



Methodology for the  
**Net Impact Assessment**  
of Biodiversity in the  
Cement Sector



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# 1. Introduction

There is growing interest in various net impact approaches in relation to business and environmental and social issues. A net impact approach is a way to identify, measure, value, compare and set targets in relation to environmental, social and/or economic impacts, both positive and negative, that a project has over a period of time. In this framework, the net impact assessment (NIA) concept has become increasingly established within the extractive industry, especially with regard to biodiversity. Biodiversity assessment enables extractive companies to measure both their positive and negative impacts and thus progress towards achieving net neutral/no net loss and even net positive impact. It is therefore possible, at some sites, to avoid and reduce negative impacts and to increase positive impacts on biodiversity, so that at least no net loss or ideally an overall net positive impact is achieved.

The World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI) has long acknowledged that careful biodiversity impact management at sites is a material issue and a fundamental requirement for the sustainable operation of the cement sector. Quarrying activities, which are the essential first step in the cement

production process, often entail significant local environmental impacts as the soil is always removed and the topography altered, or local ecosystems and watersheds are impacted.

During or after extraction, opportunities arise to rehabilitate the area and ensure the biodiversity is maintained or even enhanced. In recognizing their responsibility to effectively rehabilitate quarries, CSI published the [Guidelines on Quarry Rehabilitation in 2011](#) to present a consensus view of its members on the principles of quarry rehabilitation. Further to that - and understanding the importance of biodiversity and healthy ecosystems to conservation - CSI member companies delivered the [Biodiversity Management Plan \(BMP\) Guidance in 2014](#).

This document aims to be a practical resource for use at the site level when companies are at the stage of developing their biodiversity management plans. The NIA supplements this effort and is linked to the previous guidelines as well as the 2016 [Guidelines for Environmental and Social Impact Assessment \(ESIA\)](#), with the business case of evaluating the implementation of rehabilitation and biodiversity management plans.

The purpose of an NIA is to help companies measure their impacts on biodiversity, both positive and negative, in a consistent manner using a standardized approach, in order to develop appropriate management actions. The NIA methodology can serve as an instrument to improve the knowledge of habitats existing at operation sites over time and thus helps to improve the outcomes of applied plans/activities for priority habitats and/or species. At the corporate level, the application of an NIA methodology provides the opportunity for a company to show no net loss or net positive impact and finally creates a **biodiversity balance sheet** to help internal decision-making and external disclosure. The objective for the cement sector overall is to use this approach as a tool to assess the net impact and communicate the results to civil society and a wider community of interest.

Importantly, this NIA approach and methodology links to and is expected to complement existing business decision-making references that are relevant to biodiversity, such as the [Business and Biodiversity Offsets Programme Standard and Guidelines](#) and the Natural Capital Coalition's [Natural Capital Protocol](#).

## 2. Overview

In order to assess the net impact of a quarry site and/or a plant site it is necessary to determine and compare biodiversity values at a certain moment in time (during or post-quarrying/operation) against a baseline, which should be the pre-quarrying/operation status (the status before any operation had started). In principle, the methodology is based on habitat assessment, also using species-related criteria, and compares:

- a) the coverage area;
- b) the importance;
- c) the quality/condition of each habitat at pre - and post - (or during) quarrying/operation moments.

Inputs into such a methodology could include: historical data; a previous environmental and social impact assessment (ESIA); internal or external habitat surveys; satellite or aerial photos; and relevant expert testimony. Where there is no information available about the pre-quarry/operation situation, a nearby proxy area can be referred to, such as an area that contains the same habitat types as those that existed onsite, before any operation. This must be clearly stated and explained in the NIA and presentations.

New sites or site extensions present an opportunity to both

robustly implement the mitigation hierarchy<sup>3</sup> and achieve no net loss or net positive impact through avoidance, minimization and restoration, with offsetting only as a last resort and if impacts can be offset. It should be noted, however, that net positive impact is not always possible at all sites, even when all appropriate rehabilitation and biodiversity management actions have been implemented. Expanding an operation or establishing a new quarry in a greenfield area where habitats are of high importance and/or in good condition will inevitably lead to biodiversity loss that would hardly be regained by rehabilitation in the short term. If, on the other hand, the greenfield areas consist of modified/degraded habitats, then there is an opportunity to use rehabilitation to create habitats of higher intrinsic biodiversity value than was the case before quarrying started and in a relatively short time span.

The NIA methodology considers negative impacts on biodiversity, such as land clearance, ancillary infrastructure built and the operations taking place at the site. It also considers potential positive impacts, such as restoration of extracted zones within the current or a former concession/mining area or offsite; contributions to the protection of areas with high-biodiversity value<sup>4</sup>; ecological

restoration; species-focused actions; and the creation of new habitats after mining is completed. The methodology enables a company to determine the status of its impact on biodiversity and its progress towards achieving net positive impact using the input of experts and stakeholders on suitable metrics, at both a site and group level (local, national and international).

### THE MAIN STEPS OF THE PROPOSED METHODOLOGY ARE THE FOLLOWING:

- 1 Establish the scope of analysis by choosing appropriate geographical and time boundaries.
- 2 Identify the habitat types for assessment and determine the coverage area for each, for both the baseline and at the moment of analysis.
- 3 Assess and score the importance of the biodiversity and the condition for each habitat type, for both the baseline and at the moment of analysis.
- 4 Calculate net impact.

<sup>3</sup> See [http://bbop.forest-trends.org/pages/mitigation\\_hierarchy](http://bbop.forest-trends.org/pages/mitigation_hierarchy).

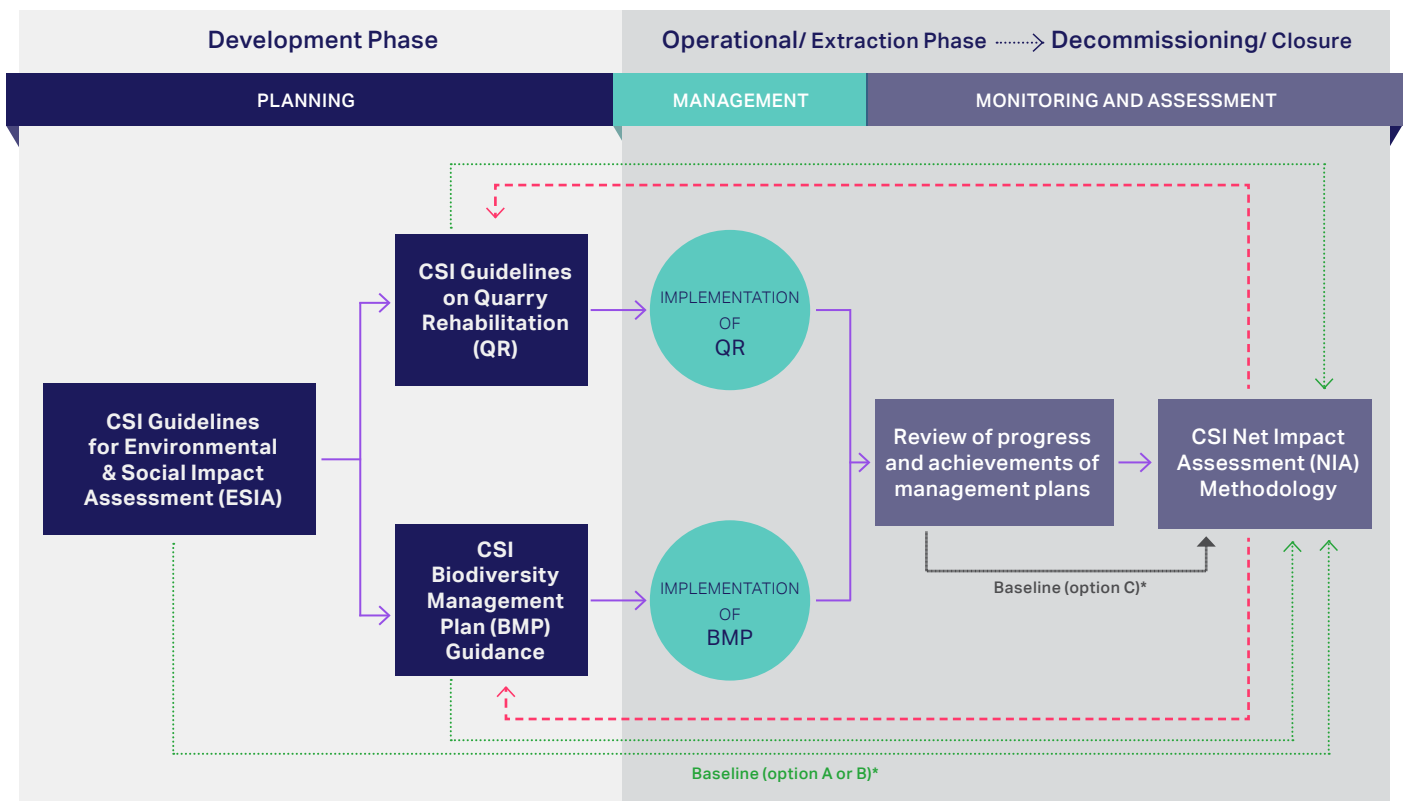
<sup>4</sup> For example: BirdLife's Important Bird and Biodiversity Areas, sites defined by the Alliance for Zero Extinction, UNESCO's Natural World Heritage sites, and the KBA Partnership's Key Biodiversity Areas.



## 2. Application

The methodology is not intended to replace wider existing systems and planned work on biodiversity (e.g. a robust ESIA, environmental management systems (EMS), biodiversity management plans (BMP), rehabilitation plans, etc.), though it may in some cases complement them or be complemented by them. For example, a rehabilitation plan can be informed by NIA methodology and steered towards a biodiversity-focused end-use and an ESIA can help inform a baseline from which to define appropriate metrics for the NIA (see Figure 1).

**Figure 1: Interaction of NIA with ESIA, quarry rehabilitation and BMP**



- Sequence for the development, implementation, monitoring and assessment of management plans at quarry sites
- .....→ Baseline information (option A or B)\* for the NIA methodology
- Baseline information (option C)\* for assessing/measuring progress after implementing management plans
- - -> Feedback from NIA to confirm/adjust/revise/improve management plans and their targets/objectives

\* See section [5.2.2. Defining Time Boundaries](#)

Notes:

- The CSI ESIA Guidelines is a practical guide for the ESIA process under the framework of implementing new investments and/or expansions to existing operations, in accordance with international good practice.
- The CSI Quarry Rehabilitation Guidelines and the CSI BMP Guidance offer a clear set of recommendations for the development of a quarry rehabilitation plan and a biodiversity management plan, respectively.

The methodology can be applied to active quarries/sites or those that are inactive, have been permanently closed or are dormant. It is designed to help companies identify how operations impact habitats, assess the effectiveness of rehabilitation and biodiversity measures, and understand changes in biodiversity over time. Depending on the assessment's objectives and desired outcomes, a company may decide to apply the methodology to a single site or across the whole portfolio (corporate level). The site selection, however, should not be limited to sites of high biodiversity value only.

#### Audience for the methodology:

- The primary audience is both corporate- and regional/site-level environmental officers and operation managers because a basic understanding of natural resources provides a good foundation for interpreting and acting on the guidance featured here.
- The secondary audience is quarry managers, with whom responsibility for decision-making on quarry operations lies and whose role it is to ensure that biodiversity is sufficiently incorporated into extraction and rehabilitation planning.

The assessment of habitats, as described in the methodology, should be conducted at the corporate and/or regional/site level with the involvement of and input from local/regional experts. The people responsible for undertaking the assessment include environmental managers, biodiversity managers (at corporate level if they exist) and operation/quarry managers. Appropriate training on the application of the methodology should be organized as needed. It is recommended that the assessment be conducted every three to five years, depending on site conditions (biodiversity sensitivities, landscape alterations, the progress of rehabilitation activities and biodiversity management, etc.).

It is also important to note at the outset that, although the proposed methodology is focused exclusively on biodiversity for reasons of simplicity, this does not discount the value of work undertaken on other environmental and social issues (e.g. water management, cultural values, education, etc.) at the site. Moreover, this also does not exclude the possibility that such broader issues might be included in a more ambitious, holistic NIA methodology in the future, once the biodiversity-focused NIA methodology has been implemented and demonstrated as effective.





## 4. NIA methodology characteristics

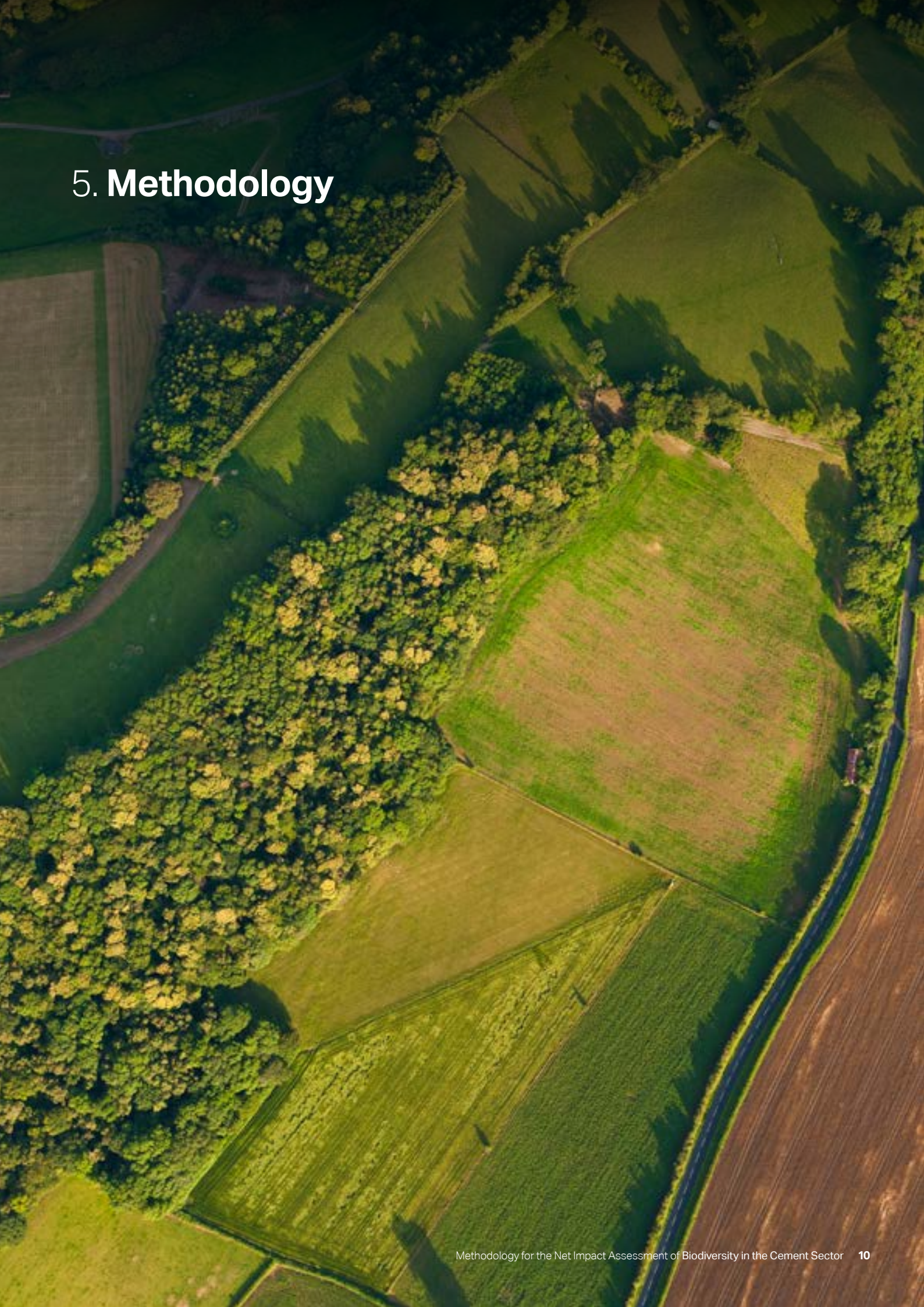
Any operational NIA system developed on the basis of the principles of this document should have the following characteristics:

- **Robustness and credibility** the methodology compares the immediate pre-quarry/operation situation and that at the moment of analysis, based on a wide range of available information.<sup>5</sup>
- **Ease of use** so as not to be prohibitively expensive or time-consuming to implement. For this reason, the methodology focuses exclusively on biodiversity (rather than broader social or environmental concerns) and mainly involves using existing sources of information. Where this information is not adequate for the assessment, and especially at sites of high biodiversity value, field surveys should be carried out to identify habitat types.
- **External acceptance/validation** to enhance the system's credibility, local/regional biodiversity experts should be involved in the assessment, especially at sites of medium to high biodiversity value<sup>6</sup> and where the expertise does not exist within a company.
- **Flexibility** to take into account varying conservation priorities, as well as varying access to information, particularly at older sites. For this reason, various criteria for evaluating the importance of the biodiversity and the habitat's condition are proposed, along with the option of using a nearby proxy area that contains habitats similar to the pre-quarry/operation situation to assess the baseline.
- **Transparency** to allow the results of the assessment to be reviewed by external stakeholders, and, if necessary, revised. Therefore, the methodology and the criteria for assessing the habitat's importance and condition need to be clearly explained and justified.
- **Linkage** to ensure efficiency and appropriateness, the evaluation of the habitat's importance and condition is informed by and aligned with all existing documents for the site itself, such as an ESIA, BMP and/or rehabilitation plan and/or by any other available sources, including external biodiversity plans. Similarly, the rehabilitation and/or conservation priorities that are identified through the NIA process will be integrated into existing and future plans for the site.

<sup>5</sup> Such as impact assessments, expert testimony, management plans, existing surveys, official databases, etc.

<sup>6</sup> Biodiversity value as defined by the Global Reporting Initiative's biodiversity requirements (GRI<sup>304-1</sup>).

## 5. Methodology



## 5.1. General steps

The main steps for the net impact assessment are:



1

### ESTABLISH THE SCOPE OF ANALYSIS

Define the geographical boundaries

Identify the time boundaries (baseline and moment of analysis) to calculate the net impact



2

### DETERMINE HABITAT TYPE AND COVERAGE AREA

Identify and delineate the habitats for assessment

Describe the different habitats and location on a habitat map

Estimate the surface area (A), in hectares, for each habitat type identified



3

### ASSESS HABITAT IMPORTANCE AND CONDITION

Score habitat importance (I) and condition (C) for each habitat type identified



4

### CALCULATE NET IMPACT

Calculate the biodiversity value (BV) of each habitat by multiplying the scores of the habitat's importance and condition with the coverage area:  $(BV) = (I \times C \times A)$

Calculate the biodiversity index (BI) by dividing the sum of the biodiversity values by the total coverage area:  $(BI) = [\Sigma (BV)] / [\Sigma (A)]$

Calculate net impact (NI) by comparing the biodiversity index of the moment of analysis with that of the baseline:  $(NI) = (BI) \text{ moment of analysis} - (BI) \text{ baseline}$

## 5.2. Establishing the scope of analysis

### 5.2.1. Defining geographical boundaries

Geographical boundaries of the area under analysis must be clearly defined. The application of the NIA methodology should cover those sites/land areas that are under a company's management control, including:

- Quarry/plant license/permit limits;
- Offset areas (compensation);
- Other areas owned/controlled by a company where initiatives to improve biodiversity are taking place.

#### Sites/land under a company's management control:

areas owned by a company or authorized through a lease or other contractual agreements with individuals or public entities (local, regional or national authorities) and where the company has the authorization, based on all required permits/licenses, to manage specific project development, mining, infrastructure works, a rehabilitation plan, a biodiversity/conservation plan, offset programs, etc. in any way.

Sites for the NIA methodology can include: active or inactive quarries/plants or even closed (depleted) quarries/plants that are still under the company's management control (meaning have not been returned to the respective authorities and/or owners based on past agreements).

#### Active quarries/plants (sites):

quarries/plants having operated for at least part of the current year with a regular or planned schedule (in the case of quarries: extraction of raw materials for cement and/or aggregate production).

#### Inactive quarries/plants (sites):

quarries/plants that have been operated in the past, have not been operating in the current year or for a longer period, but where management plans to re-initiate project activities in the future.

#### Closed (depleted) quarries/plants (sites):

quarries/plants that have stopped operations but are still under a company's management control (not returned back to the respective authorities and/or land owners) for the implementation of post-closure activities, such as rehabilitation, restoration, decommissioning, etc.



## 5.2.2. Defining time boundaries

The NIA time frame is a crucial aspect and must be clearly defined.

The time frame for the analysis should ideally be linked to the time frame of impacts from the quarrying activities and associated operations and consider the time taken for habitats to develop when rehabilitation has taken place.

The assessment is done for a certain moment in time, during quarry/plant operations or post-closure, in comparison with the baseline for the site. This assessment can also be used to determine how a site is functioning compared to an objective set by the company for that site.

For the baseline moment and assessment, the methodology proposes the three options as shown in Table 1 below.

**Pre-quarrying/operations:**  
the moment before the occurrence of the impacts from the project, e.g. before any activities have started.

**During-quarrying/operations:**  
any moment after operations have started.

The baseline moment may influence the goals of the assessment. Setting a moment during quarrying/operations as the baseline should be the last option if the first two options are not possible. In such cases, however, the outcome of the assessment will differ and will refer to measuring progress achieved after a given stage of rehabilitation and/or the implementation of a biodiversity management plan.



OPTIONS	BASELINE MOMENT	BASELINE ASSESSMENT	PROS	CONS
<b>A</b> Recommended option	Pre-quarrying/ operations	Use of <b>historical information</b> about the specific project site (e.g. reconstructing natural habitat maps from historical aerial photos or remote-sensing imagery)	<ul style="list-style-type: none"> <li>✓ Available baseline information before project development and any activities provides a sound framework for the application of the NIA methodology.</li> <li>✓ When historical information is available, the process is less time-consuming and requires fewer resources – ease of use.</li> </ul>	<ul style="list-style-type: none"> <li>✗ Insufficient data or unreliable information may pose risks for a credible assessment and comparison of conditions before and after quarrying activities.</li> <li>✗ Due to the long duration of activities/operations, additional resources to conduct field investigations may be required to supplement the historical data.</li> </ul>
<b>B</b> If option A is not possible	Pre-quarrying/ operations	Use of proxy information (e.g. creating a surrogate baseline from historical data or surveys of nearby habitats similar to what was likely present at the project site before construction/operations began)	<ul style="list-style-type: none"> <li>✓ This baseline assessment still allows for a comparative evaluation before and after quarrying activities.</li> <li>✓ The required survey and field investigations for the proxy approach strengthen the credibility of the baseline assessment.</li> <li>✓ The proxy area may serve as a control field to identify and evaluate changes in habitats over time.</li> </ul>	<ul style="list-style-type: none"> <li>✗ This approach needs to be carefully managed, since the proxy area may not represent the conditions before activities/operations.</li> <li>✗ Additional time and resources are required for a more detailed survey.</li> </ul>
<b>C</b> If options A or B are not possible or if targeting another kind of assessment	During quarrying/ operations	Use of information based (normally) onsite survey inside the project site	<ul style="list-style-type: none"> <li>✓ Flexibility in defining a baseline at any moment in time (during activities/ operations).</li> <li>✓ The survey offers a representative picture of the actual situation at the site.</li> </ul>	<ul style="list-style-type: none"> <li>✗ Possible to measure only the results after a given stage of rehabilitation and biodiversity management and not compare with the status before any activity/operation has started.</li> <li>✗ Additional time and resources are required for a more detailed survey.</li> </ul>



## Practical example

### Step 1. ESTABLISHING THE SCOPE OF ANALYSIS

#### Defining geographical and time boundaries

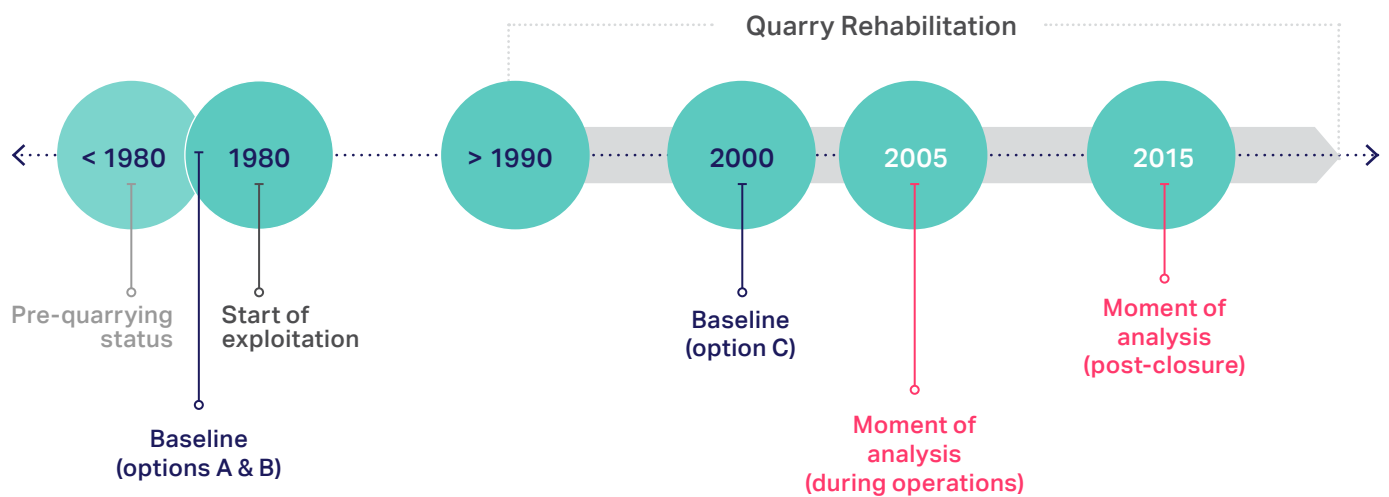
A quarry opened in a green-field area in 1980. Total area under management control is 120 hectares, but the quarry activities covered an area of 46 hectares. Rehabilitation started in 1990 in depleted parts of the quarry with the recreation of the natural habitats using native species.

**Baseline moment options A&B (pre-quarrying status):** Immediately before the start of exploitation (1980).

**Baseline moment option C (during quarrying status):** Any moment after operations have started (e.g. 2000).

**Moment of analysis (during-quarrying status):** e.g. after 25 years of operations and 15 years of applied rehabilitation (2005) or

**Moment of analysis (post-closure status):** e.g. after 35 years of operations, including 25 years of applied rehabilitation (2015).





### 5.2.3. Use of proxy information

In the proposed methodology, when selecting the habitats for evaluation, it is necessary to obtain historical information about the habitat types and conditions that existed at a site before construction and operation (i.e. baseline information). This information could include a previous ESIA, internal or external habitat surveys, satellite or aerial photos, and testimony of relevant experts. When there are only aerial or satellite photos, the type of habitat can be characterized through recognized methodologies such as the Rapid Ecological Vegetation Mapping Method (Kappelle et al. 2002).

When baseline information for the site's geographical boundaries is not available or is inadequate, proxy information may be used. In this case, data may be obtained from an area in the surroundings of the site that exhibits the same type of habitat as the one known to exist at the site before construction and operations. This data could be based on historical information and/or onsite surveys/assessments and should be used to set the baseline. However, when using proxy information, precautionary principles should apply and use the most conservative assumption, meaning assuming that a habitat was in better condition than it may have been in reality.



## 5.3. Determining habitat type and coverage area

The next step in the assessment is to identify the different habitat types present and estimate the corresponding size area, both for the baseline and moment of analysis situations. It is important, however, not to simply classify the habitats according to the chosen system, but to allow for the fact that within one habitat type there might be different levels of importance. For example, the co-existence of a plantation forest consisting of a single exotic species and an ancient broadleaf forest. The latter has a high biodiversity importance while the former has a much lower biodiversity importance or no value at all for regional biodiversity (see 5.4 Assessing each Habitat's Importance and Condition), thus requiring different classifications.

The actions for this step of the assessment are as follows:

- Identify the types of habitats present in the site area being assessed. In some cases, information on the different habitats and land use may already be available if an ESIA has been carried out.

Non-natural areas within the quarry site area (e.g. buildings, roads, etc.) classified as active extraction areas should also be identified. The following resources can also be useful:

- Past studies conducted for the project area (rehabilitation study, maps, etc.);
- Field investigations carried out especially for the purpose of the assessment;
- Information from other studies or existing national or international databases.
- Measure the area (in hectares) of each habitat type present, ideally using a geographic information system tool. Other inputs into this process could include: a previous ESIA; internal or external habitat surveys; satellite or aerial photos; the testimony of relevant experts.
- Where no internal or external information is available about the baseline situation (e.g. pre-quarrying/operation), a nearby proxy area may be chosen, assuming that it contains the same habitat composition as that which existed during the pre-quarrying/operation stage (see 5.2 Establishing the Scope of Analysis).
- Subdivide the entire site area into the habitat types identified and delineate on a map (see Figure 2 and Figure 3).
- Record the area of each habitat in hectares in a table (see Table 2), both the situation at baseline and at the moment of analysis, noting that the number, type and area of habitats may change. In both situations, the total area must be equal.

## Practical example

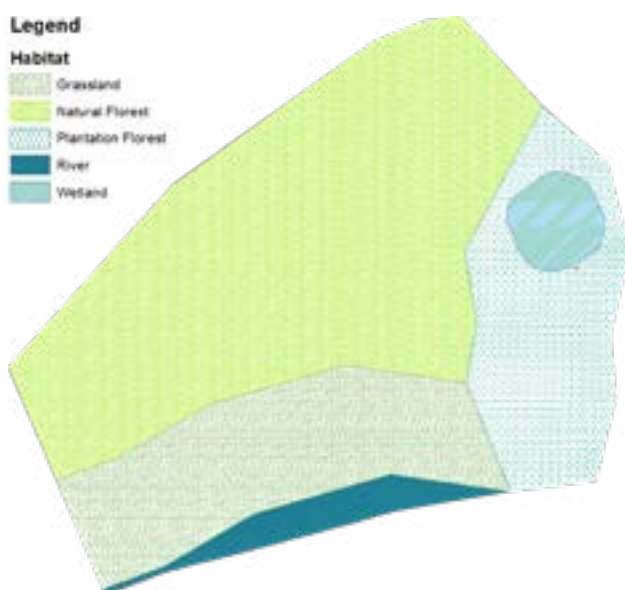
### Step 2. DETERMINING HABITAT TYPE AND COVERAGE AREA

Option A (pre-quarrying) is chosen as the baseline, that is, before any extraction and clearing activities started. It is then compared with data from a later date, with mining restricted to a smaller area and considerable rehabilitation efforts and also with post-closure status. Option A (pre-quarrying) is chosen as the baseline, that is, before any extraction and clearing activities started. It is then compared with data from a later date, with mining restricted to a smaller area and considerable rehabilitation efforts and also with post-closure status.

**Table 2: Developing a habitat map for baseline and moment of analysis**

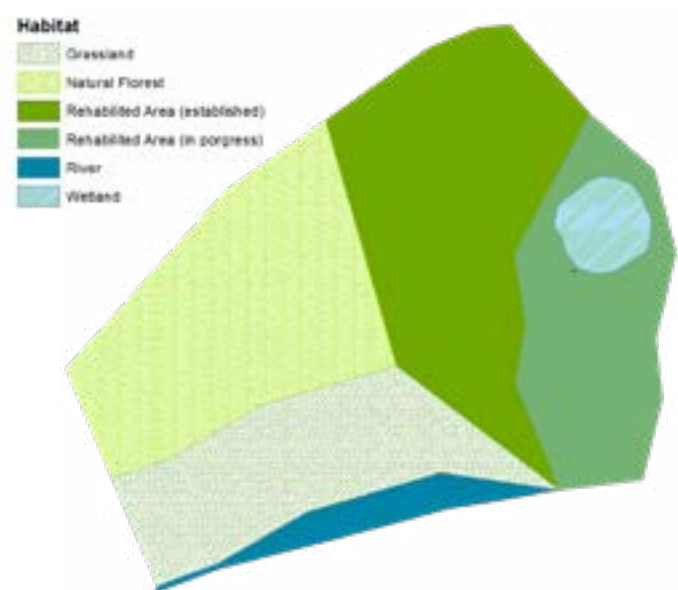
Baseline pre-quarrying	Area (ha)	Moment of analysis after 25 years	Area (ha)	Moment of analysis after 35 years	Area (ha)
Plantation forest	20	Plantation forest	0	Plantation forest	0
Natural forest	70	Natural forest	49	Natural forest	49
Grassland	25	Grassland	20	Grassland	20
Wetland	5	Wetland	5	Wetland	5
		Rehabilitated area (established)	5	Rehabilitated area (established)	25
		Rehabilitated area (in progress)	15	Rehabilitated area (in progress)	21
<b>Total habitat area</b>	<b>120</b>	<b>Total habitat area</b>	<b>94</b>	<b>Total habitat area</b>	<b>120</b>
<b>Active extraction area</b>	<b>0</b>	<b>Active extraction area</b>	<b>26</b>	<b>Active extraction area</b>	<b>0</b>
<b>Total area</b>	<b>120</b>	<b>Total area</b>	<b>120</b>	<b>Total area</b>	<b>120</b>

**Baseline**



**Figure 2: Habitat classification and mapping (baseline – pre-quarrying)**

**Moment of analysis**



**Figure 3: Habitat classification and mapping (moment of analysis – after 35 years)**

## 5.4. Assessing each habitat's importance and condition

The most challenging step in the assessment is to estimate the biodiversity importance and the biodiversity condition for each habitat. For both factors, each habitat should be scored on a simple scale, such as 1 to 4 as recommended in this methodology. Other scales could also be used as long as the same scale is used throughout the assessment and the number of categories is an even number to avoid a bias in the middle category. For nine categories or more, this rule is not as relevant.

It is recommended that the scores be accompanied by a short description summarizing why the particular score was given in order to inform future reviews and possible revisions. Any existing information available, both internal and external, should be used to inform the scoring, along with consultation with experts, to ensure that it is as robust as possible.

The carrying out of new detailed surveys is not expected as this may make the assessment expensive, time consuming and impractical.





### 5.4.1. Score for Habitat Importance

Not all habitats are equal in terms of their importance. A habitat containing biodiversity features that are outstanding and of global importance will have a higher score compared to one that is locally very common. The importance of each habitat for the baseline and moment of analysis situations is assessed and scored according to the criteria given in [Table 3](#) and applied in the practical example, as shown in [Table 4](#) and [Table 5](#).

**Table 3: Categories for habitat importance**

HABITAT IMPORTANCE		
Categories	Score	Description
<b>Very high importance</b>	<b>4</b>	<ul style="list-style-type: none"> <li>Recognized ecosystem/habitat of international importance (legal or non-legal status, e.g. the KBA Partnership's Key Biodiversity Areas,<sup>7</sup> IUCN's Business and Key Biodiversity Areas guidelines<sup>8</sup> and Red List of Ecosystems<sup>9</sup>); and/or</li> <li>Important habitats for the existence of globally threatened species (e.g. IUCN's Red List classification of vulnerable, endangered and threatened species<sup>10</sup>).</li> </ul>
<b>High importance</b>	<b>3</b>	<ul style="list-style-type: none"> <li>Recognized ecosystem/habitat of national or regional (sub-national) importance (legal or non-legal status); and/or</li> <li>Important habitat for livelihood of nationally or regionally threatened species.</li> </ul>
<b>Medium importance</b>	<b>2</b>	<ul style="list-style-type: none"> <li>Nationally and/or regionally (sub-nationally) common habitat; and/or</li> <li>Habitats that include species of least concern</li> </ul>
<b>Low importance</b>	<b>1</b>	<ul style="list-style-type: none"> <li>Habitats that do not have any threatened species, are widely distributed and relatively degraded, and can include cultivated areas, extraction areas, plantation forests that are not sustainably managed, etc.</li> </ul>

<sup>7</sup> See <http://www.keybiodiversityareas.org/home>.

<sup>8</sup> See <https://www.iucn.org/theme/business-and-biodiversity/our-work/business-approaches-and-tools/business-and-key-biodiversity-areas>.

<sup>9</sup> See <https://iucnrle.org/>.

<sup>10</sup> See <http://www.iucnredlist.org/>.

## Practical example

### Step 3. ASSESSING HABITAT IMPORTANCE AND CONDITION

Option A (pre-quarrying) is chosen as the baseline and is compared to the condition when mining activities have terminated (post-closure status).

**Table 4: Assessing the importance of each habitat for baseline and moment of analysis (post-closure)**

Baseline: pre-quarrying			
0 year – prior to start of mining	Area (ha)	Importance	Description
Plantation forest	20	1	Widely distributed non-natural habitat
Natural forest	70	2	Regionally common habitat
Grassland	25	3	Important habitat for the existence of nationally threatened species
Wetland	5	2	Regionally common habitat
<b>Total habitat area</b>	<b>120</b>		
<b>Active extraction area</b>	<b>0</b>		
<b>Total area</b>	<b>120</b>		

Moment of analysis: 35 years later, mining terminated			
35 years later, end of mining	Area (ha)	Importance	Description
Plantation forest	0	1	Widely distributed non-natural habitat
Natural forest	49	2	Regionally common habitat
Grassland	20	3	Important habitat for the existence of nationally threatened species
Wetland	5	2	Regionally common habitat
<b>Rehabilitated area established</b>	<b>25</b>		<b>Breakdown</b>
<b>Natural forest</b>	<b>13</b>	<b>2</b>	<b>Rehabilitated and converted to natural forest of importance 2:</b> 5 ha of (cleared) plantation forest 8 ha of (cleared) natural forest
<b>Grassland</b>	<b>5</b>	<b>3</b>	<b>Rehabilitated and re-established as grassland of importance 3:</b> 5 ha of (cleared) grassland
<b>Artificial lake - wetland</b>	<b>7</b>	<b>3</b>	<b>Created after end of mining, became a wetland of importance 3:</b> 7 ha of (cleared) plantation forest
<b>Rehabilitated area not yet established</b>	<b>21</b>	<b>1</b>	<b>Under progressive rehabilitation (importance 1) targeted to become 10 ha of grassland and 11 ha of natural forest:</b> 8 ha of (cleared) plantation forest 13 ha of (cleared) natural forest
<b>Total habitat area</b>	<b>120</b>		
<b>Active extraction area</b>	<b>0</b>		
<b>Total area</b>	<b>120</b>		

Table 5 shows the habitat importance for an intermediate phase during the operations, after 25 years from the start of mining activities.

## Practical example

### Step 3. ASSESSING HABITAT IMPORTANCE AND CONDITION

**Table 5:** Assessing the importance of each habitat at 25 years after mining activities have started

Moment of analysis: 25 years later, mining phasing out			
25 years after mining started	Area (ha)	Importance	Description
Plantation forest	0		Whole area (20 ha) opened up for mining
Natural forest	49	2	21 ha opened up for mining
Grassland	20	3	5 ha used for mining
Wetland	5	2	Not disturbed; maintained throughout entire operation
Rehabilitated area established	5	2	<b>Rehabilitated and converted to natural forest of importance 2:</b> 5 ha of (cleared) plantation forest
Rehabilitated area not yet established	15	1	<b>Under progressive rehabilitation (importance 1) targeted to become 5 ha of grassland and 10 ha of natural forest:</b> 5 ha of (cleared) grassland 10 ha of (cleared) natural forest
<b>Total habitat area</b>	<b>94</b>		
<b>Active extraction area</b>	26	1	<b>Active extraction area (importance 1):</b> 15 ha of (cleared) plantation forest 11 ha of (cleared) natural forest
<b>Total area</b>	<b>120</b>		



## 5.4.2. Score for habitat condition

The condition/quality of each habitat for the baseline and moment of analysis scenarios should be assessed and scored according to the criteria set out in Table 6.

For each criterion an index value between 1 and 4 is given and the condition for each habitat is then determined as the average of the scores of all criteria. Similar to the importance assessment, it is recommended that the condition scores be accompanied by a short justification.

### Criteria for habitat condition

- Maturity and structure of habitat
- Likely diversity of species typical for the region and the habitat
- Presence of invasive species
- Degree of threats to the habitat

**Table 6: Categories for habitat condition**

HABITAT IMPORTANCE		
Categories	Score	Categories
<b>Maturity and structure of habitat</b>	4	Mature and diverse habitat structure
	3	Relatively mature and diverse habitat structure
	2	Structural diversity and maturity of habitat clearly below what is regionally possible
	1	Poor structural diversity and maturity
<b>Likely diversity of species typical for the region and the habitat</b>	4	Likely to have excellent and above average species diversity typical for the region
	3	Likely to have good/very good species diversity typical for the region (supporting populations at typical abundance of all characteristic species and those of conservation concern)
	2	Likely to have only moderate species diversity for the region (supporting populations at typical abundance of most characteristic species and most of those of conservation concern, but some may be absent or atypically rare)
	1	Likely to have poor species diversity for the region (many characteristic species and many of those of conservation concern are largely absent or rare)
<b>Presence of invasive species</b>	4	No apparent signs of invasive species
	3	Little presence of invasive species
	2	Clear signs of presence of invasive species
	1	Frequent signs of presence of invasive species
<b>Degree of threats to the habitat</b>	4	No signs of significant habitat disturbance
	3	Few signs of habitat disturbance
	2	Clear signs of habitat disturbance
	1	Frequent signs of habitat disturbance

## Practical example

### Step 3 (cont.). ASSESSING THE IMPORTANCE AND CONDITION OF HABITATS

Assessing the condition of each habitat at baseline and moment of analysis (refer to [Table 6](#) criteria).

**Table 7: Assessing the condition of each habitat for baseline and moment of analysis (post-closure)**

Baseline: pre-quarrying				
0 year – prior to start of mining	Area (ha)	Importance	Condition	Description
Plantation forest	20	1	1.25 (avg. 1+1+1+2)	Poor structural diversity and maturity; poor species diversity; frequent signs of presence of invasive species; clear signs of habitat disturbance
Natural forest	70	2	3 (avg. 3+3+3+3)	Relatively mature and diverse habitat structure; good species diversity; little presence of invasive species; few signs of habitat disturbance
Grassland	25	3	2.75 (avg. 3+2+3+3)	Relatively mature and diverse habitat structure; moderate species diversity; little presence of invasive species; few signs of habitat disturbance
Wetland	5	2	1.75 (avg. 1+2+2+2)	Poor structural diversity and maturity; moderate species diversity; clear signs of invasive species; clear signs of habitat disturbance
<b>Total habitat area</b>	<b>120</b>			
<b>Active extraction area</b>	<b>0</b>	<b>1</b>		
<b>Total area</b>	<b>120</b>			

Moment of analysis: 35 years later, mining terminated				
35 years later, end of mining	Area (ha)	Importance	Condition	Description
Plantation forest	0			
Natural forest	49	2	3 (avg. 3+3+3+3)	Relatively mature and diverse habitat structure; good species diversity; little presence of invasive species; few signs of habitat disturbance
Grassland	20	3	2.75 (avg. 3+2+3+3)	Relatively mature and diverse habitat structure; moderate species diversity; little presence of invasive species; few signs of habitat disturbance
Wetland	5	2	1.75 (avg. 1+2+2+2)	Poor structural diversity and maturity; moderate species diversity; clear signs of invasive species; clear signs of habitat disturbance
Rehabilitated area established	<b>25</b>	<b>Breakdown</b>		
Natural forest	13	2	3 (avg. 3+3+3+3)	Relatively mature and diverse habitat structure; good species diversity; little presence of invasive species; few signs of habitat disturbance
Grassland	5	3	2.75 (avg. 3+2+3+3)	Relatively mature and diverse habitat structure; moderate species diversity; little presence of invasive species; few signs of habitat disturbance
Artificial lake - wetland	7	3	2.50 (avg. 2+2+3+3)	Structural diversity and maturity of habitat clearly below what is regionally possible; moderate species diversity; little presence of invasive species; few signs of habitat disturbance
Rehabilitated area not yet established	21	1	1	Poor state – still early stage of rehabilitation
<b>Total habitat area</b>	<b>120</b>			
<b>Active extraction area</b>	<b>0</b>	<b>1</b>		
<b>Total area</b>	<b>120</b>			



## 5.5. Calculating net impact

Net impact is assessed by first calculating the **biodiversity value (BV)** of each habitat. For each scenario, the biodiversity value of each habitat is calculated as follows:

Biodiversity value (BV) =

Area of each habitat (A) x Importance of each habitat (I) x Condition of each habitat (C)

Summing up the biodiversity value of each habitat gives the biodiversity index (BI)

- Biodiversity index (Baseline) =  $\sum$  Biodiversity value of each habitat (Baseline) /  $\sum$  Area

- Biodiversity index (moment of analysis) =  $\sum$  Biodiversity value of each habitat (moment of analysis) /  $\sum$  Area

The difference between the two biodiversity indexes represents the net impact

- Net impact = Biodiversity index (moment of analysis) – Biodiversity index (baseline)



## Practical example

### Step 4. CALCULATING THE NET IMPACT

Calculating the biodiversity value of each habitat and the biodiversity index of site

**Table 8: Calculating the biodiversity value of each habitat and the biodiversity index of site**

Baseline: pre-quarrying				
0 year – prior to start of mining	Area (ha)	Importance	Condition	Biodiversity value
Plantation forest	20	1	1.25	25
Natural forest	70	2	3	420
Grassland	25	3	2.75	206.25
Wetland	5	2	1.75	17.5
<b>Total habitat area</b>	<b>120</b>			<b>668.75</b>
<b>Active extraction area</b>	<b>0</b>			<b>0</b>
<b>Total area</b>	<b>120</b>			<b>668.75</b>

Moment of analysis: 35 years later, mining terminated				
35 years later, end of mining	Area (ha)	Importance	Condition	Biodiversity value
Plantation forest	0			0
Natural forest	49	2	3	294
Grassland	20	3	2.75	165
Wetland	5	2	1.75	17.5
Rehabilitated area established	<b>25</b>	<b>Breakdown</b>		
Natural forest	13	2	3	78
Grassland	5	3	2.75	41.25
Artificial lake - wetland	7	3	2.50	52.50
Rehabilitated area not yet established	21	<b>1</b>	1	21
<b>Total habitat area</b>	<b>120</b>			<b>669.25</b>
<b>Active extraction area</b>	<b>0</b>			<b>0</b>
<b>Total area</b>	<b>120</b>			<b>669.25</b>

The **biodiversity index** and **net impact** of the site are calculated as:

**Summing up the biodiversity value of each habitat gives the biodiversity index**

$$\text{- Biodiversity index (baseline)} = 668.75 / 120 \rightarrow 5.57$$

$$(\sum \text{Biodiversity value of each habitat (Baseline)} / \sum \text{Area})$$

$$\text{- Biodiversity index (moment of analysis)} = 669.25 / 120 \rightarrow 5.58$$

$$(\sum \text{Biodiversity value of each habitat (moment of analysis)} / \sum \text{Area})$$

**The difference between the two biodiversity indexes represents the net impact**

The net impact calculation gives =  $5.58 - 5.57 \rightarrow 0.01$  marginal increase in biodiversity index

Table 9 shows the biodiversity value and index for the intermediate phase, after 25 years.

## Practical example

### STEP 4. CALCULATING THE NET IMPACT

Calculating the biodiversity value of each habitat and the biodiversity index of site at 25 years after mining activities have started

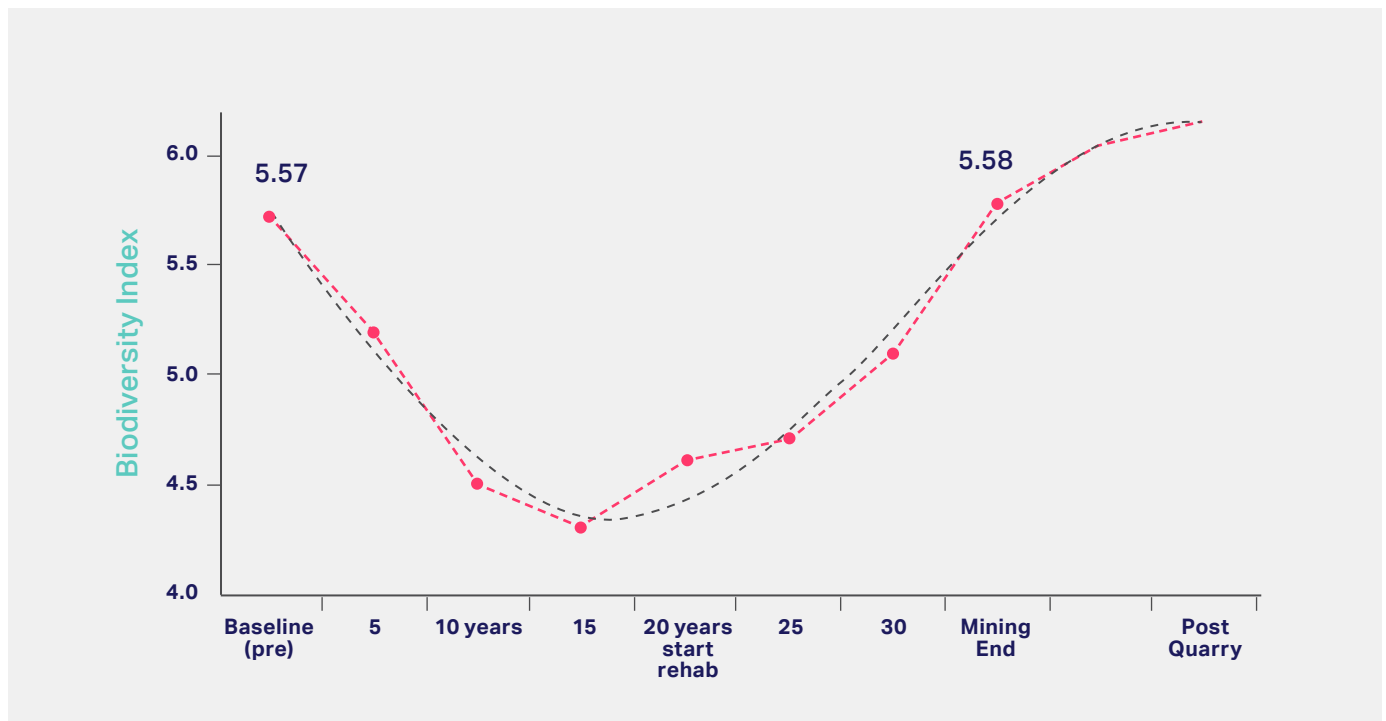
**Table 9: Calculating the biodiversity value of each habitat and the biodiversity index of site at 25 years after mining activities have started**

Moment of analysis: 25 years later, mining phasing out				
25 years after mining started	Area (ha)	Importance	Condition	Biodiversity value
Plantation forest	0			0
Natural forest	49	2		294
Grassland	20	3		165
Wetland	5	2		17.5
Rehabilitated area established	5	2		30
Rehabilitated area not yet established	15	1		15
<b>Total habitat area</b>	<b>94</b>			
<b>Active extraction area</b>	26	1	1	26
<b>Total area</b>	<b>120</b>			<b>547.5</b>
Biodiversity index = $547.5 / 120 \rightarrow 4.56$				

It can be seen that a decrease in the site biodiversity index is expected as the mining operation expands. As the active extraction area is reduced, i.e. turning land into rehabilitation areas through active management, the site's biodiversity value increases. In the example above, the following factors contributed to the enhancement of biodiversity, thus resulting in a no net loss situation at the end of the mining operations, with the potential to reach net positive impact for the site as the rehabilitated areas are increasingly well established:

- Existing wetlands were not opened up for mining activities and these habitats retained their biodiversity condition throughout the operation.
- Active management of rehabilitated areas:
  - ✓ Returning five hectares of grasslands back to its former state plus rehabilitating 13 hectares of mined-out areas into natural forest.
  - ✓ Creation of a new habitat (seven hectares of artificial lake), which has become an important wetland reserve (increase in regional importance) of moderate to good condition.
  - ✓ Ongoing rehabilitation of 21 hectares of the mined-out area.

**Figure 4: Biodiversity index trend throughout the mining life of the quarry**



## 5.6. NIA for offset areas

As explained in section [5.2.1. Defining Geographical Boundaries](#), the NIA methodology also covers sites/land under a company's management control as part of an offset/compensation program. According to the mitigation hierarchy, the role of biodiversity offsets should be seen as a last resort, after all reasonable measures have been taken first to avoid and minimize the impact of a development project and then to restore biodiversity onsite.

However, offset programs can contribute to no net loss of biodiversity or even net positive impact.

In the example used throughout this document, it is assumed that an offset program has taken place—managed in parallel with quarry activities—over a six-hectare area nearby that used to be cultivated land (baseline), with the purpose of creating a natural forest by planting native species. In this case, the biodiversity value and biodiversity index would be calculated as shown in Table 10.



## Practical example

Calculating the biodiversity value of each habitat and the biodiversity index of site, including an offset area

**Table 10:** Calculating the biodiversity value of each habitat and the biodiversity index of site, including an offset area

Baseline: pre-quarrying				
0 year – prior to start of mining	Area (ha)	Importance	Condition	Biodiversity value
Plantation forest	20	1	1.25	25
Natural forest	70	2	3	420
Grassland	25	3	2.75	206.25
Wetland	5	2	1.75	17.5
<b>Offset area</b> (former cultivated land allocated for restoration)	6	1	1	6
<b>Total habitat area</b>	<b>126</b>			<b>674.75</b>
<b>Active extraction area</b>	<b>0</b>			<b>0</b>
<b>Total area</b>	<b>126</b>			<b>674.75</b>

Moment of analysis: 35 years later, mining terminated				
35 years later, end of mining	Area (ha)	Importance	Condition	Biodiversity value
Plantation forest	0			0
Natural forest	49	2	3	294
Grassland	20	3	2.75	165
Wetland	5	2	1.75	17.5
Rehabilitated area established	<b>Breakdown</b>			
Natural forest	13	2	3	78
Grassland	5	3	2.75	41.25
Artificial lake - Wetland	7	3	2.50	52.50
Rehabilitated area not yet established	21	1	1	21
<b>Offset area</b> (restored to natural forest)	6	2	3	36
<b>Total habitat area</b>	<b>126</b>			<b>705.25</b>
<b>Active extraction area</b>	<b>0</b>			<b>0</b>
<b>Total area</b>	<b>126</b>			<b>705.25</b>

The **biodiversity index** and net impact of the site are calculated as:

Summing up the biodiversity value of each habitat gives the biodiversity index

$$\text{- Biodiversity index (baseline)} = 674.75 / 126 \longrightarrow 5.35$$

$$(\Sigma \text{ Biodiversity value of each habitat (baseline)} / \Sigma \text{ Area})$$

$$\text{- Biodiversity index (moment of analysis)} = 705.25 / 126 \longrightarrow 5.60$$

$$(\Sigma \text{ Biodiversity value of each habitat (moment of analysis)} / \Sigma \text{ Area})$$

The net impact calculation gives =  $5.60 - 5.35 \longrightarrow 0.25$  increase in biodiversity index

With the offset area, the biodiversity index has further increased, indicating additional improvements in the biodiversity conditions for all areas under management control.



## 5.7. Expert input in the NIA methodology

The input of experts is recommended for the following steps of the net impact assessment:

- Selecting the overall approach for evaluating change (pre- and post-moments);
- Selecting and collecting the appropriate information for habitat classification and evaluation, including the use of proxy information when necessary;
- Establishing the baseline and moment of analysis situation in quantitative terms (determining the coverage area of each habitat type);
- Establishing the baseline and moment of analysis situation in qualitative terms (designating the appropriate score for the importance and condition of each habitat type).





## 5.8. Development of an operational NIA system

The methodology described in this document sets the conceptual framework and explains the key principles and steps designed to measure the net impact on biodiversity of the mining activities of a cement company. The methodology is based on a habitat accounting system, taking into account the extent, importance and condition of each habitat.

It is recommended that any company wishing to further elaborate on this methodology develop clear guidelines as to how it has to be applied and that it address a number of important points that are dependent on the company's needs and capabilities, such as:

- Which sites should use this methodology? While this methodology makes recommendations, a company might select to use different criteria.
  - How often should an assessment be conducted? A green-field site in the first phases of development will inevitably lead to a loss of biodiversity but gradually show an improvement in net impact (increase of biodiversity index) when operations are nearing completion.
  - Who is to carry out the assessment? The involvement of external experts would validate the results either by consultancy or by developing quantitative approaches
- more oriented to biodiversity assessment, independent from NIA assessment. This would provide information for managers at the corporate level to compare results and improve the assessment or better train employees.
- What is the scale of a suitable scoring system? While four categories are proposed in the methodology for habitat importance and condition, more categories might be more suitable for specific needs.
  - How should habitat importance and conditions be assessed? An expert might be able to directly use the criteria in Table 3 and Table 6, whereas a non-expert may require further instructions or questionnaires.





## 6. Glossary

### **Net positive impact (NPI)**

a biodiversity management concept ensuring that, on balance, the impacts of a project, coupled with various mitigating measures, have a positive net effect on biodiversity (Imboden et al. 2014).

### **No net loss (NNL)**

originating from the Business and Biodiversity Offsets Programme, this term means that project-related impacts on biodiversity are balanced by a series of mitigation measures.

baseline: The starting point or benchmark against which changes in biodiversity attributed to the business activities can be compared.

### **Baseline**

the starting point or benchmark against which changes in biodiversity attributed to the business activities can be compared.

### **Habitat condition**

the status of a habitat and its suitability for biodiversity.

### **Habitat importance**

a factor expressing the importance and uniqueness of a certain habitat.

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## 9. Annex

### Minimum habitat classification for net impact assessment

Any guidelines developed for the operationalization of the NIA assessment would have to specify the habitat classification to be used. The proposal below is considered the minimum distinction to be made among the different habitats. Depending on the expertise used during such an assessment (e.g. experienced biodiversity expert versus non-expert staff) the classification of habitats can be more detailed or simplified.

Type	Features	Example
<b>Forest/ woodland/ shrubland</b>	<ul style="list-style-type: none"> <li>• High dominance of woody vegetation</li> <li>• Characterized predominantly by trees and/or shrubs</li> <li>• Plantations of indigenous or non-indigenous tree species primarily aimed at timber productions</li> <li>• Orchards and other non-timber plantations are excluded and categorized under cultivated land</li> </ul>	Forests (temperate, tropical, etc.), shrublands, wet or dry woodland, wood pasture, mangrove
<b>Grassland</b>	<ul style="list-style-type: none"> <li>• Characterized by the absence of trees and shrubs and the dominance of grasses in the ground layer</li> <li>• Planted or sown pastures established for the purpose of intensive livestock production are excluded from this habitat and are considered cultivated land</li> </ul>	Dry and seasonally wet grassland (acidic or calcareous), tundra, deserts (for this purpose)
<b>Rocky and sandy habitats</b>	<ul style="list-style-type: none"> <li>• Natural rock habitat that has never been mined, characterized by extensive patches (&gt;75%) of bare rocks without significant grass, shrub or tree cover, even under favorable rainfall conditions</li> <li>• Extensive areas of open karst rocks (&lt; 25% vegetation cover) to be treated as rocky habitat</li> <li>• Early successional stages on a rock or sand/ gravel substrate</li> </ul>	Naturally regenerating substrate/ sparsely vegetated ground; limestone pavement; old quarry faces left to natural rehabilitation
<b>Active extraction area</b>	<ul style="list-style-type: none"> <li>• Refers to the active extraction void and associated infrastructure and to quarry slopes (faces) where extractive operations ceased a maximum of 2 years ago</li> <li>• May be subject to some rehabilitation (e.g. planting of benches) or be left on their own</li> </ul>	Site offices and associated buildings, areas of hardstanding, haul roads, processing plant, cement plant, active extraction area; areas that are regularly disturbed, thereby minimizing biodiversity development
<b>Cultivated land and/or other man-made areas</b>	<ul style="list-style-type: none"> <li>• Includes all man-made areas where the soil has been tilled and where agricultural crops and/or other plantations have been seeded or planted for subsistence and/or commercial and/or entertainment purposes.</li> <li>• Includes pieces of land normally used for farming but left with no crops on it for a season in order to let it recover its fertility</li> </ul>	Arable land, pasture land, plantations, and garden/amenity areas; most classifications will consist of monocultures

Type	Features	Example
<b>Wetlands</b>	<ul style="list-style-type: none"> <li>• Areas where the ground is saturated with water, including bogs, marshes and swamps</li> <li>• May have pools of standing water or may not show any signs of surface water but the water might be just below the ground surface</li> <li>• Plants growing in these places are adapted to waterlogged conditions</li> <li>• Often made up of a mosaic of different wetland features, depending upon the amount of water or the frequency of flooding</li> </ul>	Reedbed
<b>Flowing waters</b>	<ul style="list-style-type: none"> <li>• Predominantly natural waterways, with flowing waters, and including springs, streams and rivers</li> <li>• Underground rivers, representing a unique karst flowing water habitat</li> <li>• Man-made waterways where water flow is very slow and may include canals and ditches, hardened embankments from quarrying operation</li> </ul>	Springs/streams/rivers, underground rivers, canals/ditches/hardened embankments
<b>Standing waters</b>	<ul style="list-style-type: none"> <li>• Open water bodies, including natural pools, ponds and lakes</li> <li>• Standing water bodies resulting from quarrying operations, either as an intentional or as an accidental outcome</li> </ul>	Natural pools and lakes, standing water bodies resulting from quarrying operations
<b>Coastal habitats</b>	<ul style="list-style-type: none"> <li>• Area of transition between the land and the sea (rocks, beaches, mudflats); may vary from rocky cliffs or pebbles, to sandy beaches or mudflats</li> <li>• Coastal salt marsh or a tidal marsh—a coastal ecosystem in the upper coastal intertidal zone between land and open salt water or brackish water that is flooded by high tides; flat low-lying land areas dominated by dense stands of salt-tolerant plants such as herbs, grasses or low shrubs</li> </ul>	Saline lagoons, coastal grazing marsh/salt marsh, coastal vegetated shingle, beaches, mudflats
<b>Outstanding features</b>	Where the habitat contains outstanding biodiversity features (e.g. karst features such as caves with waterways) identified on the site, expert opinion must be sought prior to undertaking a net impact assessment	

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