas the Opportunity Study would normally have considered alternative sites. If biodiversity offsets are identified in the Feasibility Study as a necessary or desirable option for biodiversity risk reduction, the possible sites for the offsets will also need to be evaluated, at least conceptually.

If, at this stage, the proposed investment should in the end be rejected for whatever reason, the land should be evaluated as a biodiversity asset and be dealt with in the manner described under Opportunity Study (➔ *chapter 9.2*).

10.3 Information needs

The biodiversity information needed at the Feasibility Study stage starts with the biodiversity risks and supporting information generated by the Opportunity Study, including supplementary data that might have been generated by an Extended Opportunity Study (➔ *chapter 9.5*)

The Opportunity Study will usually only be based on desk studies of publicly available information. In view of the possible limitations of quality and quantity of the available data, the Feasibility Study must correct these deficiencies. Field biodiversity surveys will form a part of most, if not all, Feasibility Studies.

While the focus of biodiversity investigations remains broadly the same as for Opportunity Studies (internationally important protected areas, critical ecosystems and habitats, internationally or nationally rare or threatened species) the emphasis in the Feasibility Study is on ensuring that recent reliable data for these elements are available and that coverage is complete. In particular, at this stage, an inventory of key ecosystems and species, protected areas and other key biodiversity areas should be prepared, as well as a map of the distribution of major ecosystems and habitats in the project area and the surroundings.

The difference between information needed for the Opportunity and Feasibility Studies basically lies in the level of specificity. More details and precision are required in the latter, so that the risks associated with the presence of important elements of biodiversity in the footprint of the preferred project option can be reduced by making design changes, with the knowledge that any costs incurred result in quantifiable risk reductions using BRM.

In addition to available public information (published papers and open online sources), additional secondary information will be sought in unpublished form (university theses, NGOs, government departments). Where significant gaps still exist, field surveys will be necessary.

As part of the identification of biodiversity risks, the Feasibility Study should identify rehabilitation and conservation options requiring spatial planning of land uses at the site. These may include, *inter alia*:

- Excluding significant karst cave systems from the mining plan footprint;
- Designing water management to avoid impacts on downstream wetlands and estuaries, as well as underground water;
- Managing hydrological issues in order to avoid negative impacts on subterranean streams in karst ecosystems (such as overfilling of karst cracks by sediments or reducing water quality);
- Preserving intact high-value elements such as forest remnants, riverine forests and floodplain grasslands as refuges and seed sources;
- Avoiding disruption of connected habitat corridors used by a variety of species for survival and dispersal.

Information on social aspects of biodiversity should be centred on natural resource use by local communities, particularly any dependence on biodiversity resources gathered from the site. The consideration of these aspects in the Opportunity Study may have been, of necessity, cursory. For the Feasibility Study, the evaluation of these factors must be more rigorous, and the data needed correspondingly richer and more reliable.

During the Feasibility Study, the legal aspects of biodiversity conservation need to be studied in greater depth than for the Opportunity Study. In particular, if biodiversity offsets are being considered as compensation for unavoidable impacts (where avoidance and reduction are not cost-effective or technically possible), the legal framework for the design and implementation of offsets must be researched.

The confidentiality of the project becomes less of an issue during the Feasibility Study, as drilling for resource evaluation is taking place at the site. This means that the Feasibility Study team can and should avail itself of the involvement of specific biodiversity expertise. This may be managed through consulting contracts or partnerships, but the relevant skills are:

- Local biodiversity knowledge
- Good general ecological and biodiversity knowledge
- Familiarity with biodiversity mitigation methods
- Specific habitats, e.g. karst
- Specific methodologies, e.g. offsets

.

10.4 Approach

The spatial scale of the biodiversity investigations in the Feasibility Study is focused on the site and a notional buffer zone surrounding it. Regional analysis will still form part of the analysis, as environments away from the direct footprint may be at risk, and land-use trends always require a broader-scale evaluation.

Typically, the Feasibility Study is completed in one-to-three months. This clearly does not allow sufficient time for a thorough biodiversity impact assessment to be carried out. Data collection in the field will necessarily be very limited, and it will not be possible to evaluate fully seasonal variations such as breeding and migration. These factors will form part of the baseline data collection in the Impact Assessment phase (➔ c*hapters 11 & 12*).

Given these limitations, the form of field work may be a Rapid Biodiversity Survey by an expert lasting only a few days. This form of survey aims to use the experience of the expert, which must be extensive, to identify significant spatial features of importance to biodiversity, and to understand the connections between the species lists and habitat maps of the site.

Involving external stakeholders is unlikely to mean engagement and discussion at this stage. At the very least, key stakeholders must be identified and researched for future engagement. It may be valuable to carry out informal soundings of trusted stakeholders, maintaining confidentiality externally. There will be no media liaison at this stage.

10.5 Biodiversity extension of current guidelines

As part of the implementation of the BMS, the current Holcim guidelines on the preparation of a Feasibility Study should be extended to cover biodiversity issues. Referring to the chapter headings of the generic Table of Contents, below is a series of suggestions as to where biodiversity issues should be integrated. The emphasis is on restricting the analysis to those points that impact on project opportunities and risks, and it

is understood that not all points mentioned in the Table of Contents will be covered in every Feasibility Study.

- ***Chapter 3 - Socio-economic Conditions***: Here, the analysis of natural resource use and dependence by local communities should be included. This could be a source of biodiversity risk as well as community risk – for example, if a village is denied access to a traditional hunting area because of the development of a quarry, there could be displacement of hunting to adjacent areas that might be of higher biodiversity value.

- ***Chapter 5 - Environmental Impacts***: This is the main section in which biodiversity risks should be integrated into the following suggested sub-headings under the existing list of headings for this chapter:

  Environmental Regulatory and other Requirements

  - This must include laws and regulations covering biodiversity conservation and management.

  Environmental Site Assessment

  - Biodiversity issues are already mentioned here, and this is where the identification and evaluation of biodiversity risks will be covered.

  Environmental Assessment of Raw Materials and Fuels

  - This should include an evaluation of major supply chain impacts on biodiversity, and consideration of any impacts to biodiversity arising from issues such as acid drainage and heavy metals.
  - Bypass dust management is included here, so issues such as the flue dust management impacts on biodiversity seen in Holcim US should be covered here.

  Project Environmental Impacts

  - This section seems to deal only with impacts of the plant.
  - Surface water and wastewater management is included here, and this must cover impacts of discharges on aquatic ecosystems and their biodiversity value.

  Resource Conservation

  - This includes freshwater consumption, and must cover the impacts of abstraction on aquatic ecosystems and their biodiversity value.

  Other Environmental Issues

  - Quarry development and biodiversity are included here. This section needs to be expanded to cover the biodiversity investigations described in the BMS and their integration into the project assessment. The placing of this issue here – the last item on the list – suggests that it may currently be seen as a marginal issue. The BMS makes it clear that biodiversity risks from quarry development could be significant threats to projects, and that biodiversity opportunities could also be significant positive factors for projects
  - Special attention, where relevant, must be given to impacts on karst ecology and hydrology

- ***Chapter 6 - Materials, Fuels and Products***: The objective of this chapter includes "environmental aspects with regard to raw materials," but there is no reference to this in the list of suggested content. This would seem to be a logical place to

consider major supply chain issues if any additives and fuels are brought from other sites, instead of in Chapter 5 above.

- ***Chapter 7 - Location, Site and Environment***: This chapter deals with infrastructure for transport, power, water, housing, etc., so could involve significant biodiversity risks.

  Natural Environment.

  - Currently mentions climate and soils but could be expanded to include land use and conservation management in the region.

  Environmental Considerations

  - No content suggested, but this is where the biodiversity investigations and risk associated with the infrastructure elements should be integrated into the project evaluation, together with an assessment of how these risks, at this early stage, can be eliminated through changes in project design (mitigation through *avoidance*; *Fig. 8*).

The target and maximum lengths for each chapter are short, suggesting that there will never be much room to describe biodiversity issues and risks in great detail. This makes it imperative that the processes for identifying, evaluating and managing biodiversity risks are aligned with the methods used for all other risks.

Holcim's BRM tool is being implemented across the Group. As the Feasibility Study is primarily concerned with carrying out risk assessment and management to optimise a proposed project, BRM should be used in its processes. Biodiversity risks must be assessed and managed in a manner that is consistent with the management of other risks to the project. This means establishing agreed categories for the significance (consequence) and likelihood (probability) of biodiversity risks.

10.6 Management of biodiversity risks

Although, by its nature and the relatively short time for its preparation, the Feasibility Study will not allow a description of the biodiversity situation in great detail, it is imperative that at least the biodiversity risks are identified and evaluated properly and that they are aligned with the methods used for assessing all other project risks.

Biodiversity Risk Matrix vs. Holcim BRM

To do this, it is first important to understand the relationship and the differences between the BMS Biodiversity Risk Matrix (*Table 2*), which is used at the Opportunity Study stage (➔ *chapter 9.4*), and the Holcim Business Risk Management tool used to identify, evaluate and manage risks, as well as opportunities, to projects, operations and business:

- The ***Biodiversity Risk Matrix*** is a plot of biodiversity value (y-axis) against impact (severity and likelihood; x-axis). The former is intrinsic and will stay the same irrespective of any development that might take place. The latter captures a mixture of *likelihood of impact* and the *possibility of mitigation* (*Table 1*) – not just likelihood only. The matrix allows priorities to be set for detailed evaluation and action, as well as the Go/No-Go decision. *This matrix is essentially a screening tool*.

- The **Holcim BRM** risk plot shows significance of impact (y-axis) and likelihood (x-axis). There are many options for using mitigation to reduce both values of

individual risks, in order to bring them into acceptable areas of the risk map. *The Holcim BRM is a management tool*. (The "likelihood" seems best suited for dealing with the occurrence of events, whereas in the Biodiversity Risk Matrix, likelihood has elements of the interaction of complex biological processes with the project. These are similar but not the same.)

Describing and classifying biodiversity risks

The approach taken throughout the BMS, and exemplified in *Table 2*, is designed to facilitate the identification of risks to biodiversity (ecosystems, species, habitats) from Holcim's projects and operations ("Biodiversity *Impact* Risks"). The focus of the Feasibility Study is the identification, evaluation and management of all significant risks to the project, including those arising from biodiversity issues and impacts ("Biodiversity *Business* Risks"). These two risks are clearly linked, but they cannot be assumed to be exactly equivalent in terms of likelihood category, significance category or risk classification.

The assessment and presentation of the Biodiversity Impact Risks is to be undertaken in such a way that it fits, as much as possible, into the Feasibility Study risk management process. This consists of the following steps:

1. Start with the biodiversity information gathered during the Opportunity Study and, if carried out, the Extended Biodiversity Study (➔ *chapter 9.4*) triggered by insufficient quantity and/or quality of biodiversity information available at the Opportunity Study stage. The information should at least comprise a list of globally or nationally endangered or otherwise important species.

2. Collect more detailed biodiversity information by means of a field survey and additional desk studies that are normally required in a Feasibility Study (➔ *chapter 10.3*).

3. Use the information to construct an initial inventory of species and a basic habitat map of the project areas.

4. Overlay on the map and species information the project Base Case, in particular the initial locations of areas of disturbance, construction and extraction.

5. Prepare a biodiversity risk register, in which each interaction between the biodiversity elements present in the area and immediate surroundings is logged as a risk for evaluation.

6. Classify each risk using *Table 2:* Biodiversity Risk Matrix and *Table 3*: Description of Biodiversity Risks, into Red/Amber/Green classes as used by Holcim.

The biodiversity risk register, prioritised using the Red/Amber/Green system, is added to the other project risks, similarly classified, for risk reduction. In the Feasibility Study stage, an effort should be made to reduce as many biodiversity risks as possible through avoidance – changing the proposed location of elements of the project to prevent impacts on sensitive areas and the species they contain.

Biodiversity impact risks are usually difficult, if not impossible, to express in financial terms at the start of a Feasibility Study. As mitigation options are identified for the highest class of risks, the additional cost of these measures will be relatively easy to quantify, but the financial magnitude of the original and final risks will often not be quantifiable. There is

additional work needed by Holcim to allow non-financial risks to be identified and evaluated in the BRM. Until this work is completed, the BMS recommends accepting the equivalence of risk classes between Biodiversity Impact Risk and BRM as proposed in *Table 3*.

The major risks of the Holcim BRM constitute those risks having Very High or High Significance and Very High or High Likelihood. The Biodiversity Risk Matrix (*Table 2*) is consistent with this: Critical and Significant risks are only defined for the highest two categories of Biodiversity Importance and Biodiversity Impact Level. This supports the equivalence of Red risks with Critical + Significant biodiversity impact risks suggested in *Table 3*.

10.7 Management implications

In order to integrate biodiversity risks into the Feasibility Study and the investment decision, Holcim must have access to biodiversity expertise. This could be achieved by recruitment and training, or by establishing formal relationships with expert organisations such as conservation NGOs or academic institutions. Such relationships could be commercial consulting contracts, with a standard product or service being provided by the organisation at a defined point in the process, or a partnership, in which the partner would be involved in defining the scope of biodiversity work on a case-by-case basis, sourcing appropriate expertise and reviewing the results for use in the evaluation process.

A combination of the two may be the most appropriate model: a series of regional partnerships with national or even local contracts with service providers. The role of the partner would be to advise Holcim on how to get technical quality and value for money from its dealings with on-the-ground experts.

Regardless of the arrangements put in place to provide biodiversity expertise in the Feasibility Study process, Holcim (probably HGRS) needs to have some in-house expertise, if only to translate the methodological and scheduling issues of biodiversity investigations for the benefit of others in the Feasibility Study team.

Table 3: Description of biodiversity risks

Risk cat. Table 2	Critical	Significant	Medium	Low
Holcim BRM	Red		Amber	Green
Protected Areas	Overlap with a significant portion of a globally recognized PA Major overlap with a nationally protected area or KBA	Any overlap with a globally recognised PA Moderate overlap with a nationally protected area or KBA Significant adverse impact on a PA	Minor overlap or proximity to a nationally protected area or KBA Significant adverse impact on a buffer zone (5km) of a PA	No significant impact on protected areas or KBAs
Habitats	Total loss on site of all of any Critical Natural Habitat (IFC) or nationally important priority habitat (NBSAP) present on site, especially karst if this represents >50% in the surrounding eco-area	> 50% loss on site of all of any Critical Natural Habitat (IFC) or nationally tant priority habitat (NBSAP) present on site, especially karst if this represents >50% in the surrounding eco-area	25-50% loss on site of any Critical Natural Habitat (IFC) or nationally important priority habitat (NBSAP) present on site, especially karst if this represents >50% in the surrounding eco-area	< 25% loss on site of any Critical Natural Habitat (IFC) or nationally important priority habitat (NBSAP) present on site, especially karst if this represents >50% in the surrounding eco-area
Species	Global or national extinction of a species Disappearance from the eco-region of a globally important (Red List or micro endemic) species Change in global status of a species to Endangered or Critically Endangered Presence of invasive species severely affecting native plants	Loss of a Red List Species from the site Change in national status of a species to Endangered or Critically Endangered Reduction of local (site and surrounding areas) population of a global Red List species by 50% Presence of invasive species with limited effect on native plants	Reduction of local population of a globally important (Red List) species by 25% Loss of local population of a nationally important species Presence of invasive species with no effect on native plants	Reduction of local population of a nationally important species by up to 50% No invasive species
Hydrological services	Severe adverse impact on water availability, water quality (including turbidity and sediment), erosion, flood protection for local habitats and ecosystems	Significant negative impact on water availability, water quality (including turbidity and sediment), erosion, flood protection for local habitats and ecosystems	Moderate negative impact on water availability, water quality (including turbidity and sediment), erosion, flood protection for local habitats and ecosystems	Insignificant impact on water availability, water quality (including turbidity and sediment), erosion, flood protection for local habitats and ecosystems
Community Use	Loss of access to areas/resources essential for livelihoods Loss of an environmental feature considered sacred or having high existence value	Reduced access to areas/resources essential for livelihoods Harm to an environmental feature considered sacred or having high existence value	Moderate impact on resources essential for livelihoods and sacred sites	No significant impact on livelihoods or sacred sites

11. HOLCIM ESIA PROCESS

11.1 Legal requirements

ESIAs are usually a legal requirement in most countries for any new development or proposed major change in an industrial process or site, such as cement production and quarrying for raw materials. Repeat ESIAs on existing plants or quarries may also be required on a regular basis, as environmental and process conditions change. A final ESIA might be required before closure of the plant or quarry.

In most countries, there is a well-defined process to be followed before approval of the ESIA report and/or Environmental Management Plan (EMP) is given by the relevant environmental authority. Usually, such a formal approval process is a prerequisite before mining or cement production can proceed. There are country-specific, or even provincial, differences in this process (albeit they might be minor only), and international companies such as Holcim have to pay particular attention to such national and local requirements. International lenders may also require ESIAs with more stringent specifications than those required by national or local authorities.

11.2 Existing ESIA guidelines

Holcim's current ESIA guidelines, adopted in January 2005 and developed jointly with other members of the WBCSD/CSI, are described as "a basic framework for taking environmental and social concerns into account throughout the life of any quarry and cement plant from initial planning to construction, through operation to eventual closure" (➔ *chapter 2.5*).

The ESIA process is also seen as a critical part of raw materials management – one of the building blocks in a pyramid leading to optimum utilisation of raw materials deposits. A subsequent guidance note on environmental impact assessment emphasises the need to carry out ESIAs within the overarching strategic planning framework, in which the development and conservation potential of land is considered in an integrated manner at a regional level. This additional guidance provides a short, more practical explanation of the different stages and tools, such as matrices, used in ESIAs.

Generally, the current ESIA guidance provides a sound basis for Holcim staff to understand the requirements of the ESIA process and the products expected. In general terms, the guidance covers most of the key environmental and social issues that are likely to be encountered by plant and quarry managers. Biodiversity is mentioned in several places, and there is a relatively substantive explanation about biodiversity and ecosystem services and the link with neighbouring communities and their livelihoods, so that the impacts resulting from cement production and quarrying can be appreciated.

Specific points of the guidelines relating to biodiversity that the IEP would like to underline are:

- The assessment of biodiversity needs to adopt a wider focus than just the site itself. It should include the wider surroundings (especially important for the Rehabilitation Plan and possible BAP) and should give particular attention to karst ecosystems that may be present.
- Both, direct and indirect impacts on biodiversity should be considered. The indirect impacts may include those arising from transport corridors, or distant impacts arising from changes in hydrology.
- Baseline surveys are absolutely important (e.g. for later monitoring) and may require more than a year if seasonal differences need to be covered. These surveys must be properly taken into account in ESIA planning and terms of reference.
- Karst landscapes, of particular importance to the cement industry, may harbour a rather unique biodiversity (often with endemic species) which could be very different from the biodiversity of other nearby landscapes. The cement industry therefore carries a special responsibility for the management of these ecosystems, and this should be reflected in ESIAs covering karst areas.
- Stakeholder consultation and involvement is clearly portrayed as one of the important steps in the ESIA process. The use of biodiversity by stakeholders, either for direct consumption for livelihoods or indirectly for recreational and educational purposes, is an important part of ecosystem services to be valued in an ESIA. Consultation with stakeholders is therefore important both to inform them and to appreciate concerns and gauge the significance of impacts on biodiversity.
- Local communities and interest groups may also have considerable knowledge about the biodiversity on the site. This can inform and focus the biodiversity surveys and impact assessment.
- For the mitigation of biodiversity impacts, the following range of possibilities (with decreasing desirability) must be considered (➔ *Fig. 8*):
  - ***Avoidance*** through careful planning
  - ***Minimisation*** through good practice and management
  - ***Rectification*** through longer-term biodiversity management planning
  - ***Compensation*** through creating biodiversity values elsewhere (biodiversity offsets)
- Advocacy of progressive rehabilitation throughout the life of the quarry is important, to keep residual impacts to a minimum.
- It emphasises the principle of no net loss of biological value in terms of biodiversity and numbers of wild animals and plants.

11.3 Biodiversity shortcomings of current guidelines

The current Guidelines by Holcim provide a good overview and explanation of the steps in the ESIA process and cover several key points. Nevertheless, the IEP feels that, in relation to biodiversity, they do not go far enough to help Holcim staff at the level of plant and quarry manager, and their environmental and social advisers, to develop, cost and manage the ESIA process and produce a report of acceptable international standard. For example:

- More practical guidance should be provided on developing Terms of Reference for consultants to be mandated with the ESIA, on commissioning and supervising these consultants, and for appraising the reports that they produce before they are submitted to the appropriate environmental authorities.

- The linkage between the ESIA and the Environmental Management and Monitoring Plan is not clear, although, as stated in the Raw Materials guidance note, this is where the ESIA is most useful, because once the assessment of impacts has been done, the mitigation and environmental management measures necessary will become obvious.
- In the section on biodiversity and ecosystems (and their importance), there is a focus on protected areas and protected species, although there is no mention of the IUCN Red List or of the other tools that can help with biodiversity assessment, such as IBAT.
- While the linkage between biodiversity and livelihoods is mentioned, it seems to relate mainly to *dependence use* and *value of natural products from the wild*. The important aspect of use of agro-biodiversity – the biodiversity associated with agricultural landscapes – is not sufficiently highlighted.
- This relates to another general shortcoming, namely the over-emphasis on protected areas and rare and threatened species, with insufficient focus on general biodiversity in the wider landscape which may be just as important (➔ *chapter 1.3 on "common species"*).
- The hierarchy of mitigation measures does not include the identification of opportunities for biodiversity enhancement during the ESIA stage, although this is recognised as a significant "selling point" for including biodiversity in all planning and operational stages.

11.4 Comments on Holcim ESIAs

While the IEP has not undertaken a systematic assessment of existing Holcim ESIAs, it has had the opportunity to look at a variety of such documents in different countries covering a range of different extraction sites.

In practice, the quality of these ESIAs seems quite variable, depending upon local requirements and the availability of environmental consultants with expertise to undertake such studies. In several instances, the biodiversity components could not be viewed as adequate.

A particularly interesting example was encountered in Indonesia, where the IFC required additional ESIA investigations on the biodiversity around the Tuban greenfield development, because the original ESIA study by the local consultants, although in line with the requirements of the local environment authorities, did not meet the more detailed needs of the international finance agency (including information on biodiversity). Differences in the requirements of permitting authorities may allow less-than-adequate coverage of biodiversity issues.

- For a global company involved in resource extraction and seeking to build up an international reputation for its environmental performance, Holcim should aim at a uniform ESIA quality level in line with international standards, irrespective of local requirements.

In some countries, biodiversity impact assessments do not yet appear to be a requirement for ESIAs of quarrying operations. China is such an example, unless a protected area is directly impacted. As this is not the case in the operations of Huaxin Cement (the local Holcim subsidiary), biodiversity has not been an issue on the company's radar screen, nor is it, at the moment, a particular concern of the Chinese regulatory authorities. However,

as a result of the Panel's visit in 2009, in a quick move to rectify this gap, biodiversity was not only immediately included in the company's Environmental Policy, but a number of recommended Rapid Biodiversity Surveys were also initiated.

In summary, the current ESIA guidance provided by Holcim is generally good and gives a sound overview of the impacts of cement production and quarrying on biodiversity, but perhaps does not go far enough to ensure that internationally acceptable ESIA standards are met everywhere. Comments made to the IEP during country visits suggest that, while relevant staff knew about the existence of the guidelines, they were not being used nationally. Consistent application of approved guidelines must be part of a credible BMS.

12. BIODIVERSITY REQUIREMENTS IN ESIA

12.1 Purpose

The objective of the biodiversity investigations of the ESIA stage is *to make a full assessment of all impacts on biodiversity and provide mitigation measures that will be accepted by the permitting authority and that will provide the company with the basis for an effective Environmental Management Plan*.

There are four parts to this purpose:

- Ensuring that the proposal – greenfield development, new quarry, site extension or closure – is approved by the relevant permitting authorities in the most effective and efficient way;
- Ensuring compliance with the safeguard policies of financing agencies;
- Providing the company with a framework for future environmental management that will be compliant, minimise impacts on biodiversity and take advantage of opportunities for biodiversity enhancement; and
- Providing the company with baseline evidence that may be used as a defensive tool to show that not all subsequent impacts are due to the project.

12.2 Outcomes/activities

A successfully concluded ESIA process will result in the following key outcomes:

- It will collate the available information on the biodiversity in and around the site, and will supplement this with surveys to provide an adequate and appropriate baseline against which future changes in biodiversity can be monitored.
- It will establish compliance with the environmental and social safeguards or regulations that apply to the particular site.
- Using the baseline information and knowledge of typical impacts from quarrying and cement production activities, it will predict the likely effects on biodiversity over different phases of the project. Usually these will include site preparation and development, operation, rehabilitation and closure. It should also include any access and materials transport infrastructure to and from the site.
- It will provide an opportunity for informing stakeholders, especially local communities that will be the most affected, about the development. The stakeholders should be encouraged to express their concerns and to prioritise issues that the company

should consider in implementing the development. This can then contribute to ideas for future community involvement.

- It will allow a systematic assessment of the level of mitigation measures (➔ *Fig. 8*) of all identified impacts. Examples for such measures could be:
  - *Creation* – take advantage of changed ecological conditions to create habitats not previously found on the site, e.g. wetlands;
  - *Improvement* – provide additional planting of specific food plants for rare species found on the site and improve protection measures;
  - *Enlargement* – extend the area of biodiversity protection of an adjacent protected area to include unused parts of a Holcim quarry site or landholding;
  - *Avoidance* - exclude identified significant caves on the site from the quarrying activities;
  - *Minimisation* - limit the times and seasons of blasting to avoid disturbance of breeding species;
  - *Rectification* - develop settlement lagoons to remedy impacts of water pollution on aquatic life in and downstream of the site;
  - *Compensation* – accept that some biodiversity loss is unavoidable and compensate local users with alternative sources of livelihood. The concept of biodiversity offsets is a form of compensation.
- It will provide the framework for the biodiversity components of the EMP. This should follow the BMS definitions of the biodiversity importance category of the site and the level of impacts, bearing in mind that the ESIA process may have provided additional information that may lead to their reassessment. Where appropriate, the EMP should make recommendations for developing a Biodiversity Action Plan (➔ *Chapter 15*).
- Where appropriate for the biodiversity category of the site, it will allow the identification of possible biodiversity indicators and propose additional surveys to establish a scientific baseline with regular monitoring to follow the course of impacts and effectiveness of mitigation and enhancement measures.
- The ESIA will provide an indication of the residual impacts after mitigation. This correlates with the remaining biodiversity-associated risk that the plant or quarry will have to manage as part of the EMP.
- The ESIA should provide an initial assessment of costs of implementing the EMP and monitoring programme, which can then be incorporated into overall operational costs of the site.

12.3 Approach

Principles

There are several important principles to be observed in the preparation of an ESIA:

- The impacts of all stages of development and operation should be assessed – site development and construction, operation, rehabilitation and closure.
- The expected impacts on biodiversity should be compared with current environmental changes and trends in biodiversity that would be likely to happen without the proposed development.

- Both positive and negative impacts should be covered, with appropriate mitigation measures to address the negative impacts, as well as possible measures to enhance the positive ones.
- Whilst the focus of an ESIA is on the proposed development, there should also be a comparison of alternatives – alternative sites, routes for access roads, methods of extraction or processing. In many cases alternative sites would have already been considered in an earlier stage of the planning process, but the key findings should be included in the ESIA for comparison. This is to demonstrate that the proposal has been developed in awareness of environmental and biodiversity issues, i.e. avoiding high biodiversity risks.

Boundaries of impact zones

Whilst the focus of the ESIA is on the site of the proposed development, a wider area should normally be considered when addressing biodiversity issues. The exact geographic delineation may differ depending on local circumstances, but usually the ESIA should take into account different types of impact zones:

- The site itself;
- A buffer zone around the site, which may be from several hundred metres to several kilometres around the site, depending upon land uses. (The width of the buffer zone will vary with the situation; initial Rapid Biodiversity Surveys, working inwards from outside the site, will guide a decision on the extent of the buffer zone required.);
- Access roads, conveyor belts and transportation routes that may cut across paths of movement or migration of some fauna, or disturb critical areas;
- Areas connected ecologically to the site, for example, rivers and streams downstream of the site that may be affected by hydrological changes or pollution resulting from quarrying. In the case of a karst ecosystem, such connections might be numerous and widespread and may only be fully understood through a special investigation of the karst hydrology and the underground watershed;
- Wider areas linked to the site by particular species, e.g. migratory species that use the site or surrounding area for resting or breeding.

Time scale

Whilst, for reasons of business expediency, the duration of the ESIA process is usually about three-to-nine months, a proper evaluation of biodiversity issues may often require a longer time-scale to ensure that the ESIA baseline studies cover the full annual cycle of different seasons (wet and dry, summer and winter). Ecological processes and species life cycles (e.g. migration of birds), and thus impacts on biodiversity stemming from industrial activities, may vary a lot throughout the year. This variation, in turn, can be crucial for the proper design of mitigation measures. In many cases, biodiversity baseline studies that do not cover an entire year have to be considered incomplete.

Therefore, if the result of a Feasibility Study indicates biodiversity issues that might be influenced by seasonality, the following approach should be adopted regarding the time allocated for ESIA:

- Ideally and preferably, from a biodiversity perspective, the time span for the ESIA, i.e. the collection of biodiversity information in the field, should be extended to cover 12-15 months. If the formal ESIA period is shorter, the collection of biodiversity information should be started earlier.

- If good-quality biodiversity data are available for the site/area (i.e. which allows assessment of seasonal usage), the period of the ESIA investigation could be reduced.
- If such data are not available and business expediency demands a faster ESIA, the ESIA must contain the recommendation for further biodiversity investigations before the EMP can be prepared.
- Alternatively, if the Feasibility Study indicates the need for a full annual cycle of biodiversity data, the collection of such baseline information should be commenced earlier so that, on termination of the formal ESIA process, all the required biodiversity information is available.

Biodiversity aspects

In line with the approaches taken in the earlier planning stages, biodiversity impacts can be categorised into five important aspects:

- *Protected areas* – the impacts upon recognised areas of high conservation value that are either in or nearby the plant or quarry;
- *Habitats* – characteristic and high-value habitats found in the area upon which the species are dependent;
- *Species* – rare or endangered species that are present in or near the quarry or plant site; characteristic species that are found in the area; invasive alien species that might be a threat to biodiversity in the area;
- *Hydrological services* – an important part of ecosystem services upon which much of the biodiversity depends, including ground and surface water balances and flows;
- *Community use* – the key uses for biodiversity by local stakeholders, including livelihood and recreational uses of biodiversity as well as spiritual values associated with biodiversity in and around the quarry and plant sites.

This categorisation can be applied to both direct and indirect impacts on biodiversity and is a useful method of organising and understanding potential effects more clearly.

External influences

The ESIA should recognise that the development may be planned in an area that has already been modified ecologically to a greater or lesser extent in the past. Likewise, it is important to realise that trends and changes in that environment are likely to continue even if the development does not go ahead, either due to natural processes, change in land-use patterns or other nearby developments with biodiversity impacts.

Therefore, the ESIA should seek to single out those changes that are likely to occur as a result of the proposed development and contrast these with changes that are likely to happen due to other natural or man-made factors. This is particularly important where the plant or quarry is to be developed where existing industrial plants and/or quarry operations are already having impacts. A careful evaluation of the additional and cumulative impact caused by the development allows a baseline to be laid, against which its specific impacts can be measured.

Economic valuation

The ESIA should include, where appropriate, estimates of the economic values of biodiversity and its use. The description of the uses of biodiversity by local user groups and communities for their livelihoods, recreation, education and research may be obtained through consultation and surveys with these groups. Estimates of values will help in addressing compensation claims, either as a result of direct loss of the resource or loss of access. (Although not feasible as a standard method, reference is made to Holcim's pilot study on the economic value of the ecosystem services provided by one of its UK gravel quarries ➔ *chapter 2.6*). It should be borne in mind, however, that it is not possible to attach a monetary value to biodiversity in all cases. The technique of contingent valuation can be used where the local economy is fully monetised.

Social assessment

Although the social impacts of the plant or quarry will be the subject of special focus in the ESIA, biodiversity-linked social impacts should not be neglected. These are usually related to the use of biodiversity by local communities, e.g. as part of their livelihood (wild food, fuel, etc.) but may also include culturally important sites, such as waterfalls and sacred forests, or be related to the recreational, tourism and educational values of the site and its biodiversity. Consultation with stakeholders from neighbouring communities will highlight these concerns and allow the value and impacts on these resources to be assessed. Biodiversity-related questions should be included in social surveys where appropriate.

12.4 Steps of the ESIA

The preparation of an ESIA is an iterative process, requiring a number of standard steps, from the initial scoping, through a baseline assessment, to the evaluation of impacts and the identification of mitigation measures, and finally leading to the formulation of recommendations for the biodiversity management of the site.

Scoping phase

During this phase, key biodiversity aspects that should be considered are to be defined. Much of this information may already be at hand if earlier stages of the BMS have been followed in the Planning Phase. If there is a separate Initial Environment Examination, as sometimes may be required, the biodiversity issues will have been identified. Nevertheless, the scoping phase provides the opportunity to review the information sources, identify gaps in information and develop a plan for filling these gaps with surveys, etc.

Baseline Assessment

During this stage of the ESIA, secondary information will be supplemented with detailed study of ecosystem types, plant communities, major groups of species, etc. This may require surveys at different times of year, with several specialists (plants, invertebrates, mammals, birds, fish and amphibians, etc). The idea is to make an assessment of what biodiversity is present in the different impact zones, its status and approximate abundance. The focus should be on the local terrestrial, freshwater and marine habitats, with special attention to individual critical species and habitats. The important ecosystem functions should also be described, especially hydrological functions, breeding and nursery areas, pollination, etc.

The baseline assessment should describe the status and distribution of rare and threatened species (nationally and internationally), important migratory species that visit the site and surrounding areas, and the presence and abundance of invasive species. Particular attention should also be paid to biodiversity corridors, the areas of land that link habitats and protected areas and allow the wider movement of animals and dispersal of plants. As more detailed baseline information is collected on species and habitats, it may be necessary to revise the biodiversity importance category of the site.

Information on the biodiversity can be gathered from stakeholders, especially local users, nature groups, schools, etc. These groups often have had a long and direct involvement with the area, and local knowledge can be invaluable in describing the particular habitats and species.

The baseline should also describe the uses of biodiversity by local communities that contribute to their livelihoods. Any biodiversity associated with agricultural land may also be important, and should be described. In some areas, the diversity of agricultural crop varieties (agro-biodiversity) may be significant.

Impact Assessment

In this analytical stage of the ESIA, changes in the biophysical conditions on and around the site that will result from the plant or quarry will be linked with the possible impacts on biodiversity. Typical biophysical changes stemming from quarrying activities include increased noise and dust, hydrological changes and lowered water quality, disturbance from increased human activity, as well as general habitat modification and loss. Ground disturbance can increase invasion by alien plants.

Important information needs at this stage include reports on what has happened in similar situations to biodiversity, so the experiences of Holcim at other sites can be extremely valuable as case studies. Scientific information on the threshold levels of water quality, noise, etc. upon different types of plants and animals should also be used to make the assessments. An assessment of the impact on Red List species found at or near the site could be particularly useful, if it can be demonstrated that the development will have, or will not have an effect on the status or the level of endangeredness of the species.[20]

Impact assessment often relies on professional judgment – the predictions of what will happen based upon knowledge and experience of what has happened elsewhere and the sensitivity of different species. Some impacts will be direct and obvious, others will be more indirect, e.g. the loss of one species that is the main food source of another, or increased competition for the remaining habitat. The need for such judgments is a compelling reason for using experienced professionals to carry out ESIAs.

Mitigation of biodiversity impacts

Following the assessment of biodiversity impacts, the most important subsequent biodiversity task in the ESIA is the identification of mitigation measures according to the hierarchy of desirability shown in *Fig. 8*. While possibilities of mitigation have also already been examined as part of the Feasibility Study (➔ *chapter 10.2*), the emphasis in the early stages of the planning phase is on *avoidance* of biodiversity impacts through changes to the project design. In the ESIA phase, however, when substantial investments in project planning and design have already been made, the focus would normally shift to *minimisation* and *rectification*. In rare instances, when mitigation on site is not possible, *compensation* measures (biodiversity offsets) might have to be considered as well.

In addition, at this stage, the opportunities for ***biodiversity enhancements*** (➔ *Fig. 8*) should also be carefully appraised. In many cases, especially in localities where biodiversity has been reduced from its original status as a result of previous land-use changes (e.g. for agricultural development and intensification), there are opportunities to manage and rehabilitate a site in such a way that species present in the past may be encouraged to recolonise. In the extreme, this could lead to the establishment of biodiversity islands in an otherwise significantly altered and "homogenised" landscape. However, biodiversity enhancement measures, whether through *enlargement*, *improvement* or *creation*, should not be considered if they are at the expense of an important existing natural ecosystem – even if it has a lower intrinsic diversity of species.

No firm rules or prescriptions can be given on which mitigation measures should be chosen in which case, except for the general priority hierarchy in *Fig. 8*, giving preference to lower levels of intervention. In practice, each case is different, depending on a variety of individual factors, such as the exact nature of the impact, the precise biodiversity elements affected (species, habitats, ecosystems, etc.) and the available management resources. Normally, expert judgment is required for this process, but the examples in the following table, grouped into five aspects of biodiversity, may help to indicate general directions of possible mitigation strategies:

Biodi-versity aspect	Examples of impact	Possible mitigation measure
Protected Areas	Quarry creates area with new habitat for rare species	Creation and endowment of new protected area (enhancement)
	Quarry located in PA	Avoid location of quarry in PA (avoidance)
	Quarry impacts on PA • Disturbance of PA • Landscape impacts • Increased level of PA management required	• Blasting control measures agreed with PA management (minimisation), • Screen planting around quarry (rectification) • Contribution to management costs of PA (compensation)
	Loss of protected habitat	Gift remaining land around quarry as conservation easement and manage as protected area (compensation and enhancement)
Habitats	Loss of part of woodland habitat on part of the site through quarrying	Enhancement and protection of habitat in the unquarried area
	Loss of springs with characteristic fauna	Avoid quarrying around springs and water courses (avoidance)
	Loss of characteristic grassland habitat during quarrying	Remove and store topsoil, rehabilitate and replant grassland (rectification)
	Quarrying on brownfield site with limited biodiversity, adjacent to urban areas	Rehabilitation of quarry for urban use, with appropriate vegetation, and provision of habitat for urban biodiversity (rectification with enhancement)
	Loss of MG4 grasslands in river valley	Accept open water habitat, create a diversity of wetland habitats – beaches, wet grasslands (rectification and enhancement)
	Loss of karst landforms with endemic flora and fauna	Offset by protecting similar sites under threat (compensation)

Species	Rare species not found previously in area starts breeding in quarry	Special measures to protect and enhance survival of species in quarry (enhancement)
	Endemic cave fauna would be lost due to quarrying	Avoid quarrying around cave (avoidance)
	Disturbance of nesting of migratory bird species	Manage blasting times and locations to minimise disturbance (minimisation)
	Calcareous grassland flora lost from quarry area	Stockpile topsoil for later use, emulate traditional grazing/mowing regimes (rectification)
	Quarry and conveyor belt interrupts predator and prey ranges	Provide crossing points and leave protective vegetation corridors (rectification)
	Total loss of threatened species from site	Relocation and ex-situ conservation; reintroduction in suitable habitats after mining (compensation)
Hydrological services	Sediment from quarry reaches and pollutes watercourses	Establish reed bed to intercept sediment (rectification and habitat enhancement)
	Ground water flows affected leading to disruption of water supplies and wetlands	Hydrological studies to show which underground water courses to avoid in quarrying (avoidance)
	Ecology of seasonal streams disrupted by year-round pumped discharge	Find alternative use for the water discharged during the dry season, e.g. irrigation (minimisation)
	Cave systems and springs dry out due to lowering of water table	Create artificial groundwater by re-injection (rectification)
Community use	Loss of amenity value of land around plant or quarry	Creation of new biodiversity habitats for new recreational uses, e.g. bird watching (enhancement)
	Quarrying might involve loss of feature of community importance, e.g. waterfall, historic cave	Avoid quarrying in this area (avoidance)
	Access to firewood disrupted by quarry	Planting of fuel wood crops for local community use (rectification and compensation)
	Loss of recreational use of woodland – walking, hunting	Factor recreation into progressive rehabilitation plan (rectification)
	Loss of site that has spiritual and cultural value in quarry	Negotiate with local religious leaders to find acceptable alternative with appropriate observances (minimisation)
	Loss of livelihood activities, e.g. farming, fishing, hunting, livestock	Compensate and assist to find other land; develop alternative food sources, fish farming, poultry raising (rectification and compensation)

Residual biodiversity impacts

Since mitigation measures often will not entirely eliminate expected biodiversity impacts, the ESIA should seek to identify residual biodiversity impacts that may still remain despite pro-active biodiversity management. The originally predicted impacts, the mitigation measure and the expected residual impact can be presented in the form of a matrix as follows:

Biodi-versity aspect	Examples of initial predicted impact	Impact rating	Examples of mitigation measure	Residual impact rating
Protected Areas	Noise and dust disturbs adjacent nature reserve		Additional noise reduction and dust abatement measures in place	
	"Scar" of quarry has significant visual impact upon a protected landscape		Early planting of screening vegetation to reduce visual impacts	
	Quarry access roads allow easy route into protected area, increasing illegal hunting		Control point established on access road, monitoring traffic for wildlife hunting	
Habitats	Conveyor belt crosses and damages wetland habitat		Alternative route found for conveyor which avoids wetland habitat	
	Limestone upland meadows with characteristic flora lost in quarry area		Top soil removed and stored for later rehabilitation and planting to match surrounding areas	
	Barren cliffs in quarry with little biodiversity value		Cosmetic blasting to create niches in benches to facilitate colonisation of rock faces	
Species	Presence of invasive alien plant species in surrounding area with high risk of increase in disturbed ground of quarry		Active monitoring and eradication programme	
	Nationally protected species of bird nests in and around quarry area		BAP implemented which protects nesting birds in unquarried area of site, and rehabilitates nesting habitat after quarrying	
	Opportunity for introductions of cliff-loving species in quarry		BAP enhances habitats for such species	
Hydrological services	Risk of sediment from quarrying reaching water courses		Construction of check dams	
	Risks of accidental spillage of oils from vehicle maintenance area		Emergency response for oil spillage prepared, equipment in place and staff trained	
	Quarrying potentially disturbs flow of groundwater maintaining the adjacent critical wetland		Hydrological surveys indicate quarry areas to be avoided to prevent groundwater impact. Monitoring of flows and remedial measures if necessary	
Community use	Access road to community source of fuel wood cut by quarry		Alternative road provided for communities to collect fuel wood from area surrounding quarry	
	No current recreational use of site		Creation of paths and walkways for bird watching, viewing cliff-loving species	
	Sheep grazing on upland meadows lost in quarry area		Protection of quarry edge from wandering livestock, compensation for loss of grazing during quarrying. Limited provision of grazing on fully rehabilitated meadow land	

Negative impacts				Biodiversity opportunity (gain)		
Critical	Significant	Medium	Low - Neutral	Moderately positive	Positive	Very positive

Development of the Environmental Management Plan

A key outcome of the ESIA are the recommendations for biodiversity management of the site during the operational phase and after termination of mining, taking into account all the biodiversity mitigation and/or enhancement measures that may have been identified in the ESIA. These recommendations form the basis for the biodiversity component of the EMP of the site, the Rehabilitation Plan and, if applicable, the BAP.

If the preceding assessments (Feasibility Study and/or ESIA) indicate particular groups of organisms that are at risk or are indicative of the ecosystem health of the site, and if the available data on these biodiversity elements are of insufficient quality or quantity, further detailed surveys may be recommended as part of the EMP. It should also be signalled at this stage if the development of a BAP should be recommended for inclusion in the EMP.

The EMP should also include provisions for ***emergency response*** if unforeseen biodiversity-related events occur, such as:

- Discovery of rare species taking advantage of the changed habitat conditions and starting to breed on the site. This may require additional protection measures to be developed, e.g. during the breeding season;
- Discovery of important, previously undetected cave system;
- Accidental spillage of oil reaches water course;
- Quarrying activities accidentally disturb underground water balance, causing springs to dry up, and changes in stream flows.

These “emergencies” require an adaptive management approach, possibly necessitating additional surveys, protection measures and monitoring.

12.5. Methods and tools

GIS mapping

The methods and tools used in ESIA biodiversity assessments rely heavily on GIS mapping and analysis, especially of land use, forest cover, water bodies, etc. Such analysis helps with the identification of different habitats, clarification of impact zones, and quantification of land areas and boundaries. This may be supplemented both visually and analytically by satellite imagery and/or aerial survey. Google Earth provides a very accessible initial way of visualising the landscape and what it contains, although the level of detail varies from location to location.

Sources of information

The quality of an ESIA is greatly determined by the quality of the collated information, and this is in turn affected by the time available for the study. Although it is recommended that 12-15 months should ideally be allowed for the study (➔ *chapter 12.3*), only a shorter investigation period might be possible. In this case, a balance needs to be found between collecting original data in the field and collating published and unpublished (i.e. secondary) information that may already exist from the site or the general area, such as:

- Literature surveys covering detailed studies within the area, in adjacent areas, e.g. of protected areas nearby, and of comparative locations elsewhere;
- Academic studies (PhD and Masters theses);

- Previous ESIAs within the region;
- Inputs and information from local environment and conservation authorities and conservation NGOs.

Such secondary information may have limitations, however. In some countries, public access to information and data may be significantly restricted, for example even to other ESIA reports. If access is difficult, or the relevant data is not available, extrapolation based on professional judgement and experience may be even more critical. Whilst detailed surveys will provide much relevant information, they need to be targeted and timed appropriately, because both time and funds for such studies will inevitably be limited. It is unlikely that a full survey with detailed information about plant and animal populations will be possible within the time frame and budget of a typical ESIA, unless there is a compelling reason for such a study, such as the presence of a rare or threatened species.

Field investigations

The methods used for field investigations depend upon what is being surveyed. Rapid Biodiversity Surveys ("walk-through" assessments) are a good method to identify key habitats and give a quick first idea of the presence or absence of certain species, especially when experts and trained observers are used to look out for specific evidence. Terms of Reference for such Rapid Biodiversity Surveys have been prepared as supplementary guidance for Holcim operating companies.

More detailed field surveys may count numbers and sizes of individuals in a defined area, or over a specified length of time; others may use traps and photographic counts. The choice of method should be discussed and agreed with the experts contracted to do the surveys, depending upon the objectives of the study.

Other field studies undertaken for non-biodiversity components of the ESIA will also be useful; for example geological and speleological surveys will indicate the presence of significant caves and underground habitats. Hydrological surveys will indicate the presence of the direction of water flows, streams and wetlands on or near the site. Social surveys may provide information on the uses of biodiversity resources on the site and how these are valued.

Prediction of impacts

Predictive impact assessment methods are often summarised in matrices, but these should be backed up by descriptive sections of the report that explain the reasons for the prediction. This should cover features of impacts such as:

- *Importance* – how important is the overall change likely to be to the locality, country, region and globally? This is especially relevant for rare and threatened species.
- *Significance* – how significant is the change likely to be, e.g. what proportion of the population will be lost?
- *Permanence* – is the change likely to be permanent, i.e. when the development or activity stops, will the change persist? An example of this might be the disturbance of bats by blasting. This would probably not be permanent once the quarrying activity ceases in that area and the bats would return to their original roosts. (In a quarry of the Czech operating company, a special "chimney" has been constructed to allow access for a bat colony to a cave, which would otherwise have been lost.)
- *Reversibility* – is the change likely to be reversible? The experience of rehabilitation has shown that many changes can be reversed.

- *Cumulative impacts* – is the change adding to impacts from other developments, e.g. other quarries nearby? Will the additional changes in the biophysical environment as a result of the new development pass a threshold and tip the balance of survival of a species in the area towards its complete loss?

Stakeholder engagement

There are many methods for stakeholder involvement. Through its well-developed social programmes, Holcim already has considerable experience in such techniques, many of which are also suited for addressing biodiversity issues.

National ESIA regulations may require formal consultation meetings to be held with stakeholders at community, district, provincial and national levels. However, focus group meetings, surveys or Participatory Rural Appraisal (PRA) methods may all be used to gather additional information about the biodiversity, its use and its value. The wisdom of local knowledge about biodiversity should not be underestimated, and may be the only way of getting information about the presence of rarely observed species that may require costly surveys to assess. The use of photographs or identification guides, e.g. of birds, plants and fish, may be useful to focus such discussions.

Large and potentially controversial developments may need an associated communication strategy for the ESIA process, ensuring that stakeholders are consulted appropriately, and the general pubic and media are kept informed.

12.6 Management implications

The lead responsibility for the ESIA process for a particular development lies with the national company, which should develop the terms of reference and commission a consultant team of specialists to undertake the ESIA and produce the necessary reports. Usually this will be the responsibility of the Project Manager and/or the company Environmental Manager. The Environmental Manager would take the responsibility for appraisal of the ESIA before it is sent for approval to the regulatory authority. However, Holcim should have the capacity and expertise (at the HGRS level) to help local companies in the development of a ToR and quality assessment of submitted ESIAs. If necessary, external experts may also help to appraise ESIA reports. In difficult cases, the Biodiversity Advisory Committee (BAC; as proposed in *chapter 19.5*) may be called in to provide advice on the development of ToRs and implementation of an ESIA. Generic terms of reference for the biodiversity components of ESIAs have been prepared to supplement existing Holcim guidance.

Some key implications for the professional execution of the biodiversity component of the ESIA process are:

- The team appointed to conduct an ESIA for Holcim should include relevant expertise in biodiversity.
- The exact nature of the expertise may be defined in the ToR or may be identified subsequently, depending upon the findings of the scoping stage.
- The consultant team should be experienced in international ESIA standards, and as far as possible national/local biodiversity experts should be included to provide detailed knowledge on species and habitats in the locality.
- Where there are significant habitats, such as karst or wetlands, ecologists specialising in these habitats should be included on the team.

- The team should be familiar with the range of biodiversity mitigation measures that may be available.
- At least one member of the Holcim company should be identified as the “owners’ representative” on the ESIA team, preferably with some training or orientation in biodiversity management.
- After completion of their studies, the ESIA team should share its findings with the site operators to increase awareness of biodiversity, the management of key habitats and species and the control of invasive alien species.

ESIAs can require significant resources to cover aspects such as satellite imagery and repeated site biodiversity surveys to cover seasonal changes. Depending upon the site, size and complexity, the need for public consultations, etc., ESIA processes can cost upwards of several hundred thousand dollars and may take from one to one-and-a-half years to complete.

EMPs also may require significant resources for implementation that should be built into the operational costs. The ESIA/EMP process should provide an initial estimate of these costs, which will be refined as EMP implementation and rehabilitation proceeds.

12.7 Recommendations for actions

The ESIA process is already well-established within the Holcim planning system, and guidelines have been provided for use by Holcim companies. These guidelines are useful and include some discussion of biodiversity issues. It is recommended that these guidelines be maintained and promoted more extensively, as there is some evidence that they may not be used as widely as anticipated. In terms of biodiversity, further guidance on biodiversity and ecosystems can be provided to assist biodiversity impact assessment as an integral part of the ESIA process.

A number of practical tools can be developed to help project and environmental managers commission, supervise and appraise the ESIA process and reports. These might include:

- Development of a checklist of typical biodiversity impacts resulting from cement production and quarrying;
- Advice on the linkage between the impacts predicted and mitigation proposals in EMPs, including a matrix of alternative biodiversity impact mitigation measures;
- Generic ToRs for carrying out biodiversity impact assessment;
- Advice on how to source local and international expertise for carrying out baseline surveys and impact assessments;
- Advice on how to cost biodiversity components of ESIAs and EMPs;
- Advice on how to appraise biodiversity components of an ESIA report; and
- A layman’s language guide to biodiversity assessment methods, to help managers understand the terms and methods used in biodiversity surveys and monitoring.

Using these tools and providing training in biodiversity impact assessment would serve to promote the use of the ESIA Guidelines. Case studies of some of the ESIAs undertaken by Holcim companies that illustrate good practice in biodiversity impact assessment should be prepared to complement such training.

13. GENERAL BIODIVERSITY REQUIREMENTS DURING OPERATIONS

13.1 Existing Holcim practices and guidelines

Holcim has already developed extensive guidelines with regard to the rehabilitation of its sites. Far less attention, however, has so far been given to the management of the sites' biodiversity.

Rehabilitation Plans

As a member of the Cement Sustainability Initiative (WBCSD/CSI), Holcim committed to developing rehabilitation plans for all operating cement-related quarries and communicating those plans to external stakeholders by 2006. Recommendations for Holcim quarry rehabilitation were originally published in 2004 and updated in 2008, in order to assist group companies to develop such plans. The latest version (V11 of 2009) contains a section that has the status of a directive (where compliance is mandatory) and a section that has some supporting guidance with the status of a recommendation (these are suggestions only, based upon good practice or experience, where compliance is recommended but not mandatory).

The objective of this directive is to make certain that all extraction sites (cement or aggregate quarries - or any part thereof) are operated and closed in a safe, environmentally and socially responsible manner and to ensure sustainable post-quarrying land uses that are acceptable to relevant stakeholders.

Holcim's "Quarry Rehabilitation Directive" is articulated around 10 ***basic principles*** that have to be implemented to ensure compliance with this directive:

1. Comply with legal requirements.
2. Know the deposit and extraction impacts.
3. Engage with relevant stakeholders.
4. Establish rehabilitation concept with clear objectives and targets.
5. Plan rehabilitation and align with extraction activities.
6. Make financial provisions.
7. Carry out and monitor rehabilitation.
8. Report on the status of rehabilitation.
9. Review and update rehabilitation planning.
10. Retain documents.

Together, these principles aim to achieve the following ***objectives***:

- To reintegrate the exhausted parts of the quarry into the landscape;
- To make the site safe and stable for future land use;

- To return land to a beneficial post-quarrying use, balancing environmental, social and economic factors;
- To ensure that after quarry closure there are no adverse long-term environmental, social and economic impacts.

The current standard of rehabilitation planning in Holcim and the implementation of these plans vary considerably between countries and sites. This can undoubtedly be attributed to differences in local regulatory requirements, local company culture and individual plant managers' interests.

In a number of cases, excellent rehabilitation results have been observed with positive outcomes for local biodiversity that range up to the establishment of highly diverse nature reserves functioning as biodiversity islands in an otherwise heavily modified, biodiversity-poor landscape.

In other areas, however, some of the rehabilitation work seems to be driven by a concern for expediency to fulfil requirements by local authorities that are based more on aesthetic factors and traditional views of landscaping than on conservation considerations. While pleasing results have been achieved relatively quickly, the biodiversity gains are very limited and the costs have been higher than might have resulted from a more ecological, albeit slower, approach.

Biodiversity Action Plans

So far, at the Holcim Group Level, no formal guidelines have been developed with regard to BAPs. However, at the country level, significant progress has been made in certain instances.

Aggregate Industries in the UK has recently published a short pamphlet entitled "Biodiversity Plan 2008-2012", providing an excellent template for site-specific BAPs. Of particular value is the acknowledgment of the importance of landscape conservation, the need for establishing links to existing regional and national BAPs (where those may exist) and the requirement of monitoring in order to track the level of achievement towards a desired outcome.

While Aggregate Industries initially aimed at having BAPs for every site, it has now been recognised that such an approach might stretch capacities too far - and indeed it might not always make sense to have a separate BAP. The proposed prioritisation makes sense as it is rooted in the logic of not requiring the same amount of biodiversity effort for all sites. However, the process by which a total of 16 sites have been prioritized for the time being is not quite clear.

13.2 On-site management sequence

The operational processes at an extraction site can be broadly split into the following steps:

- Site preparation
- Extraction
- Rehabilitation
- Closure
- Post-closure management and monitoring

Generally, each of these steps has different impacts on biodiversity and has different management requirements, in order to minimise the impact and maximise the benefit of remedial action. Very often, these different steps will run concurrently within a specific extraction site, as new areas in the site are being prepared for extraction whilst some worked areas are already undergoing rehabilitation.

The integrated nature of these different operational steps favours the formulation of an integrated approach for rehabilitation and biodiversity management that applies to the whole site and to the whole extraction operation. As an example, topsoil that is removed during the site preparation phase to allow access to the resource must be correctly stored in order to be effectively used during the rehabilitation phase.

13.3 Starting points for biodiversity management

The key biodiversity issues should already have been identified by the time a site becomes operational. Partly, this may have happened during the planning phase (Feasibility Study), but the issues should also have been analysed in detail and in their entirety during the ESIA process. The ESIA should also have provided clear guidance on mitigation measures to be adopted during operations to reduce biodiversity impact, on opportunities to enhance biodiversity values and on the type of eventual rehabilitation to be aimed at.

The biodiversity management of a site, to be outlined in the EMP, should build on a number of central pillars:

- ***Intrinsic biodiversity value of the site***: progressively determined during the planning and assessment phases from the initial identification of the biodiversity importance category (y-axis in Biodiversity Risk Matrix ➔ *Table 2*) to the more detailed biodiversity inventories.

- ***Seizing opportunities***: besides the mitigation of negative impacts, there should be a growing focus in the operational phase (ideally already sketched out in the ESIA) on seizing opportunities for biodiversity enhancement through habitat enlargement, improvement or creation (➔ *Fig. 8*). Examples of such situations are:
  - *Capitalising on "accidents-of-history"* - some sites might have a history of past exploitation followed by periods of recovery, whilst others may have enjoyed periods of informal protection as sites for possible future use, during which they turned into local biodiversity islands. Such events in the past might provide a base for maximizing biodiversity benefits during operation.
  - *Re-creation of habitats formerly present* - In localities where biodiversity has been reduced from its original status as a result of previous land-use changes (e.g. for agricultural development and intensification), there could be opportunities to rehabilitate a site to its former, more diverse status (e.g. re-establishment of a riverine floodplain after gravel extraction).
  - *Creation of new habitats with high biodiversity value* – during the course of the rehabilitation work, new habitats may be created which were not necessarily present on the original site but that may represent scarce habitats in the broader regional landscape and thus hold a high or specific biodiversity value (e.g. creation of an aquatic habitat instead of a dryland restoration).

- ***Landscape context***: as highlighted in the biodiversity policy principles, biodiversity management and rehabilitation should be carried out in the context of the surrounding landscape in order, for example:
  - to consider the changing matrix of surrounding land use and land cover over the lifetime of the quarry and how this may positively or negatively influence the setting and attainment of biodiversity targets;
  - to establish connectivity with other important biodiversity areas in the vicinity;
  - to achieve a contextual view in terms of biodiversity offsets and (sub)regional planning.

- ***Community expectations and desires***: as another important principle, expectations and desires of local stakeholders should provide important inputs for rehabilitation and post-closure land-use planning and will often influence the level of biodiversity elements (especially biodiversity enhancement) that can be built into such plans. These will in turn have some bearing on the institutional arrangements that might be required to achieve positive biodiversity outcomes.

13.4 Biodiversity Action Plans vs. Rehabilitation Plans

Although the preparation of a Rehabilitation Plan is not only good practice advocated by the WBCSD/CSI but also a legal/regulatory requirement in most countries, the preparation of BAPs as the basis for biodiversity management of individual sites is at the moment only pursued by a few selected sites managed by Aggregates Industries in the UK.

However, since many Rehabilitation Plans do contain clear biodiversity-related components (of varying levels of intensity and relative importance), and since in most Holcim operations rehabilitation is an ongoing management concern (and not only dealt with towards the end of a site's life cycle), there are, for all intents and purposes, many Holcim sites with longer-term biodiversity management programmes. In addition, biodiversity issues might also be addressed on an ongoing basis through the EMP.

This raises the question of the connections among these various documents containing elements of biodiversity management and what would be the best approach to achieve maximum coherence in this process?

Logically, and as an expression of exemplary land stewardship, one could advocate the development of a BAP for every site, with rehabilitation and post-mining management forming an integral part of it. However, this would neither be realistic for an industrial company (exceeding its resources and capacity), nor would it represent a meaningful contribution to conservation, since many sites would not be of such high biodiversity value.

Therefore, given its legal and regulatory origin, the Rehabilitation Plan is being taken as the point of departure for institutionalising biodiversity management in the operational phase. Depending on the biodiversity importance, local requirements and circumstances, various levels of biodiversity inputs into Rehabilitation Plans are proposed in the BMS. These range from adherence to certain minimum standards to be observed everywhere to the completion of a full BAP that stands alongside, but interconnected with the Rehabilitation Plan.

13.5 Level of biodiversity inputs into Rehabilitation Plans

As explained in *chapter 13.2*, since Rehabilitation Plans for quarries are mandatory in most situations, the paramount biodiversity management measure in the operational phase is to ensure the inclusion of a proper biodiversity component into the Rehabilitation Plan. The BMS proposes three levels of biodiversity input, depending on the position of the site in the biodiversity risk matrix as determined by the intersection of biodiversity importance (y-axis of the matrix) and biodiversity impact level of the operation (x-axis of the matrix) (➔ *Table 4*):

Table 4: **Biodiversity and Rehabilitation Plans**

		Biodiversity Impact Levels (from *Table 1*)			
		A	**B**	**C**	**D**
Biodiversity Importance Category	**1A**	High: **BAP**	High: **BAP**	High: **BAP**	Med./High
	1B	High: **BAP**	High: **BAP**	High: **BAP**	Medium
	2	High: **BAP**	High: **BAP**	High: **BAP**	Medium
	3	Med./High	Med./High	Min./Med.	Min./Med.
	4	Minimum	Minimum	Minimum	Minimum

LEVEL OF BIODIVERSITY INPUTS INTO REHABILITATION PLANS

High biodiversity input ➔ Biodiversity Action Plan (BAP)

- Specific positive biodiversity targets
- Re-vegetation using only native species
- Active control of invasive alien species
- Long-term post-closure management for biodiversity-related land use
- Active monitoring of target attainment
- Ultimate land use for conservation (taking into account land-use patterns in the broader landscape) or for natural resource use/biodiversity (forestry, grazing, etc.)

Medium biodiversity input

- May include biodiversity targets (together with targets for other forms of land use)
- Re-vegetation using only native species
- Active control of invasive alien species
- No biodiversity monitoring (except presence/absence of invasive alien species)
- Ultimate land use based on a natural resource base/biodiversity (forestry, grazing, etc.) with due cognizance of the land-use patterns in the broader landscape

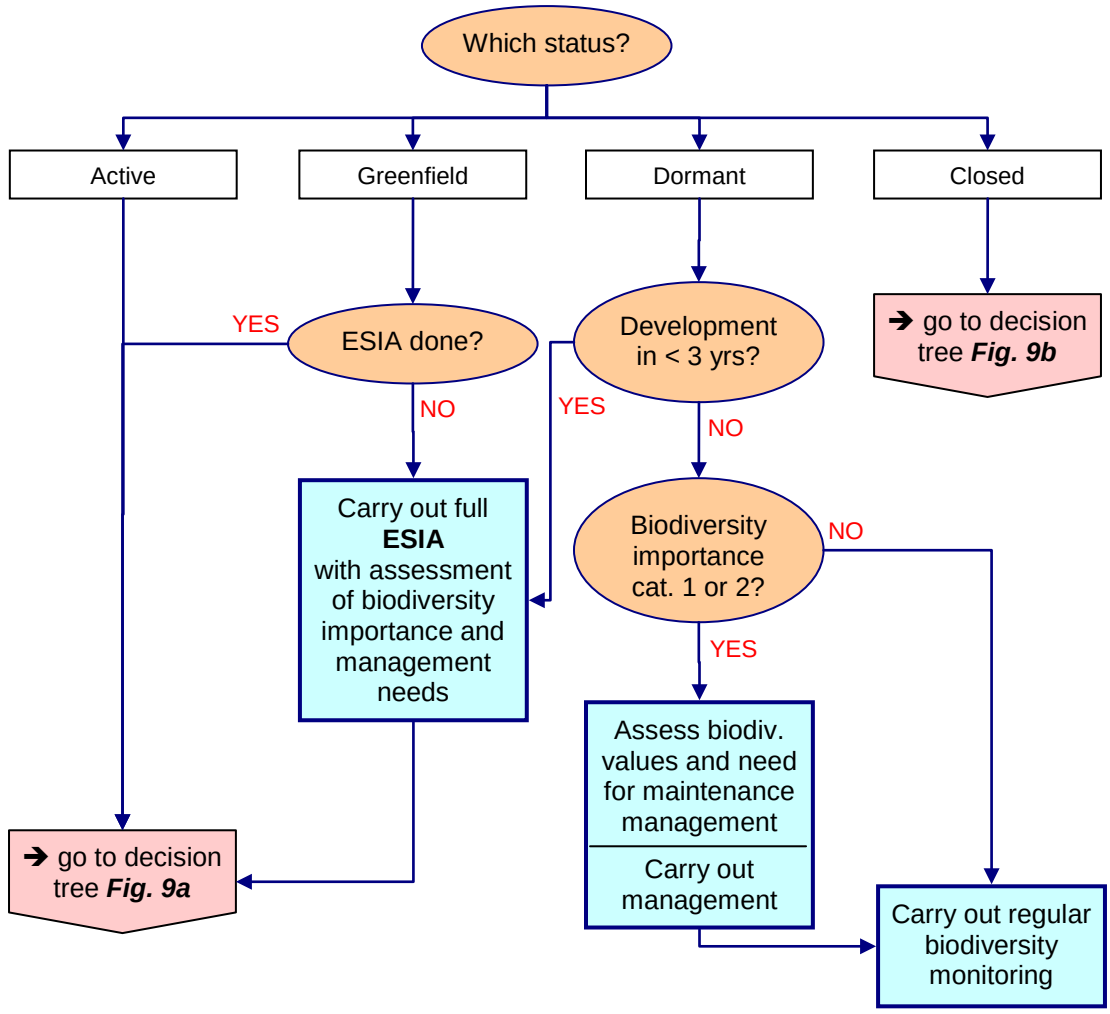
Minimum biodiversity input

- Re-vegetation using non-invasive alien species or native species
- Active control of invasive alien species
- No biodiversity monitoring
- Ultimate land use not primarily geared at biodiversity or depending on biodiversity (e.g. residential/industrial)

It is acknowledged that the cells in *Table 4* do not exactly mirror those of the Biodiversity Risk Matrix (➔ *Table 2*). The reason is that if one would associate the need for a BAP with a *Critical* or *Significant* risk value only, there would be no BAPs required for category C sites that have globally threatened species on site or close by. On the other hand, if one linked a *Medium*, *Significant* and *Critical* risk with the need for a BAP, this would mean that BAPs would be required for sites with only a 'C' category of biodiversity importance. The above recommendation is therefore based on a more refined view that focuses on BAPs for sites with a high biodiversity value only.

A series of decision trees have been compiled to assist with translating the above table into practice and determining when and how to incorporate biodiversity considerations into the Rehabilitation Plan (➔ *Fig. 9, 9a, 9b*).

Figure 9: **Decision tree for biodiversity in operational phase (extraction sites)**



The decision trees should be tested on the basis of the *highest* biodiversity value or biodiversity requirements of the site, even though this may not necessarily apply to the entire part of the site, but rather only a smaller portion of the site. For example, a BAP

may be required for a very small but important part of the site, whilst the remainder of the site may be rehabilitated with virtually no biodiversity considerations.

With regard to the application of the BMS to the great number of existing active sites (➔ *chapter 20.2*), it is likely that a formal biodiversity importance categorisation may not yet have been conducted. To operationalise the BMS, it is important to conduct these assessments so that the appropriate level of required biodiversity input into existing Rehabilitation Plans can be determined.

Figure 9a: **Decision tree for active extraction sites**

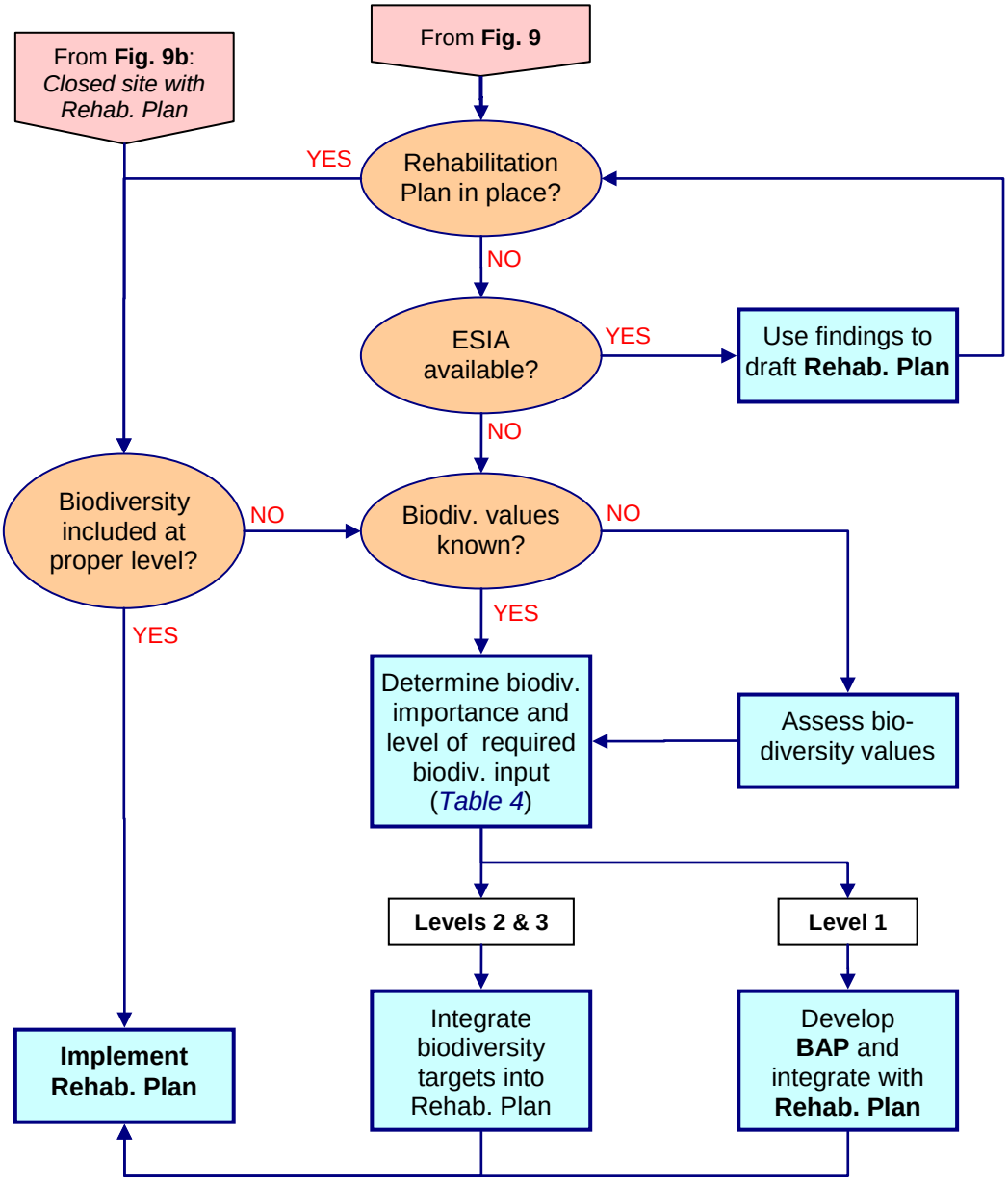
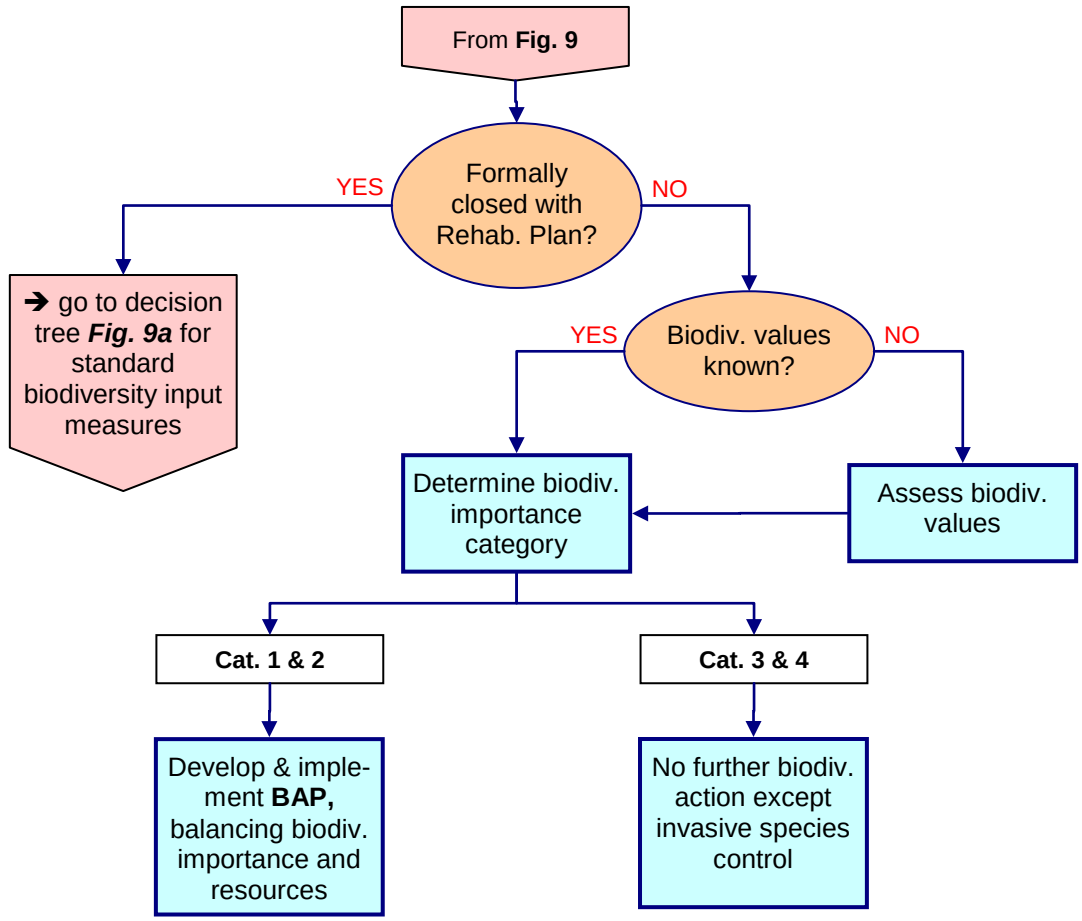


Figure 9b: **Decision tree for closed extraction sites**



13.6 Biodiversity offsets

More and more, whether voluntary or mandatory, biodiversity offsets are being planned and implemented as part of a wide range of industrial and non-industrial development projects, including by the mining sector. The Business and Biodiversity Offsets Programme (BBOP), a coalition of different organisations including conservation NGOs and representatives of the business sector, has recently published extensive guidelines and recommendations on this special case of biodiversity mitigation measures.[21]

Biodiversity offsets are a response to unavoidable biodiversity loss. They are generally seen as a less desirable option and under no circumstances should they be considered a substitute for possible measures higher up on the biodiversity mitigation pyramid (➔ *Fig. 8*). Offsets are not sufficiently well-established as a conservation technique for the IEP to encourage their widespread use by Holcim. Special circumstances (to be evaluated on a case-by-case basis), however, might render them a prudent way forward.

For example, offsets may have the benefit of conserving a sample of the habitat undisturbed by mining operations and could add to the future conservation value of a rehabilitated quarry, if they are nearby or contiguous. Or, it may be important for local stakeholder relations to use offsets as an early mitigation measure when other options like

habitat restoration cannot start for many years as the quarry develops. Due to the large time lags of habitat rehabilitation, the full benefits of such work can often only be enjoyed by the next generation, whereas offsets can deliver benefits to the immediately affected stakeholder generation.

Even with the best of rehabilitation programmes, residual negative effects on biodiversity might remain, in which case offsets could be a good option for mitigation. Although not formally labelled as such, the restoration of grasslands for feeding Sarus cranes some 30 km distant from the Holcim plant in Vietnam is an example of good practice for offsets.

However, on the down side, it should be borne in mind that areas set aside as biodiversity offsets will require the highest level of biodiversity management input (i.e. the preparation of a full BAP) and should be accompanied by a good public information process explaining the rationale of such a move. Furthermore, if offset sites are distant from the impacted site, their creation may raise concerns with communities originally not affected by Holcim operations. Additional social impacts may emerge and need to be addressed.

For a full evaluation of offsets as a mitigation measure, and for comprehensive recommendations on how to plan and implement such a programme, the above-mentioned BBOP document is recommended as an excellent and comprehensive guideline.

13.7 Implementation considerations

The process of compiling and implementing Rehabilitation Plans is already well-established within Holcim operations. However, biodiversity considerations are often not sufficiently prominent. The need to show a quick result in “greening” an area can result in erroneous species choices and/or inflated expenditure. A better understanding of the issue of biodiversity and its consideration will be key in this regard.

The compilation and implementation of BAPs is a process that is much newer to Holcim. At the moment, it is mostly confined to the UK, probably because of the widespread use of this concept in the policy and planning landscape of that country. Much therefore remains to be learned and adopted throughout the Holcim Group in order to fully integrate BAPs into the Operational Phase.

13.8 General recommendations for Operational Phase

- The categorisation of sites according to their biodiversity values is an essential prerequisite to a meaningful application of the BMS in general, and of the development of Rehabilitation Plans and BAPs in particular.
- Since desk studies will easily miss elements of important biodiversity value, the results of field assessments (at a minimum a “walkover survey” by a person with local biodiversity expertise) will be needed as planning input into biodiversity management planning (if not available from an ESIA, it must be collected during the Operational Phase).
- Generic ToRs must be compiled for carrying out biodiversity surveys that address the issue identified above.
- A partnership culture should be adopted whereby biodiversity expertise is sourced preferentially through local and other partnerships.

- Individual sites must always be considered in a broader landscape context in order to realise biodiversity benefits.
- Strategic opportunities, even with a sector-wide engagement, should be explored for access to resources coupled with a broader long-term biodiversity conservation strategy and appropriate long-term land-use model for a larger landscape or region.
- Sites should also always be considered in their social context, in terms of how post-closure land-use choices will benefit the local community as far as ecosystem services and economic opportunities are concerned. Consultation with local communities should be continuous as community preferences may change over time.

14. BIODIVERSITY REQUIREMENTS IN REHABILITATION PLANS

14.1 Purpose

The general purpose of a Rehabilitation Plan is *to satisfy regulatory and community requirements for the rehabilitation of the impacted part of the site* - to which the BMS adds the specific objective of ensuring that biodiversity conservation considerations are being included in line with the biodiversity importance and potential of the site.

In addition to its various environmental aspects, rehabilitation of an extraction site has considerable ***social dimensions***, often, in fact, significantly determining its objective and design in the first place. For example:

- Direct local employment opportunities in the rehabilitation actions;
- Restoration and improvement of ecosystem services (water, dust control, aesthetic setting etc.);
- Return to previous form of land use or creation of new land use opportunities such as farming, fishing, forestry, hunting, recreation, ecotourism (which may, of course, be subject to legal requirements, responsibilities and liabilities regarding access and use).

14.2 Outcomes/activities

In line with a recommendation by the members of the WBCSD/CSI the IEP supports the view that all active Holcim extraction sites and greenfield sites where extraction plans have been completed should have a Rehabilitation Plan. In most countries, this would already be a regulatory requirement and a condition linked to extraction permits.

The ICMM has produced a highly useful resource document that focuses on the closure of mining (quarrying) operations.[22] As the closure phase is integral to a Rehabilitation Plan, this document provides important links to biodiversity aspects that should be considered during this phase.

Key requirements and characteristics of a Rehabilitation Plan (some of which are further expanded on below) are:

- Regulatory requirements have been identified and taken into account;

- Appropriate and desired post-closure land-use and management options are established in consultation with stakeholders;
- Biodiversity- and/or community-led rehabilitation targets are set;
- Minimum levels of biodiversity input are included (in those cases where a BAP is not required);
- Opportunities for biodiversity gains are identified (in those cases where a BAP is in existence or is required);
- Progressive rehabilitation steps are defined and set out in time and space;
- Long-term sustainability of the rehabilitation actions in terms of the desired outcomes is ensured.

Rehabilitation Plans, whilst addressing a variety of potential risks (e.g. in relation to safety and the geological stability of the site), also have a strong focus on opportunities, such as the creation of an area providing some kind of economic or recreational benefit to local communities. In relation to biodiversity, the same dual approach of management of potential risks (e.g. the invasion of alien plant species that could inhibit the restoration of a valuable local habitat) and the seizing of opportunities for biodiversity enhancement will have to be pursued.

Since the rehabilitation of a site might stretch over long periods of time, this will require, to some extent, flexible and adaptive management approaches allowing the company to respond to concerns of stakeholders, legal requirements and external environmental factors that might change over time.

14.3 The importance of targets

It is essential that a Rehabilitation Plan be guided by a clear overall objective and measurable specific targets towards the attainment of this objective. These targets will be the basis of the monitoring programme (➔ *chapter 18*).

Usually, objectives and targets will have to balance interests and aspirations of local communities, regulatory requirements and, as postulated by the BMS, biodiversity considerations. In such situations, it is difficult, and in most cases actually impossible, to satisfy all requirements to a maximum extent. A hierarchical grouping of targets will be required. The following approach towards such a prioritisation is being proposed, based on the biodiversity importance of a site:

- ***For category 1 and 2 sites***: Targets defined through biodiversity conservation needs and opportunities (that must also take into account predicted environmental changes due to external factors) should be the primary ones, with other targets (e.g. interest of local communities) to be optimised underneath them.
- ***For category 3 and 4 sites***: Targets defined through local communities or other stakeholders should provide the primary guidance. These targets might be recreational or other forms of land use, but could also be conservation-oriented targets if the local community has such interests.

Targets will also be influenced by the intensity of the management inputs that are required, or can be afforded, and the legal and practical realities of the local region.

14.4 Approach

- The Rehabilitation Plan focuses on those parts of a site that have actually been exploited. However, especially when a biodiversity component is involved, it may relate to other parts of the site as well. As an example, the control of invasive species might have to cover the entire site in order to be successful.

- Ideally, rehabilitation is an ***ongoing process*** throughout the lifecycle of a site:
  - starting right at the time of the initial site preparation (e.g. topsoil and seed bank storage, translocation of rare species, etc.);
  - progressing steadily throughout the operational cycle of the site;
  - usually intensifying towards the final rehabilitation at closure;
  - being maintained after closure through aftercare for as long as might have been mandated by local authorities or agreed to in partnership arrangements.

- Although there is a wide variety of techniques and methods available for rehabilitation, they should all conform with these ***underlying principles***:
  - Approaches in restoration and conservation that work with nature, rather than against it, by capitalising on natural processes, locally available species and local adaptation;
  - Where legally allowed, reliance as much as possible on natural plant re-establishment and re-vegetation, aiming for aesthetic/functional landforms (e.g. “Landscape Simulation” in the Peak District, UK), particularly in response to stakeholder expectations and concerns;
  - Progressive implementation;
  - Actions that are linked to BAP recommendations and to BAP monitoring results (if a BAP is included);
  - Two-way linkages with the BAP: rehabilitation must be done in a certain manner to ensure that BAP provisions can also be realised, and BAP monitoring results must be fed back into the rehabilitation process in order to eventually modify the techniques used;
  - Follow-up to ensure long-term success of rehabilitation achievements (e.g. mid-to-long-term alien invasive plant control).

- Stakeholder engagement includes liaison with the regulatory authorities as well as with local stakeholders (particularly in terms of desired post-closure land-use options and BAP targets).

14.5 Information needs

If the Rehabilitation Plan is the result of a normal planning sequence, the background information needed for the development of its biodiversity component should mostly have been collected during the ESIA – in fact, the general objectives and possible specific biodiversity targets should already have been identified as well.

However, many situations can be envisaged where Rehabilitation Plans might have to be developed in the absence of results of earlier investigations. In China, for example, Holcim will probably be confronted with such a situation where, in the past, biodiversity issues have hardly been addressed in ESIAs but rehabilitation requirements are now expected to

receive more attention by the regulatory authorities. In such cases, new data will have to be collected from the site and the surrounding area, as indicated in *Fig. 9a*, covering the following:

- Information on local terrestrial, freshwater or marine habitat and species;
- Special data on individual critical species and habitats in relation to set targets and objectives;
- Information needed for a good understanding of local ecological systems (e.g. site moisture regime, seed bank dynamics, pioneer species, invasive potential, etc.).

Finally, in order to allow an adaptive management approach to rehabilitation (learning by doing) it is important that past and ongoing rehabilitation actions are properly documented and evaluated.

14.6 Management implications

Since rehabilitation has been an ongoing concern in Holcim's operations for a long time, various management structures and processes are already in place to deal with this requirement. However, in line with the recommendation that biodiversity components (the level of which depends on the biodiversity importance of each site) should be built into Rehabilitation Plans in a formal and standard manner, adjustments of skills and practices for rehabilitation management might be needed. Indeed, this will be required for the implementation of the entire BMS through the various planning and operational stages (➔ *chapter 19*).

Particularly pertinent management implications are:

- ***Quality control***: whilst rehabilitation management is supervised and directed by local staff, some form of independent quality control should be allowed for – at national company or HGRS levels, if necessary with the support of outside expertise;
- ***Monitoring***: to give credibility to biodiversity-related rehabilitation targets (and justify possible special investments) an effective monitoring process is needed (➔ *chapter 18*);
- ***Technical implementation***: for many tasks, specialised service providers can be appointed with great success, as long as company supervision and monitoring is of a high standard;
- ***Training***: company staff, as well as those from external service providers, must be trained and skilled to incorporate biodiversity aspects into classic restoration activities;
- ***Finances***: the operational budget must be sufficient to allow effective rehabilitation and, in particular, to fund the after-care of the already rehabilitated areas.

15. BIODIVERSITY ACTION PLANS

15.1 Purpose

The Biodiversity Action Plan (BAP) represents the highest level of biodiversity management for an active extraction site. Whereas every mining site must have a Rehabilitation

Plan, the BMS recommends the development of a complementary BAP only for those sites of high biodiversity importance (cat. 1 & 2) that may potentially experience medium-to-critical levels of impacts on biodiversity (➔ *chapter 13.5* and *Table 4*).

The general purpose of a BAP is *to enable the site management to maintain or improve biodiversity values during the operational and post-closure phases of the project*.

A BAP normally serves two major aims:

- ***Mitigating biodiversity loss***, with the objective of maintaining the diversity of species, habitats and ecosystems and the integrity of ecological functions; and
- Seizing opportunities for ***enhancing biodiversity*** as a contribution towards the remediation of significant global, regional and local biodiversity losses caused by expanding human economic activities worldwide.

While the former is increasingly mandatory and regulated by permitting conditions, the latter is still largely voluntary but encompasses the potential to demonstrate a commitment towards environmental issues. The mining sector, generally criticised for its destructive form of land use, is making particular efforts with respect to enhancing biodiversity by advocating the concept of "*no net biodiversity loss*" as a major principle. The cement and aggregate industry, including Holcim, has already pioneered many success stories around the world, especially in relation to the restoration of highly diverse habitats in alluvial flood plains where, through active management, species diversity has been greatly enhanced.

15.2 Outcomes/activities

As postulated for Rehabilitation Plans (➔ *chapter 14.3*), the biodiversity mitigation and enhancement measures of a BAP must be based on defined objectives and measurable targets. The choice of targets for specific biodiversity outcomes is usually more difficult than the determination of commercial or extraction targets for a quarrying site, and probably more complex than targets for the social activities around a site. The effects of management actions may have time delays of many years, and there may be many uncontrollable external factors at play that could greatly influence the outcome of biodiversity management.

In contrast to the Rehabilitation Plans, where primary objectives may relate to non-biodiversity values, BAPs, by definition required for sites of high biodiversity importance, will in most cases give priority to biodiversity-led targets, with other forms of land use being subsidiary considerations (i.e. not jeopardising biodiversity conservation).

To ensure the attainment of identified biodiversity objectives and outcomes, the following key principles must be adhered to:

- Biodiversity targets (see example in box below) should be in relation to national or other level Biodiversity Action Plans that might cover the area;
- The principal actions required to attain each of the targets should be defined;
- The outcome of these actions should be monitored;
- Management actions should be adapted based on the monitoring results;
- The long-term sustainability of the biodiversity management should be ensured through appropriate partnerships and resourcing;
- The BAP should be integrated with the site's Rehabilitation Plan and EMP.

BAPs also result in various direct or indirect ***social outcomes***:

- Promotion of sustainable socio-economic activities and outcomes related to biodiversity management;
- Promotion of educational and research opportunities;
- Active involvement of local volunteer groups.

TARGET TYPES FOR BIODIVERSITY ACTION PLANS

Targets for Habitats

- Maintaining Extent - No reduction in the area of BAP habitat;
- Achieving Condition - Maintain and/or improve the condition of the existing BAP habitat;
- Restoration - Improve the condition of relict or degraded habitat; and
- Expansion - Increase the extent of BAP habitat.

Targets for Species

- Range - Maintain or increase range compared to range in reference year or at start of monitoring; and
- Population Size - Maintain or increase population size compared to level in reference year or at start of monitoring.

Targets for processes and flux

- Variation – Maintain current variation in, for example, fire return periods (avoid homogenization through too rigorous management).

Partly based on *Peak District Biodiversity Action Plan Mid-Term review 2001-2007*
www.peakdistrict.org/bapreview.pdf

15.3 Approach

A number of principles must be observed in the creation of a BAP:

- Since BAPs are complementary to Rehabilitation Plans, they must be formulated in such a way as to accommodate progressive rehabilitation and legal requirements.
- Although the BAP concerns a single site, it should take into account the wider landscape and conservation context, as these determine the biodiversity targets of the Plan (thus including buffer zone and potential corridors for connectivity).
- A site-specific BAP should be hierarchically linked to higher-order (e.g. regional or national) BAPs, if available, so that it may function as a contributory input into the targets of a BAP at a larger spatial level and/or higher-order system level.
- BAPs should be integrated with all of the other types of environmental management plans that might already exist for the site (or parts thereof) or for adjacent areas (e.g. SSSI's in the UK).
- In the same manner, a BAP must be linked to the EMP (with the BAP having the function of addressing provisions found in the EMP).
- The time scale for the compilation of a BAP is six-to-12 months, depending on the size of the area, type of ecosystem, quality of available information, number and

interest of stakeholders, regional setting, regulatory framework, and competence of and level of interest by regulatory authorities.

Methods and techniques in the development and implementation of BAPs are based on the same principles as for any environmental management plans:

- Detailed field investigations should be conducted;
- Biodiversity targets should be set;
- Monitoring programmes should be created to assess progress towards stated biodiversity outcomes;
- Monitoring must be related to adaptive management assumptions and thresholds of potential concerns (or triggers for action) must be set;
- Monitoring should be based on accepted ecological monitoring standards;
- Monitoring techniques must be cost-effective and appropriate for application;
- The techniques chosen for application must be consistently used over an extended period, including climatic cycle fluctuations, and only amended or disbanded if they are clearly inappropriate or when a vastly superior technique and procedure has been developed;
- Monitoring results should feed back into GIS and databases;
- Adaptive management should be used;
- Stakeholder engagement should be included, for example liaison with regulatory authorities and regular interactions with local communities (Community Advisory Groups).

15.4 Information needs

While the information needs for BAPs are basically the same as for the biodiversity components for Rehabilitation Plans, the required level of detail and accuracy might be higher. The development of a BAP, preferably to be undertaken by a contracted expert or a partnership NGO, would normally include the collection of some further relevant background data, even if an ESIA has been carried out at an earlier stage.

15.5 Relationship between Rehabilitation Plans and BAPs

As to the question of lumping or splitting the plans for rehabilitation and biodiversity management the following has to be borne in mind (see also *chapter 13.4*):

- The Rehabilitation Plan is mostly geared towards ensuring compliance with legal and permit provisions;
- The BAP is based on reaching certain biodiversity targets (not necessarily based on a formal requirement);
- All (or most) active sites will have Rehabilitation Plans, but BAPs are not warranted where biodiversity values are low;
- Rehabilitation Plans will often be implemented by people or service providers with a different set of skills, experience and outlook than that required for the implementation of the BAP provisions.

Therefore, a stand-alone BAP may be preferable. Nevertheless, since they will often be implemented simultaneously, the BAP and Rehabilitation Plan should have strong linkages with each other, as well as with the EMP that addresses many other aspects of environmental management, some of which might have an indirect linkage with biodiversity.

	Rehabilitation Plan	Biodiversity Action Plan
Legal requirement	Generally required as part of permit conditions	Mostly voluntary but more and more becoming a required part of the permitting process
Biodiversity focus	Often secondary focus	By definition primary focus
Targets for end land use	Can be different from original land use, based on practical considerations and/or community demands	Can be different from original land use, primarily based on biodiversity preferences, but may be influenced by community demands and practical considerations
Target(s) for end site condition(s)	Target(s) set locally	Determined by national or regional biodiversity target(s)
Site area concerned	Mostly extraction areas, as well as stockpiling, service and transport areas	Covering whole site (extraction sites and non-disturbed areas alike)
Site preparation	Need to stockpile topsoil and store indigenous plants *ex-situ* for later re-establishment	Need to stockpile topsoil and store indigenous plants *ex-situ* for later re-establishment
Earthworks and landscaping	Extensive, but limited by legal requirements	Limited, but may need to exceed legal rehabilitation requirements in order to achieve a meaningful biodiversity outcome
Angle of repose	May be preferred from a financial perspective	May not be acceptable as a habitat for indigenous species
Level of intervention	Mostly active. Although a *laissez-faire* approach may be appropriate for certain restoration purposes, this will be mostly limited by legal and permit conditions.	Active or passive. *Laissez-faire* with protection (relying on the passage of time to achieve a certain outcome) is often an acceptable and cost-effective strategy.
Vegetation	Choice of species based on growth potential and functional role (soil binding, erosion control, etc.). Non-invasive alien plant species may be preferred.	Choice of species based on local occurrence and their function in habitat creation for other plant species and indigenous fauna. Alien species are to be avoided.
Fauna	Mostly of secondary importance	Often of primary importance, depending on biodiversity target(s)
Visual/aesthetic connection to the surrounding landscape	Often highly prized by the local community (in terms of obtaining a visually compatible land form)	Mostly secondary to biodiversity considerations
Biological connectivity to surrounding landscape	Often of limited importance and/or significance	Mostly highly significant in terms of target attainment and/or avoidance of threats
Social aspects	Mostly linked to restoring previous land use and/or aesthetics	Aesthetics, heritage, environmental education

Ecosystem services	Mostly aimed at restoring/replacing previous services to users/ecosystems outside the project area (provisioning, regulating and cultural services, as defined by the Millennium Ecosystem Assessment)	Mostly focused on ecosystem support (internal) (according to the Millennium Ecosystem Assessment terminology)
Recreational demands and opportunities	Open-air activities. Limited by threats to restoration outcomes (stability, erosion, etc.)	Access to nature, environmental education. Limited by disturbance to native fauna and flora
Expertise required	Geo-engineering, restoration ecology	Biodiversity, population ecology, restoration ecology
Implementation	Progressive	Progressive
Implementers	Quarry management, sub-contractors	Service providers, NGOs, volunteers, quarry management
Monitoring	Focused on structural and cover elements of vegetation	Focused on habitat, fauna and flora diversity
Time horizon	Short- to mid-term (with specific end date)	Long-term (in perpetuity)

15.6 Management implications

Supervising and directing a BAP requires a certain management set-up. Whereas the implementation of Rehabilitation Plans will often by handled by Holcim site staff themselves, a broader range of options might have to be considered for the implementation of a BAP, ranging from full in-house responsibility to a total hands-off approach. The different options are:

- Establishment of an in-house management team that has the necessary conservation management knowledge and capacity;
- Outsourcing the management to a conservation partner (e.g. local conservation NGO or conservation agency);
- Creation of a separate entity (such as a Trust) that becomes responsible for implementation;
- Partial or full outsourcing of some or all management activities to a private sector provider (could be an existing service provider or it could be a new entity set up to generate social benefits in terms of employment and capacity building in the local community);
- Integrating interested volunteers, school groups, etc. in certain facets of the BAP (as opportunities for outdoor or educational experiences).

As for Rehabilitation Plans, adequate funding needs to be available for the successful implementation of a BAP. The estimation of the long-term costs must be in the ToR of BAP development, so that these costs may be properly included in the financial planning of the responsible plant and/or national company. The BAP funding strategy also needs to ensure that the costs of biodiversity management, which might have to continue for many years after closure, will be guaranteed (particularly also if the land or control of the land is transferred to a third party).

16. GENERAL CONSIDERATIONS

16.1 Rationale

If biodiversity management is to be integrated into Holcim planning and operational processes in a convincing manner it will have to be underpinned by a credible programme of Monitoring and Evaluation (M&E), such as those that are routinely undertaken for other aspects of business performance, including output of products, economic performance, health and safety or pollution control. Ultimately, biodiversity management should result in a Key Performance Indicator (KPI) for the entire company – as has indeed been postulated by Holcim itself when commissioning this work.

The rationale for biodiversity M&E originates from the following sequence of evident questions (and associated sub-questions) arising out of the principles of good land stewardship and professional management:

RATIONALE FOR MONITORING & EVALUATION

1. **Recording biodiversity:** *Do you know the biodiversity of the site for which you are responsible?*
   - Do you know the biodiversity importance category?
   - Do you have an inventory of key ecosystems, habitats and species?
   - Do you know how the critical species are using the area?

2. **Monitoring biodiversity:** *Do you know if biodiversity is changing while you are operating the site?*

3. **Evaluating biodiversity change:** *Do you know why it is changing?*
   - Is this due to:
     - Holcim's activities;
     - Activities of others;
     - General environmental changes of the surrounding area; or
     - A combination of the above?
   - Do you have to adapt mitigation measures?
   - Are there opportunities for doing more and creating biodiversity gains?

4. **Reporting on biodiversity performance:** *How successful is your biodiversity management?*
   - On site?
   - In your country?
   - For the entire company?

5. **Reporting on biodiversity outcomes:** *What impact does your management have on the status of biodiversity?*

16.2 Key requirements

The big challenge for the design and the implementation of a BMS M&E programme is to find a balance between what is practicable and doable by an industrial company and what is meaningful from a biodiversity conservation point of view:

- ***Practicable***: For the initial biodiversity inventories, which are mostly done in conjunction with ESIAs or the development of management plans, outside expertise is probably being used as a matter of course. However, for the subsequent monitoring, an operational process that will be repeated at regular intervals, the system should have a large component that can be executed by Holcim staff (after appropriate training) (➔ *chapters 18.6*).

- ***Meaningful***: The programme should provide credible and defensible information that allows Holcim to feel confident about the management of its biodiversity assets and about its accountable and transparent reporting on biodiversity performance.

16.3 Limitations

Despite the aim of fulfilling these two requirements, any M&E system will in the end only be as good as the amount of time and resources that are being invested into it. The more Holcim is prepared to spend on M&E, the more weight the results will carry. Experience has shown that, in conservation, a meaningful M&E programme measuring impact (as against performance only) may have a price tag of 5-10% of the associated project costs (i.e. biodiversity management of a quarry operation).

Also, since in biodiversity management there are long time lags and a diversity of external contributory factors, the M&E system will result more in the demonstration of trends, rather than making direct linkages between management measure and changes in biodiversity. However, while in relation to individual sites the information value of the M&E results might for these reasons be limited, on a higher (e.g. country) level, the cumulative results might provide a good indicator for the overall outcome of biodiversity management (➔ *chapter 18.8* on KPI).

17. BIODIVERSITY INVENTORIES

17.1 Purpose

As an expression of responsible land stewardship, the general purpose of collecting information on biodiversity at extraction and large production sites is *to know what biodiversity assets Holcim controls on its land and is responsible for*. In the same manner as a thorough knowledge of the mining resources *below* ground is required for the planning of resource extraction, information on natural assets *above* ground is essential for reducing impacts on and safeguarding biodiversity.

More specific objectives of the biodiversity inventories are:

- assessing biodiversity importance and risks of the site;

- evaluating impacts on biodiversity, required mitigation and possible biodiversity enhancement measures (inputs for Feasibility Study, ESIA, Rehabilitation Plan and BAP); and
- providing baseline data for the monitoring of biodiversity and measuring the effectiveness of biodiversity management.

17.2 Biodiversity inventory levels

The collection of data on biodiversity must have a clear functional purpose. Whilst, for the proper implementation of the BMS, information on local biodiversity must be collected for *all* Holcim sites qualifying for inclusion in the BMS (➔ *chapter 4.4*), the question of what should be collected, and at what degree of detail and accuracy, will depend on the precise function it has to serve. This will inevitably vary from site to site, depending on the biodiversity importance of the site, and the nature of Holcim commercial activities and required biodiversity management, but three broad levels of biodiversity inventory data can be defined:

- ***Basic level***: Data to assess the biodiversity importance of the site and the major risks that could result from Holcim operations.
- ***Standard level***: Data to underpin biodiversity management, i.e. the planning and implementation of mitigation and enhancement measures.
- ***Advanced level***: Data for monitoring the effectiveness of biodiversity management.

The table below summarises which level of inventory is required for which site and what information should be included in the different types of inventories (for a complete overview of the various levels of biodiversity inventory and monitoring ➔ *Table 5*).

	WHICH SITES? ***If any one of these apply:***	***WHAT INFORMATION?***
Level: Basic	***All extraction sites*** (active, dormant, closed) Other sites ***>5ha***, ***owned*** by Holcim Other ***active*** sites ***>5ha***, ***leased*** by Holcim Other sites known to be of special ***local biodiversity importance***	For area within 5km of site, list of: - Globally endangered or rare species (IUCN Red List) - Nationally endangered or rare species (national Red List) - Internationally or nationally recognised PAs/reserves - Globally outstanding ecosystems - Nationally important ecosystems/habitats Important ecological connections to habitats of nearby globally or nationally endangered species or to nearby PAs Level of landscape and natural ecosystem diversity around site Potential for re-creation on site of a habitat more diverse than surrounding landscape
Level: Standard	***Any site*** with ***Rehabilitation Plan*** containing a biodiversity component or ***BAP*** ***Any site*** of biodiversity importance ***cat. 1 or 2***	**Qualitative** list of species occurring on, or making use of site (as complete as can be achieved in ESIA or similar background study) - Vertebrate species - Important non-vertebrates - Higher plants, especially those characteristic for

	Any ***active*** or ***closed resource*** site of importance ***cat. 3***	respective ecosystems - Karst species (if relevant) Major ecosystem and habitat types on site and their approximate extent Type of surrounding landscapes, ecosystems and land-use forms Natural resource use by local stakeholders on or around site List of possible indicator species
Level: Advanced	Sites where: - Biodiversity management requires the monitoring of certain species, habitats or ecosystems - Biodiversity indicators have been chosen for measuring site, national or global biodiversity management performance	**Quantitative** baseline information for selected biodiversity parameters required for monitoring programmes, such as: - Distribution and abundance of chosen indicator species - Extent and quality of habitats or ecosystems - Areas affected by biodiversity management measures

17.3 Information needs

The basic information needs for the different levels of biodiversity inventories are in the above table. The information for the basic inventory should be consistent and comprehensive for every site, but some site-specific variations will be inevitable for the standard level – and even more so for the advanced level. The completeness of a species list, for example, will somewhat depend on local ESIA requirements, length of time available, or the expertise of the ESIA team – and might indeed not always be necessary to design a biodiversity management programme. For the advanced level, the required quantitative data will be focussed on those particular biodiversity parameters selected for a specific site.

17.4 Data collection

- ***Basic level:*** As much as possible of this information should be collected during the Opportunity Study, but it might have to be complemented with data resulting from the Feasibility Study, and possibly even further amended as a result of the ESIA. The principal method is to collate the information from available on-line data sources, especially IBAT. If the on-line datasets are not complete enough, or of insufficient resolution, more individual approaches might be required, such as consultation by specific experts (➔ *chapter 9.4*).

- ***Standard level:*** The bulk of the information required for this level should result from the ESIA, possibly supplemented with data collected as part of the preparation of the Rehabilitation Plan or a BAP. The data collected for these inventories will require the involvement of one or more outside experts (➔ *chapters 12.4/12.5* and *14.5*).

- ***Advanced level:*** The data required as a baseline for biodiversity monitoring is very specific and will have to be collated by an external expert or NGO partner (➔ *chapter 18.2*).

17.5 Biodiversity Database

While the *standard* and *advanced* biodiversity information is to be kept by individual plants as part of the background documentation for biodiversity management, the *basic level* biodiversity information is to be integrated into a global database maintained by HGRS.

Such a database has in fact already been created by Holcim, concurrent with the development of this BMS proposal. Its information source is a biodiversity questionnaire designed in iterative steps with feedback from the IEP and distributed as part of the annual PEP to be completed by all plants.

- It should be noted that these self-assessments by plant staff with no particular biodiversity training appear to be of mixed accuracy, reducing the present usefulness of the database. The system should be progressively further developed and improved to ensure that all the data originating from the basic biodiversity inventories (compulsory for the large majority of extraction and large production sites) are eventually of reliable and consistent quality.

To achieve this, a number of measures should be considered:

- Further development of the guidelines for these basic database inventories;
- Training for responsible staff;
- More in-depth training of a few selected staff who will survey all sites in a region or a country;
- Adoption of a timetable for completion of the database on existing landholdings within two years, based on a priority system (➔ *chapter 20.2*).

Finally, as an important ***management implication***, it must be ensured that HGRS does have the capacity, resources and expertise to populate and maintain the database and make some judgment of the quality and accuracy of the submitted information.

18. BIODIVERSITY MONITORING

18.1 Purpose

The general aim of M&E is to obtain timeline data on chosen parameters and analyse the results in relation to undertaken activities. Whilst the first step of measuring the parameter is a relatively straightforward scientific undertaking (albeit not always simple), the second step of evaluating the results and identifying cause and effect is a more complex and often scientifically less-robust undertaking in biodiversity management. Holcim requires such timeline data on biodiversity for two principal purposes:

- ***Biodiversity impacts***: to understand the impacts of the company's activities on biodiversity (*biodiversity impact monitoring*);
- ***Management effectiveness***: to assess the effectiveness of biodiversity management measures on performance and outcome levels (*management effectiveness monitoring*).

Four hierarchical monitoring ***objectives*** can be derived, where each is dependent on the results of the previous one:

- Monitoring changes in biodiversity (status, distribution and composition of species, quality and distribution of habitats and ecosystems);
- Assessing the effect of human activities on biodiversity;
- Evaluating the effectiveness of biodiversity management measures on performance and outcome levels (against chosen indicators or targets);
- Providing information for reporting on biodiversity management performance and outcomes.

18.2 Preconditions for monitoring

For each of the two principal purposes of monitoring, there is a fundamental precondition without which monitoring programmes do not make sense:

- For ***monitoring impacts*** on biodiversity, ***baseline information*** on the status of biodiversity before activities began is required. This is one of the important functions of biodiversity inventories (e.g. in conjunction with ESIAs). If this information has not been collected as part of previous investigations, or is likely not to be up-to-date anymore, baseline information must be collected before the onset of activities whose impact one would like to monitor.
- For ***measuring effectiveness*** of biodiversity management, ***targets*** must have been set against which progress can be assessed. The importance of such targets for biodiversity management has been highlighted in *chapter 15.2.*

18.3 Biodiversity monitoring levels

As for biodiversity inventories, the degree of impact monitoring (intensity, frequency, etc.) and the nature of the monitored parameters will be dependent on external requirements that might be linked to operating permits, internal needs of performance evaluation and available resources. Even if the exact monitoring programme is likely to vary at each site and be tailored towards specific needs, three main (additive) levels should be distinguished :

- ***Basic level***: Combination of impact and management effectiveness monitoring to provide feedback on biodiversity management;
- ***Standard level***: Impact monitoring of qualitative changes in selected biodiversity parameters;
- ***Advanced level***: Impact monitoring of quantitative changes in selected biodiversity parameters.

The table below summarises which level of monitoring is required for which site and what type of biodiversity parameters should be chosen (a summary overview of the various levels of biodiversity inventory and monitoring is provided in *Table 5*).

	WHICH SITES? ***If any one of these apply:***	***PARAMETERS AND FREQUENCY***
Level: Basic	***Extraction sites:*** - Active sites with ongoing BAP, Rehab. Plan (with biodiversity component) or other forms of biodiversity management - Old sites, closed for <10 years with ongoing or past (<5 years) biodiversity management ***Production sites*** containing >5ha of contiguous unused, natural land of biodiversity importance cat. 1-3 AND with ongoing or past (<5 years) biodiversity management	***Once per year***: **qualitative** assessment of up to five site-specific *selected* biodiversity indicators
Level: Standard	***Extraction sites:*** - Any site of biodiversity importance cat. 1 or 2 - Active or closed sites with some form of ongoing or past (<5 years) biodiversity management ***Production sites*** containing >5ha of contiguous unused, natural land of biodiversity importance cat. 1-3 AND with ongoing or past (<5 years) biodiversity management	***At least every 3 years***: ***qualitative*** "walkover" surveys of: - extent and status of (*selected*) key ecosystems/habitats of the site - presence of (*selected*) key species of plants and animals representative and charcteristic for the ecosystems and habitats concerned
Level: Advanced	*Selected* active ***extraction sites*** with BAP or other forms of major biodiversity management	**At least once a year: *quantitative*** assessment of: - Status of *selected* species of plants and animals representative and characteristic of the ecosystems and habitats concerned - Other appropriate, *selected* ecosystem or habitat parameters

The general thinking and key principles of the proposed monitoring programmes are:

- Some basic form of biodiversity impact and effectiveness monitoring should be carried out at every site with ongoing or past (less than five years) biodiversity management.
- For reasons of practicality and simplicity (i.e. execution, if possible, through local Holcim environmental staff) the annual monitoring at these sites is focused on up to five selected site-specific indicators that will be used to measure biodiversity performance of the site (to be aggregated into a national and global performance indicator).
- To complement this information, at least every three years a qualitative Rapid Biodiversity Survey should be undertaken by an expert for a qualitative assessment of key habitat/ecosystem features and characteristic plant and animal species.
- Such a Rapid Biodiversity Survey should also be done at every Holcim site of biodiversity importance cat. 1 or 2 (i.e. presence of globally or nationally important species and protected areas), unless proper ESIA information is available.

- Some extraction sites with high levels of biodiversity management (BAPs) should be chosen (e.g. a minimum number in each country) for additional quantitative monitoring of selected biodiversity parameters by appropriate expert(s).

18.4 Information needs

While biodiversity inventories are a "one-off" investigation with the aim of providing as comprehensive a picture as possible, monitoring aims at establishing time-line data sets on selected biodiversity parameters. They should be as consistent as possible so that changes over time can be derived.

The nature of the data required for the different levels of monitoring vary from each other:

- ***Basic level:*** Since this is the most frequent and regular type of monitoring (once per year at every site), the data should be as easy as possible to collect: above all, an indicator that, if possible, could be assessed by a non-expert and presented by means of a simple numerical system (➔ *chapter 18.5*).

- ***Standard level:*** The information needed for this type of impact monitoring (*qualitative* "walkover" surveys at sites with biodiversity management targets) is in principle the same as for biodiversity inventories (➔ *chapter 17.3*), though generally less comprehensive and focused on selected elements of biodiversity (e.g. characteristic species groups). The comparison of results with those of previous surveys would be more elaborate than for basic-level monitoring. Available techniques for analysing such datasets (i.e. assessing trends of changes) are also based on fitting the data into numerical systems.

- ***Advanced level:*** The data requirements for the intensive (once per year) *quantitative* monitoring of a series of (selected) biodiversity parameters could be similar to what might have been needed for the preparation of a BAP (i.e. as baseline information) and would generally be analysed and presented in a manner tailored towards the specific data.

18.5 Indicators

The choice of indicators is a critically important step for the design of a monitoring programme, especially for the basic-level monitoring, and determines the relevance, as well as the practicality of the monitoring scheme.

Level and relevance of indicators

The central initial question is: *What do we want to assess with the help of the monitoring data*? On a continuum of cause-and-effect, linkages from a specific activity on the ground to an ultimate impact on biodiversity can be measured at different levels, as shown in *Fig. 10*. For reporting to local management on the annual attainment of targets in the work plan (*biodiversity management indicators*), different parameters have to be chosen than for the reporting of biodiversity impact indicators. The BMS is mainly concerned with the latter, and indicators should be set accordingly.

As an example, in relation to the restoration of a destroyed forest habitat, the following indicators are conceivable:

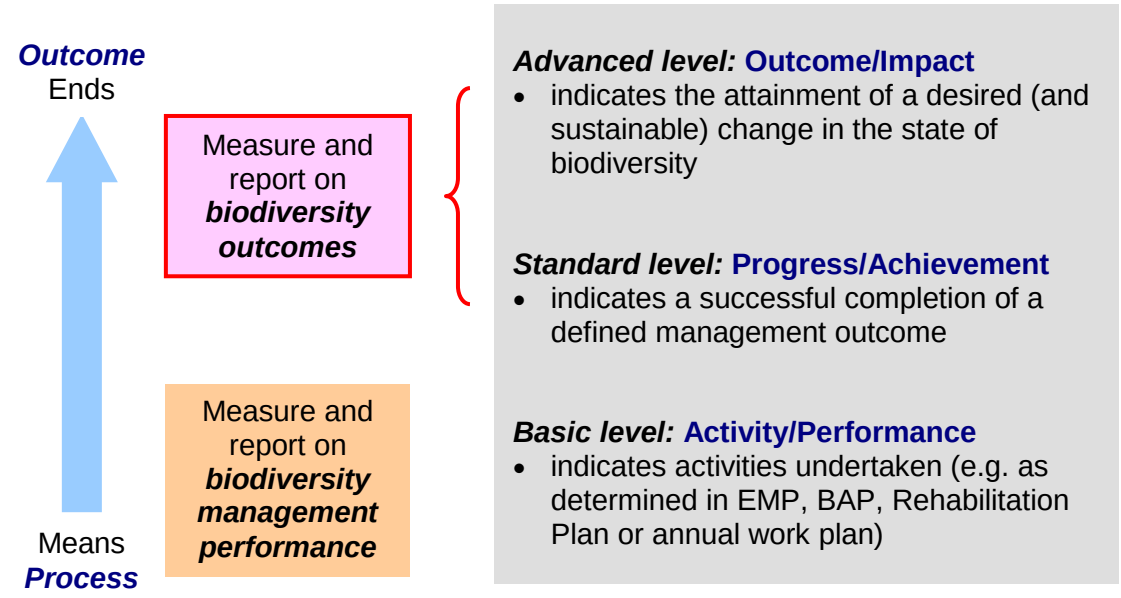
- ***Activity*** (1 year): meeting annual tree-planting target.
- ***Progress*** (10 years): young forest successfully established.
- ***Outcome*** (25+ years): characteristic plant/animal species inhabiting forest.

Types of indicators

In order to meet the requirement of practicality, indicators should be:

- meaningful, but relatively straightforward to measure;
- measurable by means of a standardised methodology;
- ideally assessable by non-experts (e.g. Holcim environment staff), although support from a collaborating NGO or expert might be required;
- designed in such a way that they can be expressed by means of a numerical value or another form of standardised classification (so that progress can be tracked easily from year to year);
- identified at an early stage, ideally already during the ESIA (to be included in ESIA ToR);
- reported as part of the annual environmental assessment.

Figure 10: **Levels of biodiversity monitoring**



Although the indicators will probably differ a lot among sites, if similar habitats or ecosystems are involved, efforts should be made to introduce a certain element of constancy. On sites with karst formations, for example, at least one cave-related indicator should be chosen. Examples of biodiversity parameters that could be used as monitoring indicators are given in the box below.

Choosing indicators

As also stipulated for biodiversity management *targets*, indicators for measuring possible changes in biodiversity should be identified as early as possible (e.g. during the ESIA) for several reasons:

- The identification of suitable indicators (practical and meaningful) has to be done by an expert – the person investigating biodiversity for the ESIA might well be best qualified for doing so;
- Budget provisions for M&E could then be incorporated at an early stage of site management planning;
- If the indicators are eventually to be monitored by Holcim site staff, appropriate training could also begin early.

EXAMPLES OF INDICATORS FOR MONITORING PROGRAMMES

Species

- Presence of selected species with accuracy level ranging from yes/no to quantitative information on numbers and/or distribution (for monitoring level 3)
  - Nationally or globally red-listed species
  - Species of special local conservation concern
  - Species characteristic of habitats/ecosystems
- Number of species recorded within a fixed observation period or along a transect line
- Species diversity (levels 2 & 3)
- Abundance index of important/problematic species (invasive plants)

Habitats/Ecosystems

- Extension/contraction of different habitats plotted on map
- Coarse assessment of vegetation structure
- Plant diversity around fixed sample points
- Ground cover

18.6 Execution of monitoring programmes

Although ultimately it will depend on the precise circumstances at individual sites, resources and expertise, an M&E programme should aim at the following arrangements:

- ***Basic level:*** The monitoring of up to five basic indicators, to be reported on as part of the PEP, should be designed in such a way that, if ever possible, it could be undertaken by suitable Holcim staff. Some training will be required, but this must be viewed as an important and justifiable investment for the success of the BMS.
- ***Standard level:*** This type of monitoring, a *qualitative* assessment of key biodiversity features to be done at least every three years, should basically be in the form of a Rapid Biodiversity Survey conducted by a good general naturalist familiar with the specific locality. Alternatively, such a task could be part of a partnership agreement with a local NGO.
- ***Advanced level:*** Since this monitoring contains a quantitative element, it will inevitably call for the involvement of outside expertise (individual, consulting firm, NGO). It is proposed that, ultimately, a small number of sites with

particularly important biodiversity values are chosen per country for this kind of more detailed monitoring. It could be expedient to have the same persons covering all chosen national sites.

18.7 Corporate reporting on biodiversity

Part of the IEP assignment is to investigate the possibility of a Key Performance Indicator (KPI) for Holcim relating to biodiversity. This is in fact seen as an essential component of a BMS that will help Holcim effectively manage its biodiversity assets.

However, a distinction should be made among three different types of reporting on biodiversity:

1. ***Reporting on biodiversity assets***: Based on the information collected in the HGRS Biodiversity Database (➔ *chapter 17.5*) Holcim's Corporate Sustainability and Responsibility Report should in future progressively include more summary information about the biodiversity values of its landholdings and the efforts invested into biodiversity management.

2. ***Reporting on biodiversity management performance***: As part of the annual PEP, every plant and/or site should be requested to report on the results of the basic biodiversity monitoring. Since these indicators should be expressed numerically (or in a system of categories), they should also lend themselves for aggregation on country or global levels (➔ *chapter 18.8*).

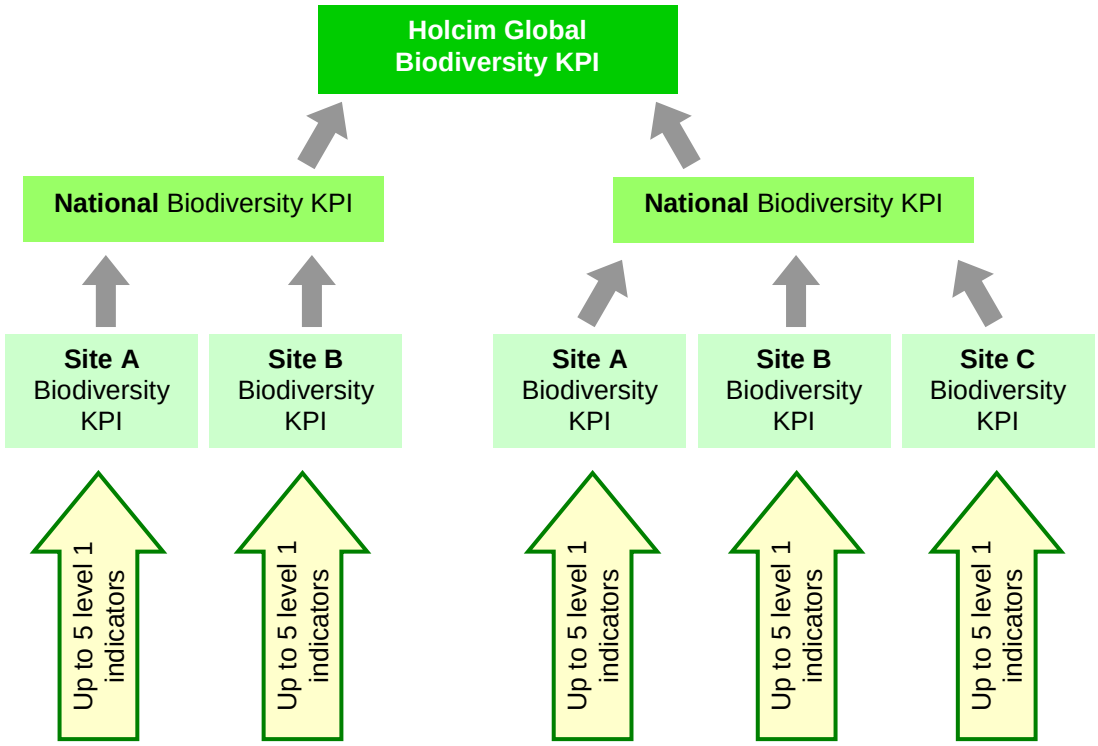
3. ***Reporting on biodiversity outcomes***: Building on the results of the standard-level biodiversity monitoring (the advanced level could probably also be included) and parallel to the reporting on biodiversity assets, this should become a feature of the Holcim Sustainability Report. Similar to the performance indicator, the results should be aggregated on higher geographical levels in order to present a summary picture of the status of biodiversity on Holcim landholdings (➔ *chapter 18.9*).

18.8 Biodiversity Performance Indicators

As part of the PEP, each site should annually collect information on up to five selected numerical performance indicators. These can be aggregated into a biodiversity site KPI that in turn could be aggregated into biodiversity KPIs on national and international levels respectively (➔ *Fig. 11*).

It might take some experimentation as to how precisely such an aggregation should be done, and the system might not be the same for the site level as for the national/ international levels. For the latter, a simple method could initially be used, such as the percentage of site KPIs showing a positive development, until, through the experience of usage, a more refined method has emerged.

Figure 11: **Aggregation of biodiversity KPIs**



18.9 Biodiversity Outcome Indicators

While basic-level monitoring will result in a *Holcim Global Biodiversity KPI,* a *Biodiversity Outcome Indicator* derived from the findings of the two higher levels of biodiversity monitoring (standard and advanced) would be more relevant and meaningful for assessing the effectiveness of the BMS and its underlying policies. To measure the outcomes of corporate investment into biodiversity management, this indicator should become a fixed part of the Sustainability Report. Although the information content would be considerably more than is required by the GRI standards, it would likely give Holcim particular credibility in this field.

Ultimately, the outcome reporting could provide the basis for Holcim to adopt the concept of "*no net biodiversity loss*" as a high-level management goal. Such a policy has already been adopted by Rio Tinto. The undoubtedly complex issues that are attached to such a concept (e.g. the question of how biodiversity of different ecosystems may be compared with each other – also a central discussion point in relation to biodiversity offsets) would have to be carefully evaluated for the cement and aggregates industry. However, the IEP believes that solutions to such questions could be found.

- It is recommended that Holcim should identify and establish impact measurement indicators that could serve as a basis for an eventual adoption of a "no net biodiversity loss" policy.

Table 5 - Summary of inventory and monitoring levels

➔ *For more details see respective tables in text*

Levels	*During which phase?*	*At which sites?*	*What is it needed for?*
Basic Inventory level List of rare/threatened species and important protected areas	**Opportunity Study** (with possible amendments from Feasibility Study)	Extraction sites Other sites >5ha Sites of known local biodiversity importance	Identification of biodiversity importance category Identification of position on Biodiversity Risk Matrix Holcim global biodiversity database
Standard inventory level Qualitative list of species, habitats and ecosystems	Possible first information from Feasibility Study **ESIA** Preparation of biodiversity element of Rehab. Plans Preparation of BAPs	Sites with Rehabilitation Plan or BAP All sites of biodiversity importance cat. 1 or 2	Planning of biodiversity management (Rehab. Plans, BAP) Baseline for biodiversity monitoring
Advanced inventory level Qualitative list of species, habitats and ecosystems	ESIA Preparation of biodiversity element of Rehab. Plans **Preparation of BAPs**	Sites with significant biodiversity management Sites with indicators to measure biodiversity management performance and outcomes	Planning of biodiversity management (Rehab. Plans, BAP) Baseline for biodiversity monitoring
Basic monitoring level Annual qualitative assessment of selected biodiversity indicators	**Operational phase**: Rehabilitation Plan and BAP	Sites with ongoing or past (>5 years) biodiversity management	Evaluating effectiveness of biodiversity management Planning of adaptive management For site, national and global biodiversity KPI reporting
Standard monitoring level Every 3 years: Qualitative Rapid Biodiversity Surveys of key species and habitat/ ecosystem features	**Operational phase**: Rehabilitation Plan and BAP	Sites of biodiversity importance cat. 1 or 2 Sites with ongoing or past (>5 years) biodiversity management	Evaluating effectiveness of biodiversity management Planning of adaptive management For biodiversity outcome reporting
Advanced monitoring level Annual quantitative assessment of selected species and ecosystem parameters	**Operational phase**: Rehabilitation Plan and BAP	Selected extraction sites with major biodiversity management	Evaluating effectiveness of biodiversity management Planning of adaptive management For biodiversity outcome reporting

19. MANAGEMENT REQUIREMENTS

The introduction of the BMS in Holcim operations will have various management implications. Many of these are interspersed throughout the text, either stated explicitly or contained implicitly in the manifold recommendations, proposed principles and suggestions of the report. The key requirements are briefly summarised in this chapter, followed by a last chapter on the approach and priorities for introducing the BMS into Holcim operations.

19.1 Management commitment

Even the best possible arrangement of management structures and processes to implement the BMS will only be as good as the commitment of top management to make it work and make it a visible priority on policy, planning and operational levels.

A high-level company-wide target such as the proposed ultimate aim of "no net biodiversity loss" would be one of the best ways of bringing biodiversity issues into everybody's mind. Holcim's high success in advancing health and safety standards in its global operations is a good example, and a similar route should be considered for "*global biodiversity health and safety*".

Such a high-level commitment would need to appear regularly in internal and external company communications, focussed, for example, on the proposed national and global biodiversity KPI and the inclusion of the biodiversity outcome indicators in corporate sustainability reporting.

In view of Holcim's devolved structure, specific efforts will be required to transfer such a commitment to the top management of national companies. Particular challenges might be faced in countries where Holcim does not have management control and/or where biodiversity is not a priority in regulatory requirements.

19.2 Inclusion in policies and guidelines

In the early stages of the IEP work, the thinking was directed towards a separate policy on biodiversity (level 1 in *Fig. 6*) and possibly some separate guidelines for the various stages on level 2. After becoming more familiar with Holcim planning and operational habits, it became clear that a more sensible way to put the BMS into practice would be to amend existing guidelines and directives wherever possible and not to add more to an already rich list of existing management documents. Basically, biodiversity concerns should be introduced through a process of "infiltration".

While it will have to be decided by Holcim how to realise this in detail, these are the *major* amendments required:

- Inclusion of biodiversity policy statement, policy principles and associated implementation principles (➔ *chapter 6*) in Environmental Policy, possibly by means of a linkage to a supporting directive or recommendation. A reference to biodiversity issues should probably also be made in the social and/or CSR policies.
- Inclusion of biodiversity in ProMap guidelines as outlined in *chapters 8-10*, especially *chapter 10.5*. It is recommended also to look at the option of separate guidelines for biodiversity in the planning process.
- Amendment of ESIA guidelines as suggested in *chapter 12.7*.
- Amendment of Rehabilitation Guidelines to allow for the inclusion of varying levels of biodiversity components (➔ *chapter 13*, esp. *13.5*), as well as the proposed M&E provisions.
- Development of new Guidelines for BAP (including M&E provisions) – this may be by means of a separate document or an additional section to the Rehabilitation Guidelines and could build on relevant material already existing in the UK, the International Petroleum Industry Environmental Conservation Association (IPIECA) BAP Guidance or those of other companies that might already have such documents (e.g. Rio Tinto).
- Amendments of PEP instructions to include relevant points about inventories (➔ *chapter 17.3*) and KPI reporting (➔ *chapter 18.8*)

19.3 Operational handbooks

A series of operational guidelines – toolkits for the Holcim staff on the ground (level 3 in *Fig. 6*) – are required. Their preparation is in fact already being planned by Holcim. The precise content and the style of these technical implementation aids will have to be aligned with other such documents that Holcim already uses in its operations.

- In addition, in order to help develop a good internal understanding of the BMS, its rationale and major objectives, the preparation of an internal information document is recommended that gives a general overview of the system and shows where the different contributions requested from field and management staff are docked into the system.

19.4 Management structures and processes

Holcim's existing management structure appears suitable for dealing with biodiversity in a consistent and comprehensive manner throughout company operations. Since biodiversity issues have a high element of site and country specificity, a devolved management system is conducive to taking appropriate measures.

However, the successful operation of a decentralised structure requires good central support systems; this also applies to the implementation of the BMS, especially regarding biodiversity expertise and quality control.

Expertise

- One or two ***biodiversity experts*** should be recruited to HGRS to guide and advise on issues that will inevitably arise in the introduction of a new

management system. These experts should have good credentials in biodiversity conservation, as well as an understanding of business operations.

- Some key HGRS staff involved in planning and providing technical support to site and country management should receive specialized training in biodiversity management (➔ *chapter 19.6*).

- In addition, the appointment of a small ***Biodiversity Advisory Committee*** (BAC) is recommended, consisting of, for example, three external experts and two internal members to counsel Holcim on biodiversity issues and provide expertise on difficult implementation questions.

Quality control

- In order to feel confident about the system and public reporting on biodiversity performance and outcomes, a good quality control system needs to be in place, to assess the quality of biodiversity components in ESIAs, Rehabilitation Plans and BAPs, as well as that of the reporting of indicators. Initially, this might have to be undertaken by HGRS, but the aim should be to gradually build up the capacity of the environmental division of larger country operations to carry out this function regionally and locally.

19.5 Internal skills and training

As highlighted elsewhere, the implementation of the BMS requires a wide variety of skills. With increasing experience and mainstreaming of the BMS as part of normal operational processes, some of these skills could ultimately be covered by internal staff. However, external skills will always be required as well.

The areas where internal skills, knowledge and levels of understanding need to be developed most (either through training of professional staff or recruitment of people with relevant experience) are given below. Some of these skills should be placed in HGRS, whilst some should be available on national and/or site levels:

- Broad knowledge of biodiversity conservation issues in relation to mining and of the BMS (through several levels of management and technical staff);
- Ability to assess the quality of biodiversity information and to interpret monitoring results;
- Capacity to assess the quality of biodiversity studies and recommendations (ESIA, Rehabilitation Plans, BAP) by external experts;
- Competence to draw up biodiversity-related ToRs that are relevant to the ecological systems, the likely impacts and the required interventions;
- Ability to supervise biodiversity management activities on the ground;
- Competence in measuring and reporting on KPIs (level 1 biodiversity monitoring).

- For the first point, a biodiversity training module should be developed that could be incorporated into existing Holcim training courses at various levels of management.

- In addition, it would be useful for Holcim to recognise biodiversity expertise and the performance of biodiversity management tasks explicitly in its human resource system.

19.6 External expertise and partnerships

Holcim is working with a wide variety of external experts in almost every aspect of its operations. As the IEP has been able to ascertain on the ground, this also applies in relation to biodiversity.

The introduction of the BMS will further extend the need for such external support, initially to help develop certain methods and processes, but then also on an ongoing basis for specialised tasks (as is already happening now):

- High-level advice on biodiversity conservation and policy questions (members of the BAC);
- Biodiversity inputs into Feasibility Studies;
- Biodiversity inputs into ESIAs, especially biodiversity inventories;
- Plans for biodiversity management (Rehabilitation Plans or BAPs);
- Level 2 and 3 biodiversity monitoring and analysis of results.

While some of this work needs to be contracted to outside experts (individual(s) or special agency), some could be part of a longer-term cooperation agreement with a local conservation NGO or a local academic institution. In fact, in many places Holcim already successfully runs such partnerships. Usually they are on the basis of individual sites (where the partner institution might also be involved in biodiversity management), but in some countries they have been set up on a national level (e.g. national partnership agreements with a local IUCN entity).

- It is recommended that partnerships with NGOs or other institutions that could make a positive contribution to Holcim's biodiversity management and external relations should be established wherever this is possible, particularly at sites with stated biodiversity management targets.

19.7 Finance

Even though the BMS has been conceived to build on existing systems and to streamline existing management procedures (in order to keep its costs commensurate with its business benefits), some aspects will require additional resources – at the HGRS, national and site levels. As an expression of a management commitment to the BMS, the appropriate resources for its implementation will have to be mobilised.

Many of the proposed measures will not result in substantial additional costs; they are being budgeted for now and also have to be undertaken in the future (e.g. various types of planning studies and management plans). The aim of the BMS is to make them, where necessary, more effective for biodiversity.

Nevertheless, there are activities where the scope will have to be extended (e.g. inclusion of biodiversity in ESIA studies even if this is not required by the regulatory authority), and additional costs will inevitably result. And some activities will be new and require new

funding. Biodiversity monitoring, for example, if pursued properly, could be 5-10% of related biodiversity management costs.

20. ROLL-OUT OF THE BMS

20.1 Principal management situations

In designing the BMS, the IEP had in mind that, ultimately, it must provide clear guidance for Holcim on what to do in each of the following principal management situations:

1. What to do in case of a new development?

- *For brownfield or greenfield developments*: Follow the standard BMS process for dealing with biodiversity issues in all planning and operational phases, from risk avoidance to opportunity enhancement (largely developed with this scenario in mind, although variations due to commercial expediency or local regulations may be required).
- *For extension of existing active site*: Follow the BMS process, which may be abbreviated depending on the level of biodiversity management already taking place.

2. What to do at the large number of existing sites?

- *Active and closed sites*: Determine biodiversity importance/risk and take biodiversity action according to criteria of Biodiversity Risk Table.
- *Dormant sites*: Determine biodiversity importance and initiate inventory and monitoring programme according to level of importance.

3. What to do in case of an acquisition (due diligence)?

- Enter into the standard process at a point depending on the precise nature and status of the acquisition (➔ *chapter 8.4*)

4. What to do in an emergency?

- As indicated in *chapter 12.4*, the EMP should include provisions for emergency response through adaptive management if unforeseen biodiversity-related events occur.

20.2 Timings and priorities

Rolling-out the BMS into Holcim planning and operational procedures will require a phased approach. Basically, there are three major steps, each with a number of different one-off actions or ongoing activities. Some may partly overlap in time, run entirely concurrently or may only be started after another has been completed:

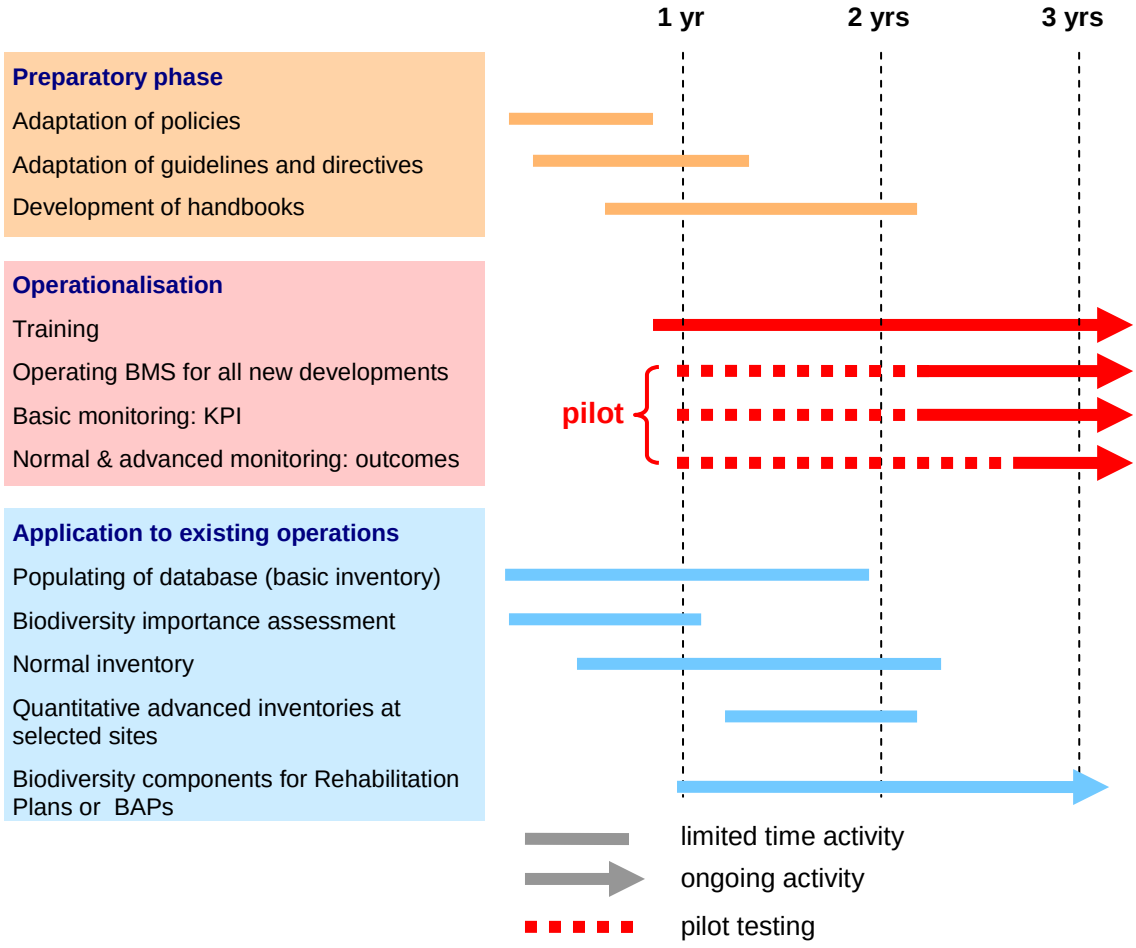
- ***Preparatory steps***: development and adaptations of policies, guidelines and handbooks, creation of structures and processes, and initial training;
- ***General operationalisation***: introduction of the system for ongoing running as part of normal operational processes (preceded by pilot testing at selected localities);
- ***Application to existing operations***: retrofitting of existing sites into the BMS, especially collection of missing data and development of BAPs where required.

The timing of these steps and their activities – When should they begin? Over how long a period they should stretch? Which can overlap? Which should run in sequence? – can be devised in a flexible manner and has to be determined by Holcim dependent on other business priorities, available resources and capacities. A general suggestion for relative starting times and length of individual activities is provided in *Fig. 12*.

Whatever the timetable will look like, a phased introduction is highly advisable, as a simultaneous start everywhere would exceed resources and capacities and thus increase the likelihood of failure. Likewise, the retro-application of the BMS to existing sites (biodiversity data, basic monitoring for KPI, BAPs, etc.) will also have to be staggered; nevertheless, it should be planned against stated deadlines for completion. To assist such a phased approach, the following general priorities are suggested:

- ***Priority 1***: Sites under planning application, sites approaching closure, any site of biodiversity importance cat. 1 & 2.
- ***Priority 2***: Sites of biodiversity importance cat. 3, closed sites with ongoing obligations and responsibilities.
- ***Priority 3***: Sites of biodiversity importance cat. 4, dormant sites.

Figure 12: **Relative timings for the BMS roll-out**



20.3 Preparatory steps

It was already clear during the development of the BMS and the ongoing discussions with relevant staff that Holcim appears to be determined to operationalise the system as early as possible. As a result of constant interactions between the IEP and Holcim, the required adaptation of the relevant policies was initiated well before the formal completion of the first BMS draft.

The re-drafting of several key guidelines and directives commenced immediately after submission of the first draft and was partly carried out in parallel with the external review process and preparation of the final version of the BMS.

By the time of the completion of the revised BMS in July 2010, Holcim had already given formal attention to adjustments of the following internal documents:

- Environmental Policy (inclusion of biodiversity);
- Quarry Rehabilitation Directive;
- Opportunity Study check list;
- Feasibility Study - Chapter 5: Environmental and social impact;
- ESIA check list.

In addition, based on recommendations made by the Panel during the development of the BMS, a number of new internal planning and information documents were initiated by Holcim, including:

- Biodiversity Risk Matrix;
- Biodiversity database (inventory of active and inactive extraction sites);
- Biodiversity questionnaire;
- Biodiversity roadmap target;
- Biodiversity case study collection and newsletter;
- Biodiversity message trail.

20.4 General operationalisation

Although the BMS has been developed with a constant eye on its practicality of implementation, the IEP does not exclude the possible need for further improvements.

- Therefore, it is recommended that a pilot study of all or some BMS elements should be carried out in selected countries before the full system is introduced in global Holcim operations.

It might be advantageous to do this in countries visited by the IEP, where some degree of awareness about the proposed approach has already developed. A detailed analysis of this pilot run, especially the operational practicality of the BMS, would allow Holcim to make further adjustments before a global application.

20.5 Application to existing operations

As only very few new plant and/or quarry developments are initiated by Holcim every year, there are limited opportunities for applying the BMS through the full cycle of planning,

development and operation. Therefore, for a credible adoption of the BMS and approach to biodiversity conservation, the application of the BMS to existing operations, in particular to the 550 extraction sites identified through the biodiversity questionnaire (➔ *chapter 2.3*), is of great significance in the early phases of its operationalisation.

- For retro-fitting key elements of the BMS to existing extraction sites, time targets (of a maximum of two-to-three years) should be set so that they are up-to-date on biodiversity information and basic monitoring and can thus be fully brought into the system.
- A timetable should also be developed for supplementing existing Rehabilitation Plans with biodiversity components (if they do not have any and fall into the eligible category) or for developing BAPs (where these will be required), although longer timelines would be needed for this process.

To assist the process of applying the BMS to existing operations (with an initial focus on active extraction sites, both cement and aggregate quarries) and show what needs to be done at which site, a decision tree has been developed by Holcim and further refined by the IEP (➔ *Fig. 13 and 13a*).

Figure 13: **Application of BMS to existing sites**

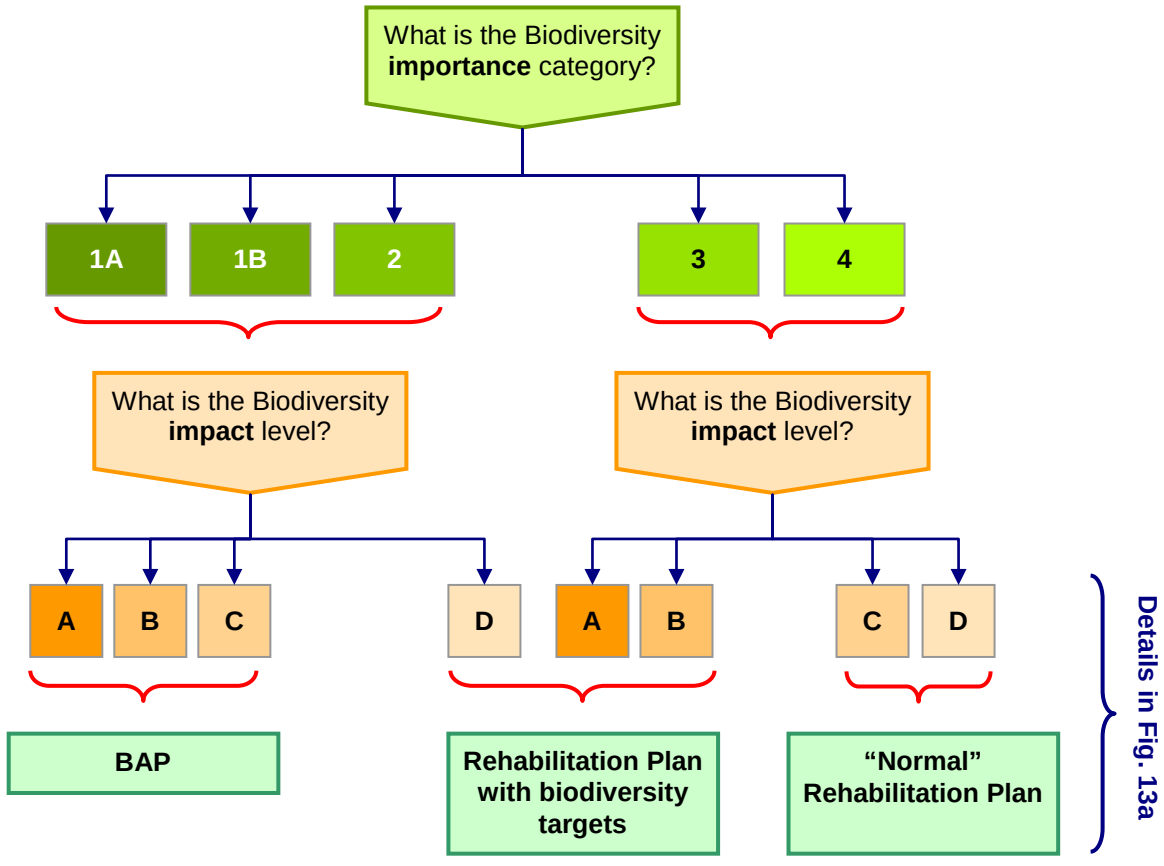
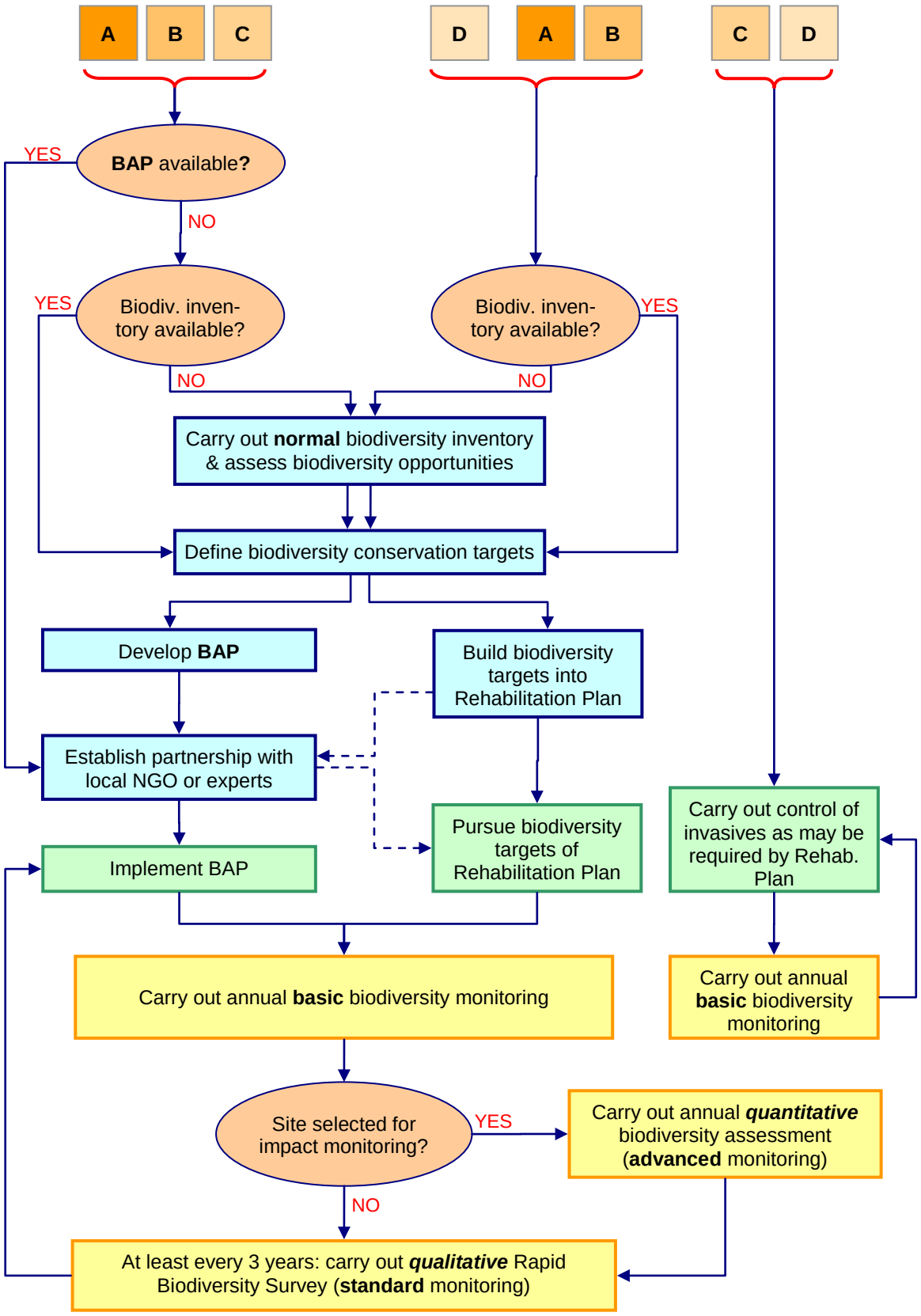


Figure 13a: **Application of BMS to existing sites** (cont.)



ABBREVIATIONS

AFR	Alternative Fuels and Raw Materials
BAC	Biodiversity Advisory Committee
BAP	Biodiversity Action Plan
BBOP	Business and Biodiversity Offsets Programme
BIC	Biodiversity Importance Category
BMS	Biodiversity Management System
BRM	Business Risk Management
CBD	United Nations Convention on Biological Diversity
CSD	Corporate Sustainable Development
CSI	Cement Sustainability Initiative of the WBCSD
CSR	Corporate Social Responsibility
DJSI	Dow Jones Sustainability Index
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortisation
EMP	Environmental Management Plan
EMR	Emission Monitoring and Reporting
ERT	Emission Reduction Targets
ESIA	Environmental and Social Impact Assessment
GRI	Global Reporting Initiative
GTZ	German Development Agency
HGRS	Holcim Group Support
IBAT	Integrated Biodiversity Assessment Tool
IBRD	International Bank for Reconstruction and Development
ICMM	International Council on Mining and Metals
IEP	IUCN-Holcim Independent Expert Panel
IFC	International Finance Corporation
IPIECA	International Petroleum Industry Environmental Conservation Association
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Areas
KPI	Key Performance Indicator
NGO	Non-governmental organisation
ORM	Operational Roadmap Targets
PEP	Plant Environmental Profile
RMM	Raw Materials Management
SEP	Sustainable Environmental Performance
UNEP	United Nations Environment Programme
WBCSD	World Business Council for Sustainable Development
WCMC	World Conservation Monitoring Centre (UNEP)

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A useful list of relevant further articles and documents is in the first listed document of the International Council on Mining & Metals (2006): Good Practice Guidance for Mining and Biodiversity.