Guidelines for Environmental & Social Impact Assessment

Cement Sustainability Initiative (CSI)

wbcsd

GUIDELINES FOR ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

Cement Sustainability Initiative (CSI)

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01 INTRODUCTION

The Cement Sustainability Initiative (CSI) is a global effort by leading cement producers who believe there is a strong business case for the pursuit of sustainable development. Collectively, these companies account for around 30% of the world's cement production. The CSI is an initiative of the World Business Council for Sustainable Development (WBCSD). The CSI has developed this document to guide the preparation of an Environmental and Social Impact Assessment (ESIA), replacing the earlier guidelines published in 2005.

The guidelines have been prepared to reflect international good practice. Cement and aggregates industry operators (existing and future) are encouraged to use the guidance to inform the development of an ESIA as part of the process required to secure governmental permissions for the implementation of new investments and expansions to existing operations globally.

The objective of this document is to guide users through the ESIA process, in accordance with international good practice. It offers a practical guide for all projects—both large and small scale. The guidelines are intended for use by both ESIA practitioners and project decision-makers. Where relevant, the document references the CSI Charter.

CSI member companies are all signatories of the Charter *www.wbcsdcement.org*, which lays out a suite of actions to be carried out by companies as part of their contribution to sustainable development. These actions relate to several topics that should be addressed in an ESIA, for example, CO2 and other emissions, responsible use of fuels and raw materials, employee health and safety, and impacts on water and biodiversity.

02 CONTEXT

2.1 An introduction to environmental and social impact assessment

An Environmental and Social Impact Assessment (ESIA) should be seen as a process that starts at the conceptual design stage of a project and continues throughout project construction, operation and decommissioning. During the process, several deliverables are prepared to guide the activities of the specific stage.

The purpose of an ESIA is to identify the positive and negative impacts caused by project implementation. This is assessed through an analysis of the effects resulting from interaction between environmental and social components and the various activities of a project and its development, including temporary (for example, during construction) and associated facilities.

Associated facilities are defined by the *International Finance Corporation* (IFC) as facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable (IFC 2012).

ESIAs vary in scope and type of analysis, depending on the characteristics of the proposed project. In doing so, each element of a project should be analyzed for its potential to affect the environment and/or society during each phase of the project (including construction, operation and decommissioning).

ESIAs address a project's environmental and social costs and benefits, including an appraisal of the economic implications of the proposed project. The ESIA should consider the project as designed, in addition to potential alternative options (including that of no action).

In addition to the direct effects outlined above, the possible interactions between different environmental components (indirect effects) should also be considered, together with the impacts that could occur in conjunction with other activities taking place in the near vicinity at the same time (cumulative effects).

2.2 The importance of an ESIA to project implementation

Jurisdictions in most countries around the world require an ESIA to be undertaken before authorization (for example, permitting, licensing, planning consent) for certain types of projects is granted. National legislation often varies between countries, so it is vital to establish the local requirements prior to embarking upon the ESIA process.

- The core principles that underlie the ESIA process remain fundamentally the same throughout the world:
- Establishment of a robust understanding of the existing environment and social setting;
- Identification of the potential impacts upon the environment and local communities (both positive and negative) as a result of the proposed changes; and
- Ensuring that the design, implementation, operation and subsequent decommissioning of the development is carried out in such a way as to minimize adverse impacts on, and maximize potential benefits to, the environment and affected communities.

2.3 Management considerations

Managers will understand that if an ESIA is not accepted by the authorities, then permission for the development of the project will not be granted. It is important to appreciate that the ESIA is not simply a planning exercise. An ESIA process has the potential to alter the design of the proposed

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facility. Substantial cost and time savings can be achieved if these changes are appraised and incorporated early in the design process. An ESIA process is also the vehicle through which the engagement (and ultimately the agreement) of decision-makers, local communities and other stakeholders is achieved.

Experience has shown that an ESIA is often not commissioned until a relatively late stage in the development process; consequently, pressure is exerted to minimize the timeframes within which the ESIA is delivered. Furthermore, a desire to maintain a degree of confidentiality with respect to the emerging proposals will often prevent open dialogue with stakeholders and affected communities until a very late stage in the ESIA process.

In an effort to counter these relatively common managerial decisions, some important considerations when embarking on the ESIA process are set out below.

I Promoting benefits

Focused commercial investment has the potential to introduce substantial benefits to local communities, including infrastructure improvements and job creation that encourage reinvestment in the local economy. Development may also provide positive changes to the natural environment (for example, the creation of wetland areas to improve biodiversity as part of site restoration. Embracing and promoting these positive outcomes is a key responsibility of ESIA practitioners and has the potential to contribute greatly to an organization's corporate social responsibility (CSR) agenda.

II Timeframes

The ESIA process will typically take a minimum of 12 to 18 months to complete, particularly where there is limited information available describing the existing environment. Within areas of particular environmental or social sensitivity, the ESIA process may take longer.

III Engagement

Most national legislative frameworks require that interested stakeholders be invited to comment on the findings and recommendations of an ESIA process. Experience has shown that when open dialogue is sought with stakeholders at an early stage, the level of ownership and engagement increases substantially and the potential risk of dissent upon submission of the planning application (supported by the ESIA) is reduced. Conversely, negative stakeholder and/or public input, particularly at a late stage in the ESIA process, will often lead to costly delays and the need to revisit the design and the ESIA. In many cases, planning authorities will be reluctant to approve a development in the face of negative public reaction.

IV Influencing design

The ESIA must appraise the final proposed design of the development. If it is shown that the development will adversely affect the environment or local communities, then there will be a need to modify the design. The revised design will then need to be reappraised as part of the ESIA process. This iterative approach will be required until such time as the effects are shown to be of low significance or adequate compensation or offset measures have been identified.

V Coordinated and integrated approach

Components of an ESIA process (for example, environmental assessment, public consultation, etc.) or an ESIA as a whole are often requirements for project licensing and permitting. Therefore, efforts invested in an ESIA often facilitate and streamline the accomplishment of other mandatory stages (environmental licensing, waste management permitting, quarry licensing, etc.) of project development.

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CASE STUDY 1

Synergies of an ESIA, from a traditional to an integrated approach

Historically, a company would outsource the delivery of the ESIA to a consultant as a total package, providing design input only on an “as needed” basis. In this instance, however, the decision was made to manage the ESIA internally as an integral part of the project development process.

Specialist technical input was sourced from external consultants in relation to water, air, biodiversity, soils, transport and social. The over-arching coordination and direction of the ESIA was retained in-house.

This approach achieved much more effective coordination between not only the external technical specialists who were involved in developing the ESIA, but also those internally who were responsible for the delivery of the project. This enhanced the wider team’s appreciation of the ESIA process and findings. It also enabled faster decision-making in relation to project design, the identification of acceptable mitigation solutions, and the commitment to future monitoring.

The key learnings include:

- Ownership – The active involvement of a cross-functional team within the organization transferred the sense of ownership of the ESIA process to many, rather than a single project coordinator;

- Capacity building – This approach spread the understanding of the ESIA process to the wider team and enabled the use of the ESIA as a basis for decision-making;

- Timely completion – Regular and active coordination throughout the ESIA process ensured quicker internal alignment, leading to the ESIA being delivered on time; and

- Cost efficiency – By maintaining ESIA project coordination in-house and using external experts only where needed, costs incurred as part of the ESIA process were reduced.

Specific considerations that should be taken into account by managers and designers at an early stage in the design process are provided in *Appendix C: Considerations for managers and designers* (page 97). These offer a clear sense of the potential benefits that the ESIA process can provide to the project, to the environment and to local communities. It is acknowledged that the scale and nature of the proposed development and the environment within which the project is being developed may have a bearing on the degree of investment that will be required as part of the ESIA process. Ultimately, the requirement for (and the scale of) an ESIA will be determined by the screening and scoping phases, which are described in *section 4.3: The screening phase* (page 26) and *section 4.4: The scoping phase* (page 30). A summary of the extent of ESIA investment required for projects is provided in **Table 1** below.

Table 1: Summary of the extent of ESIA investment required for projects

Size of project footprint	The size of the project footprint will typically have relatively little bearing on the scope of the ESIA that is required. The primary consideration will be the nature of the project that is being proposed and hence the environmental and social impacts that this may introduce. For example, the use of a site for packaging and distribution will typically have fewer potential environmental effects than a manufacturing facility even if it occupies a larger area. In contrast, the introduction of a cement manufacturing facility (including grinding, combustion and milling) occupying the same area is likely to have greater potential environmental effects. The ESIA requirements for the two projects will therefore be different.
Complexity of project	The complexity of the project will typically have a relatively large bearing on the scope of the ESIA that is required. For example, the development of a cement manufacturing facility incorporating quarrying, packaging and distribution operations represents a potentially significant change to the existing environment, with numerous activities that may affect the natural environment and local communities. In contrast, a small quarrying operation (in isolation) presents fewer ways in which the existing environment might be changed; therefore, the scale and scope of the ESIA baseline and impact assessments will shrink accordingly.
Project extension	The ESIA requirements for an extension to an existing project will typically be more muted than for a new development. This is because, in this instance, the "baseline" will be defined by the existing environment, including the presence of the current active operation. There will typically be a requirement for significant ESIA investment only if there are substantial changes to the nature of the operation (for example, the introduction of a new cement manufacturing facility adjacent to a site where previously only quarrying had taken place).the scale and scope of the ESIA baseline and impact assessments will shrink accordingly.

03 INTERNATIONAL STANDARDS

An ESIA is a legal requirement in most, if not all, countries of the world. Compliance with national legislation and local planning regulations is mandatory in all circumstances. In certain situations, however, the proponent may also be required to comply with certain international standards.

Typically this will be a requirement where international funding is being sought to support the development of the project. In some circumstances, however, proponents may choose to demonstrate compliance with international standards under their own volition.

For ESIA purposes, compliance with international standards is often defined by adherence to the Equator Principles and therefore to the IFC Performance Standards. Other international ESIA standards (such as those from the EBRD may also be applicable.

Compliance with national legislation is generally all that is required for Organisation for Economic Co-operation and Development (OECD) (www.oecd.org) countries. This is because the requirements for ESIA under national legislation mirror those set out by the IFC in those countries.

CASE STUDY 2

ESIA for a greenfield project in a developing country according to international standards

The Antea project, one of the largest industrial greenfield investments in Albania, was partly funded by the IFC and the European Bank for Reconstruction and Development (EBRD). The project includes the construction of a new cement production facility and the development of two associated quarries to produce and supply the main raw materials for the operation.

During the screening phase, the project was classified as a "Category A" project according to IFC's Environmental and Social Review Procedure and EBRD's Environmental and Social Policy, mainly because it required significant land acquisition and a change in the land's character that was considered to likely have "significant, adverse and largely irreversible" impacts. In addition to the national legislative requirements, the project was required to go through the development of a full ESIA, including an Environmental and Social Management Plan (ESMP), and a Social Compensation Plan Framework (SCPF), in line with IFC and EBRD standards.

The ESIA for the Antea project was prepared by an independent international consultant, and comprised all required phases according to international standards: from scoping and baseline appraisal to impact assessment and mitigation measures, covering the environmental and social aspects throughout all stages of the project (construction, operation, decommissioning).

The socio-economic aspect was the most challenging issue throughout this ESIA process. The ESIA identified different categories of local households that would be affected by the project due to economic displacement as a result of the acquisition of farmland that was previously used for food production and was a source of income.

Consequently, from the outset of the ESIA process, which took almost two years to complete, consultation and engagement with affected stakeholders was carried out. The primary purpose of the engagement activity was to inform stakeholders, obtain their views and inputs into the initial phase of the scoping study, inform them so as to increase their understanding of the potential impacts, and provide an opportunity to raise issues or concerns during the drafting of the ESIA.

A Public Consultation and Disclosure Plan (PCDP) was developed to cover the initial stages of the ESIA. It continued as an ongoing process throughout the construction and operation phases of the project.

The effective communication strategy, engaging at an early stage with the vulnerable local stakeholders, culminated in the resolution of complex problems to the satisfaction of all parties. The company compiled an SCPF that addressed the economic displacement and established the compensation process, including capacity building within the local community.

In conclusion, the ESIA process, irrespective of its scale, scope and type of analysis, is important for understanding the existing environmental and social conditions, assessing the potential impacts, and proposing mitigation measures before the development of a project. Starting at the very early stages of the project, an ESIA, along with engagement and open dialogue with stakeholders, can be very effective. The ESIA not only drives the permitting process, it also builds consensus and good relationships with the local communities and other stakeholders for the long term.

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04 THE ESIA PROCESS

4.1 Overview

As stated in *section 2.2: The importance of an ESIA to project implementation* (page 11), while national legislation varies from country to country, the core approach to the development of an ESIA remains the same. A staged process is required, which is presented in the flow chart in **Figure 1**.

Public consultation will also influence the development of the project and is undertaken throughout the ESIA process. Typically, however, consultation with the public will focus upon the scoping and impact assessment stages, during which information is shared and feedback is sought.

An ESIA process must consider all stages of the development process, including the construction of the facility, site operations, the dismantling and decommissioning of the site, and site restoration. An ESIA should consider not only the potentially adverse impacts that the development may have and how these will be mitigated, but should also highlight any positive changes that the development may introduce for the natural environment and local communities.

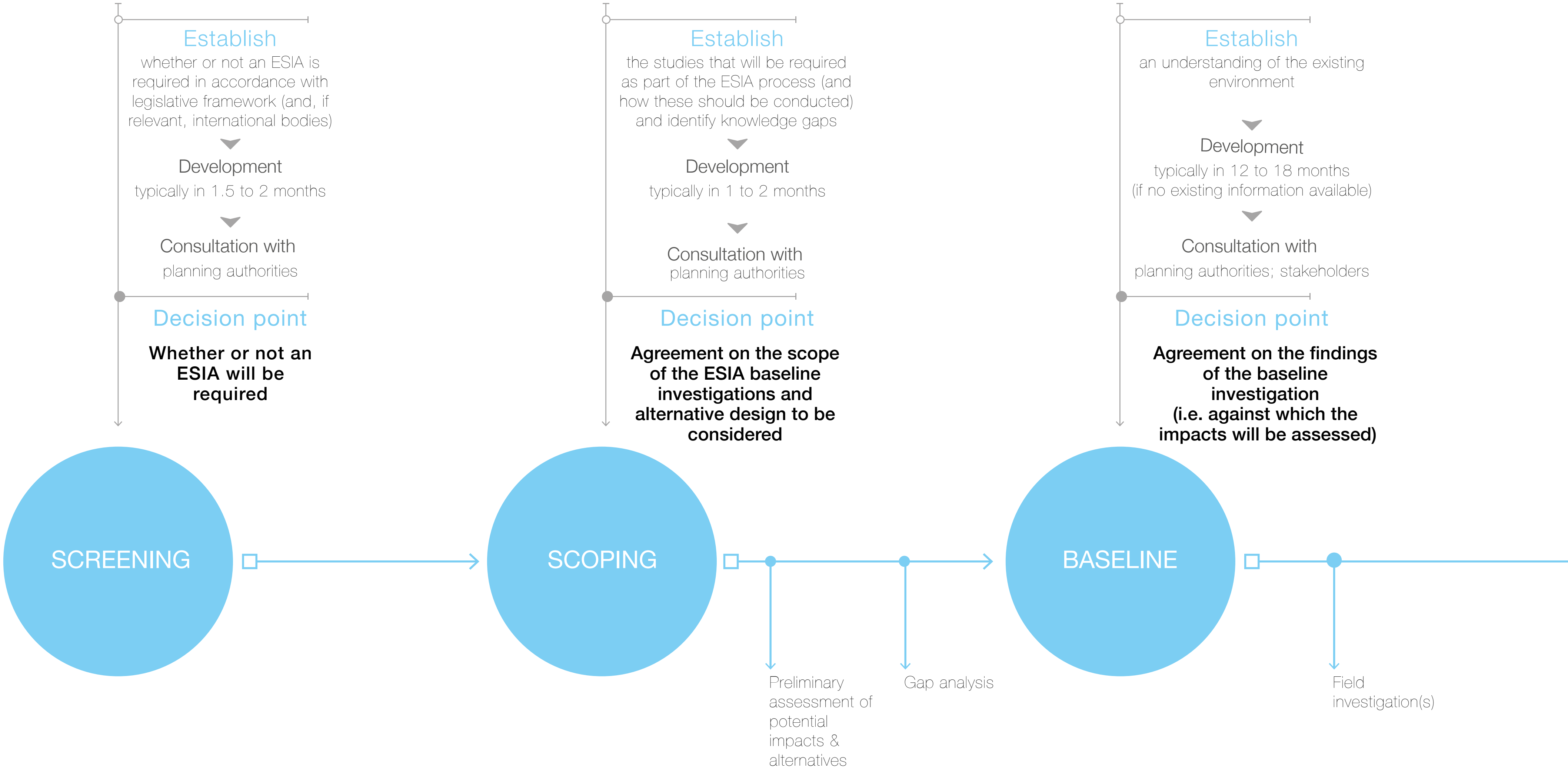
It is noted that the timeframes outlined within the flow chart are indicative of a typical ESIA that is carried out in accordance with international standards.

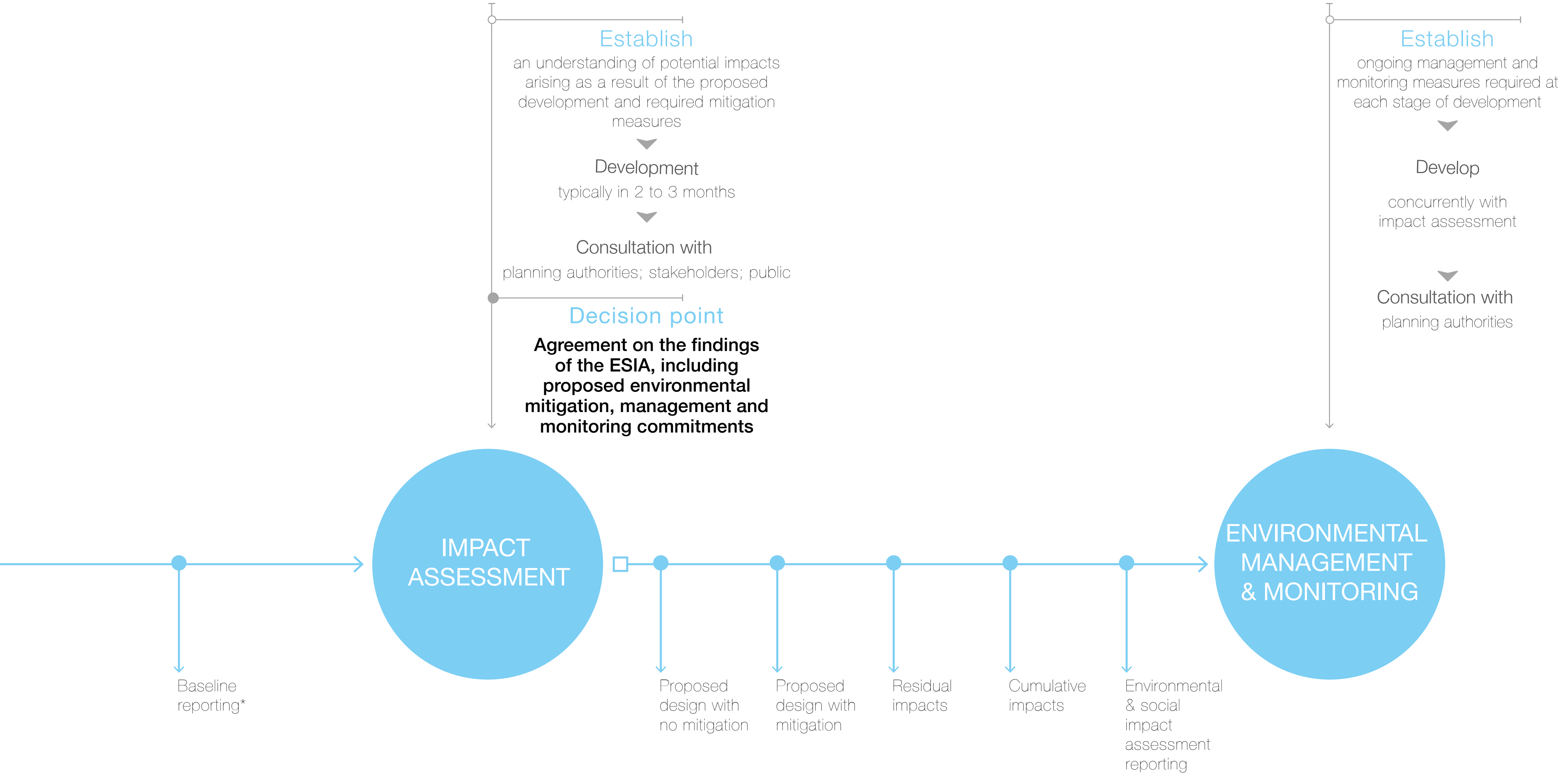
Typical means that:

- The project is on a greenfield site (no previous development);
- The project is in an area with no particular environmental designation (not near a site with an international, national or local designation, such as a Special Area of Conservation, a Special Protection Area, a Ramsar site, or a Site of Special Scientific Interest); and
- There is some existing baseline data available.

The ESIA schedule may be longer or shorter depending on the specific circumstances, for example, if the existing environment or local community is particularly vulnerable to change or if there are challenges to the development from the authorities or stakeholders.

Figure 1: Flow chart presenting the ESIA process





* The submission of a baseline report to the planning authorities is not always a mandatory requirement and should be confirmed at an early stage

4.2 Project description

A detailed quantitative project description should be developed at an early stage. It should include the primary facilities that are proposed to be constructed and operated, as well as any associated project facilities and operations.

These might include transmission lines, transportation routes, treatment plants, etc.

Table 2 below provides an outline of the information that should be included in the project description (Inter-American Development Bank 2011).

Table 2: Information that should be included in the project description

Topic	Example of information that should be included
Objectives and scope of the project	Present a high-level description and location of the proposed development facilities, such as limestone quarries; clay, pyrite, gypsum and sand sources; storage facilities for raw materials, product, waste; buildings, installations (kilns, mills/grinders, separators, heat exchangers, stacks), tanks (above and below ground for fuel); hazardous materials; special materials (for example, radioactive substances, asbestos, PCB, ozone-depleting compounds, radon); wastes; emissions/discharges; associated infrastructure, etc. Present the rationale for the development. Provide details about the developer (and parent company if appropriate) and the independent consultant.
Project location	Provide a site description and maps, plans and aerial or other photographs. They should clearly identify the location of the proposed development relative to various surrounding land uses and/or key environmental, social or cultural features (if already identified).
Site preparation and construction	Describe the construction works required prior to commencement of industrial operations, including: • Timing, staging and hours of construction work; • Site clearing and preparation activities (such as earthworks, excavation and backfilling); and • Details of the construction workforce, including source, expected numbers, work camps, and fluctuations throughout the construction period.

Table 2: Information that should be included in the project description (continued)

Topic	Example of information that should be included
Project design	Provide a detailed layout of the proposed development and associated infrastructure, including (when applicable): • Site plans that must show the maximum probable land area affected by the proposal; • Layout plan(s) of the development showing (as a minimum) buildings, stacks, storage areas for raw material and waste, roads, parking and infrastructure, including all utilities, such as fuel filling station, power supply and water supply; Provide a detailed description of the extent and type of cement project anticipated, including a description of the uses proposed and the processes to be incorporated, including: • Flow chart of the proposed activity, including information on inputs (raw materials, fuels, water, chemicals, etc.) and outputs (wastewater, solid or hazardous wastes, air emissions, etc.). This should include extraction activities (sand, limestone, clay, pyrite, gypsum and chalk), water sources, export facilities, transportation routes, storage facilities, the manufacturing process (mills/grinders, preheaters, pre-calciner, kilns), packing facilities, etc. • List of machinery and process equipment, including technical information (such as capacity and expected hours of operation) and operational control measures (emissions limitations and rate data related to NOx, SOx, dust, noise, etc.). The CSI *Guidelines for Emissions Monitoring and Reporting in the Cement Industry* (CSI 2012) identify the specific pollutants and emission sources that all CSI member companies have agreed to monitor; and • An estimate of the essential types and expected consumption of raw materials and fuel types. This will include power supply requirements and proposed energy conservation measures; proposed usage of water in the different industrial stages and sources of water supply; quantities of solid and liquid waste generated and programs for collection, recycling, storage, treatment and disposal (solid waste and hazardous waste). The *WBCSD Global Water Tool* (WBCSD 2015) is a free and easy-to-use tool for companies and organizations to map their water use and assess risks relative to their global operations and supply chains. The *Global Water Tool for the Cement Sector* (CSI 2013) is a sector-based customization of the *WBCSD Global Water Tool*. Further, the *CSI Protocol for Water Reporting in the cement industry* (CSI 2014) presents detailed metrics, terminology, definitions and guidance for water accounting in the cement sector; it encompasses the site data required for disclosure and/or benchmarking based on the nature of operations. Provide a description of transportation, including internal and external transport activities, access, parking, and loading/unloading arrangements. Provide details of storage facilities for raw materials and hazardous, toxic or inflammable substances (type of storage, size, number, surface coating, roofing, drainage, measures to prevent dust problems, etc.). Provide details on the co-processing of fuels and raw materials. The CSI *Guidelines for Co-Processing Fuels and Raw Materials in Cement Manufacturing* (CSI 2014) offers both basic explanations in relation to the role of fuels and materials in cement products and practical guidance for cement companies to use in managing their materials and fuels. Present the anticipated operating hours (week days, weekend and holidays).

Table 2: Information that should be included in the project description (continued)

Topic	Example of information that should be included	
Employment	Provide details of the anticipated number of technical and non-technical jobs the project will create, with a particular reference to where the workforce is located.	Present details of the proposed housing and service facilities for onsite workers.
Overview of proposed project closure plan	Present a summary of plant decommissioning and (where appropriate) removal of equipment from the site (including disposal). Present a summary of the proposed site use following closure of the facility.	

4.3 The screening phase

The purpose of screening is to differentiate those projects that may have a detrimental effect on the environment from those where no impact is likely to occur. The screening process will therefore determine whether an ESIA is required, and if so, what level of assessment is needed. This determination (for example, whether the anticipated environmental effect will cross a legislative threshold) is driven by the relevant national and/or international standard that is to be applied.

The screening phase of the ESIA aims to determine the following:

The need for, and level of, environmental assessment;

- A preliminary review of the potential environmental effects that could result from the project;
- The necessary permits or approval processes (for example, environmental approvals, rezoning, etc.) along with any additional requirements that might be associated with external financing; and
- The potential for community acceptance of the development.

The good practice approach to screening appears is shown in **Figure 2**. On this basis, two outcomes of the screening process are possible:

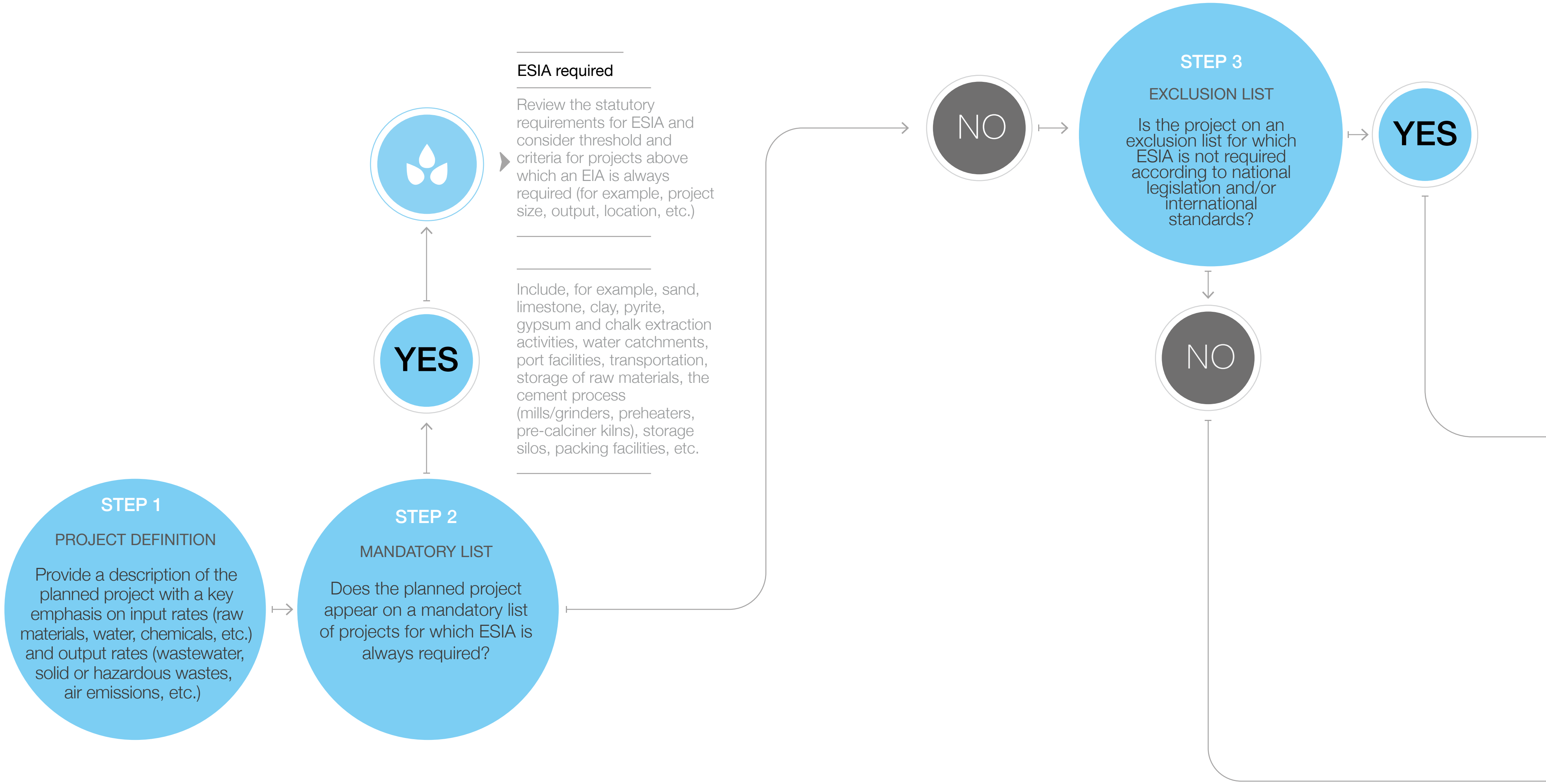
- Limited environmental impact:
  Projects that have few or no impacts proceed without any further environmental assessment studies. This will typically occur for low-impact projects situated in locations that are not sensitive to environmental change (such as brownfield, small-scale plant expansions).
- Adverse environmental impact/regulatory trigger
  If the screening assessment indicates that the project may negatively impact the environment or if regulatory requirements are triggered and/or additional information is required, the project moves into an ESIA process.

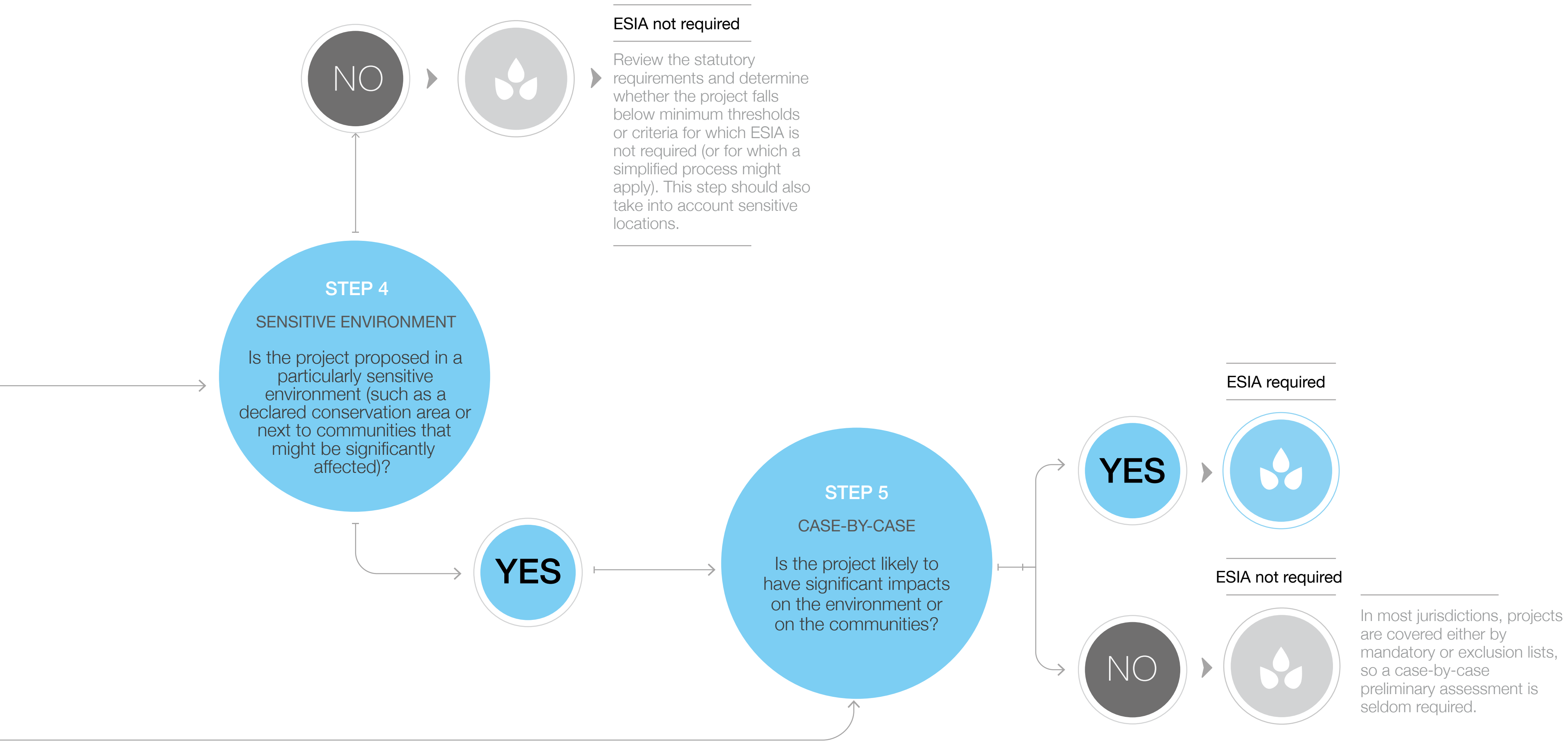
Pre-screening consultation with the regulatory authorities is advisable as it can save time for all parties. Through this consultation mechanism, a mutual understanding of the requirements can be obtained from the outset. This consultation is intended to promote cooperative governance by involving the relevant stakeholder departments early in the planning process.

The pre-screening consultation may take the form of a formal meeting, a telephone conversation or written correspondence. Consultation at such an early stage should avoid delays occurring at a later stage caused by requests from the authority requiring additional information. The consultation will also provide the opportunity for an exchange of views and a discussion regarding the nature of the ESIA that may be required.

> “Pre-screening consultation with the regulatory authorities is advisable as it can save time for all parties. Through this consultation mechanism, a mutual understanding of the requirements can be obtained from the outset.”

Figure 2: Flow chart presenting the screening process




NO
ESIA not required
Review the statutory requirements and determine whether the project falls below minimum thresholds or criteria for which ESIA is not required (or for which a simplified process might apply). This step should also take into account sensitive locations.
STEP 4
SENSITIVE ENVIRONMENT
Is the project proposed in a particularly sensitive environment (such as a declared conservation area or next to communities that might be significantly affected)?
YES
STEP 5
CASE-BY-CASE
Is the project likely to have significant impacts on the environment or on the communities?
YES
ESIA required
NO
ESIA not required
In most jurisdictions, projects are covered either by mandatory or exclusion lists, so a case-by-case preliminary assessment is seldom required.

Important information to be exchanged during this correspondence can include:

- A description of the project;
- A description of the aspects of the environment likely to be significantly affected by the project; and
- A description of any likely significant effects, to the extent of the information available on such effects.

In the event that international funding is required for a particular project, the screening phase should be used to categorize the project so as to guide the subsequent ESIA process. Within OECD countries, this will be guided by the relevant national or regional legislation (for example, European Union (EU) directives within Europe). Elsewhere, project categorization will be defined by the IFC, as summarized below:

Description of project categories as defined by the IFC

Category A - A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. A potential impact is considered sensitive if it may be irreversible (for example, lead to loss of a major natural habitat) or affect vulnerable groups or ethnic minorities, involve involuntary displacement or resettlement, or affect significant cultural heritage sites. These impacts may affect an area broader than the sites or facilities subject to physical works. Environmental Assessment (EA) for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including, the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance. A full environmental assessment is required, which is normally an ESIA.

Category B - A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas, including wetlands, forests, grasslands and other natural habitats, are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of a Category A EA. Like a Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance.

Category C - A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

4.4 The scoping phase

4.4.1 Overview

Scoping is the process of identifying potential environmental and social impacts associated with the development of and focusing the ESIA process on the pertinent issues.

An initial scoping of potential impacts will identify:

- Those impacts that are thought to be important;
- Those thought to be negligible or of such a low level of effect that they can be eliminated from further investigation; and
- Those for which the importance is uncertain.

The level of detail required as part of an impact assessment will depend heavily upon the nature and scale of the development, the sensitivity of the environment, and issues identified during the scoping process. Therefore, it is important that the scoping exercise be carried out effectively.

This relationship is reflected in **Figure 3**, which highlights that a limited ESIA is likely to be required where the project has low impact potential and is likely to take place in an environment that is not sensitive to change. At the other end of the scale, greenfield projects occurring in highly sensitive environments will require a full ESIA and/or might result in a project “no go” early in the scoping phase.

Considering the complexity and the need for input from specialists, it is advisable that the proponent engage a qualified independent consultant to carry out the scoping stage. In some legislative frameworks, this is a mandatory requirement.

The purpose of scoping is to:

- Consider reasonable and practical alternatives for the project;
- Inform stakeholders of the development;
- Identify potential impacts that could result from the development;
- Evaluate concerns expressed from stakeholders and understand how local context, culture and values inform the concerns;
- Define the boundaries of an ESIA study (both in time and geographically);
- Determine the analytical methods that should be used to establish the significance of impacts;
- Establish ongoing mechanisms for consultation; and
- Establish the terms of reference (ToR) for specialist studies in the impact assessment phase of the ESIA; the ToR will set out the scope, methodology and procedural requirements that will be undertaken as part of the technical studies.

Figure 3: Diagram indicating potential ESIA effort in relation to project scale and environmental sensitivity

Full ESIA Potential "no go"
High project impact potential / High environmental sensitivity
(For example, greenfield development of cement plant and quarry adjacent to declared conservation area and/or communities)

Full ESIA Focus on sensitive receptors
Low project impact potential / High environmental sensitivity
(For example, alternative fuel project in a sensitive airshed)

Full ESIA Focus on mitigation of impacts
High project impact potential / Low environmental sensitivity
(For example, greenfield development in an already disturbed environment)

Full ESIA
Moderate project impact potential / Moderate environmental sensitivity
(For example, quarry expansion resulting in landscape disturbance)

Limited ESIA Focus on mitigation of impacts
Low project impact potential / Low environmental sensitivity
(For example, small-scale plant expansion resulting in impact within existing footprint)

4.4.2 The scoping exercise

The following steps are required when undertaking the scoping exercise:

Step 1

Prepare an outline of the scope (plan of study for scoping).

Step 2

Identify the preliminary environmental impacts through an evaluation of how the project may relate to its receiving environment. A detailed project description (see *section 4.3: The screening phase* on page 26) and background description of the receiving environment will be required to complete this task.

Step 3

Initiate discussions with external stakeholders. The stakeholders should be offered the opportunity to raise issues that they would like to see addressed during the ESIA as well as the opportunity to suggest alternatives.

Step 4

Identify issues of concern, including those raised by stakeholders (see step 3 above) and evaluate the significance of issues to determine which should be evaluated further in the ESIA.

Step 5

Develop a strategy/ plan of study to address the key issues

4.4.3 Scoping report

The scoping phase should be documented in the form of a scoping report that is submitted to the authority for review and approval. The scoping report should basically be a concise presentation of the major issues and opportunities identified and the public participation process.

As a minimum, the report should include:

- A brief description of the project;
- All the alternatives identified during the scoping process;
- All the issues raised by interested and affected parties and how these will be addressed; and
- A description of the public consultation process, including a list of interested and affected parties, and minutes of meetings.

The scoping report should also contain detailed ToR for the ESIA. The ToR is also referred to as a plan of study in some jurisdictions.

The ToR will set out:

- A description of the environmental impacts and opportunities identified during scoping that may require further investigation and assessment;
- A description of the feasible alternatives identified during scoping that may be investigated further;
- A description of the baseline field programs that are to be carried out;
- A description of ongoing consultation proposed for the ESIA process;
- A description of the proposed method of identifying the environmental and social impacts;
- A description of the proposed method of assessing the significance of these impacts; and
- A proposed schedule for the ESIA studies.

It is important that the information in the scoping report be as comprehensive as possible. This is because a decision about whether the project should go ahead or not and whether an ESIA is required to further investigate issues and alternatives will be made on the basis of this report. In many cases where there are no major issues identified, the scoping report will be sufficient for a decision to be made and no further studies will be required.

4.5 Baseline

4.5.1 Overview

The primary objective of the ESIA process is to appraise the potential changes that the proposed project may have upon the existing environment and society and how this can be avoided (ideally) or mitigated. To inform the appraisal of any possible changes that may occur, it is necessary to first establish an understanding of the existing environment before any clearing of the site to make way for development. This is the purpose of the baseline study.

The baseline appraisal should consider all aspects of the environment that may be altered by the proposed project. These can be categorized as physical, biological or socio-economic attributes as summarized in **Table 3** and presented in the following guidance. The baseline should be based upon the findings of the screening and scoping studies.

Table 3: Baseline considerations

Physical	Surface water and sediments, groundwater, air quality, noise, soils and land use
Biological	Biodiversity
Socio-economic	Socio-economic (social), cultural heritage, traffic and transport

The scope of the baseline study, including attributes that will be appraised, and the geographical extent of the analysis, will typically have been agreed with the relevant decision-makers as an outcome of the scoping phase. It is important to re-emphasize that the scope (and detail) of the baseline study should be commensurate with the size and scale of the project and hence the potential changes that the project may have upon the environment and society.

The baseline study will typically be developed in three stages:

- Desktop study: Office-based exercise during which readily available existing information (i.e. that can be used to describe the existing environment) is collected and reviewed to ensure its appropriateness for use within the ESIA;
- Field study: The stage within which additional data is captured in the field, with the intent of addressing any gaps that have been identified in the existing knowledge base; and
- Reporting stage: Collation of the captured information into the baseline report as described in *section 4.6: The baseline report* (page 55).

4.5.2 Physical studies

Baseline investigation is required to establish the state of the natural environment before any changes take place as a result of construction, operation and decommissioning of a quarrying and/or cement manufacturing facility. Therefore, to assist the scoping of the baseline study, it is useful to have an appreciation of the nature of the potential impacts that may occur as a result of the proposed project.

“The baseline appraisal should consider all aspects of the environment and society that may be altered by the proposed project. These may be categorised as physical, biological or soci-economic attributes...”

Table 4 provides a snapshot of the typical changes in physical aspects that arise during the development and operation of a cement manufacturing facility, assuming that it is being introduced within a currently undeveloped site. This is not intended to be a comprehensive list of impacts; however, these are the effects that are most common in developments of this type.

Typical impacts – new development (cement)

PLEASE NOTE: The changes summarized below reflect impacts (positive and negative) that may occur as a result of a typical cement industry development. This is not intended to be a comprehensive list of potential impacts; not all impacts listed will be relevant for every site.

Table 4: Typical changes to physical aspects that arise during the development and operation of a cement manufacturing facility

Technical area	Construction phase	Operational phase	Closure phase
Surface water and sediments *Global Water Tool for the Cement Sector* (CSI 2013)	Clearance of vegetation may result in an increase in the level of suspended solids washing into rivers and streams following heavy rainfall; movement of vehicles may result in fuel and oil leaking into surface water bodies; earthworks may result in a change to catchment boundaries, altering overland flow paths.	River diversions and surface water storage facilities (for example, weirs) may provide beneficial changes to local biodiversity and improve local water supplies; dust and dirt (and adhered particulates) from exposed surfaces may wash into rivers and streams following rainfall; withdrawals (i.e. for water use) and/or discharges from the operation may alter the quality and/or quantity of flow in local water bodies; quarry dewatering may lower the water table and hence the base flow in local rivers.	The quarry void may represent a potential alternative source of water for local communities; long-term industrial use of the site may contaminate the underlying soils and local water bodies; the post-closure landscape of the site may further alter the n rate of flow to local streams.©
Groundwater	Movement of vehicles may result in fuel and oil leaking into the underlying soils, resulting in the contamination of the water table.	Drilling of groundwater wells; quarry dewatering and/or withdrawals may improve local water supplies; fuel and chemical spillages may result in the contamination of underlying soils and groundwater resources from water wells (i.e. to satisfy water demands) may lower the water table.	Cessation of long-term quarry dewatering may restore groundwater levels and improve access to water supplies; long-term industrial use of the site may contaminate the underlying soils and water table; backfilling of quarry voids with less permeable material may alter local groundwater flow regimes.
Air quality *Guidelines for Emissions Monitoring and Reporting in the Cement Industry* (CSI 2012)	Clearance of vegetation and increases in traffic may result in an increase in the level of dust and particulate matter in the air surrounding the site (and along access roads).	Traffic movements and quarrying activity may increase the level of dust and suspended particulates; emissions from the kiln may increase the ambient air temperature and/or may increase the concentration of noxious gases in the air.	Following decommissioning of the operations, there are no impacts upon air quality.

Table 4: Typical changes to physical aspects that arise during the development and operation of a cement manufacturing facility. (continued)

Technical area	Construction phase	Operational phase	Closure phase
Noise and vibration *Safety in the cement industry: Guidelines for measuring and reporting* (CSI 2008)	A temporary increase in traffic importing/exporting materials may increase the level of noise along routes to and from the project; construction activity on site may result in an increase in noise levels to areas surrounding the site.	• Operation of machinery within the quarry and/or plant and loading areas may increase noise levels to surrounding areas, particularly during nighttime hours in the case of 24-hour operations; movement of vehicles to and from the site may increase noise to areas adjoining site haulage corridors. • Operation of a quarry, with periodical blasting for material extraction, generates ground vibrations that may negatively affect buildings and neighbors close to the quarry site.	Following decommissioning of the operations, there are no impacts upon noise.
Landscape and visual amenity	Changes (temporary or long term) to the landscape, including the introduction of above-ground installations, may alter the views to, from or beyond the site.	Changes (temporary or long term) to the landscape, including the introduction of above-ground installations, may alter the views to, from or beyond the site.	Decommissioning of the site may result in a permanent change to the landform and/or landscape (for example, replacement of vegetation with open water due to quarrying activity), improving the amenity and/or biodiversity value of the site.
Soils and land use *Biodiversity Management Plan (BMP) Guidance* (CSI 2014)	Clearance of vegetation may increase soil erosion due to wind and rain and may alter the surface temperature of the surface soil layer(s), which in turn may reduce the viability of the soils to support existing land uses (for example, agriculture); temporary and/or permanent changes to the site during construction may alter drainage paths, potentially altering the moisture and/or chemical composition of existing soil layers.	Movement of vehicles throughout unpaved areas of the site may lead to the compaction and water logging of soil (to depth); temporary stockpiling of topsoil layers during operations may expose soils to erosion and may alter the composition of the soil structure following long-term storage (for example, the "washing out" of fine grained material).	Managed decommissioning of the site provides an opportunity to improve the yield of the land, improving site drainage and restoring soil layers to promote agriculture or to introduce a natural wetland habitat.

4.5.2.a Surface water and sediments

Baseline data capture

Topography

Topographic mapping should be sought from the best available sources. This should include a detailed depiction of the project area and immediate surroundings (ideally providing 1-meter contours) and a sufficient level of detail to enable catchment delineation for the wider region.

Climate data

Long-term rainfall and evaporation datasets for the region should be sought from web-based sources and/or the national authority. Daily rainfall and pan evaporation should also be collected at the site itself throughout the baseline data collection period, providing a comparison with the available (long-term) regional datasets to establish how representative these are of local conditions within the project area.

Surface water flow

The rate of flow should be appraised for all potentially affected surface water bodies (for example, sources of water supply for dust suppression, raw material preparation and cooling; receiving waters for quarry releases; and water bodies that may be affected by quarry dewatering). Where not already available from the local authorities, this will typically be achieved through the installation of automatic data loggers that will capture changes in water levels at regular time intervals (for example, every 15 minutes). Spot gauging may also be taken (for example, by the installation of gauge boards that can be read on a daily basis to record the maximum water level).

It is important to ensure that seasonal changes to the flow regime are understood. Ideally this should involve the capture of flow information for each season (i.e. quarterly). As a minimum, however, a representative dry or summer season and a representative wet or winter season flow rate should be captured. Within areas that are affected by a springtime snow melt, it will be important to capture information during this season.

Surface water and sediment quality

The existing water quality of all potentially impacted surface water bodies (and the underlying sediments) should be appraised. Where not already available from local monitoring programs, this will typically be assessed through in-situ testing and the capture of samples from the field for laboratory testing, including heavy metals, pathogens and hydrocarbons. The suite of laboratory tests carried out should reflect the likely contaminants that may be found in the surface water and sediments prior to the development (i.e. as a result of existing land uses) and during the construction, operation and decommissioning of the project.

Once again, it is important to ensure that any fluctuations in water quality that may occur as a result of seasonal changes are understood. For this reason, samples will ideally be captured on a quarterly basis over a representative 12-month period.

As a minimum, a representative dry or summer season and a representative wet or winter season sample should be collected for analysis.

Establishing a surface water baseline (data analysis)

Surface water users and co-dependent habitats

An understanding of existing surface water users should be established. This will typically be achieved via a visual survey of local communities and industries situated nearby and/or downstream of the project area to establish where water is being drawn, how much is being drawn, and how the water is being used (for example, for washing or for drinking). An understanding of existing habitats (aquatic, riparian and terrestrial) that are dependent upon the long-term integrity of the surface water environment should also be established. This will typically be informed by the biodiversity team(s).

A risk assessment should be carried out using readily available tools (for example, the *Global Water Tool for the Cement Sector* (WBCSD 2013a), or Aqueduct (World Resources Institute)) to provide a qualitative appraisal of the relative availability of water within the proposed region of operation and hence the likely degree of risk that may be posed by water scarcity.

Surface water availability and quality

A daily water balance model should be established to simulate how the quantity and quality of flow within the river, stream or lake responds to inputs (for example, rainfall over the catchment) and outputs (for example, evaporation, seepage, withdrawal). The model can then be adjusted as part of the impact assessment to probe any changes to inputs (for example, changes in catchment area, quarry discharges) and/or outputs (for example, withdrawal for processing) that may occur as a result of the project.

Flood risk appraisal

If the project is in an area that may be susceptible to flooding, this should be considered. This may be flooding from rivers, the sea or as a result of overland flow due to the passing of an intense storm event. Typically, a simple flood risk model will be sufficient to establish the likely extent and frequency of flooding at the project site and to probe how the proposed changes (i.e. as a result of the development) may alter the risk of flooding to adjacent areas. In areas that are known to be flood prone, however, early discussions should be sought with the regulatory authority to ensure that a suitable level of detail is provided as part of the flood risk analysis.

4.5.2.b Groundwater

The groundwater baseline appraisal is described below. It is noted that groundwater and surface water baseline studies should be carried out in close collaboration to ensure that interactions between the two regimes are captured coherently.

Baseline data capture

Geology

Topographic mapping should be sought from the best available sources. This should include a detailed depiction of the project area and immediate surroundings (ideally providing 1-meter contours) and a sufficient level of detail to enable catchment delineation for the wider region.

Groundwater flow

Long-term rainfall and evaporation datasets for the region should be sought from web-based sources and/or the national authority. Daily rainfall and pan evaporation should also be collected at the site itself throughout the baseline data collection period, providing a comparison with the available (long-term) regional datasets to establish how representative these are of local conditions within the project area.

Groundwater quality

The rate of flow should be appraised for all potentially affected surface water bodies (for example, sources of water supply for dust suppression, raw material preparation and cooling; receiving waters for quarry releases; and water bodies that may be affected by quarry dewatering). Where not already available from the local authorities, this will typically be achieved through the installation of automatic data loggers that will capture changes in water levels at regular time intervals (for example, every 15 minutes). Spot gauging may also be taken (for example, by the installation of gauge boards that can be read on a daily basis to record the maximum water level).

It is important to ensure that seasonal changes to the flow regime are understood. Ideally this should involve the capture of flow information for each season (i.e. quarterly). As a minimum, however, a representative dry or summer season and a representative wet or winter season flow rate should be captured. Within areas that are affected by a springtime snow melt, it will be important to capture information during this season.

Establishing a surface water baseline (data analysis)

Groundwater users and co-dependent habitats

An understanding of existing groundwater users should be established. This will typically be carried out in collaboration with the surface water team and should involve a visual survey of local communities and industries situated nearby to establish the presence (and nature of use) of existing wells.

An understanding of existing flora and fauna species that may be dependent upon local groundwater springs and/or wetland areas should also be established. This will typically be informed by the biodiversity team(s).

Groundwater availability and quality

Using the captured baseline availability (depth and flow) and quality data, a conceptual model should be developed to simulate the response of the regional groundwater regime to inputs (for example, seepage, river base flow) and outputs (for example, abstractions). The model can then be adjusted as part of the impact assessment to study any changes that may occur as a result of the project (for example, quarry dewatering).

Flood risk appraisal

If the project is in an area that may be susceptible to flooding, this should be considered. This may be flooding from rivers, the sea or as a result of overland flow due to the passing of an intense storm event. Typically, a simple flood risk model will be sufficient to establish the likely extent and frequency of flooding at the project site and to probe how the proposed changes (i.e. as a result of the development) may alter the risk of flooding to adjacent areas. In areas that are known to be flood prone, however, early discussions should be sought with the regulatory authority to ensure that a suitable level of detail is provided as part of the flood risk analysis.

4.5.2.c Air quality

In order to rigorously appraise the potential changes that may impact upon the ambient air environment, it is necessary to establish an understanding of the existing air quality and how this fluctuates seasonally and in response to existing human activity. Air emissions may arise from manufacturing activities such as grinding or kiln operations; the transport of raw materials to the site (for example, triggering plumes of dust from unsurfaced roads); and dust from stockpiles of raw materials, hoppers, crushing plants, vents and furnaces. All CSI member companies have agreed to monitor emissions sources identified in the CSI *Guidelines for Emissions Monitoring and Reporting in the Cement Industry* (CSI 2012). The air quality baseline appraisal is described below.

Meteorological data

Meteorological data should be collected at the site, including wind speed and direction, temperature, humidity, solar radiation and barometric pressure. Where not already available from local gauging stations, this will typically be achieved through the installation of a weather station at the site, with automated collection of data at regular 10-minute intervals, ideally over a 12-month period (i.e. to capture seasonal weather changes).

Regional meteorological data should also be sought from published sources and/or the national authorities. This will allow a comparison with the captured local datasets to establish how representative these are of conditions regionally and to ascertain whether the monitored period reflects an "average" year. Long-term meteorological data sets can also be used to consider potential climatic changes in the region which may be important in managing the continued productivity of the facility over its entire life cycle.

Ambient air quality

The quality of the existing air environment (i.e. prior to any development of the site) should be established. This will typically be achieved through the installation of monitoring equipment at strategic locations throughout the site and the surrounding area (i.e. situated downwind of the project and at sensitive human and ecological receptors). The monitoring equipment should typically (as a minimum) include passive diffusion tubes to assess atmospheric gases (i.e. laboratory sampling for the presence of nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and ozone (O_3). In developed countries (i.e. where power sources are readily available), continuous air quality monitoring may be required. This will be agreed with the relevant decision-makers as an outcome of the scoping phase and may include Frisbee gauges to monitor dust (including potentially heavy metals) and a real-time particulate analyzer to assess fine particulates. A more detailed baseline monitoring study may also include heavy metals, dioxins and furans (i.e. through pumped active sampling and analysis of the filters), and hydrocarbons (i.e. through passive diffusion tubes).

The monitoring of ambient air quality will ideally be carried out on a monthly basis over a 12-month period. As a minimum, however, samples should be collected at sufficient intervals to represent seasonal fluctuations in rainfall/humidity (i.e. wet/winter and dry/summer seasons for all locations) and wind speed/direction (i.e. an additional autumnal sampling regime may be required).

Any regional air quality data should also be sought from published sources and/or the national authorities. This will allow a comparison with the captured local datasets to establish how representative these are of conditions regionally and to ascertain whether the monitored period reflects an "average" year. Long-term air quality data sets can also be used to consider potential trends in ambient conditions due to wider changes in the region (for example, desertification may lead to greater concentrations of dust or industrialization may lead to greater concentrations of gaseous substances). These regional changes may again be important in managing the continued productivity of the facility over its entire life cycle.

It is recommended that the results of the baseline monitoring assessment be presented in comparison to the relevant air quality standards. The report should also include details of the monitoring locations and any potential sources of emissions already in the vicinity.

The meteorology and air quality baseline data can be used in an air dispersion modelling assessment (during the ESIA) to predict the potential impacts of the facility. Data collected during the baseline assessment will allow the current air quality to be characterized and any future monitoring undertaken when the project is operational can be compared against this to quantify impacts.

4.5.2.d Noise and vibration

Heavy machinery (crushers, grinding mills, blowers, compressors and large fans) used in cement manufacture can give rise to emissions of noise and/or vibration. Blasting activities in the quarrying process further contribute to high levels of noise and vibration.

Baseline noise conditions are typically established through a monitoring program. The timing and locations of noise monitoring are dependent on local circumstances and must be representative of the project being assessed. For example, if a facility is proposed to operate 24/7, it will be necessary to establish baseline noise levels during daytime (typically 07:00 to 18:00) and nighttime periods (typically 23:00 to 07:00).

Noise monitoring locations will be at noise-sensitive receptors (for example, dwellings, schools, hospitals, places of worship, etc.). It is sufficient to select monitoring locations that are representative of community interests; it is not necessary to monitor at every receptor. The siting of noise monitoring equipment within audible range of existing significant noise sources should be avoided. Professional judgment and experience are required in the careful selection of appropriate representative monitoring locations.

International Organization for Standardization (ISO) standards for acoustics first developed in 1996 (Part 1, ISO 2003 and Part 2, ISO 2007) set out the equipment to be used to undertake measurements, the conditions under which noise measurements should be undertaken, measurement parameters and appropriate siting of monitoring equipment. The duration of the noise monitoring program should be sufficient to ensure consistent and repeatable results. Note that in certain circumstances it may be necessary to carry out additional noise monitoring to understand any difference in baseline noise levels due to seasonal effects. Weather conditions during the monitoring period should be recorded, noting in particular any periods of high wind speed or heavy rainfall.

The recording of baseline noise conditions should include ambient (Leq), background (L90), minimum (LMin) and maximum (LMax) parameters. Contiguous measurement periods of 1 hour maximum during daytime and 5 minutes maximum during nighttime should be adopted. Although the noise monitoring equipment may be set for unattended automatic monitoring, it is recommended that some of the monitoring period be attended to allow contributing aspects of the noise environment to be understood and distinguishing characteristics noted. For example, nighttime periods in remote rural areas may see an increase in noise levels due to wildlife.

It is recommended that the results of noise monitoring exercises be presented in summary format with original and complete datasets included as an appendix in the baseline study report. Where daytime and nighttime noise levels have been recorded, it may be helpful to present a time history of noise levels to identify any diurnal trends. The summary report should include details of monitoring location, date and time, weather conditions and a qualitative description of the noise environment at that location, in particular noting any distinguishing features of it.

The potential impacts of vibration, associated with the use of explosives, should also be considered as a key element of the impact assessment process. Any existing industry (i.e. prior to project implementation) that may cause vibration to nearby infrastructure and/or buildings should be identified and monitored.

Noise and vibration may adversely affect not only surrounding communities but also those employed within the plant. The CSI ranks healthy and safe working conditions for employees and contractors at the top of its priorities and has published guidelines – *Safety in the cement industry: Guidelines for measuring and reporting* (CSI 2008) – that provide standard, cross-company systems to measure, monitor and report on safety performance that individual companies can implement.

4.5.2.e Landscape and visual amenity

Landscape effects are the result of physical changes to the character and quality of the landscape (note that they do not have to be visible). Visual effects result from changes to views experienced by the local population, including residents, visitors and workers within the study area.

There is no internationally recognized methodology or IFC Performance Standard for the assessment of landscape and visual effects; however, the following provide useful references:

- The *Guidelines for Landscape and Visual Impact Assessment* (Landscape Institute and Institute of Environmental Management and Assessment 2013) provide the most comprehensive guidance for undertaking a qualitative assessment;

- The *Visual Resource Inventory and Visual Resource Contrast Rating Manual* (United States Department of the Interior) provide detailed methodologies for a quantitative assessment of landscape and visual effects; and

- The *CSI Biodiversity Management Plan (BMP) Guidance* (CSI 2014) provides detailed guidance that aims to support the objective of minimizing impacts and, where possible, enhancing biodiversity.

The study area for the landscape and visual baseline assessments (regional and local) are defined by the zone of theoretical visibility (ZTV)—the area from which there would be a direct line of sight to the key components of the proposed development.

The aim of the landscape baseline study is to assess the existing character and sensitivity of the landscape. A desk-based study of aerial imagery, mapping and published documentation should be undertaken to identify and record planning constraints/protected areas or physical features, including land use, geomorphology, vegetation cover, potential tourist features/visitor attractions, roads, recreational trails and important cultural sites.

The findings of the desk-based assessment would ideally need to be verified in the field and additional information relating to perceptual qualities of the landscape, including tranquility, remoteness and rarity, should be recorded to identify specific features worthy of protection and to identify those areas within the study area most sensitive to change.

The information should be presented in plan form showing a series of individual landscape character areas or types (homogenous areas of landform and land cover with specific, identifiable characteristics or features), along with a written report summarizing the key characteristics and the sensitivity of each area/type.

The aim of the visual baseline study is to identify the location and sensitivity of viewers within the study area who may be affected by the proposals. The location of towns, villages, isolated settlements, roads and visitor locations (including popular cultural sites and public viewpoints) within the study area should be recorded on scale plans. Ideally this information should be verified in the field; alternatively, it could be confirmed using up-to-date high-resolution aerial imagery and mapping. Crucial views from local settlements or important viewpoints should be recorded photographically. Ideally, photographs should be taken from representative locations that are visited by many viewers.

Each site photograph should be taken using a standard lens to capture a 90° to 180° field of view, without causing distortions to the image. The photographs should be suitable for the production of fully rendered photo-realistic photomontages at the impact assessment stage.

The landscape and visual assessment should consider the site during daylight and darkness, taking into consideration the potential impact of the site establishment, operational, decommissioning and post-closure phases of the development.

> "An ESIA should compile a list of important biodiversity features, expected risks and opportunities arising from the project that could affect those values, mitigation and management options, and possible opportunities for biodiversity enhancement derived from the project"

4.5.2.f Soils and land use

In order to rigorously appraise the possible changes that may impact upon the quality and yield potential of existing soils (for example, to support agriculture), it is necessary to establish an understanding of the integrity of existing soils prior to any development taking place. The soils and land-use baseline appraisal is described below.

Soil assessment

Readily available soils and land-use mapping should be sought from published sources and/or the regional authorities. Recent aerial photography should also be sought, where available. An appraisal of existing soil types should be carried out based upon the existing information available, considering soil depth and the potential of the soils to support land use (for example, soil fertility to support agriculture, sand content to support industry).

Soil sampling

Representative soil samples should be collected throughout the site to establish the physical and chemical properties of the soil(s) and the depth and configuration of soil layering. The purpose of the soil sampling is to consider how the soils and the associated land uses may be impacted by changes to the site as a result of the proposed development (for example, changes to topography and drainage routes, removal of vegetation).

Soil mapping

A map of the soils within site (and immediate surroundings) should be prepared, reflecting the relative quality and composition of the various soil types that have been identified.

Land use

A map should be prepared, reflecting existing land use, including (as a minimum) residential areas, existing industry, agriculture, undisturbed forest, habitat protected areas.

4.5.3 Biodiversity

The Convention on Biological Diversity (CBD and Netherlands Commission for Environmental Assessment 2006) recognizes impact assessment as an important decision-support tool to help plan and implement development with biodiversity in mind. Consequently, the effects and impacts on biodiversity should be investigated by an independent specialist with the appropriate experience and qualifications.

This is reinforced by the cement sector, which:

- Appreciates the multi-use context of limestone resources, including cultural and historical values, ecological service values and touristic values;
- Understands the growing scientific knowledge of limestone ecosystems with resulting calls for improved conservation and management (government, non-governmental organizations (NGOs), media, etc.), including the fact that limestone and karst systems harbor species new to science that are often range restricted and endemic. Consequently, the quarrying of isolated limestone hills can result in global-level extinctions and effects on such biodiversity need to be avoided or carefully managed (International Cement Review Research 2012);
- Recognizes the philosophy of the precautionary principle: that the absence of scientific certainty does not justify avoiding/postponing actions to prevent biodiversity impacts; and

- Acknowledges that appropriate decommissioning and restoration of quarry sites provides an opportunity to improve biodiversity values (communities, NGOs, media).

An ESIA should compile a list of important biodiversity features, expected risks and opportunities arising from the project that could affect those values, mitigation and management options, and possible opportunities for biodiversity enhancement derived from the project. The intent of the process should be based on the concept of no net loss of biodiversity in the project area or a net positive impact in areas of identified priority or critical habitat (as defined by the IFC in *Performance Standard 6* (IFC 2012)).

The data collected during this exercise will be important to identifying biodiversity-relevant key performance indicators (KPIs) and will form the basis for the monitoring and management of risks for the life of the project (construction, operation, decommissioning and post-closure) (Energy and Biodiversity Initiative 2014). Depending on the nature of the potential effect on biodiversity, these data will also need to be sufficiently adequate to enable the determination of the preliminary nature of biodiversity offsets, if so required.

The characterization of the biodiversity baseline for a particular site should involve two parts:

- The identification and contextualization of the site's biodiversity value; and

- Field surveys to confirm the biodiversity value.

CASE STUDY 3

Reconciliation of natural heritage with quarrying

San Carlos quarry is located in Cerro Gordo, an extinct volcanic hill that is included in the volcanic area of Campos de Calatrava in Ciudad Real in central Spain. This is a crucial source of pozzolan for the nearby cement works. In the territory of Campos de Calatrava, volcanoes are an essential part of the natural, social and cultural heritage. The volcanic field is located in a continental rift and contains several craters (maars) that are filled with water, thereby forming volcanic lakes. The presence of these volcanic lagoons makes this a sensitive area from the point of view of biodiversity, attracting abundant and diverse bird life.

The environmental and social values attributed to the region are firmly held by local communities, academics and environmental causes, leading to considerable opposition to the intended quarrying of the available resources.

Several articles were published by the scientific community, including representatives from the University of Castilla-La Mancha. All of these objected to the presence of the quarry on the basis of the negative impacts on the volcanic formations. Meetings were held between the scientific community and the local authorities in an effort to apply pressure that would lead to the refusal of planning permission to operate.

The company took over the quarry operation from the original developer and, because of these concerns, felt it was important to develop a strategy that would take into account the unique volcanic landscape and the rich biodiversity in the area, striving to make it compatible with the quarrying activities. The main objectives of the strategy were to find a solution that would help preserve some of the volcanic formations within the hill while also respecting the cultural heritage of the area, but still allow quarrying activities to continue.

A dialogue was commenced with representatives from the university and the local community at the earliest possible stage. This was very difficult in the initial stages and it was not possible to find an acceptable solution. Stakeholders were encouraged to visit the site to see the operations, thereby highlighting what was being done to improve biodiversity, creating awareness about natural heritage.

During these visits, the stakeholders were able to see the different types of volcanic formations that were previously hidden by the grazing land. Consequently, an idea was formulated to protect part of the quarry and create an open air museum for the volcano.

An area was set aside within the quarry that would be used for educational purposes, including further research by the university and an opportunity for tourism that would provide income and employment in the future for the local community. A partnership was subsequently formed with the Campo de Calatrava Association and the University of Castilla-La Mancha to develop this open-air Volcanic

Museum. Educational books, brochures and panels have also have been developed by the company, with the scientific collaboration of the university.

The quarry has become an important haven for predators (raptors), including the Spanish imperial eagle (*Aquila adalberti*), the golden eagle (A. *chrysaetos*), the booted eagle (*A. pennata*) and owls (*Bubo bubo)*. The pozzolanic material, which is easy to dig, makes the quarry a perfect habitat for rabbits to burrow in. Consequently the site has become a key source of food for these birds of prey within a protected area.

The primary outcomes that were achieved include:

- Through dialogue and a formal agreement, it was possible to achieve engagement and create a valuable asset that harmonized the industrial use of the quarry with the key “natural” values that are attributable to the volcano.
- Tourism and promotion of this rural area have been enhanced as a result, thus having a very positive impact upon local business.
- New, innovative and exciting ways to educate the local community about volcanic structures were achieved, demonstrating that mining is not only necessary but can be achieved in an integrated and sustainable manner.

4.5.3.a Identification of biodiversity value

Biodiversity value is a term used by the International Council on Mining and Metals (ICMM) and the IFC. Biodiversity values represent components of biodiversity at various levels of biological organization, such as genes, species or ecosystems that are important for conservation.

The establishment of the biodiversity baseline of the project area should begin in the scoping phase with the identification of the biodiversity value of the project site using secondary data sources. Such sources should include, yet not be limited to, those contained in the *IBAT for Business – Integrated Biodiversity Assessment Tool* (BirdLife International et al.), national databases (if these exist) and consultation with local experts.

The CSI *Biodiversity Management Plan (BMP) Guidance* (CSI 2014) also provides a practical resource for use at the site level, offering step-wise guidance in the appraisal and management of biodiversity.

A biodiversity constraints/sensitivity map of the wider project area should be generated that includes, as a minimum, depending on the scale of project:

- Legally protected areas. (International Union for Conservation of Nature (IUCN) categories I to IV for the classification of protected areas and non-designated areas, including areas of local, regional and national conservation priority;
- Key biodiversity areas (KBA) (including important bird areas (IBA) and endemic bird areas (EBA) as defined by BirdLife International);
- Land cover and land use;
- Critical habitat (as defined by IFC *Performance Standard 6* (IFC 2012);
- Soils and geology, in particular karst environments and known caves;
- Catchments and hydrology;
- Existing infrastructure and disturbance; and
- Proposed project infrastructure (including roads and transport routes, plant sites, quarry sites, etc.)

This map should be used to identify areas of influence from direct, indirect, induced and cumulative effects and risks and therefore should encompass an appropriate discrete management unit (DMU) that will form the basis of the biodiversity and ecosystem services regional study area of the impact assessment.

This map can also be used to identify:

- Areas of High Conservation Value (HCV) – guidance, manuals, tools and studies for assessing HVC areas can be found on the “Documents” page of the website at *www.hcvnetwork.org/resources*;
- Possible avoidance options through the design of the project; and
- Potential areas for offsetting, should these be required (Forest Trends Association, Business and Biodiversity Offsets Programme 2012).

In line with general conservation planning principles and the best practice embodied in the Convention on Biological Diversity Guidelines (CBD and Netherlands Commission for Environmental Assessment 2006) and IFC *Performance Standard 6* (2012b), three levels of biodiversity value should be considered. These should cover (as appropriate to the project area and needs) the terrestrial, subterranean, aquatic and marine environments.

Habitats and ecosystems

The focus should be on the representativeness and extent, irreplaceability, vulnerability, naturalness, fragility and resilience, and connectedness and linkages of habitats and ecosystems within the project area. Included in this is the need to gain an understanding of the current drivers of change, processes and functions of the habitats and ecosystems.

Species

The focus should be on populations and habitats of species of concern, in particular species of high conservation concern (as recognized regionally, nationally and internationally), range-restricted and/or endemic species, "umbrella species", congregatory and migratory species, common species whose populations are declining regionally, and invasive species.

In line with standard conservation priority setting, this should focus on vertebrates and higher plants, which can act as proxies for other taxa. However, an exception to this is in karst environments and subterranean habitats where range-restricted and endemic invertebrates and other troglobites can occur. It should be recognized that the majority of troglobitic fauna are not yet classified or assessed by the IUCN and very little information, if any, is generally available about them. Therefore, it is critical that experts and scientists in the area be engaged during the scoping, baseline and impact assessment stages to assess the value of these taxa.

Ecosystem services

The focus should be on the benefits (direct, indirect, option and existence values) that the project and stakeholders in the project area (the beneficiaries) derive from the ecosystems in the project area (Imboden et al. 2010 and Landsberg et al. 2013). Importantly, these benefits will need to be identified through stakeholder engagement and integration with the social assessment team to assimilate local knowledge and notions of value. They will also need to address community concerns regarding the integrity of subsistence and livelihood systems and how ecosystems and biodiversity supports those systems. The WBSCD *Corporate Ecosystem Services Review (ESR)* (WBCSD 2012) has been developed to assist companies to manage business risks and opportunities arising from their operation's interdependence (and potential impact on) ecosystems.

An initial risk screening of the project's activities and associated effects on the biodiversity values of the project site should be conducted based on the mitigation hierarchy (avoidance, minimization, rehabilitation and compensation) as outlined in *International Cement Review* (International Cement Review Research 2012). This screening can help rank biodiversity values of the project area in terms of importance and sensitivity to potential effects and impacts and thus help focus the collection of appropriate data during the field surveys. Relevant risk screening approaches are provided in the IUCN *Integrated Biodiversity Management System* (Imboden et al. 2010), the Energy and Biodiversity Initiative's *Integrating Biodiversity into Environmental and Social Impact Assessment Processes* (Energy and Biodiversity Initiative 2014b) and the CSI *Biodiversity Management Plan Guidance* (CSI 2014c).

4.5.3.b Field surveys

Based on the results of the desktop biodiversity values assessment, a field survey program should be designed that takes full account of the seasonality and natural cycles/variability of the habitats and ecosystems, species and ecosystem services of the project area. The detail of the required surveys will be dependent on the nature and scale of the project, as determined during the desktop stage.

In this regard, it may be beneficial to engage general biodiversity specialists who can focus broadly on the impacts early and provide a perspective of impacts across a variety of ecosystem types. Following this, more detailed studies could be commissioned as required. The *CSI Biodiversity Management Plan Guidance* (CSI 2014c), provides detailed guidance on field investigations within Chapter 5 (Stage 2) of the document.

The intent of the field surveys should be to gather sufficient additional information to complement the data collected during the desktop stage and fill in any data gaps that will be crucial for the impact assessment and subsequent mitigation, management and monitoring. As mentioned, the field surveys should cover (as appropriate to the project area and needs) the terrestrial, subterranean, aquatic and marine environments.

To this end, the field studies should, as a minimum, aim to:

- Confirm the extent and condition of the habitats and ecosystems in the project area as identified on the sensitivity map;
- Compile as complete a list as possible of vertebrate and higher plant species occurring in the project area, including species of concern, as well as karst-dependent troglobitic species, if these occur. An assessment of populations and habitat requirements will also be required; and
- Gather information on local community/stakeholder use and dependence of ecosystem services in the project area and which ecosystems supply which services.

The survey team should be suitably qualified, competent and experienced in undertaking quantitative and qualitative biodiversity surveys using established and published techniques. The limitations of identifying appropriate expertise, especially those experts in the field of cave ecosystems and species, is recognized. However, the best available knowledge should always be sought for surveys; and, depending on the project location and conditions, the survey team should be established so as to reflect the nature of the environment within which the project is being developed. The survey team might include experts in the areas identified in **Table 5.**

4.5.4 Socio-economic studies

4.5.4.a Socio-economic (social)

For certain projects, impacts on people can be more significant than environmental impacts. Adverse social impacts can threaten the viability of a proposed development throughout the project phases. The WBCSD has developed *Measuring Socio-economic Impact – A WBCSD Guide for Business* (2013), which is intended to help companies navigate the complex landscape of socio-economic impact measurement.

The key characteristics and variables that are often correlated with adverse social impacts of development proposals include:

- Demographic changes, such as in the size and composition of the resident population or the influx of a temporary workforce;
- Economic change, such as new patterns of employment (marginalizing long-term, older residents); and
- Environmental change, such as alterations to land use (specifically with respect to subsistence agriculture), natural habitat and hydrological regimes, resulting in a loss of subsistence or livelihood in resource-dependent communities.

Table 5: Potential biodiversity survey topics and specializations

Terrestrial ecology	Vertebrates and higher plants; limestone and karst systems; landscape ecology
Aquatic ecology	Vertebrates and macro-invertebrates; wetlands and riparian systems; limestone and karst systems; fluvial geomorphologyv
Subterranean ecology	Troglobitic invertebrate and vertebrate fauna and ecosystems; cave geomorphology and hydrology; hydrogeochemistry
Marine ecology	Mangroves; sea grass meadows; estuaries; coral reefs
Ecosystem services	Socio-ecological systems; cultural heritage and stakeholder engagement; supply and demand economics

The project may also provide positive benefits for local communities (for example, job creation, up-skilling and an enhancement of the local economy by increasing trade with local suppliers). Baseline studies for social parameters aim to compile a socio-economic description of an affected area and are typically determined through secondary information and, where necessary, the use of questionnaires and community surveys often conducted through dialogue and direct interaction with local communities.

The scope of the socio-economic baseline study is outlined below.

Local and regional economic situation

Describe the recent evolution (over the past 5 to 10 years) of the local economy in the project-affected area. This should take into account the gross domestic product (GDP) of the community, city, region or state in which the project is located. The baseline should identify the contribution of key sectors to the economy and how these might have changed in the review period (5 to 10 years) while identifying the drivers of change. The contribution of sectors to the economy should be extended to include existing businesses operating in the area. Where practicable, the baseline should consider the future development prospects in the area to determine whether the proposed development is compatible with the projected economic growth plans.

Existing infrastructure

The existing infrastructure in an area should be described. This description should consider the current condition of the infrastructure and its capacity to cope with additional loads.

Key infrastructure to consider will include:

- Transportation networks (for example, road infrastructure, waterway infrastructure, railway infrastructure, ports and harbors, etc.);
- Telecommunications (for example, telephone, Internet, etc.);
- Community infrastructure (for example, schools and universities in the project area, libraries, hospitals and clinics, youth centers and aged care facilities, etc.);
- Emergency services (for example, fire management, ambulances, etc.);
- Waste management infrastructure (for example, landfill sites, etc.);
- Energy infrastructure (for example, power generation, transmission lines, pipelines, etc.); and
- Water infrastructure (for example, reservoirs for regional water supply, reticulation pipelines, effluent release, etc.).

Demographic information

Defining the social make-up of adjacent communities is key and should consider age and gender distribution of the community, population growth (over the past 5 to 10 years), cultural diversity and language distribution, family and household characteristics (for example, household/dwelling type, household income, family structure, etc.). Special attention should be given to describing the nature, number and distribution of indigenous and vulnerable people that may live in the project area.

Employment status

The employment status of the community should be described and should take into account the level of unemployment in the community, income levels, type of employment relationship (employee/self-employed/unpaid/for own consumption/full-time/part-time/formal/informal, etc.), whether people are employed locally and the industries in which the community is employed.

Health, security and safety

The levels of crime in the area should be considered along with any recent social uprisings, etc. The health status of the community should be described, considering the key disease indicators, such as: HIV/AIDS, respiratory illnesses, gastrointestinal illnesses, rates of childbirth survival, etc.).

The health and safety of employees rank as top priorities for the CSI, which in 2015 developed the Health Management Handbook, to address risks from occupational exposure to noise and dust in the cement industry.

Dependence on natural resources in the project area

Develop a physical and biophysical natural resource map with communities to determine their use of resources for food, fuel, construction, medicines, water sources, sacred sites, etc. and to establish the perceived quality of these resources to sustain human life or as features of cultural significance.

Human rights

Increasingly, developers are required to ensure that their projects:

- Do not cause or contribute to adverse human rights impacts; and
- Seek to prevent or mitigate adverse human rights impacts that are directly linked to their operations, products or services by their business relationships, even if they have not contributed to those impacts.

A human rights impact assessment (HRIA) is a process to systematically identify, predict and respond to the potential impact on human rights of a development project. They have historically been conducted as standalone exercises but are increasingly being incorporated into ESIA processes. There is no standardized global approach to addressing human rights issues within an ESIA. However, approaches should include assessing:

- The human rights context prior to the proposed project, with a specific emphasis on understanding who may be affected; and
- The relevant human rights standards and issues, projecting how the proposed activity (and associated business relationships) could have adverse human rights impacts on those identified. Internationally recognized human rights issues should be used as a reference point since any of these rights may be impacted by a particular development.

The emphasis of HRIA within an ESIA should be on individuals from vulnerable and marginalized groups, including indigenous peoples, minorities, migrants, persons living in poverty, persons living under repression and occupation, the elderly, persons with disabilities, and youth.

4.5.4.b Involuntary resettlement and land acquisition

The involuntary economic or physical resettlement of people represents one of the most significant social impacts that any project may face and, if managed incorrectly, is likely to create the most significant risk to a development project and/or the reputation of the proponent. In addition, if poorly planned, resettlement will result in unnecessary suffering for affected communities and potentially to the environments into which they have been settled.

In order to ensure that none of the households planned for resettlement face significant hardship when establishing a quarry and/or cement plant, a Resettlement Action Plan (RAP) needs be developed to provide specific measures to plan for future resettlement and ensure that resettlement that has already occurred has been fair and transparent and that such households are also included in future monitoring of livelihood restoration.

All avenues to explore the avoidance of any involuntary resettlement or loss of land should be investigated prior to undertaking any RAP. Therefore the RAP should only be undertaken once involuntary resettlement and/or land acquisition is required and documented proof exists that alternatives were explored to minimize resettlement.

The objectives of the RAP are to:

- Avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs;
- Avoid forced eviction for land access;
- Anticipate and avoid, or, where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected;
- Improve, or restore, the livelihoods and standards of living of displaced persons; and
- Improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

The scope of work for the resettlement planning should include the following six phases:

— I Preparation phase —

The preparation phase should include mapping of the affected areas, describing the rationale for displacement while illustrating project alternatives, undertaking a legal review to present relevant legislation surrounding resettlement, and identifying the institutional landscape.

— II Participatory planning phase —

The second phase should commence with public consultation and disclosure with affected communities, stakeholders and interest groups. Resettlement Working Groups (RWGs) should be established with clear ToR to assist with the planning activities and to ensure adequate participation of the affected communities in the planning process. A grievance mechanism should be developed to deal with any grievances that may arise during the planning and implementation phases. Following this, a moratorium should be declared to avoid opportunistic in-migration as a strategy to benefit from compensation. Eligibility criteria for resettlement assistance will be established based on this agreement.

— III Resettlement field survey phase —

The field survey phase should include the compiling of a socio-economic baseline of the affected and host community, undertaking a census survey of all affected households, including demographic, livelihood and vulnerability information, and undertaking an asset survey of all affected built and non-built (crops, trees, land) assets. Qualified valuers should then carry out valuations and develop a register of all affected assets. During the field survey phase, potential host sites will also be identified and discussed with both the affected and host community.

— IV Resettlement planning negotiation phase —

An entitlement framework should be developed during the resettlement planning negotiation phase, identifying categories of affected people and loss, along with appropriate compensation and assistance, and eligibility criteria for such assistance. A livelihood development plan should be compiled for resettlement households to restore and enhance lost or affected livelihoods and a community development plan developed for the re-establishment of displaced and required community assets and infrastructure.

— V Implementation planning phase —

The implementation planning phase should involve identifying organizational roles and responsibilities for resettlement activities, developing a monitoring system to track progress and report on implementation of the RAP, compiling a comprehensive budget with land acquisition costs and compensation for lost assets and physical displacement, and developing a detailed implementation schedule for all key resettlement and rehabilitation activities linked to the budget activities.

— VI RAP sign-off and submission phase —

The final stage of the RAP process should include producing compensation certificates for each Project Affected Person (PAP), disclosing the final non-financial RAP document to the public for comment and submitting the final compiled RAP to the relevant authorities.

4.5.4.c Cultural heritage

Cement production involves the use of several quarried raw materials, such as limestone, clay, shale and gypsum. Limestone is one of the key raw materials for cement production. It is widely available and is one of the most versatile industrial rocks, but some limestone regions are noteworthy for their unique fossil record or their importance as ancient and modern cultural heritage sites.

The objective of a cultural heritage baseline study is to collect comprehensive, robust data in order to undertake an assessment of the potential effects of a proposed project upon cultural heritage sites and receptors within a clearly defined study area. Receptors can be tangible or intangible.

Tangible cultural heritage can include:

- Archaeological and paleoenvironmental sites and artefacts;
- Historic and/or architecturally significant structures and buildings;
- Historic districts;
- Historic or cultural landscapes;
- Religious sites, including cemeteries and cultural or sacred/spiritual sites (which can include natural features); and
- Paleontological sites.

Intangible cultural heritage can include:

- Cultural traditions;
- Traditional knowledge;
- Festivals;
- Ceremonies;
- Music, songs, dance and artistic expressions; and
- Traditional lifestyles and customs.

The study areas for the cultural heritage baseline assessment will need to be defined at the outset of the project. The local study area will typically comprise two elements:

- The footprint of the preliminary scheme, which will be the focus of archaeological surveys; and
- The communities within proximity to the proposals (for example, to consult and determine their cultural sites and traditions).

This should be updated as the scheme design is refined.

A desk-based study of available aerial imagery, mapping and published literature should be undertaken prior to any field work in order to identify and record the locations of known designated and undesignated cultural heritage features and to gain an understanding of the site types and cultural heritage traditions that may be present.

The field baseline data collection strategy would then follow and can be divided into two main elements:

- Archaeological survey(s) within the area(s) of proposed development; ground-truthing the landscape and mapping all discoveries, including the application of scientific techniques, such as remote sensing, if appropriate; and
- Consultations to identify sacred sites and practices of cultural heritage value associated with the communities that lie within proximity of the development.

For cultural heritage issues, the following groups may be relevant for consultation:

- Users and owners of cultural heritage;
- Communities embodying traditional lifestyles;
- National heritage institutions and government ministries;
- Museums, institutes and universities;
- Historical preservation groups; and
- Religious leaders and/or groups.

The findings of the desk-based study and field work should aim to identify specific cultural heritage elements requiring protection and to identify those sites and traditions within the study area most sensitive to change. This will aid in the finalization of design options and project layouts.

The information gathered should be presented in a report summarizing the key characteristics of the cultural heritage environment and the sensitivity of each site/type, and should provide accompanying maps and photographs. Authors should be cognizant of disclosing locational data of “secret” sites revealed by the community to third parties.

Ideally, the cultural heritage team would work in collaboration and share data with other environmental and social teams throughout the baseline phase.

> “A desk-based study of available aerial imagery, mapping and published literature should be undertaken prior to any field work in order to identify and record the locations of known designated and undesignated cultural heritage features.”

4.5.4.d Traffic and transport

Traffic is potentially a critical community safety concern. Therefore an ESIA should establish the traffic volume associated with the movement of materials and/or personnel on public roads. On the basis of this information, a traffic routing plan and program needs to be prepared in advance of the commencement of any activities. A principle concern for the traffic assessment is the impact of construction traffic loads, specifically during the transportation of heavy equipment to site.

The primary scope of works to determine traffic and transport impacts in an ESIA is to determine the following:

- The transportation requirements of all aspects of the cement plant operations that will not only be restricted to the operations themselves but also include the input and output logistical operations;
- The expected impact on the transportation system and road network, especially in terms of heavy vehicle movements of super and abnormal loads;
- The long-term maintenance and management actions that are required to ensure a sustainable solution from a transportation point of view;
- The required layout (geometric standard, cross-section, number of lanes and type of traffic control) of all the critical elements (bottlenecks) of the road network, including accesses, from a capacity and operational point of view;
- The additional impacts of informal (typically unpaved) roads during the construction phase (for example, dust, noise, etc.) potentially creating significant nuisance to local communities; and
- Any need for the provision of public transport facilities that are linked to the road network, the location and the layout of these facilities.

In establishing a baseline to support this assessment, the following basic methodology is required:

- Plan and conduct traffic field surveys, including classified vehicular counts and perhaps interviews;
- Obtain, evaluate and interpret transportation planning information, such as available local and regional road network planning;
- Obtain, evaluate and interpret spatial land-use planning information on the expansion and future growth of the area or region; and
- Identify and formulate various road network alternatives based on available transportation and land-use planning information.

4.5.5 The importance of karst environments in cement production

Karst landscapes develop as a result of water eroding soft (soluble) rock, including limestone, resulting in the creation of subterranean drainage systems and caverns. Karst is therefore of particular relevance to the cement industry, as described by the IFC:

> *"Limestone is the principal raw material for cement production. To date, the environmental focus of industry has been the production process, including the air emissions from heating materials to extreme temperatures, and the dust from grinding raw materials and end product. Biodiversity is now gaining recognition as an important management issue, as the scientific understanding of limestone ecosystems grows, particularly for environments.*
>
> *Typically rugged, dramatic landscapes, karst provides a range of micro-habitats with high levels of endemic and*

little-studied species. Limestone environments also control groundwater levels and water flows which can affect communities and biodiversity many miles from the mining and extraction sites."

In summary, it is crucial that particular emphasis be placed upon achieving a sound understanding of the karst environment that may exist within a proposed cement project area, and the habitats that it may support, as an integral part of the ESIA process.

4.6 The baseline report

The findings of the baseline studies should be presented in a baseline report. In many jurisdictions, there is a requirement to submit the baseline report to the relevant planning authorities for approval as an integral step in the ESIA process. It is recommended that interested stakeholders (including the general public) also be given the opportunity to comment on the baseline report, providing an opening for input as the ESIA develops. The findings of the baseline assessment are to be included in the final ESIA report. See *section 4.7.8: The ESIA report* (page 64).

The baseline report should provide a concise summary of the findings of the baseline studies that have been completed. Each of the technical studies should be presented as a separate chapter in the baseline report. It is recommended that the length, language and the structure of each chapter be presented consistently to provide a coherent description of the existing environment prior to any development taking place. The baseline report should summarize the field investigations that have been carried out, including where and when samples were taken.

Where more detailed technical reports have been prepared as an outcome of the field investigations (for example, comprehensive field testing programs), it is recommended that these be presented as an appendix to the baseline report. The front-end baseline report would typically be limited to around 50 to 70 pages in length, plus appendices.

Color mapping should be used wherever possible to provide clarity to the interpretation of the baseline report.

4.7 Impact assessment

4.7.1 Overview

Having established the environmental and social baseline, meaning prior to any development taking place, it is necessary to consider the potential impacts that may arise as a result of the proposed project.

It is important to emphasize that investment in industrial development has the potential to introduce positive change to the local area. It is essential that this be optimized, wherever possible, as part of the planning and design process and highlighted within the ESIA. Examples of enabled positive change may include the introduction of jobs and infrastructure investment and the flow down of economic activity within local communities. Ecological enhancement may also be achieved through quarry rehabilitation/restoration post-closure.

The impact assessment should consider each phase of the development, including:

- Construction: this includes all potential changes that occur on site from the initial point of access;
- Operation: this encompasses all phases of the site development once operational; and
- Decommissioning: this includes any permanent changes that are made to the site following cessation of the industrial activity.

> "It is recommended that interested stakeholders (including the general public) also be given the opportunity to comment on the baseline report, providing an opening for input as the ESIA develops."

It is noted that most national jurisdictions now require applicants to provide a closure plan (supported by a financial bond) to demonstrate a commitment to restoration of the site post-closure.

The impact assessment will typically not commence until a design freeze has been established, setting out with relative certainty the design of the proposed facility throughout each phase of operation. Any subsequent changes to the design will need to be reappraised as part of the ESIA process.

It is important to emphasize, however, that the environmental team has provided input into the design process prior to completion of the "design freeze". This will ensure that the potential enhancement benefits that the project may offer to the environment and/or local communities are optimized wherever possible. This will also ensure that (as a minimum) the design incorporates basic measures that are in accordance with good environmental practice, thereby minimizing the potential impacts on the existing environment. For example, the installation of a settling (or sediment) pond for the treatment of quarry withdrawal or water runoff from the cement plant site prior to discharge into local streams is a design measure that would typically be incorporated in accordance with international good practice.

The impact assessment should be carried out to provide a transparent and consistent appraisal of the magnitude and significance of potential changes to the existing environment. A recommended approach for the assessment of change (or impact) is presented in *section 4.7.3: Measuring potential change* (page 57).

The appraisal of the impacts will be informed by a technical appraisal of the proposed design changes throughout the lifetime of the development, building upon the baseline established previously. The level of complexity and detail required as part of this technical appraisal will depend upon the nature of the proposed development (i.e. the degree of change anticipated) and the relative sensitivity of the receiving environment:

- Where the change arising as a result of the development will be very limited, and/or the existing environment is largely impervious to change, a simple qualitative statement is likely to be sufficient; or

- In contrast, should the baseline appraisal have identified a particularly sensitive natural environment, and/or the scale of the development will be significant (for example, a substantial daily dewatering rate is proposed to enable quarrying in dry conditions within close proximity to a community that relies upon groundwater for their local supply), then more detailed modelling is likely to be required.

A typical range of impact assessments, including indicative time and budgetary commitments, is provided in *Appendix D Typical impact assessments* (page 99). It is important to identify the anticipated degree of detail that is likely to be required at the earliest possible stage (ideally during the scoping phase) to ensure that the required supporting information is collected during the baseline field investigations and sufficient time is provided within the available ESIA schedule. The timescales and budgets set out within the table provided are only indicative and are intended to provide an order of magnitude for the likely outlay (and time commitment) that may be expected as part of the impact assessment.

4.7.2 Alternative options

In addition to a detailed consideration of the proposed final design for the project, it is important that an analysis of possible design alternatives be carried out as part of the ESIA impact assessment.

This should be presented as a qualitative appraisal of alternative design options that may have been discounted on technical and/or economic grounds but that may differ in the impact (and/or benefit) posed to the surrounding natural environment and communities. The alternative options may include the re-location of the proposed facilities and/or the adoption of different processing technologies.

The assessment of alternatives should also include an appraisal of the "do nothing" option, thereby emphasizing the potential positive (and adverse) changes that the proposed development may represent.

4.7.3 Measuring potential change

The section below provides an illustration of a methodology that may be applied when appraising the potential change (or impact) that the proposed development may have upon the existing environment. It is important to note that there is no prescriptive approach set out in existing legislation as to how the assessment of change should be carried out and that this is intended purely as an example. It is, however, important that the method that is adopted be transparent and applied consistently.

The potential change (or impact) upon the existing environment as a result of the proposed development can be assessed by considering the following, relative to each attribute of the existing environment (or discipline area) that has been appraised as part of the baseline study:

Nature of change

The nature of the change (or impact) that is being considered may be positive, neutral or negative. For example, a gain in available habitat area for a key species would be classed as positive, whereas a habitat loss would be considered negative.

Magnitude of change

The magnitude of change (or impact) is a measure of the degree of change that will be incurred as a result of the proposed development and may be classified as:

- none/negligible;
- minor;
- low;
- moderate;
- high; or
- very high.

The categorization of magnitude should be based on a set of criteria that is specific to the discipline area being considered. For example, in the case of surface water, the magnitude may be defined as the extent to which the water quality (for example, suspended solids) exceeds the adopted national criteria.

Duration of change

The duration of change (or impact) refers to the length of time over which an environmental impact may occur. This may be categorized as:

- transient (less than 1 year);
- short term (1 to 5 years);
- medium term (5 to 15 years);
- long term (greater than 15 years with impact ceasing after decommissioning of the project); or
- permanent

Nature of change

The scale of change (or impact) refers to the area that may be affected by the proposed development and may be classified as:

- site (i.e. the extent of change is restricted to areas within the boundaries of the site);
- local (for example, affecting the water supplies to communities that are in close proximity to the site);
- regional (for example, affecting habitat areas that may support species that are of regional significance);
- national or international.

Probability of occurrence

Probability of occurrence is a measure of the likelihood of the change (or impact) actually occurring. This may be categorized as:

- no chance of occurrence;
- improbable (less than 5% chance);
- low probability (5% to 40% chance);
- medium probability (40% to 60% chance);
- high probability (most likely, 60% to 90% chance); or
- definite (impact will definitely occur).

4.7.4 Significance of change

The guidelines below provide an example methodology that may be applied when appraising the significance of the change (or impact) that the proposed development may have upon the existing environment.

Having assessed the attributes of change set out above, the significance of the change (or impact) should then be appraised. A simple scoring system may be adopted in line with the example provided in **Table 6**.

Table 6: Example significance scoring system

Magnitude	Duration	Scale	Probability
10 Very high/unknown	5 Permanent	5 International	5 Definite/unknown
8 High	4 Long term*	4 National	4 High probability
6 Moderate	3 Medium term**	3 Regional	3 Medium probability
4 Low	2 Short term***	2 Local	2 Low probability
2 Minor	1 Transient	1 Site only	1 Improbable
			0 No chance of occurrence

**impact ceases after closure of activity **5 to 15 years ***0 to 5 years*

The significance of the change (impact) may then be determined as:

SP (Significance points) = (Magnitude + Duration + Extent) x Probability

where the relative significance of the change (or impact) is typically ranked as set out in **Table 7**.

Table 7: Example significance ranking scheme

Value	Significance	Significance
SP > 75	Indicates **high** environmental and/or social significance	The degree of change (or impact) that the project may have upon the environment and/or the community(s) is unacceptably high. It is unlikely that an impact of this magnitude can be satisfactorily mitigated. If this impact cannot be avoided, the project is unlikely to be permitted for development.
SP 30-75	Indicates **moderate** environmental and/or social significance	The degree of change (or impact) that the project may have upon the environment and/or the community(s) is high. The project may be compromised if this impact cannot be avoided or mitigated (i.e. to reduce the significance of the impact).
SP < 30	Indicates **low** environmental and/or social significance	The degree of change (or impact) that the project may have upon the environment and/or the community(s) is relatively low. Opportunities to avoid or mitigate the impact should be considered; however, this should not compromise the viability of the project.
	Positive impact	The changes will have a positive benefit upon the existing environment and/or the community(s).

Adopting this approach, where it is deemed that the SP of the project exceeds a value of 30, the project design should be reviewed so as to mitigate the potential impact that the development will have upon the existing environment. This will involve the modification of the design to avoid sensitive areas of the site and/or to incorporate additional measures that will reduce the resulting significance of the change.

An iterative process should be adopted, re-evaluating the significance of change of the revised design until such time as the project achieves a "low" significance score or the relevant planning authorities deem a higher environmental significance as being acceptable.

4.7.5 Mitigating adverse change

Mitigation measures aim to remedy or compensate for the predicted adverse impacts of the project. Many social and environmental mitigation measures will be in response to legal requirements. However, in many situations companies will have a business case for going beyond compliance and will want to demonstrate more advanced mitigation to meet stakeholder concerns, with long-term results and benefits.

Mitigation is both a very important principle and practice. It means that companies do their best to reduce, neutralize and repair the impact of their activities on people and the natural environment. All mitigation efforts should, however, focus first on how to avoid social and environmental impacts in the initial stages of planning. This has much greater beneficial effect than remedial action later. To this end, a hierarchical approach should be taken when considering the mitigation of environmental changes (impacts) as a result of the proposed development, meaning:

Wherever possible, adverse impacts should be **avoided.** This would typically be achieved by relocating the development or substantially altering the process.

Where it is not possible to avoid adverse impacts, design measures should be adopted to **minimize or reduce** the significance of the negative change. This may include the incorporation of water treatment ponds to remove contaminants, or the construction of a barrier to reduce noise levels to adjacent receptors.

Where mitigation through design does not fully address (remove) the adverse impact, measures should be adopted to **repair and restore/rehabilitate** the environment at the earliest possible stage. This may include the progressive remediation of eroded areas, replanting following construction (and/or phased operations) and progressive rehabilitation of quarry sites.

Where residual impacts remain following mitigation and restoration, measures may be required to **offset or compensate**. This may include the provision of land elsewhere.

More on the mitigation hierarchy can be found in the CSI Quarry Rehabilitation Guidelines (2011) and the CSI Biodiversity Management Plan Guidance (2014). More on the mitigation hierarchy can be found in the CSI Quarry Rehabilitation Guidelines (2011) and the CSI Biodiversity Management Plan Guidance (2014c).

“Mitigation is both a very important principle and practice. It means that companies do their best to reduce, neutralize and repair the impact of their activities on people and the natural environment. All mitigation efforts should, however, focus first on how to avoid social and environmental impacts in the initial stages of planning.”

CASE STUDY 4

Rehabilitation of the Cortijo Nuevo gravel pit by planting integrated organic citrus trees, with landscape integration

The company is committed to restoring their sites and returning the area to previous uses (i.e. prior to quarrying) as soon as possible, ensuring that the area affected by the excavation work is always limited to what is strictly necessary. If it is managed adequately, rehabilitation work provides an important opportunity to show society and stakeholders that the operator is a responsible steward of the natural resource that is being tapped.

The Cortijo Nuevo gravel pit is located in the municipality of La Rinconada (Sevilla) in southwestern Spain. The area has a continental Mediterranean climate and supports several towns and villages for which agriculture is the main source of income.

The mine produces between 300,000 and 400,000 tonnes of aggregates a year, and the material is extracted by a dry transfer method. An operational work face has been created that is between 6 and 8 meters high after removal of the 1.5 meter deep (average) topsoil layer. The excavation has been done mechanically with a backhoe and/or front-end loader.

An assessment of the previous conditions of the land prior to quarrying was made to ensure that post-closure land use will not be impacted by the result of the quarrying activity. This assessment included air, water, flora and fauna, site safety, landscape integration, human activities and cultural heritage. The analysis considered not only the footprint of the excavation but also of the surrounding area. This was to avoid causing an impact as a result of the rehabilitation work and to ensure continuity of the landscape in the surrounding environment.

In order for the affected area to remain consistent with the existing habitat, rehabilitation is being carried out by planting fruit trees that were cultivated prior to the operation. In this way, good productivity is achieved by converting the restored area into a thriving agricultural plot with yields and economic benefits for the area.

The fact that operations and restoration of the area are simultaneous has enabled the surface area of land impacted to be kept to a minimum. It has also allowed for an increase in the effectiveness of the restoration process. The restored land is being agriculturally cultivated at the same time as the site is in operation. The progressive rehabilitation of the Cortijo Nuevo gravel pit has achieved the following demonstrable successes:

- The concurrent technical development, start-up and rehabilitation of the quarry, without adversely impacting upon operations;
- The satisfaction of the administration resulting in the scheme being adopted by the authorities as a benchmark for the region; and
- Overcoming technical difficulties in order to restore the different site areas, returning them to their original levels of environmental and agricultural value.

There is debate about the legitimacy of land compensation (or substitution) as a mitigation measure. Land compensation involves allowing extraction on land of high conservation value (for example, species-rich grassland, lowland tropical forest or an area important for large congregations of birds) for which a company has or seeks extraction rights in exchange for the company releasing another area for protection. The fundamental principle of substitution is that there should be no net loss of biological value in terms of biodiversity and numbers of wild animals and plants. This means that a mitigation strategy based on substitution should result in either a neutral or positive situation for biodiversity.

An offset is action taken outside but near a development site, where possible, to balance negative impacts. The developers may either take the action themselves or pay for others to do it on their behalf. While offsets are simple in concept, offset schemes must be carefully designed to ensure their full beneficial potential is achieved in practice, with financial offsetting being a last resort.

The European Commission (EC) has released a document entitled *Best Available Techniques* (BAT) *Reference Document for the Production of Cement, Lime and Magnesium Oxide* (Schorcht et al. 2013) that provides a useful reference document for those involved in the design and operation of a site. The BAT reference guide (or BREF, short for BAT Reference) provides a summary of design techniques that are considered current best practice and will assist in minimizing the potential effects upon the environment.

Furthermore, the *CSI Guidelines for Emissions Monitoring and Reporting* (2012) provides a framework for monitoring and reporting emissions. This is enhanced by CSI guidelines relating specifically to mercury.

Other relevant references that may be used to guide the development of appropriate mitigation solutions include (but are not limited to) the IFC *Environmental, Health and Safety Guidelines for Cement and Lime Manufacturing* (2007) and the CSI *Guidelines for Co-Processing Fuels and Raw Materials in Cement Manufacturing* (2014).

4.7.7 Cumulative impacts

Most national legislation and international standards require the consideration of the cumulative impacts of the proposed project upon the existing environment.

The possibility of cumulative impacts should be considered, taking into account other developments that may be planned within the area that could exacerbate (or be exacerbated by) the changes that will occur as a result of the proposed project. As an example, geomorphology will dictate that the availability of sand and gravel for aggregates and concrete production will generally be found within a relatively narrow corridor in close proximity to rivers. Consequently, it may be considered unusual (i.e. within the developing world where product demand is high) for a single operator to be quarrying in isolation. Under these circumstances, it would be necessary to consider whether adjacent operators are also planning concurrent expansions to their development that may have an exacerbating effect upon the local environment and/or communities.

The appraisal of cumulative impacts should be restricted to a high-level qualitative assessment of known planned projects within the area, as informed by the regional planning authorities.

Reference is made to the *Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets* (IFC 2013) to guide the assessment of cumulative impacts within the developing world.

4.7.8 The ESIA report

The findings of the impact assessment studies should be presented in an ESIA report for submission to the relevant planning authorities for approval.

The ESIA report should provide a concise summary of the findings and recommendations of the technical studies that have been completed as part of the impact assessment.

Each of the technical studies should be presented as a separate chapter in the ESIA report. It is recommended that the length, language and the structure of each chapter be presented consistently to provide a coherent description of the anticipated changes to the environment (positive and negative) and how these will be addressed.

The ESIA report should include, as a minimum, the following items:

- A non-technical summary (NTS) written in a simple, non-technical language with an overview of the project, the alternatives considered, the time schedule for construction, the potential environmental impacts and their effects, and proposed mitigation measures; it should conclude by setting out the residual effects of the development after mitigation and an overall conclusion on the environmental viability of the project;

- A description of the objectives of the proposed project, the various project components during construction, operation and decommissioning, the requirements for ancillary infrastructure, employment requirements, etc.;

- A description of project alternatives comprising a description and evaluation of the impacts and cost-benefit assessment of the various alternatives considered, including a no-project option; the rationale for selecting the presented alternative should be provided;

- A description of the institutional and legal environmental framework associated with the project, including any project-specific regulatory policies and guidelines that should be followed; this should include local regulatory requirements, international standards and sector-specific guidance where required;

- A description of the existing environmental and social baseline conditions of the project area and their direct and indirect areas of influence;

- An analysis of the direct and indirect environmental and social/cultural impacts and risks, including cumulative impacts that represent the combined effects from multiple projects or activities in the direct and indirect areas of influence;

- A record of the ESIA process and a summary of the results of consultation with affected groups, as set out in *section 5: Stakeholder engagement* (page 68).

- Options and recommendations for mitigation measures, such as preventing, avoiding, reducing, eliminating or compensating for the impacts of the selected alternative; and

- A description of the proposed environmental and social management and monitoring framework, including the schedule, assignment of responsibility and budget, as set out in *section 6: Environmental ans social impact management and motinoring* (page 78).

Where more detailed technical reports have been prepared to describe the analyses that have informed the impact assessment, it is recommended that these be presented as an appendix to the ESIA report. The main text of the ESIA report would typically be limited to around 30 to 50 pages and would be supported by separate detailed technical appendices.

Color mapping should be used wherever possible to provide clarity to the interpretation of the baseline report.

CASE STUDY 5

Resource conservation by co-processing of hazardous waste in India

The company has initiated several resource, carbon and energy efficiency projects in its pursuit of sustainable development. One of these focuses on the co-processing of hazardous waste.

India has an active pharmaceutical industry, which results in various residual wastes, some of which are of high calorific value. The proximity of operations to pharmaceutical industry clusters ensures the continual availability of these wastes. In collaboration with external and internal stakeholders, the company has developed a state of the art alternative fuel system to use spent solvents to replace fossil fuels.

All waste products from pharmaceutical industries areclassified as hazardous waste within India, which invokes regulatory constraints, particularly in relation to material transportation. All measures are therefore taken to mitigate the safety and environmental risks involved in the transport, storage and processing of these hazardous wastes.

The company strives to promote alternative energy supplies at the Mellacheruvu cement plant among its stakeholders as a benchmarking model for waste use. In addition to reducing greenhouse gas (GHG) emissions and conserving natural resources, the scheme has been successful in improving the performance of the plant since its commissioning in 2012.

Financial year	Kiln coal replacement [% coal replaced]	Thermal substitution rate [%]
2012 to 2013	3.62	0.93
2013 to 2014	5.67	1.26

It is a requirement of most national legislation and international standards to consider the residual impacts of the proposed project on the environment. All measures that have been adopted to avoid, minimize and/or offset potentially adverse impacts should be considered. This process should follow the scoring process adopted as part of the impact assessment (for example, as per the examples set out in Table 6 and Table 7).

The residual impact assessment should consider environmental risks that may arise as a result of accidents, for example, fuel spill, explosion, dam failure. The contingency plans that have been identified to manage incidents of this nature should be outlined.

05 STAKEHOLDER ENGAGEMENT

Stakeholder engagement in an ESIA aims to provide a mechanism through which people from a diversity of perspectives who are likely to be impacted by a given project are provided with an opportunity to raise issues and to have these issues considered during and after the environmental assessment process.

At the same time, it is important to recognize that the consultation process is not designed to force consensus among stakeholders but rather to create a forum within which stakeholders can express their views without threat of sanction.

5.1 Why engage with stakeholders?

Stakeholder engagement is a critically important component of the ESIA for a cement facility or aggregates quarry and is more often than not a mandatory requisite in an ESIA with legally established deadlines and approaches. It increases the value of impact assessment as a planning tool to inform the planning of a cement plant and government decision-making. Effective stakeholder engagement during impact assessment creates a platform to build trust, credibility and stakeholder capacity and forms the beginning of a positive, long-term relationship between the cement plant, its neighbors and other stakeholders. Importantly, the integration of public issues and technical environmental and social assessment gives comfort of mind that issues have been dealt with. The more active a facility is in involving stakeholders and understanding their concerns, the more time a plant has to consider this feedback in making critical decisions.

When communication and stakeholder involvement is non-existent or reactive, the results can include long court battles, protests at the gates, boycotts, environmental damage and facility closures. An active approach leads to decision processes that generally proceed with less difficulty and greater benefit for everyone involved.

In the experience of the cement industry, neighbors and other stakeholders respond positively to citizen advisory or community liaison committees, clarity of information, honest environmental reporting on performance measures, plant open days, pollution prevention initiatives, and well-designed environmental restoration projects. Collaboration between the community, regulators and industry improves both facility performance and living conditions for all involved.

Further guidance is available from the CSI within the *CSI Biodiversity Management Plan Guidance* (CSI 2014c: Chapter 5, Stage 3) and the *CSI Quarry Rehabilitation Guidelines* (CSI 2011: Chapter 3).

CASE STUDY 6

Impacts of local and political aspects in the ESIA process

In order to ensure the viability of one of its plants for a further 60 years, the company intended to open a limestone and marl quarry on one of its properties. The proposed quarry was situated in close proximity to local communities that had lived in the shadow of an operating waste landfill for the past two decades. Although managed scrupulously, the landfill did at times result in traffic and odor nuisances for the local residents. This resulted in a negative perception of the proposed quarrying operation.

Considerable effort was put into the successful engagement of local and national authorities in the ESIA process, resulting in positive feedback and governmental support for the project at an early stage. However, the project suffered strong opposition from local communities at later stages of the ESIA process.

The public protests and the political context led the municipality to repeal their support; as a consequence, the final decision was to decline planning permission.

The following key lessons were captured as an outcome of this process:

- It is essential to ensure that the ESIA considers the concerns of the local community and is comprehensive, clear and transparent in its analysis, findings and recommendations;

- The potential synergies between projects (in this case, the quarry and the landfill) need to be clearly and openly presented so that stakeholders can appreciate not only the cumulative negative impacts that must be addressed but also the potential advantages that may be achieved;

- Communicate early and openly – A strategy of open communication from the outset of the project reduces the possibility of misunderstandings that can lead to delays or setbacks; this stakeholder engagement process should overcome the minimum standards provided by the national regulations for public consultation;

- An interactive and inclusive communication process should start (with all stakeholders, including local communities) early in the ESIA process; and

- In this instance, the ESIA process coincided with a national election, enhancing the sensitivity of the local community and the municipality to issues of public relevance; it is crucial to remember that the political context is a crucial driver for a given project's success or failure. The electoral process may assume huge importance and should not be forgotten in stakeholder engagement and ESIA planning.

It is important to recognize that it is not possible to achieve sustainability by government decree, meaning in a top-down manner. Key stakeholders must be identified early and dialogue must be open and frank to achieve engagement. Inclusive, exhaustive (and sometimes arduous) engagement is generally the easiest way to achieve the required social license to operate.

“Collaboration between the community, regulators and industry improves both facility performance and living conditions for all involved.”

5.2 Who are the stakeholders in an ESIA process?

Stakeholder identification is a crucial step in managing the overall stakeholder engagement process. Accurate stakeholder identification reduces the risk of a narrow stakeholder group dominating the engagement process.

Stakeholders might include:

- Government authorities at the national, regional and local levels, including traditional leadership groups;
- Non-commercial and non-governmental organizations at the international, national, regional and local levels, including organized community-based organizations or interest groups (labor, environment, youth, education, religious, business, health, etc.);
- Local communities within a defined distance from the cement plant and/or the quarry site, including individual residents as well as non-organized groups with particular areas of interest or that may be at risk or disadvantaged (the elderly, different genders, people with disabilities, ethnic minorities, indigenous groups, etc.); depending on the nature (and hence influence) of a particular project, the local community may extend well beyond the physical and biological study areas;
- Commercial organizations and business associations;
- Employees; and
- Media.

A number of cement plants have successfully established community liaison committees to guide stakeholder engagement during an ESIA and to provide an ongoing mechanism to discuss issues of interest and concern with community groups after project implementation.

The purpose of a community liaison committee is to:

- Assist with information dissemination to and obtaining feedback from community groups;
- Assist in resolving issues and conflicts, including between the cement plant operator, governmental bodies and community groups;
- Guide the developer on important issues that might affect the local community;
- Review incidents and resolve issues related to safety and security between the plant and community; and
- Monitor environmental performance against the Environmental and Social Management Plan (ESMP).

When established at the outset of an ESIA, these committees provide valuable insights into how the ESIA should be conducted and guide the process. They do not, however, take the place of stakeholder engagement with wider community groups.

5.3 The principles and objectives of stakeholder engagement

The over-arching objectives of stakeholder engagement during an ESIA process are to:

- Provide sufficient and accessible information to enable stakeholders, including local communities, to become, at a minimum, informed and educated about the proposed project and its potential impacts and to build their capacity to participate;
- Identify and discuss issues of concern and suggestions for enhanced benefits;

- Comment on alternatives;
- Contribute local knowledge and experience to the impact assessment;
- Receive feedback from the process on how their comments were addressed; and
- Achieve regulatory and statutory compliance.

These objectives are underpinned by a number of key principles, which are outlined below:

Stakeholder participation principles for the cement industry

- Engagement is inclusive (consultation takes place with all sectors of society and affords a broad range of stakeholders the opportunity to become involved).
- Information is sufficient to allow meaningful contributions and, in accordance with the sensitivity of the project, is accessible (in a language that stakeholders can understand and written in a non-technical manner).
- Information is consistent between stakeholder groups, allowing all participants to access the same information.
- Information is presented to stakeholders in various ways (for example, by way of discussion documents, meetings, workshops, small group discussions, print and broadcast media).
- People who are not specialists in the ESIA process are assisted, helping them understand the concepts involved.
- Enough time is allowed for comment but stakeholders' time is not wasted on options that are no longer viable; stakeholders know when their input is required in a timely manner.
- There are various opportunities to comment at various stages in the process.
- There are various ways for stakeholders to comment (written submissions, comment sheets, briefing meetings, stakeholder meetings, personal contact with members of the technical team).
- Stakeholders have many opportunities to exchange information and viewpoints (for example, at stakeholder and other meetings).
- Stakeholders are supplied with information that helps them understand their roles and responsibilities in the process (for example, time agreed upon by which comments should be provided, at which points decisions will be made about what aspects and by whom).
- Stakeholders are clear as to when and how the feedback will be used within the ESIA process.

The WBCSD Measuring Impact Framework Methodology (2008) has been developed to help companies understand their contribution to development and use this understanding to inform their operational and long-term investment decisions.

The key outcomes of the consultation process within each phase of the ESIA process are presented below.

During scoping

Provide sufficient and accessible information to enable stakeholders to:

Become informed and educated about the proposed project and its potential impacts, building their capacity to participate;

Identify issues of concern and suggestions for enhanced benefits, comment on alternatives and contribute local knowledge and experience; and

Verify that their comments, issues of concern and suggestions have been captured and considered in the ToR for the impact assessment.

During the impact assessment phase

Verify that their issues and suggestions have been evaluated; and

Comment on the findings of the ESIA and ensure that all concerns regarding the project have been assessed and understood.

During the decision-making phase

Provide stakeholders with the record of the outcome of the decision by the local authority, as well as the planned next steps.

5.4 Techniques for stakeholder engagement

Various techniques may be employed through stakeholder engagement exercises.

Public meetings and open houses

Public meetings are often the cornerstones of public participation processes and provide the opportunity for stakeholders to raise their concerns in open forums. Open houses are regularly used to supplement public meetings. The open house principle is one that involves no formal presentations in a plenary setting but in which presenters are available to discuss various items with stakeholders. An open house makes it easier for people who are unaccustomed or unwilling to speak in front of large groups to engage in one-on-one dialogue with a member of the ESIA team.

Workshops and seminars in focus-group discussions

Focus-group discussions are especially powerful when clarifications are required from the community or when the developer will need to assess the population’s opinions on a particular issue. Focus-group meetings will also be held, as far as logistics allow, when specifically requested by a given interest group. The community liaison committee is a critical party in focused discussions.

Newspaper articles and publications in popular media

Articles could be written on an ongoing basis and forwarded to popular media to promote participation in an ESIA. Topics could include, inter alia:

- General presentation by the developer;
- Presentation of the ESIA and appropriate regulatory process requirements, including envisaged timeframes, opportunities to comment, etc.;

- Descriptions of a cement plant's processes, highlighting resource use and pollution implications and what can be done to manage these aspects so as to minimize or prevent environmental and social impacts;
- Summaries of the outcomes of the ESIA, including major impacts, impact significance, mitigation, etc.; and
- A description of post-ESIA activities, including developing and implementing environmental management programs during construction and operations.

Internet

A dedicated website should be maintained by for a public participation process and should include an e-mail address to which comments and issues can be sent. That said, it is well recognized that people in developing countries still experience difficulties in accessing the Internet. For this reason, Internet access is viewed simply as a complementary function to the other mechanisms described here.

Brochures and information sheets

The purpose of brochures and information sheets is to provide further information on the projects, the practitioners and the developers. These should be written in easily accessible language and should be taken away, read and digested in a stakeholder's own time. Written records need to be maintained for all community engagement processes. These include records of the issues that were raised by stakeholders and how these were dealt with in the ESIA.

CASE STUDY 7

Why fuels in the cement industry are so controversial and what should be done about it: ESIA as an instrument for stakeholder involvement

With the objective of improved sustainability performance in the cement industry, operators actively seek the use of alternative energy sources. Nevertheless, the use of alternative fuels (and hazardous waste in particular) in the cement industry within Portugal was considered deeply controversial. Stakeholders inherently held a sense of mistrust towards industry, perceiving that insufficient testing had been carried out to demonstrate that the use of alternative (hazardous waste-based) fuel was safe. Despite the regulatory requirement for an ESIA, the wider community felt that this was a process of relatively limited value that would cease upon the issuing of a permit to operate.

In recognition of stakeholder concerns, the company adopted a process that extended well beyond the core regulatory requirements. They commenced testing of alternative fuels in 2003, some four years prior to the development of the ESIA. All of the data collected from the testing period was shared openly with stakeholders between 2003 and 2007.

The company established an environmental stakeholder committee (ESC) and invited the committee's participation in the ESIA screening and scoping phases. Independent bodies were invited to review the outcomes of the testing conducted by the operator and the findings of the ESIA technical studies were discussed openly with the stakeholders. All aspects of the data collection and interpretation process were transparent, forming an essential part of reducing the perception of risk and the acceptance of the process.

The company retains their commitment to ongoing monitoring, sharing of information and ongoing cooperation with stakeholders.

The company is now actively using all types of alternative fuels available, including hazardous waste.

The company now operates a facility with a considerable depth of knowledge of the emissions and a long-term bio-monitoring program. The perceived level of risk within the community has dropped substantially as a consequence, falling from 51% to 17% between 2003 and 2014.

In conclusion, despite the fact that the communities are suspicious of technical decisions, they are able to understand scientific reasoning, demonstrable measurements and experimental comparisons. The company focused on providing factual information, engaging stakeholders from the outset. This provided an opportunity for them to contemplate the information provided and to draw their own (informed) conclusions.

Inclusive, exhaustive (and sometimes arduous) engagement is generally the easiest way to achieve the required social license to operate.

"(...) it is crucial to remember that the political context is a crucial driver for a given project's success or failure. The electoral process may assume huge importance and should not be forgotten in stakeholder engagement and ESIA planning."

06

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING

6.1 The purpose of an Environmental and Social Management Plan (ESMP)

An Environmental and Social Management Plan (ESMP) effectively provides the mechanism through which the findings of the ESIA and the associated mitigation measures are implemented as the project moves beyond the study phase into construction, operations and, ultimately, decommissioning and rehabilitation. On this basis, an ESMP is the means through which systematic approaches to business or organizational environmental management are designed.

An ESMP is typically a living document and should be reviewed and updated on a periodic basis depending on the nature of impacts occurring, changes in the receiving environment and/or regulations, changes in internal organizational requirements, etc.

The purpose of the ESMP is to:

- Ensure that any conditions of approval submitted by a regulator and/or lender are met;
- Ensure that the resources allocated for environmental management are sufficient so that the follow-up is consistent with the significance of impacts;
- Verify environmental performance and ensure that direct or indirect impacts on communities are understood and continually managed;
- Respond to changes in project implementation; and
- Respond to unforeseen events.

6.2 What should be included in an ESMP?

The scope of an ESMP will differ according to specific project requirements; however, an ESMP will typically include the following measures:

- Mitigation measures to be implemented during the construction, operation and decommissioning phases;
- References to control guidelines and standards;
- Responsibilities for the implementation of the ESMP;
- Verification, monitoring and training requirements; and
- Reporting requirements.

In addition to an overall ESMP, detailed plans addressing each of the impacts identified should be prepared. The typical plans required for a cement plant and associated quarry along with the key objectives of each plan are described in *Table 8*.

Table 8: Summary of plans typically included in a cement plant and quarry ESMP

Plan	Objectives	
Air quality management plan (*CSI Guidelines for Emissions Monitoring and Reporting in the Cement Industry 2012*)	• Ensure that the final design of the cement and quarry activities accommodate an air quality management system that will keep the area's ambient air quality within acceptable regulatory and international guideline limits. • Install air pollution control devices at process and material transfer areas and establish fugitive emission control measures to minimize important emissions (PM10, NOx, SO_2, CO, TSP) and dust fallout levels caused by activities at the cement plant and associated quarries. • Provide detailed reports for all measures to ensure that air quality is adequately managed during construction and operation.	• Ensure that dust does not endanger employee health or have negative safety impacts on the site and minimize the fallout nuisance in surrounding communities. Guidance is provided in the *CSI Health management handbook: Adressing occupational exposures in the cement industry* (CSI 2015) • Ensure fugitive emissions, including odors, dust, smoke and fumes, are either prevented or controlled so that they do not cause an environmental nuisance. • Limit net greenhouse gas emissions through efficient energy use.
Noise and vibration management plan	• Ensure that the cement plant, generators, quarry blasting, etc. include an acoustic management system that will prevent noise from exceeding regulatory standards. • Minimize noise emissions caused by the cement plant and associated facilities to levels that do not cause nuisance in surrounding communities and/or exceed regulatory standards.	• Avoid complaints from surrounding communities, especially during night hours. • Minimize vibrations resulting from blasting at quarries in order to stay within permitted limits and prevent damage to adjacent properties and structures.
Water management plan	• Ensure aquifers are not depleted or the recharge rate reduced, resulting in negative impacts on the availability of drinking and irrigation water for surrounding communities. • Ensure the quality of the water is not reduced, neither through the recharge of the shallow aquifers accessed by the communities nor contamination from the quarry or cement plant.	• Manage the wastewater and storm water runoff from the plant so as not to contaminate groundwater and/or streams adjacent to the project. • Achieve meaningful reductions in water use across the site and maximize wastewater reuse.

Plan	Objectives
Biodiversity management plan *CSI Biodiversity management planning (BMP) guidance* (CSI 2014)	• Specify how any endangered species found on site will be protected. • Specify the management of threatened fauna/flora on site. • Minimize the detrimental impacts of the cement plant's development and/or quarry expansion on biodiversity. • Reduce the risks of environmental non-compliance. • Determine priority habitats to be created through rehabilitation.
Waste management plan	• Keep waste to a minimum and emphasize the waste management hierarchy of reduce, reuse, recover and eliminate wherever possible.
Health and safety plan(s) for workers and for the community	• Minimize economic and social disruption to local communities. • Enhance opportunities for employment, job creation and social development. • Minimize health and safety impacts to local communities. • Manage public safety along public roads outside the cement plant and quarrying areas, including an awareness plan. • Minimize economic disruption of local economic and livelihood systems.
Quarry and plant closure plans *CSI Guidelines for Quarry Rehabilitation 2011; CSI Biodiversity management planning (BMP) guidance* (CSI 2014)	• Rehabilitate the former quarry and cement plant site with a clearly assessed post-closure land-use plan; ensure that rehabilitation complies with legal requirements and that the site is left in a safe and stable condition. • Develop and implement biodiversity management at quarry sites of high biodiversity value.

6.3 Verification and reporting

It is the responsibility of the company to conduct regular internal audits of the environmental performance of the project. The audits should be a systematic evaluation of the activities of the project in relation to the specified criteria of the condition of approval. The auditing results should be submitted to the regulator for review and comment. Compliance monitoring of the surrounding environment should be included in the auditing process.

The compliance monitoring should be the responsibility of the proponent; however, the regulator may choose to undertake ad hoc monitoring to verify the compliance monitoring results. The auditing of the competent agency would be through the verification of internal reports.

The auditing and monitoring results may be prepared in the form of an environmental performance report describing the extent to which the proponent has complied with its environmental requirements. The report should be submitted to the regulator but may further be submitted to stakeholders for their comment and review. The aim of the report should be to provide honest information about environmental performance.

6.4 Environmental and social monitoring

The monitoring part of the ESMP is designed to determine the efficacy of mitigation measures and to verify predictions made at earlier stages of the ESIA process. The monitoring program should be designed to determine whether mitigation measures have been implemented in accordance with the agreed schedule and are working as expected or whether it is necessary to introduce corrective measures.

During project implementation, monitoring can include:

- Compliance monitoring that aims to check that specific regulatory standards and conditions are met (such as with respect to atmospheric emissions, effluents, noise propagation levels, etc.); and
- Impact monitoring that aims to compare predicted and actual (residual) impacts and hence determine the effectiveness of mitigation measures.

Key parameters for monitoring the environmental and social performance of a cement project are described below.

Table 9: Key parameters for monitoring the environmental and social performance of a cement project

Environmental aspect	Key parameters	
Air quality	• Monitor dust, SO_2 and NOx on a continuous basis, in stack. • Monitor heavy metals (Cd, Tl, Hg, Cu, Mn, Mg, Co, Sb, As, Pb, Ni, V), volatile organic compounds (VOC), PCDD/F in stack. • Monitor ambient air quality at key receptors.	• Monitor occupational exposure to dust using personal dust monitors on operators at the cement plant and the quarry. • Keep a complete inventory of CO_2 e.q. emissions, on a facility basis.
Noise and vibration	• Assess noise at fence line and in surrounding communities.	• Measure blast induced vibrations and noise at quarry.
Water resources (CSI 2014) (CSI 2016)	• Monitor groundwater levels and water quality parameters upstream and downstream of the project. • Monitor water consumption and conduct water audits to identify opportunities for water conservation.	• Monitor volumes of wastewater removal from septic systems.
Biodiversity (CSI 2014)	• Depending on the biodiversity targets and management plan, monitoring of: • Terrestrial ecosystems, including: * Habitats through georeferenced photographic records of terrestrial habitats in the various habitats identified; * Flora through quantitative sampling within each major vegetation type, including areas that have already been transformed;	* Reptiles, frogs, birds and mammals through active searching of likely habitats; and * Habitats that may be unique to karst environments. • Aquatic ecosystems, including: * Aquatic habitat, including the quality of in-stream and riparian habitats; and * Specific sampling and analysis of aquatic invertebrates and fish.

Table 9: Key parameters for monitoring the environmental and social performance of a cement project (continued)

Environmental aspect	Key parameters
Waste management plan	• Produce an annual waste monitoring report detailing waste generated and the total volumes recycled, disposed, etc.
Socio-economic management plan	• Produce procurement records in a form that will allow for the annual analysis of the number, value and general content of contracts for goods and services by supplier location and ownership, particularly to identify contracts to local businesses; the same requirements shall be placed on contractors providing goods and services. • Maintain records on health and safety, accident, breach of worker codes of conduct and any other relevant records pertaining to events that occur in direct relation to project activities. • Maintain records on all public education events, including the content and participation in programs. • Maintain records of all formal consultations, meetings and grievance and dispute events with affected people, their governments, project employees and contractors, noting attendance, issues raised and resolutions. • Maintain copies of all information disclosure materials distributed by the project.

"An ESMP is typically a living document and should be reviewed and updated on a periodic basis depending on the nature of impacts occurring, changes in the receiving environment and/or regulations, changes in internal organizational requirements, etc."

07 PRACTICAL CONSIDERATIONS

Experience has shown that there are a number of relatively common pitfalls within the delivery of the ESIA process that can undermine the timing, cost and/or penultimate success of a major planning application.

A number of practical considerations that may minimize the potential risk of delay, escalating costs, and/or failure to secure planning permission are outlined below.

- An ESIA process will typically take two years or more if complying with international standards (depending upon the availability of suitable existing baseline data and scale of the project).

- The cost of an ESIA may be substantial, particularly where development is proposed in an area of very limited existing environmental data (for example, within the developing world), where the environment is particularly sensitive to change (for example, designated sites), and/or where there is a vulnerable or reticent local community that may be impacted.

- An ESIA is a public document and may be subject to scrutiny by an independent specialist review team. It is important to ensure that the ESIA is carried out by a suitably qualified team (including local specialists) that can sensibly probe the local environment, that has the technical capacity to understand the specific implications of the entire project, and that can provide workable recommendations for mitigation (meaning that are appropriate locally).

- It is crucially important to ensure that consultation is carried out with individuals who are representative of (and authorized to speak on behalf of) the stakeholder and/or community groups that they are intended to represent. If consulted parties are not representative of the groups that they profess to represent, there is a high risk of dissent from the wider community during the latter stages of the ESIA process.

- It is crucially important to respect the language and culture of the communities within which the ESIA team, and ultimately the proposed facility, will be operating. Local support should be sought wherever possible to ensure that both the formalized consultation process and day-to-day interactions in the field are carried out respectfully and appropriately.

- ESIA field teams (i.e. during the baseline data collection phase) should take considerable care to ensure that approvals are sought from landowners throughout the study area prior to carrying out any field measurements, bearing in mind that many of these areas will be upstream and/or downstream of the proposed development site.

- ESIA field teams must ensure that all local customs and laws are abided by at all times (for example, speed limits through local communities). Failure to behave in a respectful manner while operating within the local area can portray the project in a very negative light, leading to potential dissent and in certain circumstances security issues on site.

08 APPENDICES

A. Glossary

ESIA term	Definition
archaeology	The study of the remains left from humans' past existence.
associated facilities	Facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable. (source: IFC *Performance Standards* 2012 and 2012)
baseline	A surveyed or predicted condition that serves as a reference point to which later surveys are coordinated or correlated.
baseline data	Data gathered during the social and environmental assessment used to describe the relevant existing conditions of the project, such as physical, biological, socio-economic, and labor conditions, including any changes before the project commences.
catchment	An extent of land where water from precipitation drains into a body of water.
compensation	Payment in cash or in kind for an asset or a resource that is acquired or affected by a project at the time the asset needs to be replaced. (source: IFC *Handbook for Preparing a Resettlement Action Plan* 2002)
consultation	Consultation involves two-way communication between the client and the affected communities. The consultation process should begin early in the ESIA process, be based on prior disclosure and dissemination, and enable meaningful participation. The consultation process provides the affected communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them. (source: IFC *Performance Standards* 2012 and 2012b)
critical habitat	Areas with high biodiversity value, including: (i) habitat of significant importance to critically endangered and/or endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. (source: IFC *Performance Standards*, 2012 and 2012)

ESIA term	Definition
cultural heritage	Moveable or immovable objects, property, sites, structures or groups of structures having archaeological (prehistoric), paleontological, historical, cultural, artistic and religious values. Unique natural features or tangible objects that embody cultural values (such as sacred groves, rocks, lakes and waterfalls). Certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations and practices of communities embodying traditional lifestyles. (source: IFC *Performance Standards* 2012 and 2012)
cultural significance	The World Bank's *Guidance on Cultural Heritage in Environmental Assessment* defines "cultural significance" as a concept in estimating the value of a site. Sites that are likely to be significant are those that help our understanding of the past, or enrich the present, and that will be of value to future generations. Cultural significance can be assessed in different ways and with varying scope. The process may be informal and rapid or it may be a formal process that requires specialized expertise (such as archaeologists, legal specialists, anthropologists and botanists). It may deal with an individual site or be part of a regional or local overview. The appropriate level of detail will vary according to circumstances, but is likely to include aesthetic value, historic, scientific or research, social, economic and amenity value.
cumulative impacts	Incremental impact on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted. (source: IFC *Performance Standards* 2012 and 2012)
decommissioning	The cessation of operations of a cement manufacturing site. May include demolition and reclamation and/or redevelopment of the site.
displaced persons	People living in the project area that must move to another location. Displaced persons can be classified as persons: • Who have formal legal rights to the land they occupy; • Who do not have formal legal rights to land but have a claim to land that is recognized or recognizable under the national laws; or • Who have no recognizable legal right or claim to the land they occupy or use. (source: IFC *Performance Standards* 2012 and 2012)

ESIA term	Definition
ecosystem	A community of living organisms (plants, animals and microbes) in conjunction with the non-living components of their environment (like air, water and mineral soil), interacting as a system.
ecosystem services	The benefits that people obtain from ecosystems, including: provisioning services (such as food, fiber, freshwater, timber, medicinal plants); regulating services (such as surface water purification, carbon storage and sequestration, climate regulation, protection from natural hazards); cultural services (such as natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment); and supporting services (such as soil formation, nutrient cycling, primary production. (source: IFC *Performance Standards* 2012 and 2012)
effluent	Wastewater—treated or untreated—that flows out of a treatment plant, sewer or industrial outfall; generally refers to wastes discharged into surface waters.
endangered species	Species that are under threat of extinction as listed on the IUCN Red List of Threatened Species. (source: IFC *Performance Standards* 2012 and 2012)
erosion	The process by which material, such as rock or soil, is worn away or removed by wind or water.
facilities	All physical assets, equipment and installations of any type from time owned, in the possession of, or operated or legally controlled by or on behalf of the project entity for the purposes of the project activities.
field survey	A walkover exercise to identify archaeological sites through the surface collection of artefacts and historic landscape analysis.
fluvial	An adjective describing soil and sediment that has been transported by water in a river.
footprint	The area of land directly affected by project disturbance.
forced eviction	The permanent or temporary removal against the will of individuals, families, and/or communities from the homes and/or lands that they occupy without the provision of, and access to, appropriate forms of legal and other protection. (source: IFC *Performance Standards* 2012 and 2012)

ESIA term	Definition
geomorphology	The science of surface landforms and their interpretation on the basis of geology and climate. That branch of science deals with the form of the Earth, the general configurations of its surface and the changes that take place in the evolution of landforms.
ground-truthing	The visual inspection of site conditions with the intent to verify the conditions predicted by a model or map/imagery.
hazardous waste	Substances classified as hazardous wastes as defined by international conventions or local legislation. (source: IFC *Performance Standards* 2012 and 2012)
informed participation	Informed participation involves organized and iterative consultation, leading to the client's incorporating into their decision-making process the views of the affected communities on matters that affect them directly, such as proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues. (source: IFC *Performance Standards* 2012 and 2012)
in-situ	Being in its original position; not having been moved or transferred to another location.
intangible cultural heritage	Cultural knowledge, innovations and practices of communities embodying traditional lifestyles. (source: IFC *Performance Standards* 2012 and 2012)
involuntary resettlement	Physical displacement (relocation or loss of shelter) and economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use. (source: IFC *Performance Standards* 2012 and 2012)
landform	One of the multitudinous features that taken together make up the surface of the Earth. It includes all broad features, such as plain, plateau and mountain, and also all the minor features, such as hill, valley, slope, canyon, arroyo and alluvial fan.
local community	Community within the project's area of influence.
local study area	A defined area of land within which baseline conditions are described.

ESIA term	Definition
mitigation	Where companies do their best to reduce, neutralize and repair the impacts of their activities on people and the natural environment.
offset	An action taken outside, but near, a development site that reduces negative impacts.
pollution	Both hazardous and non-hazardous chemical pollutants in the solid, liquid or gaseous phases, and includes other components such as pests, pathogens, thermal discharge to water, GHG emissions, nuisance odors, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts, including light. (source: IFC *Performance Standards* 2012 and 2012)
project affected person (PAP)	Any person who, as a result of the implementation of a project, loses the right to own, use or otherwise benefit from a built structure, land (residential, agricultural or pasture), annual or perennial crops and trees, or any other fixed or moveable asset, either in full or in part, permanently or temporarily. (source: IFC *Handbook for Preparing a Resettlement Action Plan* 2002)
rehabilitation	To return a degraded ecosystem to an undegraded condition, but which may also be different from its original one.
renewable energy	Energy sources derived from solar power, hydro, wind, certain types of geothermal, and biomass.
resettlement action plan	A plan designed to mitigate the negative impacts of displacement; identify development opportunities; develop a resettlement budget and schedule; and establish the entitlements of all categories of affected persons (including host communities). (source: IFC *Performance Standards* 2012 and 2012)
risk assessment	A technique to assess risk by analyzing the likelihood or magnitude of an incident or condition. Usually performed using a matrix analysis linked to a level of response or action. Can be used for risks to health and safety, environment, operations, reputation or market condition. In these guidelines, use of this term does not imply any particular set of risk assessment processes.
runoff	The portion of water from rain and snow that flows over land to streams, ponds or other surface waterbodies. It is the portion of water from precipitation that does not infiltrate into the ground or evaporate.

ESIA term	Definition
scoping	Identifies which particular issues, their content and extent, should be covered in the environmental information submitted by the developer to the competent authority within an ESIA.
screening	The screening stage is the process by which a decision is made on whether or not an EIA/ESIA is required for a particular project.
security of tenure	A condition where individuals or communities e have been resettled to a site that they can legally occupy and where they are protected from the risk of eviction. (source: IFC *Performance Standards* 2012 and 2012)
sediment	Mineral particles such as sand, silt and clay that are transported by water.
stakeholder engagement	Part of the social and environmental assessment; it is an ongoing process that may involve the following elements in varying degrees: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to affected communities. (source: IFC *Performance Standards* 2012 and 2012)
stakeholders	People or institutions that feel they may be affected by, or may affect, an organization's activity.
visual amenity	The value of a particular area or view in terms of what is seen. Visual amenity relates to the quality, pleasantness or attractiveness of views towards, from and between areas. Landscape elements that increase attractiveness or value will contribute to visual amenity, as will development and changes to landscape elements.

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C. Considerations for managers and designers

Scoping/exploratory stage	• Selection of "low-carbon" cement production options to minimize any climate change concerns (such as cements blended with slag, fly-ash, etc.). Despite its GHG implications, cement is a sustainable, durable building block of all infrastructure for society. • Plant location options in the context of proximity of primary raw materials (limestone, shales, etc.) and secondary raw materials (fly-ash, slag, etc.), as well as transport of cement products to market (by rail, water, road). • The need for exploratory drilling of raw material deposits. • Impacts of raw material extraction on groundwater (geology and hydrology). • Impacts of raw material extraction on biodiversity, habitats and ecosystems, not only in the quarry/plant area but also in surrounding areas. Possible future offsetting, but the preference is for onsite ecology management. • Possible finds in the context of archaeology, paleontology, etc. • Rights of indigenous peoples of the plant and surrounding areas.
Construction phase	• Positive and negative social and economic effects of an influx of non-native construction contractors. • Challenges of transporting large loads to site (kiln sections, mill bodies, up to 10 meters in diameter). • Construction of overhead electricity power lines to supply the plant.

Operational phase	• Visual impact of plant on the landscape (buildings 80 to100 meters in height). • Impacts not only of conventional pollutants (noise, dust, SOx, NOx, etc.) but also of minor pollutants (mercury, other heavy metals, VOCs, dioxins/furans, etc.) • Impacts on ground and groundwater, both in loss and possible contamination. • Process water usage, minimized through harvesting and recycling, particularly in water-stressed regions. • Possible fire, explosion and health risks of storage and use of alternative fuels (which may include sewage sludge, animal meal, solvents, etc.). • Possibility of fire/explosion in coal or petcoke firing. • Possible captive power generation onsite or use of renewable energy (such as biomass, solar, wind, etc.). • Inward transport of conventional and alternative fuels, conventional and alternative raw materials, and outward transport of clinker and/or cement products. • Positive and negative effects on health (occupational hygiene) and safety (fatalities and accidents) of employees, contractors and visitors. • Possible health benefits to local community through community support programs, particularly in developing regions. • Possible generation of affordable housing programs through micro-financing, again mainly in developing regions.
Decommissioning (closure) phase	• Restoration of quarries, with no net loss of biodiversity; in many situations there can actually be an increase in biodiversity values. • Other after-use possibilities include recreation/leisure facilities, agricultural land, construction of housing. • Future decommissioning and dismantling of plant or conversion to other industrial use.

D. Typical impact assessments

Analysis level		
Minimum requirement	The level of analysis that would be required where the nature of the development is such that it is unlikely to measurably impact upon the receptor in question.	
Typical requirement	The level of analysis that would typically be required where there is a local receptor that may be impacted by the proposed development; however, the receptor is not particularly sensitive and/or the nature of the change is not expected to be significant.	
Maximum requirement	The level of analysis that would typically be required where the receptor has been shown (as part of the baseline appraisal) to be particularly vulnerable to potential change or the nature of the development is such that there is the potential to result in a significant change to the natural environment.	
PHYSICAL STUDIES		
Surface water & sediments		
Minimum requirement	Qualitative appraisal of changes to low- and high-flow regimes within the affected rivers and streams	3 to 4 weeks US$ 10,000
Typical requirement	Simplistic modelling of flood risk and surface water quality/quantity	6 to 8 weeks US$ 30,000
Maximum requirement	Detailed hydrodynamic modelling of flood risk, seasonal water availability (low flows) and seasonal water quality	Up to 3 months US$ 100,000

Geochemistry

Minimum requirement	Qualitative appraisal of the typical mineralogy of geological materials that will be disturbed and or deposited by the proposed mining and processing activities	2 to 3 weeks US$ 6,000
Typical requirement	Geochemical risk assessment including sample collection, standard static geochemical testing and classification of the potential for constituents of concern and drainage quality risks (conceptual models)	6 to 8 weeks, US$ 20,000-60,000
Maximum requirement	Detailed geochemical assessment and prediction of drainage quality. Includes kinetic geochemical testing that typically runs over a 25-week period (inclusive of last analyses) and integration with hydrological and groundwater models	Up to 5 months, US$ 20,000-60,000

Groundwater

Minimum requirement	Qualitative appraisal of changes to the groundwater regime in regards to derogation of existing uses based on reduction in resource availability or contamination	4 to 5 weeks US$ 15,000
Typical requirement	Simple analytical models of the impact of dewatering or contamination	5 to 8 weeks US$ 40,000
Maximum requirement	Time variant numerical modelling of the impact of the development on the groundwater regime in regard to flow and quality	2 to 4 months US$ 100,000-200,000

Air quality

Minimum requirement	Qualitative appraisal/screening assessment of likely changes to emissions to air from a general design, including changes to transportation if known Discussion of potential impact on air quality with respect to the protection of human health and habitats, a method which would highlight whether a more detailed assessment is required or not	2 to 3 weeks US$ 5,000
Typical requirement	Air dispersion modelling assessment of likely impacts of emissions to air from proposed development design Consideration also of associated transportation changes where appropriate Interpretation of results with respect to the likely impact on air quality with respect to the protection of human health and habitats Potential consideration of GHG impacts as well	4 to 6 weeks US$ 10,000-15,000
Maximum requirement	Air dispersion modelling assessment of likely impacts of emissions to air from proposed development design and design iterations (e.g. stack height analysis, emissions location considerations, emissions abatement, etc.) to meet compliance with appropriate regulations for air quality Detailed modelling of associated transportation changes where appropriate Interpretation of results with respect to the likely impact on air quality with respect to the protection of human health and habitats Potential requirement for a human health risk assessment as well Consideration of detailed air flow changes via computational fluid dynamics if numerous complex buildings nearby Consideration of micro climate changes if in areas of sensitive habitats Consideration of GHG impacts	Up to 3 months US$ 50,000-100,000

Noise

Minimum requirement	Semi-qualitative assessment of potential noise effects, including identification of noise and vibration sources and separation distance to receptors	3 to 4 weeks US$ 8,000-10,000
Typical requirement	Basic propagation model of identified typical noise and vibration sources, including consideration of local ground and topography effects to predict indicative noise levels at receptors	6 to 8 weeks US$ 20,000
Maximum requirement	Detailed noise and vibration propagation model of identified specific sources Prediction of levels at receptors, including tonal noise effects	Up to 3 months US$ 50,000

Landscape & visual amenity

Minimum requirement	Qualitative desk-based appraisal of the landscape and visual effects	2 to 3 weeks US$ 8,000
Typical requirement	Qualitative/quantitative assessment with site reconnaissance and schedule of landscape and visual effects	5 to 7 weeks US$ 25,000
Maximum requirement	Full quantitative landscape and visual assessment with zone of theoretical visibility mapping, site reconnaissance, photo-realistic visualizations and impact schedules in accordance with the relevant legislative framework	Up to 3 months US$ 70,000

BIOLOGICAL STUDIES

Biodiversity

Minimum requirement	Desktop study of biodiversity resources within defined study area, including high-level vegetation mapping from aerial imagery, client-supplied data and online literature search	2 to 4 weeks US$ 6,000-10,000
Typical requirement	Desktop study, including high-level vegetation mapping from aerial imagery, client-supplied data and literature review for each specialist discipline (terrestrial/aquatic/wetland) Field study including ground-truthing of preliminary vegetation mapping, general survey of faunal use/activity on the site from direct observations and recording of evidence of presence (for example, droppings, tracks) Upstream and downstream sampling of fish and macroinvertebrates where aquatic systems may be affected; wetland delineation and health assessment where relevant Depending on location, requirement for separate seasonal surveys (wet and dry season)	Potentially one year if separate seasonal surveys required US$ 10,000-30,000
Maximum requirement	Comprehensive literature review for each specialist discipline and potentially separate species (of concern) groups Separate field study for each specialist discipline Terrestrial fauna—specific surveys carried out for each faunal group (bird, mammal, herpetofauna, insects) with species-specific surveys for species of conservation concern Terrestrial flora—full botanical surveys in wet and dry season Aquatics—detailed aquatic survey with specialist fish and macroinvertebrate studies and metal testing of tissues Wetlands—delineation and health assessment, identification and assessment of wetland reserve locations Offsetting studies (defining location and scale) may be required for projects in high-biodiversity areas that support endangered species and critical habitat	1 to 2 years US$ 100,000-1,000,000

Ecosystem services

Minimum requirement	High-level land-use mapping from aerial imagery, identification of ecosystem goods and services (EGS) potentially affected within project area of influence	2 to 4 weeks US$ 10,000-15,000
Typical requirement	Air dispersion modelling assessment of likely impacts of emissions to air from proposed development design Consideration also of associated transportation changes where appropriate Interpretation of results with respect to the likely impact on air quality with respect to the protection of human health and habitats Potentially consideration of GHG impacts as well	8 to 12 weeks US$ 20,000-50,000
Maximum requirement	Review of the nature and extent of ecosystem services within the project site and its area of influence Identification of the conditions, trends and external (non-project) threats to such services Distinguishing of the beneficiaries of such services and engagement as part of the stakeholder engagement strategy Natural capital modelling (GIS) Identification of the associated key social, operational, financial, regulatory and reputational risks Identification and implementation of mitigation measures that aim to maintain the value and functionality of EGS	1 to 2 years (iterative process throughout ESIA duration) US$ 100,000-500,000

SOCIO-ECONOMIC STUDIES

Cultural heritage

Minimum requirement	High-level desk-based screening using datasets of nationally designated heritage assets, aerial photography and cartography to determine cultural heritage potential	3 to 4 weeks US$ 5,000
Typical requirement	Cultural heritage desk-based assessment, site walkover survey and consultation to determine if further predetermination requirements are necessary (which could comprise focused geophysical survey and trial trenching)	6 to 8 weeks US$ 25,000
Maximum requirement	Detailed desk-based assessment, site survey and consultation, including supplementary suite of nonintrusive and intrusive evaluation techniques	Up to 3 months US$ 90,000

About the World Business Council for Sustainable Development (WBCSD)

The World Business Council for Sustainable Development (WBCSD), a CEO-led organisation of some 200 forward-thinking global companies, is committed to galvanising the global business community to create a sustainable future for business, society and the environment. Together with its members, the council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action. Leveraging its strong relationships with stakeholders as the leading advocate for business, the council helps drive debate and policy change in favour of sustainable development solutions.

The WBCSD provides a forum for its member companies – who represent all business sectors, all continents and a combined revenue of more than $7 trillion – to share best practices on sustainable development issues and to develop innovative tools that change the status quo. The council also benefits from a network of 65+ national and regional business councils and partners organisations, a majority are based in developing countries. www.wbcsd.org

About the Cement Sustainability Initiative (CSI)

The CSI is a global effort by 24 leading cement producers, with operations in more than 100 countries. Collectively, these companies account for around 30% of the world's cement production and range in size from very large multinationals to smaller local producers. All CSI members have integrated sustainable development into their business strategies and operations, as they seek strong financial performance with an equally strong commitment to social and environmental responsability. The CSI is an initiative of World Business Council for Sustainable Deveploment (WBCSD).

www.wbcsdcement.org

www.wbcsdcement.org/water

Acknowledgement

The CSI would like to warmly thank the following organizations for contributing to the stakeholder consultation process in developing this document: BirdLife International, European Bank for Reconstruction and Development (EBRD), Flora & Fauna International, International Union for Conservation of Nature (IUCN), European Aggregates Association (UEPG), World Resources Institute (WRI), World Wildlife Fund (WWF) - represented by Ward Environmental.

Disclaimer

This report is released in the name of the WBCSD. It is the result of a collaborative effort by members of the Secretariat and executives from member companies participating in the CSI. Drafts were reviewed among CSI members, so ensuring that the document broadly represents the majority view of this group. This does not mean, however, that every member company agrees with every word.

Designer: Terminal Creativa, México

business solutions for a sustainable world

World Business Council for Sustainable Development www.wbcsd.org

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