A cross-sector guide for implementing the Mitigation Hierarchy

Executive summary and Overview

Cross Sector Biodiversity Initiative

ICMM International Council on Mining & Metals

IPIECA

EQUATOR PRINCIPLES

Prepared by The Biodiversity Consultancy

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ICMM International Council on Mining & Metals IPIECA EQUATOR PRINCIPLES

Prepared by The Biodiversity Consultancy. CSBI would like to express its thanks to the International Finance Corporation (IFC) for substantial technical input and financial contribution to this document.

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Executive summary

The mitigation hierarchy is a tool designed to help users limit, as far as possible, the negative impacts of development projects on biodiversity and ecosystem services (BES).

It involves a sequence of four key actions—'*avoid*', '*minimize*', '*restore*' and '*offset*'—and provides a best-practice approach to aid in the sustainable management of living, natural resources by establishing a mechanism to balance conservation needs with development priorities.

This guidance document is designed to guide users through the practical implementation of the mitigation hierarchy, and offers guidance for understanding each step in the sequence described above, both at the initial design and planning stages of a project and throughout the project's lifespan. It is aimed primarily at environmental professionals, working in, or with, the extractive industries, and who are responsible for managing the potential risks of project impacts on biodiversity and ecosystem services.

The development of this document was, in part, motivated by the International Finance Corporation (IFC) *Performance Standards on Environmental and Social Sustainability*, in particular *Performance Standard 6* (PS6) on *Biodiversity Conservation and Sustainable Management of Living Natural Resources* (IFC, 2012a).

The CSBI recognizes that not every project is governed by IFC PS6, and that the extractive industry, biodiversity science, performance standards and other expectations may evolve and change. This guidance is not, therefore, constrained by IFC PS6 but more broadly reflects the state of the art and good practice of operationalization of the mitigation hierarchy for biodiversity and ecosystem services impact management in the extractive industries.

The structure of the document is described below.

The Overview

The *Overview* introduces the mitigation hierarchy as a framework for managing the risks and potential impacts of development projects on biodiversity and ecosystem services. It provides a formal definition of the mitigation hierarchy according to the Cross-Sector Biodiversity Initiative (CSBI), and clarifies the meanings of the terms *avoid*, *minimize*, *restore* and *offset* as used in the context of this guidance document (similar terms may have different legal implications in some jurisdictions).

The *Overview* presents the ecological, economic, regulatory and reputational drivers for applying the mitigation hierarchy, and describes its uses in terms of performance measurement, scheduling, achieving cost-effectiveness in project operations, and as a risk assessment and management tool.

Lastly, the *Overview* emphasizes the importance of engaging financers, and internal and external stakeholders, in the decision making process, and the consequent need for maintaining effective communication and documentation. Examples of key communication materials are provided.

Section 1: Avoidance

Section 1 introduces the concept of *avoidance*—the first and most important step in the mitigation hierarchy. The benefits and potential considerations of *avoidance* are summarized, and the different types of *avoidance* are explained, with details provided on how each type of *avoidance* can be undertaken. A number of practical examples are presented to illustrate how *avoidance* has been used by the extractives industry in a range of different circumstances. Guidance on the general practice of *avoidance* is provided, together with a summary of the potential constraints and challenges that may be encountered. This section closes with a summary of how improved ecological information and new technology can combine to give rise to new ideas for *avoidance*, and examples of recent innovative approaches are provided.

Section 2: Minimization

Section 2 is dedicated to the second step in the mitigation hierarchy—*minimization*. The principles and types of *minimization* are presented, together with a summary of the advantages and considerations that may need to be borne in mind. Practical examples of *minimization* are provided to demonstrate how this step has been used effectively by the extractives industry in a variety of different circumstances. This section closes with guidance on the general practice of *minimization*, a summary of potential constraints and challenges, and a note on innovative ideas for its application.

Section 3: Restoration

Restoration is presented in Section 3 of the guidance. The rationale for *restoration* is presented and, as with *avoidance* and *minimization*, the advantages of, and potential considerations for, *restoration* are also summarized. A summary of the key principles and steps for implementing *restoration* are presented, together with guidance on the practice of *restoration*, including realistic goal-setting, effective management of the process, and performance evaluation. A number of examples describing how *restoration* has been successfully employed in practice are also presented.

Section 4: Offsets

Section 4 presents the fourth and final step in the mitigation hierarchy—*offsets*. An explanation of the rationale for *offsets* is provided, together with a brief analysis of the business case for BES offsets. The key principles for using biodiversity *offsets* are summarized, as are the different types of *offsets* and the steps involved in the practice of *offsetting*. A practical example is included to demonstrate how *offsetting* has been used to aid habitat recovery for threatened fauna and flora species in a marine environment. The section closes with a summary of significant issues emerging as industry continues to design and implement biodiversity *offsets*.

References and further information

A *References* section is provided at the back of the guidance, followed by a list of useful weblinks and a comprehensive selection of relevant titles for further reading. Terminology used within the scope of the guidance is clarified in a *Definitions* section, and a summary of the acronyms used within the guidance is also provided. Finally, the two *Appendices* provide (1) an analysis of future developments and (2) details of knowledge gaps, for both *avoidance* and *minimization*.

Overview

About this document

What is the mitigation hierarchy?

The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services[1] (BES). The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities.

As defined by the CSBI (*Framework for Guidance on Operationalizing the Biodiversity Mitigation Hierarchy*, December 2013), the mitigation hierarchy is: '*the sequence of actions to anticipate and avoid impacts on biodiversity and ecosystem services; and where avoidance is not possible, minimize[2]; and, when impacts occur, rehabilitate or restore[3]; and where significant residual impacts remain, offset*.

The mitigation hierarchy is not a standard or a goal, but an approach to mitigation planning. It can be used in its own right or as an implementation framework for BES conservation goals such as no net loss (NNL) or net gain/net positive impact (NPI), regulatory requirements and/or internal company standards. It provides a mechanism for measurable conservation outcomes for BES that can be implemented on an appropriate geographic scale (e.g. ecosystem, regional, national, local).

1 See the *Definitions* section on page 79 of the complete guide and, for further explanation, the A-Z of Biodiversity: www.biodiversitya-z.org/content/biodiversity.pdf

2 In the mitigation hierarchy, and in this guidance, '*minimization*' is used in a general sense to mean 'reduce' or 'limit' as far as feasible. It is not used in the legal sense current in some jurisdictions, where the term 'minimize' means 'reduce to zero'. In many instances, it is not possible to reduce a biodiversity-related risk or impact to zero, and if it is possible, the net incremental environmental/social benefit may not justify the significant additional cost.

3 In the mitigation hierarchy, and in this guidance, '*restoration*' is used in a broad and general sense. *Restoration* does not imply an intention to *restore* a degraded ecosystem to the same state and functioning as before it was degraded (which is the meaning in some specific jurisdictions, and may be an impossibly challenging or costly task). *Restoration* may instead involve land reclamation or ecosystem rehabilitation to repair project impacts and return some specific priority functions and biodiversity features to the ecosystems concerned. There are many terms linked to *restoration*, including rehabilitation, reclamation and remediation: these activities only amount to *restoration* when they ensure gains for the specific BES features of concern that are targets for mitigation.

What is this document for?

This document provides high-level guidance, with pointers to further information, for using the mitigation hierarchy effectively to manage the potential impacts[4] of extractive activities on BES, at a landscape scale, throughout project lifespans. It aims to reflect state-of-the-art good practice of operationalizing the mitigation hierarchy for biodiversity impact management for extractive industries. The guidance is aimed at those working in, or with, industry and financial institutions, who are responsible for overseeing the application of the mitigation hierarchy, and who need a sound grasp of current good practice and its ongoing evolution, as well as a quick and simple way to find additional detailed information when necessary. It draws upon experts in relevant fields and current scientific literature, recognizes gaps and challenges in the implementation of each step of the mitigation hierarchy and leaves room for adaptability to future advances in these areas.

This guidance aims to:

- clearly define the mitigation hierarchy and its application to extractive projects;
- offer practical guidance for understanding and implementing each step of the mitigation hierarchy throughout the lifespan of an extractive project;
- outline how to determine and demonstrate loss or gain of biodiversity and/or ecosystem services as a result of mitigation action or inaction;
- offer practical measures for predicting and verifying conservation outcomes over time;
- allow flexible application, adaptable to site-specific environmental, operational and regulatory circumstances; and
- be systematically applicable across a range of extractive industry projects and natural environments[5].

The guidance is framed to be compatible with other IPIECA and ICMM guidance on biodiversity, ecosystem services and *offsets*, and with the CSBI Timeline Tool and Baseline Biodiversity Data Collection Guidance[6]. It focuses mainly on mitigating impacts on biodiversity, but also addresses ecosystem services (the benefits people receive from ecosystems) when appropriate. The two are closely related, but not in a straightforward way. Conserving biodiversity is likely to maintain existing ecosystem services, but the reverse may not always be so. Application of the mitigation hierarchy to ecosystem services is relatively new. As more experience is gained, this guidance may be updated accordingly.

For both biodiversity and ecosystem services, this guidance assumes a focus on significant (or material) impacts. This means that the impacts are on a BES feature that has substantial intrinsic or ecosystem service value, for example because it is highly threatened, unusual and localized, or of major cultural or economic importance, or in an intact and unmodified state. It also means that the potential impacts are not minor or trivial—for example they would severely reduce a species' viability, or the ability of a habitat to maintain viable populations of its native species. BES performance standards of the Multilateral Financial Institutions, such as the IFC's Performance Standard 6 (IFC, 2012a), provide useful frameworks and guidance for assessing the materiality of impacts. Identifying the BES features of concern is an important first step in applying the mitigation hierarchy. Once these features have been identified, they form the target for application of all the mitigation hierarchy components.

This guidance covers the mitigation of impacts that could be expected to arise from a project's routine activities related to exploration, construction, operation and closure. It does not address the risk of accidents and emergencies. While engineering and planning to prevent, contain and manage emergencies are a crucial part of project design and operation, they are beyond the scope of this document.

How this document is structured

This document is structured according to the components of the mitigation hierarchy, i.e. *avoidance*, *minimization*, *restoration* and *offsetting*:

- The *Overview* (this section) introduces the mitigation hierarchy and its operationalization as a whole. It covers the primary drivers for implementing the mitigation hierarchy over the lifespan of an asset and touches on topics that are common to all the components of the mitigation hierarchy.

[4] Direct, indirect and cumulative. See the *Definitions* section on page 79 of the complete guide.

[5] This guidance does not cover offshore ecosystems, where there is as yet very limited experience of how to apply the mitigation hierarchy.

[6] Full references and weblinks (where available) are given in the *References* section of the complete guide.

- Section 1 focuses on the first, and often the most important, component of the mitigation hierarchy—*avoidance*. This preventive step is intended to *avoid* impacts on the most sensitive BES, through site selection, project design and/or scheduling.
- Section 2 presents the second component of the mitigation hierarchy—*minimization*[7]. This is also a preventive step, and aims to reduce impacts that cannot be *avoided* through physical, operational or abatement controls.
- Section 3 discusses the first remediative component of the mitigation hierarchy—*restoration*[8]. Where damage or degradation to biodiversity values cannot be *avoided* or further *minimized*, there may be scope for remediation via rehabilitation or *restoration* efforts.
- Section 4 covers the last component of the mitigation hierarchy—*offsets*. This step is the last resort to address those significant residual impacts that could not be prevented through *avoidance* and *minimization*, or adequately corrected through *restoration*/rehabilitation. Additional conservation actions are also covered in this section.

Sections 3 and 4 are less detailed than Sections 1 and 2. Extensive information and guidance already exists for *restoration* and *offsets*. This document outlines the key issues for these components and provides signposts to relevant material elsewhere.

Rationale for use of the mitigation hierarchy

There are ecological, economic, regulatory and reputational drivers for applying the mitigation hierarchy:

Ecological drivers: these include protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources, through limiting and/or repairing project impacts on BES. Impacts on biodiversity can adversely affect the delivery of ecosystem services, and this may in turn have negative consequences on human well-being. It may also affect the viability of projects that have significant dependencies on those ecosystem services.

Regulatory drivers: the mitigation hierarchy is used by many financial institutions, industries, governments and NGOs. Several financial standards and safeguards (International Finance Corporation Performance Standard 6 (IFC PS6), European Bank for Reconstruction and Development Performance Regulation 6 (EBRD PR6), World Bank Environmental and Social Standard 6 (ESS6), and the Equator Principles) all require application of the mitigation hierarchy for management of impacts on BES. The US Wetland Banking, the European Union Birds and Habitats Directives and Australia's Environment Protection and Biodiversity Conservation Act are examples of regulatory frameworks that also require application of the mitigation hierarchy.

Economic drivers: effective application of the mitigation hierarchy can reduce risks, costs and delays for industry and financial institutions during project development. Companies that follow good practice in environmental management, including application of the mitigation hierarchy, may secure easier and less costly access to finance, land and resources[9].

Reputational drivers: stakeholders increasingly expect that the mitigation hierarchy should be carefully applied, as good practice towards achieving sustainable development.

[7] In the mitigation hierarchy, and in this guidance, '*minimization*' is used in a general sense to mean 'reduce' or 'limit' as far as feasible. It is not used in the legal sense current in some jurisdictions, where the term 'minimize' means 'reduce to zero'. In many instances, it is not possible to reduce a biodiversity-related risk or impact to zero, and if it is possible, the net incremental environmental/social benefit may not justify the significant additional cost.

[8] In the mitigation hierarchy, and in this guidance, '*restoration*' is used in a broad and general sense. *Restoration* does not imply an intention to *restore* a degraded ecosystem to the same state and functioning as before it was degraded (which is the meaning in some specific jurisdictions, and may be an impossibly challenging or costly task). *Restoration* may instead involve land reclamation or ecosystem rehabilitation to repair project impacts and return some specific priority functions and biodiversity features to the ecosystems concerned. There are many terms linked to *restoration*, including rehabilitation, reclamation and remediation: these activities only amount to *restoration* when they ensure gains for the specific BES features of concern that are targets for mitigation.

[9] e.g. Rainey *et al*. (2014).

Uses and components of the mitigation hierarchy

The mitigation hierarchy is useful as a framework because it can:

- **Promote performance measurement:** it is the tool by which biodiversity conservation goals (e.g. NNL, net gain/NPI, regulatory or company internal policy goals) can be achieved. Intelligent application of the mitigation hierarchy can reduce the costs of achieving such goals.
- **Reduce scheduling delays and instigate cost-effective approaches:** the mitigation hierarchy is a feedback optimization process to make the most cost-effective investment while effectively managing impacts on biodiversity and ecosystem services. Science, stakeholders, finance and industry schedules all factor into the judicious use of each component of the mitigation hierarchy.
- **Function as a risk assessment and management tool:** the mitigation hierarchy is a risk management tool and an Environmental and Social Impact Assessment (ESIA) planning tool. Appropriate application reduces business costs and scheduling/financing delays. The effective application of the mitigation hierarchy provides the opportunity for early identification of BES risks and mitigation options. This facilitates early business forecasting of potential mitigation requirements and options, schedule and cost estimates, and implications for project feasibility.

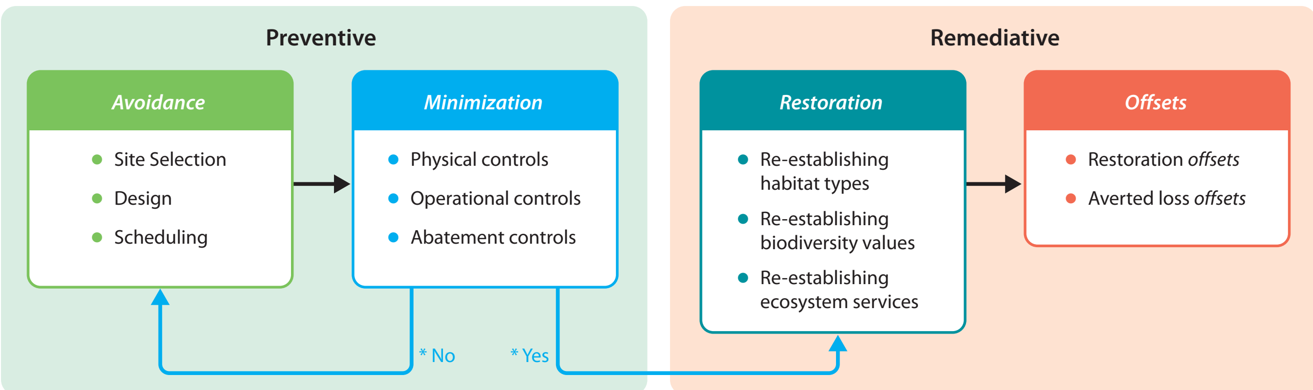
Figure 1 illustrates the iterative process of *avoiding* and *minimizing* until remaining risks and impacts can be managed through the remediative measures of *restoration* and *offsetting*.

The mitigation hierarchy can be viewed as a set of prioritized, sequential components that are applied to reduce the potential negative impacts of project activities on the natural environment. It is not a one-way linear process but usually involves iteration of its steps. It can be applied to both biodiversity and related ecosystem services. There are two preventive components, *avoid* and *minimize*, and two remediative components, *restore* (or rehabilitate) and *offset* (see Figure 3). As a rule, preventive measures are always preferable to remediative measures—from ecological, social and financial perspectives.

Preventive measures

Avoidance, the first component of the mitigation hierarchy, is defined by the CSBI[10] as '*Measures taken to anticipate and prevent adverse impacts on biodiversity before actions or decisions are taken that could lead to such impacts*.'

Figure 1 *Schematic diagram showing the implementation of the mitigation hierarchy*



* Can potential impacts be managed adequately through remediative measures?

[10] Definitions in this section are from CSBI (2013a), *Framework for Guidance on Operationalizing the Biodiversity Mitigation Hierarchy*, December 2013. See also the *Definitions* section on page 79 of the complete guide, for comparison with other definitions that are available.

Avoidance is often the most effective way of reducing potential negative impacts. Its proper implementation requires biodiversity and ecosystem services to be considered in the pre-planning stages of a project. When *avoidance* is considered too late, after key project planning decisions have been taken, cost-effective options can easily be missed.[11]

Minimization, the second component of the mitigation hierarchy, is defined by the CSBI as '*Measures taken to reduce the duration, intensity, significance and/or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible*'[12]. Well-planned *minimization* can be effective in reducing impacts to below significance thresholds.

Remediative measures

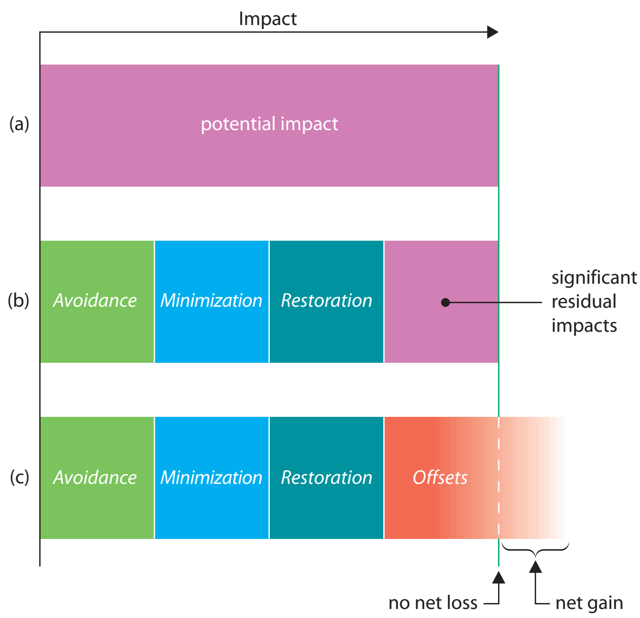
Restoration is used to repair BES features of concern that have been degraded by project activity. It involves measures taken to repair degradation or damage to specific BES features of concern—which might include species, ecosystems/habitats or priority ecosystem services—following project impacts that cannot be completely *avoided* and/or *minimized*. In the context of the mitigation hierarchy, *restoration* should focus on the BES features identified as targets for mitigation.[13] *Restoration* is usually carried out on-site and to repair impacts caused (directly or indirectly) by the project. Implementation of *offsets* (see below) may also involve restoration activities carried out off-site to repair impacts not caused by the project. These different kinds of restoration activities should not be confused.

Offsetting forms the final component of the mitigation hierarchy. *Offsets* are defined by the CSBI as '*Measurable conservation outcomes, resulting from actions applied to areas not impacted by the project, that compensate for significant, adverse project impacts that cannot be avoided, minimized and/or rehabilitated/restored*'. *Offsets* should have a specific and preferably quantitative goal that relates directly to residual project impacts. Often (but not necessarily) this is to achieve no net loss or a net gain of biodiversity. *Offsetting* is a measure of last resort after all other components of the mitigation hierarchy have been applied.

Offsets can be complex, expensive and uncertain in outcome. The need for *offsets* should therefore be reduced as far as possible through considered attention to earlier components in the mitigation hierarchy.

In the example shown in Figure 2, a project's potential impact (a) is reduced by taking measures to *avoid*, *minimize* and *restore* impacts (b) but a significant residual impact remains; this can be remediated via an *offset* (c), which in this case leads to a net gain in biodiversity.

Figure 2 *Application of the mitigation hierarchy components*



[11] The CSBI Timeline Tool partly aims to address this: www.csbi.org.uk/workstreams/timeline-tool

[12] In the mitigation hierarchy, and in this guidance, '*minimization*' is used in a general sense to mean 'reduce' or 'limit' as far as feasible. It is not used in the legal sense current in some jurisdictions, where the term 'minimize' means 'reduce to zero'. In many instances, it is not possible to reduce a biodiversity-related risk or impact to zero, and if it is possible, the net incremental environmental/social benefit may not justify the significant additional cost.

[13] In the mitigation hierarchy, and in this guidance, '*restoration*' is used in a broad and general sense. *Restoration* does not imply an intention to *restore* a degraded ecosystem to the same state and functioning as before it was degraded (which is the meaning in some specific jurisdictions, and may be an impossibly challenging or costly task). *Restoration* may instead involve land reclamation or ecosystem rehabilitation to repair project impacts and return some specific priority functions and biodiversity features to the ecosystems concerned. There are many terms linked to *restoration*, including rehabilitation, reclamation and remediation: these activities only amount to *restoration* when they ensure gains for the specific BES features of concern that are targets for mitigation.

Box 1 Differentiated application of the mitigation hierarchy for biodiversity and ecosystem services

The mitigation hierarchy can be applied to both biodiversity and ecosystem services. However, the approach may need to be differentiated to reflect their distinct characteristics. While biodiversity represents the stock of nature (genes, species and ecosystems), ecosystem services are the benefits to people that flow from this stock when it is combined into integrated and functioning systems.

Where there are significant potential impacts on ecosystem services, the following points should be borne in mind when applying the mitigation hierarchy:

- Identifying the beneficiaries, and the extent of their dependence on the service(s), requires both sociological expertise, and appropriate stakeholder consultation. This information on demand and dependence needs to be brought together with information on how impacts will affect ecosystems and the flow of services. In practical terms, this means bringing together the social and environmental components of impact assessment—which often operate separately.
- Dependencies may extend not only to Affected Communities (defined as a group of stakeholders using an ecosystem service that is affected by the project and reliant on that ecosystem service for their well-being) but to the project itself.
- Understanding the spatial aspect of impacts is crucial. While Affected Communities typically are close to the project site, this is not always the case—for example where there are impacts on water supply or quality which can affect distant communities downstream.
- *Offsets* for ecosystem services should be located so that they deliver to the Affected Communities. This could necessitate a composite *offset* for the project, with separate locations to *offset* residual impacts on biodiversity and on ecosystem services. Ecosystem services that were previously out of reach can sometimes be made accessible by changes in tenure, targeted training, or facilitation of travel. In some situations, compensation for ecosystem services can only feasibly be provided through substitution (e.g. a borehole replacing flowing surface water) and/or monetary compensation. Engineering or monetary compensation is usually less satisfactory than an ecosystem-based approach. It may also not be possible to compensate for some important ecosystem services (e.g. spiritual value) in this way.
- There may often be mitigation trade-offs between different ecosystem services, between services provided to different stakeholder groups, and between biodiversity and ecosystem services. For example, increasing access to, or use of, productive services (such as wood fuel or fisheries) could be incompatible with improved biodiversity conservation, and with some regulating or cultural services. Situations often also arise where the ecosystem services relied upon by Affected Communities involve unlawful activities (e.g. timber or bushmeat harvesting). Where complex trade-offs and dependencies are involved, it is particularly important to obtain a sound understanding of the ecological, social, political and economic contexts, materiality of impacts, and the available options and their consequences. Extensive stakeholder consultations (and probably negotiations), will be necessary.

Many tools are available to guide the identification and prioritization of ecosystem services, such as those from IPIECA/IOGP (www.ipieca.org/publication/ecosystem-services-guidance-biodiversity-and-ecosystem-services-guide) or WRI (www.wri.org, e.g. Landsberg *et al.*, 2013: *Weaving Ecosystem Services into Impact Assessment: A Step-by-Step Method*). Modelling tools such as InVEST (www.naturalcapitalproject.org/InVEST.html) or ARIES (www.ariesonline.org) may be useful in determining current baselines and trends, and potential project impacts.

The first components of the mitigation hierarchy are often the most useful and effective

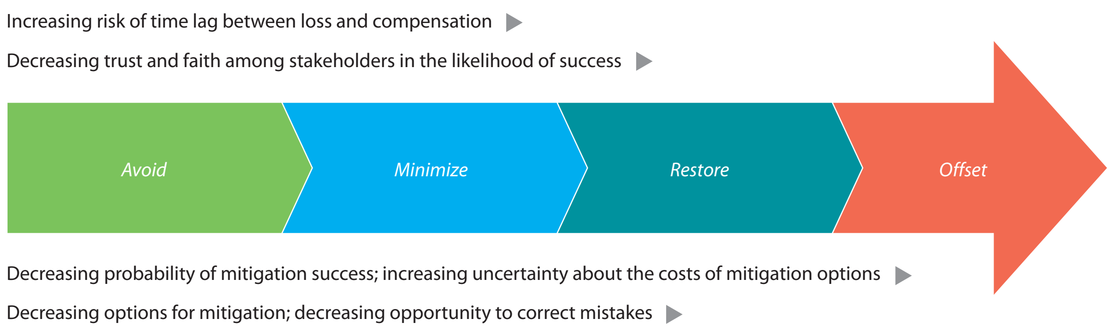
The mitigation hierarchy is a hierarchy in terms of priorities. As a general rule, this means that the earlier components need special emphasis. While all components of the mitigation hierarchy are important, rigorous efforts to *avoid* and *minimize* as far as feasible are likely to achieve significant reductions in potential impacts (Figure 2). Careful implementation of the early components of the mitigation hierarchy will reduce the project's liability for *restoration* and *offsets* measures. This is important as these later mitigation components may often—but not always—encounter the following (see also Figure 3):

1. Increasing technical, social and political risks (e.g. technical failure of restoration, or political failure of a biodiversity *offset*).
2. Increasing uncertainty of costs, and risk of cost escalation.
3. Increasing costs per unit of BES.
4. Increasing requirements for external stakeholder engagement and specialist expertise.
5. Decreasing opportunity to correct mistakes.
6. Decreasing confidence and trust among key stakeholders.

However, the opportunity costs of *avoidance* and *minimization* may often be larger for the project site (because it contains valuable mineral, oil or gas resources) than for other ecologically similar areas. There may thus be a strong economic rationale for *restoration* and (especially) *offsets* to be favoured over *avoidance* and *minimization* in addressing potential impacts. In practice, therefore, trade-offs between environmental and economic effectiveness may need to be considered and resolved. There is no simple formula for doing this, and different risks and considerations will need to be weighed carefully in the context of societal preferences and stakeholder concerns.

There are often fewer options and higher risks further along the mitigation hierarchy. Where it is feasible, *avoidance* tends to have fixed, known costs and in many cases a higher probability of success than later components. Beyond *avoidance*, mitigation options usually diminish, and challenges related to cost, schedule and stakeholders often become more significant. Exceptions occur however (e.g. *restoration* may in some cases be riskier and more expensive than *offsetting*) and projects will need to be considered on a case-by-case basis.

Figure 3 *Avoid, minimize, restore, offset*



The mitigation hierarchy and the project lifespan

The CSBI Timeline Tool[14] illustrates how options for the preventive components (*avoidance* and *minimization*) occur primarily, but not exclusively, early in the project planning cycle, and options for the remediative components (*restoration* and *offsets*) occur later and throughout operations.

Figure 4 illustrates the application of the mitigation hierarchy across the project lifespan and highlights the components most likely to be of importance during each broad stage.

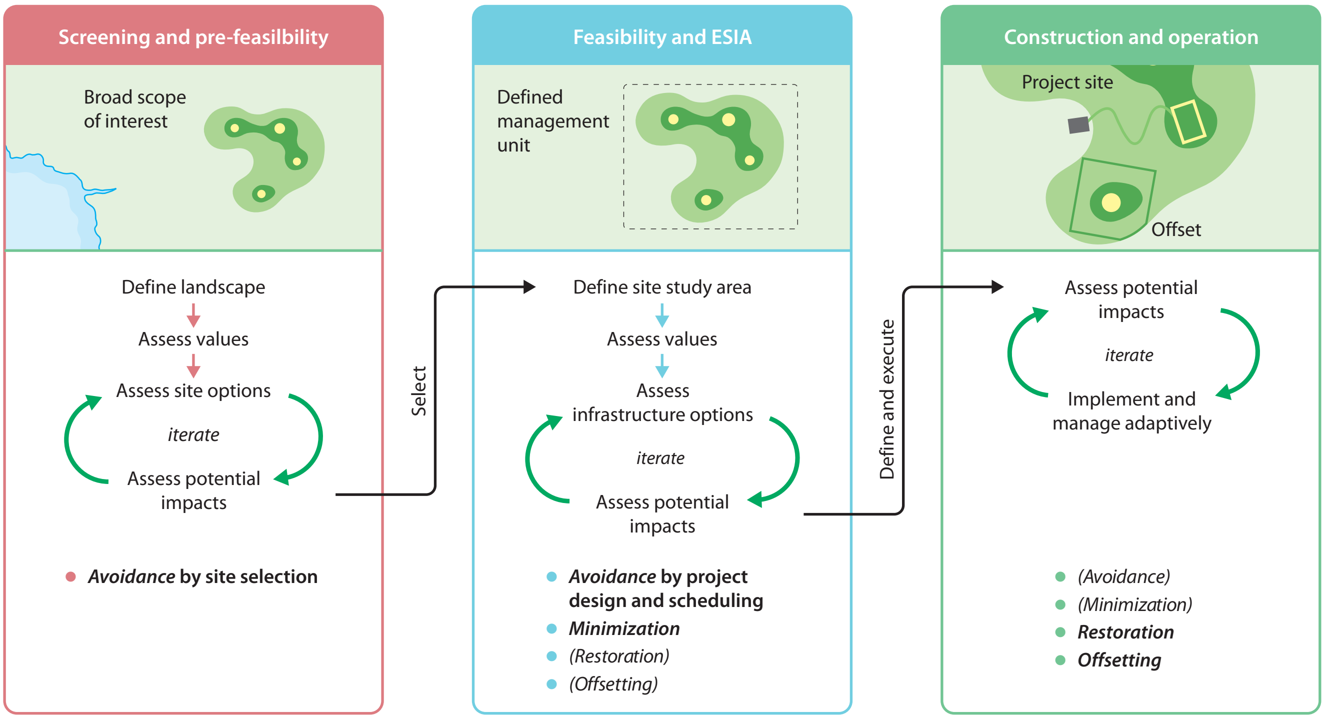
Selection of project sites through ecosystem-level BES screening occurs at the pre-feasibility assessment stage. Once a site has been chosen, further *avoidance* and *minimization* occurs within the project site. During construction and operation, implementation of the mitigation hierarchy involves adaptive management. Work undertaken during each stage includes defining study areas, assessing BES values and impacts, and choosing and implementing mitigation options. Iterative decision making (shown by the green arrows in Figure 4) is desirable at each stage.

Using the mitigation hierarchy before, during and after the ESIA

The mitigation hierarchy has traditionally been used during the ESIA and, more recently, the *offset* design process. However, it is proving valuable in current good practice to also use the approach before and after the ESIA.

Before the ESIA, the mitigation hierarchy functions as a risk assessment framework to assess the magnitude of BES risks, for example to consider whether it is feasible to mitigate impacts at the site, whether the site can be *restored*, and whether an NNL can be achieved. Questions to ask include: Is there a risk of irreversible or non-*offsettable* impacts? Are there less-damaging alternatives that are feasible? And, with respect to ecosystem services: Is the proposed development likely to be sustainable in this location, given its natural resource dependencies?

Figure 4 *Applying the mitigation hierarchy across three broad stages of the project timeline*



[14] CSBI Timeline Tool www.csbi.org.uk/workstreams/timeline-tool

Table 1 *Financial institutions and industry use the mitigation hierarchy for different purposes at different stages of the project lifespan*

Project stage	Industry use of the mitigation hierarchy	Financial institution use of the mitigation hierarchy	Key mitigation hierarchy components implemented
Pre-ESIA	• Risk assessment: first screening for potential *offset* locations	• Risk Assessment	• *Avoidance* by site location • (*Offsets*)
ESIA	• Mitigation design • Feedback optimization approach to mitigation investment • Residual impact assessment • *Offset* design	• Conceptual framework • Guidance for clients	• *Avoidance* by project design and scheduling • *Minimization* • (*Restoration*) • (*Offsets*)
Post-ESIA	• Performance tracking • Adaptive management	• Performance tracking for loan and/or financing agreement actions[15] (ESAPs, EPAPs[16]) • Performance audits	• (*Avoidance*) • *Minimization* • *Restoration* • *Offsets*

During ESIA, the mitigation hierarchy can function as the principal ESIA organizing framework for BES. It guides planning and communication. Half way through the ESIA process, it is good practice to use the mitigation hierarchy as a feedback optimization tool (see below). This involves checking to determine whether impacts remaining after *avoidance* and *minimization* can be remediated (with *restoration* and *offsets*). If remediation would incur unacceptably high costs or risks, it may be necessary to go back and reassess the earlier components of the mitigation hierarchy.

After the ESIA, during the construction and operations phase, the mitigation hierarchy functions as an adaptive management framework for practitioners, as an audit tool for regulators and financial institutions, and as an NNL tool in *offset* design.

Both industry and financial institutions apply the mitigation hierarchy across the different stages of the project cycle, but for slightly different purposes. For industry, the mitigation hierarchy is mainly a tool for planning and adaptive management; for financial institutions it provides a framework to guide clients, and a means to audit performance (Table 1).

How to move to the next component of the mitigation hierarchy and use feedback to optimize investments

The mitigation hierarchy is not a one-way linear process, and entails both feedback and adaptive management to optimize investments (see Figure 5 on page 14).

The principle

The question, 'How much *avoidance* is enough?' depends on the mitigation options remaining for the biodiversity features of concern, after this component has been applied. Iteration may therefore be necessary (Figure 5).

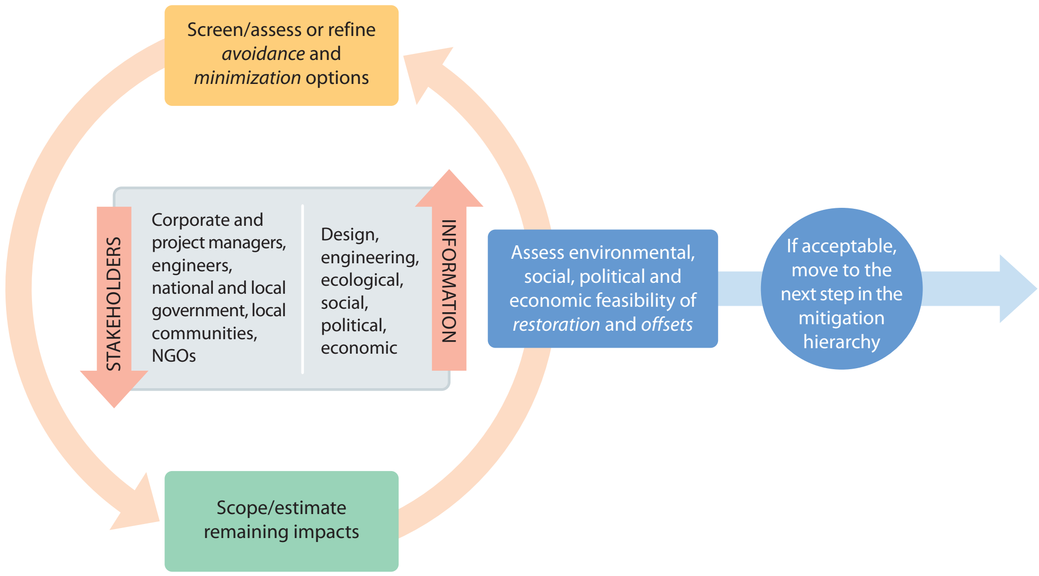
The method

1. Apply *avoidance* and *minimization* measures to potential BES impacts using a risk-based approach.
2. Characterize and estimate the magnitude of the potential remaining impacts to be addressed by *restoration* and, if necessary, *offsetting*.
3. Assess the environmental, social, political and economic feasibility of *restoring* or *offsetting* this type and magnitude of impact on BES values.

[15] Equator Principles (2014). *Guidance for EPFIs* [Equator Principles Financial Institutions] *on incorporating environmental and social consideration into loan documentation*. www.equator-principles.com/resources/ep_guidance_for_epfis_on_loan_documentation_march_2014.pdf

[16] Environmental and Social Action Plans (mainly multilateral finance institutions (MFIs)), and Equator Principle Action Plans (Equator Institutions). For an example see: www.pgi-uk.com/Doc/pdf/EIAReports/Equator-Principles-Action-Plan-for-Pungwe-B.pdf

Figure 5 *The iterative stages in the assessment of options and impacts, to optimize investment in components of the mitigation hierarchy*



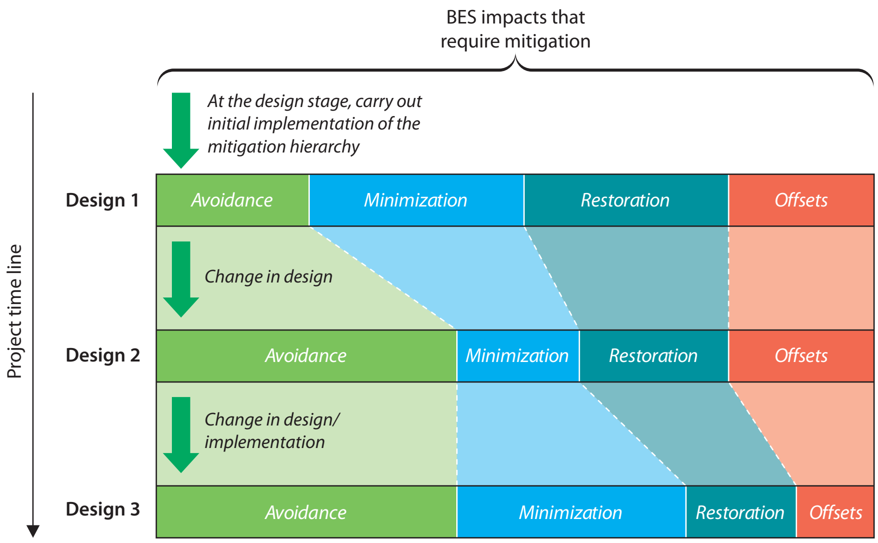
4. If risks and/or costs are too high, return to *avoidance* and *minimization* and repeat the evaluation process
5. Throughout the process, communicate the options with planners, engineers and decision makers.

The outcome

Figure 6 (below) shows an example of how changes in emphasis across the mitigation hierarchy may result during the design phases as new information becomes available and further consultation takes place.

Several rounds of application (iterations) of the mitigation hierarchy are likely through a project's planning and operational phases. When using a no net loss/net gain framework, scenarios need to be informed by quantitative assessment of losses and gains. In the hypothetical example presented in Figure 6, the iterative application of the mitigation hierarchy at the design stage leads to increased use of *avoidance* and *minimization*, ultimately reducing the scale of *restoration* and *offsets* needed for remediation.

Figure 6 *Increasing the use of avoidance and minimization in project design through iterative application of the mitigation hierarchy*



In this hypothetical example, assessment leads to modification of Design 1, which would have left unacceptable potential impacts remaining after ***avoidance*** *and* ***minimization****. In the next iteration, Design 2 achieves further* ***avoidance****, but it would still not be unfeasible to* ***restore*** *or* ***offset*** *the potential impacts. Design 3 further* ***minimizes*** *potential impacts, reducing the scale of* ***restoration*** *and* ***offsets*** *needed for remediation.*

Box 2 Biodiversity and ecosystem services—risks, impacts and dependencies

Risks associated with BES take two forms: the risk that development projects pose to BES, and the risk that impacts on BES (if not adequately addressed through the mitigation hierarchy) can pose to development projects.

Intrinsic risk

This is the risk of significantly damaging important and sensitive biodiversity features or ecosystem services. This may also pose a direct risk to a project that is dependent on specific ecosystem services.

Compliance risk

This is the risk of failure to comply (or being perceived not to comply) with government regulation or finance safeguards. This could result in fines, delays and increased costs, as well as slower and more troublesome approvals for future projects and reduced access to finance, natural capital and land.

Reputational risk

This is the risk that shareholders, stakeholders and wider society may perceive that good practice has not been followed in relation to BES. This could result in weakened relationships with stakeholders, and reduced trust (with an increased chance of protests or political obstacles causing delays and costs), a diminished 'social licence to operate' locally, nationally and/or internationally, diminished investor confidence and loyalty, and lower staff morale. As with compliance risk, it could also result in reduced access to finance, land and natural resources.

Avoidance and *minimization* help to prevent potential impacts, and the intrinsic, compliance or reputational risks that these would pose. *Restoration* and *offsets* help to remediate impacts that have already happened. Failure to remediate adequately may also pose intrinsic, compliance or reputational risk.

For a more detailed discussion of risks and impacts see the IPIECA-IOGP *Ecosystem services guidance*, available at: www.ipieca.org/publication/ecosystem-services-guidance-biodiversity-and-ecosystem-services-guide

Application of the mitigation hierarchy including *offsets* to achieve BES targets

No net loss (NNL) can be defined as the point at which project-related impacts on biodiversity are balanced by measures taken through application of the mitigation hierarchy, so that no loss remains. Where the gains are greater than the losses, net gain results.

NNL and net gain are therefore targets which can be used to drive performance in the application of the mitigation hierarchy. NNL or net gain may be required for specific biodiversity values by some regulatory frameworks or financing conditions. Where feasible, IFC PS6 requires NNL for impacts on Natural Habitat and net gain for impacts on Critical Habitat[17], and this approach is increasingly regarded as best practice. Projects may take many years to achieve NNL, and many milestones will be set along this journey.

However, the mitigation hierarchy may be applied without having NNL or net gain as a goal. Setting clear targets for the biodiversity features of concern and taking a quantitative approach are still desirable to ensure effective delivery.

Currencies and metrics to demonstrate BES losses and gains exist but are still being refined and tested.[18]

BES target feasibility assessments

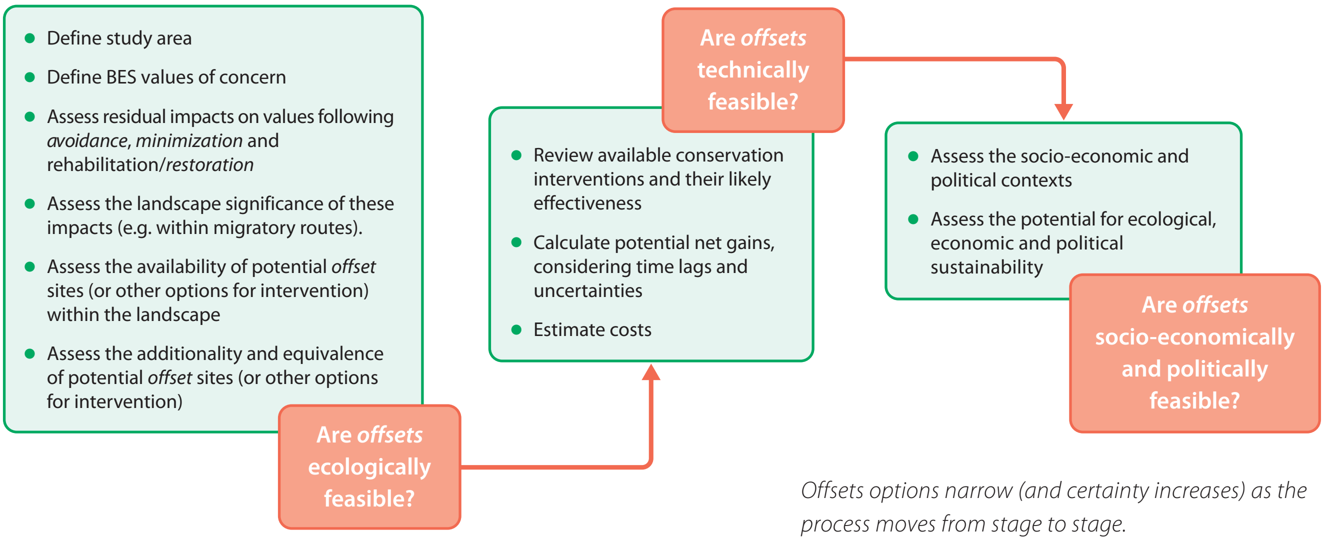
BES target feasibility assessments evaluate the likelihood that a project will achieve specific targets, such as NNL or net gain. Some financial institutions look for such predictions—qualitative feasibility and quantitative forecasts—in loan-supporting documents[19] to provide a greater degree of certainty of BES targets being met.

[17] For projects financed by the IFC or financial institutions adopting PS6. Definitions of Natural Habitat and Critical Habitat can be found in IFC Performance Standard 6 (www.ifc.org/wps/wcm/connect/bff0a28049a790d6b835faa8c6a8312a/PS6_English_2012.pdf?MOD=AJPERES) and the accompanying Guidance Note 6 (www.ifc.org/wps/wcm/connect/a359a380498007e9a1b7f3336b93d75f/Updated_GN6-2012.pdf?MOD=AJPERES).

[18] An example framework for measurement is outlined in ICMM-IUCN (2013) Independent report on biodiversity *offsets*. Available at www.icmm.com/biodiversity-offsets

[19] Project examples include Oyu Tolgoi (Mongolia, http://ot.mn/en) and several others not yet at financial close.

Figure 7 *Steps in assessing the technical and political/business feasibility of a biodiversity conservation target (e.g. no net loss)*



Feasibility assessments consider technical, social, political and economic issues. To answer the question, 'Is it possible to achieve a target?' (such as NNL), the burden of proof goes through the stages of theoretical feasibility, technical feasibility (including cost considerations) and socio-political feasibility (including sustainability considerations) (Figure 7). As greater certainty is achieved, the project mitigation and *offset* options are narrowed down, as in any project design process.

At a coarse scale, such assessments can initially be completed as a desktop exercise, before a field assessment is undertaken. Financial institutions will also be interested in the track record or capacity of clients to undertake such work.

Measuring the contribution of mitigation hierarchy components towards a BES target

A BES target forecast (such as for NNL) can be done by assessing losses versus gains predicted from the application of each step of the mitigation hierarchy through the project life span.[20]

Once appropriate metrics for BES features (or surrogate measures, if appropriate) have been chosen, a precautionary approach, with specialist input, can be used to predict the gains expected from *avoidance*, *minimization*, *restoration* and *offsets*. For averted loss *offsets*, the determination of net gain can be achieved through estimates of change predicted in the absence of the *offset* (the 'counterfactual' scenario).

Applying the mitigation hierarchy retroactively

The mitigation hierarchy is ideally applied from the earliest stages of a new project, or an existing project's expansion. It is more challenging to apply the mitigation hierarchy retrospectively to a project that is already operational. In this case, the potential for *avoidance* and *minimization* is likely to be limited, but opportunities could become apparent when, for example, site layout and timetabling of activities are reviewed. However, an ongoing project may still provide significant opportunities for *restoration* and, especially, *offsetting*. One challenge is that, frequently, baseline (pre-project) data

[20] For examples, see the gains forecast for the QIT Madagascar Minerals project (Temple *et al.*, 2012—www.thebiodiversityconsultancy.com/wp-content/uploads/2013/06/Forecasting-towards-NPI.pdf) and the loss/gain table of habitats and species for Bardon Hill Quarry, UK (Temple *et al.*, 2010—www.thebiodiversityconsultancy.com/wp-content/uploads/2013/06/Biodiversity-Offset-Case-Study-Bardon.pdf)

for priority BES features are limited, making it hard to assess project impacts quantitatively (or even qualitatively). This may require 'back-casting', inferences based on current status in relation to land-use and other changes since the project started.

Communication and documentation

The reputational benefits of, and indeed recognition for, selecting certain design options can be recognized if financiers[21], and internal and external stakeholders, have been consulted and engaged in the process of decision making. Therefore, the communication of the design options, key choices to be made, the technical, economic and political constraints, and the refined business case can be beneficial to a project. Communication materials could include the following:

- maps and available quantitative data on loss, potential gains, costs and social issues, to better demonstrate options on constraints and opportunities;
- an estimate of residual impacts after the mitigation hierarchy has been applied;
- figures in terms of simple metrics, such as 'quality hectares'[22] of habitat, which can help stakeholders to understand and comment on the significance of impacts, predicted gains and the proposed/adopted *avoidance* and/or other mitigation measures (some design options may need to remain confidential for commercial or other sensitive reasons); and
- a Biodiversity Action Plan (BAP) or environmental management plan, which follows the mitigation hierarchy.

[21] Lenders often require a biodiversity management plan, a biodiversity monitoring plan, and in some cases a biodiversity *offset* plan or demonstration of approach to no net loss. All these documents can be effectively based on the application of the mitigation hierarchy.

[22] 'Quality hectares': a biodiversity metric that weights habitat area by its quality (often assessed on a scale of 0–1, or 0–100%) in terms of intactness or suitability for specific biodiversity features of interest. See Temple *et al.* (2012) for an example at www.thebiodiversityconsultancy.com/wp-content/uploads/2013/06/Forecasting-towards-NPI.pdf

For the complete guide visit CSBI's website: www.csbi.org.uk/tools-and-guidance/mitigation-hierarchy

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