Resource Paper :
Limits to What Can Be Offset






BBOP
Business and Biodiversity Offsets Programme

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About this Document

The Standard on Biodiversity Offsets ('the Standard') and accompanying supporting materials[1] such as **this Resource Paper**[2] have been prepared by the Business and Biodiversity Offsets Programme (BBOP) to help auditors, developers, conservation groups, communities, governments and financial institutions that wish to consider and develop best practice related to biodiversity offsets. They were developed by members of the BBOP Secretariat and Advisory Group during the second phase of the programme's work (2009 – 2012) and have benefited from contributions and suggestions provided by interested people during the public consultation process and by others who have joined us for discussions in meetings.

Best practice in biodiversity offsets is evolving, and the Standard and supporting documents such as this Resource Paper will be further refined based on more practical experience, feedback and discussion.

All those involved in BBOP are grateful to the companies who volunteered pilot projects in BBOP's first and second phases of our work and for the support of the donors listed overleaf, who have enabled the Secretariat and Advisory Group to prepare these documents.

BBOP is embarking on the next phase of its work, during which we hope to collaborate with more individuals and organisations around the world continually to refine the Standard based on experience and practice, and to learn from a wide range of experiences with biodiversity offsets in a variety of industry sectors and geographical areas. BBOP has already benefited from drawing on the experience and approaches of a the wide range of organisations, members and non-members alike, who are developing tools and mechanisms to apply the mitigation hierarchy, including delivery of biodiversity offsets. We hope their approaches and experiences will continue to inform and ultimately comply with the Standard as it is revised over time. BBOP is a collaborative programme, and we welcome your involvement. To learn more about the programme and how to get involved please:

See: http://bbop.forest-trends.org

Contact: bbop@forest-trends.org

[1] The BBOP biodiversity offset standard, a set of resource papers, 'how-to' handbooks on biodiversity offset design and implementation, and an updated glossary, can be found at: **http://bbop.forest-trends.org/guidelines**.

[2] This paper was prepared by Amrei von Hase, with contributions from Jo Treweek, Theo Stephens, Kerry ten Kate, and Toby Gardner, and reflecting comments received during the public consultation period. The material here builds on discussion documents produced by the BBOP Guidelines Working Group during Phase 2 of BBOP.

In addition to our fee-paying membership, we thank those organisations that have provided financial support for BBOP's work[3] in its second phase:

[3] Endorsement of some or all of the BBOP documents is not implied by financial support for BBOP's work.

Contents

This document is one of two Resource Papers (the other being on No Net Loss) written to update information published in the Offset Design Handbook (BBOP, 2009a) and to support the interpretation and understanding of the Principles, and of the Criteria and Indicators (PCIs) developed for the BBOP biodiversity offset standard. The document specifically addresses Principle 2: 'There are limits to what can be offset'. The paper outlines a set of ecological and other factors that can help to determine whether impacts are likely to be easy or difficult to offset - broadly arranged according to a green-amber-red system of categories which correspond to the likely level of risk involved with proposing an offset in a particular situation. It then suggests and describes the kind of evidence ('verifiers') that should be produced to demonstrate the offsetability of impacts for each category.

The intended audience for this document is ecological specialists and technical consultants advising companies, governments and/or others wanting to undertake a biodiversity offset.

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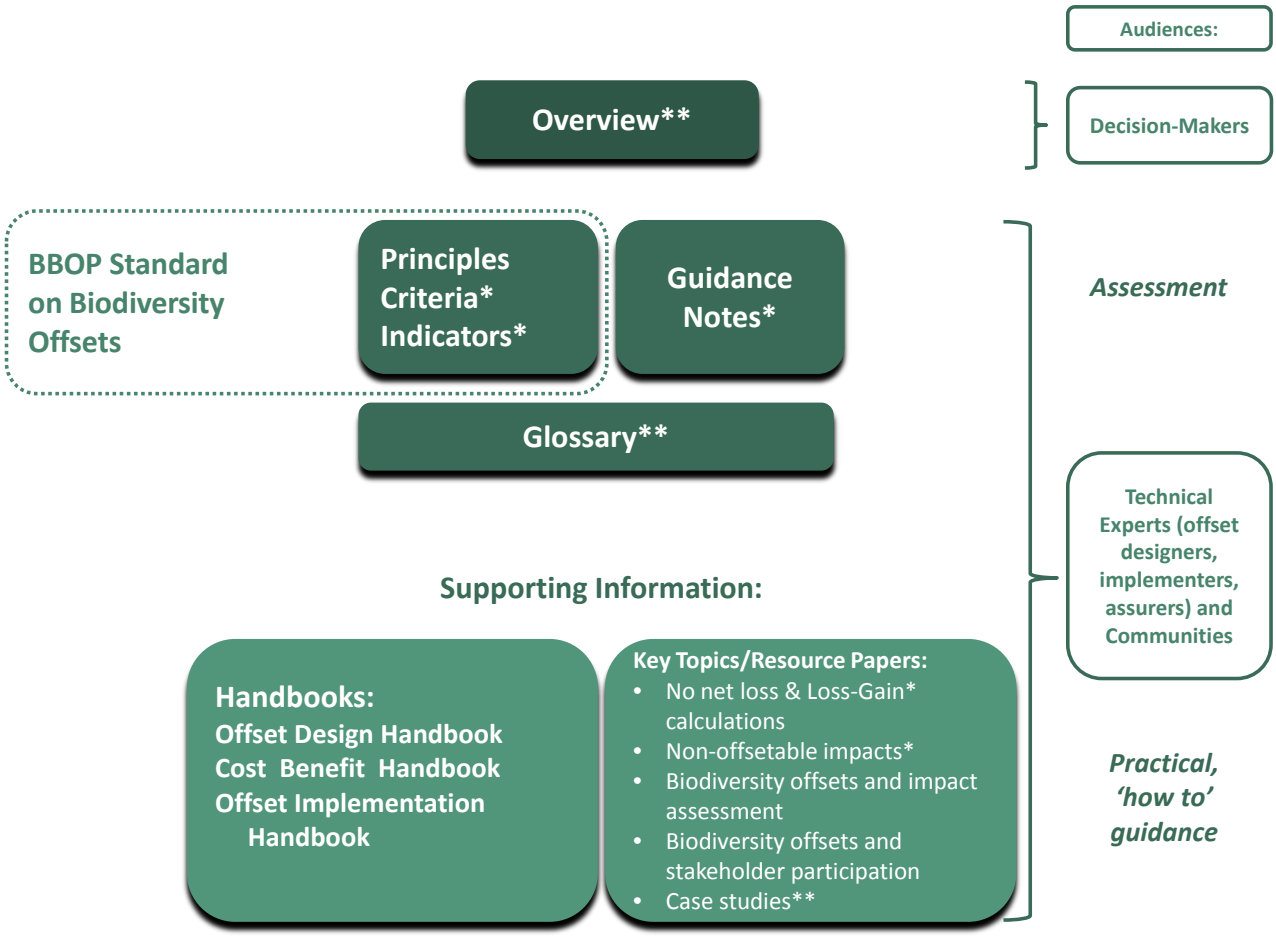
Related Documents Published by BBOP

Related documents published by BBOP include the Biodiversity Offset Standard and Guidance Notes, Resource Papers and the Glossary. The BBOP Principles, and now the Criteria, Indicators and accompanying Guidance Notes, constitute the core of BBOP's work to develop best practice for biodiversity offsets. Since BBOP was established at the end of 2004, it has also produced a number of other tools and products. The relationship between these is illustrated in **Figure 1.**

This document addresses limits to what can be offset (Offsetable/Non-offsetable Impacts) and is one of two resource papers on key topics (the other being on No Net Loss). These papers offer supporting information to accompany the Biodiversity Offset Standard and they complement and update existing guidance in the BBOP Handbooks. They are thus best read in conjunction with the BBOP Offset Design Handbook and Appendices (BBOP, 2009 a, c), the Cost Benefit Handbook (BBOP, 2009b), the Offset Implementation Handbook (BBOP, 2009d), and the BBOP standard (BBOP, 2012a).

Figure 1: BBOP Standard on Biodiversity Offsets and Associated Material

*Note: Documents published in 2009, unless marked as follows: * First prepared in 2012; ** Updated 2012*



All the documents listed in the diagram above (from 2009 and from 2012) will be available at:

http://bbop.forest-trends.org/guidelines/

Purpose of this Paper

This paper builds on existing guidance[4] and sets out BBOP's current position about which impacts on biodiversity are capable of being offset ('offsetable impacts'), and those which are not ('non-offsetable impacts'). It also helps with the further interpretation of Principle 2 and the associated Criteria and Indicators of the Biodiversity Offset Standard (BBOP, 2012a). This paper includes:

1. A brief introduction, including reference to those BBOP principles most relevant to understanding and determining offsetable/non-offsetable impacts;
2. A discussion of the main factors to consider when assessing the likelihood (and risk) that residual impacts on biodiversity will be offsetable/non-offsetable; and
3. An outline of the measures a developer should take to limit the risk of a project leading to non-offsetable impacts.

Introduction

Biodiversity offsets are defined by BBOP as: "Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development[5] after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity."

Biodiversity offsets are not appropriate for all development impacts on biodiversity as some impacts cannot be offset. Where the residual impacts of a proposed development project are so great as to cause irreplaceable biodiversity loss (such as the global extinction of a species), no biodiversity offset would be able to compensate for this loss. In such a case, a 'no net loss' or net gain outcome would be impossible to achieve (BBOP, 2012b).

The Business and Biodiversity Offsets Programme's (BBOP's) Principle 2 explicitly encapsulates this as follows:

> "There are limits to what can be offset: There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected."

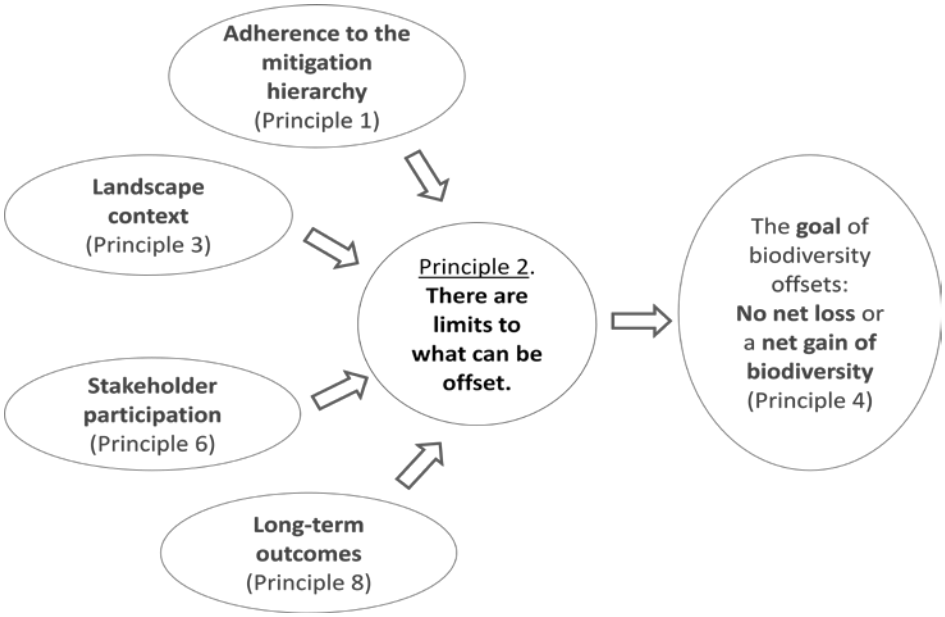
In addition, several of the other principles are important when assessing whether impacts on biodiversity components[6] are likely to be offsetable or not (see Figure 2).

[4] The Offset Design Handbook (ODH) recommends undertaking an analysis of whether residual impacts can and should be offset as part of Step 4 in the offset design process (ODH, P. 25), and suggests important considerations when doing this assessment (ODH, P. 59-66).

[5] While offsets are defined here in terms of specific projects, they could also be used to compensate for the broader effects of programmes and plans.

[6] These components could be species, their habitats, ecosystems, ecological or evolutionary processes, ecosystem services underpinned by this biodiversity.

Figure 2: Principles that Most Influence Considerations as to Whether Residual Project Impacts Are Likely to Be Offsetable to Achieve the Goal of No Net Loss or a Net Gain of Biodiversity



Indicative thresholds for non-offsetable impacts have recently been included in some banks' lending conditions (e.g., IFC, 2012) and in some national or sub-national policies and guidelines (see Treweek et al., 2010; BOP, 2011). These may provide a useful reference point for assessing the risk that a project's impacts may not be possible to offset. Yet, drawing clear-cut lines to determine when development impacts on biodiversity may be expected to be offsetable/non-offsetable is neither scientifically nor politically straightforward, especially when guidance is intended to have global application – as in the case of this paper[7].

In general, whether a specific set of development impacts on biodiversity can and should be offset is context dependent and needs to be established on a case by case basis. This requires consideration of a wide range of ecological, legal, socio-economic and financial factors, and should be guided by the advice of suitably qualified specialists and local expertise. As part of this process, reference to broad ecologically-based thresholds indicating 'risk categories' (that help discriminate offsetable from non-offsetable impacts) can be useful to guide the design and implementation of appropriate development and mitigation measures, including offsets.

A note on "when is a residual impact 'significant'"

In some situations, it is not worth undertaking an offset because project impacts on biodiversity are minimal, and can be regarded as not 'significant' in the first place, or because project impacts can be tackled by avoidance, minimisation and rehabilitation or restoration measures, so that no significant residual impacts remain. There are no definitive rules or thresholds for determining an impact's significance. However, as noted in the Offset Design Handbook and Appendices (BBOP, 2009a, c): 'Offsets tend to be required by a regulator, or considered by a project proponent, when the biodiversity that will be negatively impacted by a project is judged to be 'significant' in terms of its intrinsic or conservation value (e.g., globally threatened or locally ENDEMIC species; significant concentrations or source populations; unique ecological communities), or when its loss is likely to have significant consequences in view of its use value (e.g., high level of dependence on that biodiversity for LIVELIHOODS) or cultural value (e.g., loss of a sacred site). And: 'According to the BBOP PRINCIPLES, an offset should be considered for 'significant' residual adverse impacts on biodiversity, but it is up to developers and their stakeholders to determine what is 'significant' on a case by case basis.'

[7] Guidance offered at a global level has to be interpreted and refined with reference to the relevant regional- and local-scale context.

A useful approach (discussed below) to identifying and addressing the risk of non-offsetable impacts is to:

1. Undertake a risk assessment at the earliest possible stage in the development planning process, to determine whether non-offsetable impacts are likely. If possible, carry this out at the pre-feasibility stage, so that the results can contribute to early decisions concerning the future siting and risk profile of the project. Other opportunities may arise during the environmental and social impact assessment (ESIA) or similar studies carried out to review environmental impacts and risks (see also BBOP, 2009e: Resource paper on Biodiversity offsets and EIA). **Table 1** provides guidance on broad risk categories (red, amber and green, signifying low, moderate and high risk respectively) and associated factors that can be used to ascertain the presumption against offsetting.[8]
2. Consider the options available to limit and manage the risk that impacts may occur which cannot be offset, and implement appropriate and adequate responses to overcome the presumption against offsetting. This might include modifying the design of a project so that areas of highly irreplaceable habitat are avoided, for example, or taking measures to improve the chances of a successful offset being achieved. The associated 'burden of proof' of evidence required to give sufficient assurance that an effective offset can be achieved should rest with the developer (**Table 2).**
3. Where non-offsetable impacts will occur if the project proceeds, the fact that some specific impacts cannot be offset needs to be acknowledged. In these circumstances, for that set of residual impacts, it may be possible to deliver compensation measures that provide specific biodiversity benefits but which will not achieve no net loss.

Note: The context for assessing whether residual biodiversity impacts can be offset is to take the following steps as part of a development project's planning process (e.g., as part of an Environmental and Social Impact Assessment (ESIA)):

a) Assessing alternatives to the proposed project;

b) Applying the mitigation hierarchy to minimise the proposed project's residual impacts; and

c) Preparing a defensible breakdown of the manner in which residual impacts of the project have been determined, giving due attention to uncertainty and risk associated with the likely outcome of restoration and other forms of proposed mitigation measures.

In some cases, however, an iterative mitigation process (reconsidering avoidance and minimisation measures) may need to be followed to ensure that no net loss, as part of a project's mitigation strategy, can feasibly be achieved.

1. Factors that influence the offsetability of impacts

For a biodiversity offset to demonstrate no net loss or a net gain, it must be possible to show that the outcome conserves sufficient biodiversity of the same kind as the biodiversity lost or degraded due to a project's impacts, and that the persistence of the affected biodiversity is not compromised, or is enhanced as a result of the loss/gain exchange (see BBOP, 2011b: No net loss resource paper). The irreplaceability and vulnerability of biodiversity (explained further below) are key concepts in understanding and determining the ecological constraints on the feasibility of an offset (see also BBOP 2009a: ODH).

[8] Suggestion by Jim Salzman, 2010, personal communication.

Box 1: Irreplaceability and Vulnerability

Irreplaceability is defined in the context of a conservation target set for biodiversity with the aim of ensuring the persistence of a full range of biodiversity, to maintain biodiversity or to halt its further decline. Appropriate targets vary with the type and status of the biodiversity concerned and its context (e.g., see Noss and Cooperrider, 1994; Desmet and Cowling, 2004; Langhammer et al., 2007). The irreplaceability of a site or an area is defined by Pressey et al. (1994) as: 1) the likelihood that the site will be needed as part of a conservation system that achieves the set of targets and the biodiversity conservation goals; and 2) the extent to which the options for achieving the set of targets are reduced if the area is not available for conservation (e.g., if the site is lost due to development impacts). Irreplaceability is therefore a contextual measure, i.e., it is understood at a specific scale (e.g., at the regional or national scale). It is usually presented on a numerical scale of 0 to 1 (100%): an area with low irreplaceability means that there are numerous options for conserving representative samples of its biodiversity in the landscape, while an area identified as 100% irreplaceable should be retained in the landscape to ensure the continued representation and persistence of its biodiversity. The most rigorous statistical approach to predicting irreplaceability to-date is described by Ferrier et al. (2000) but there are various other measures or indicators that can provide some estimate of the irreplaceability of an area or of a particular biodiversity feature (e.g., a specific vegetation type, or wetland, or species and its habitat). High irreplaceability means high risk for offsetting (see below, and Figure 3).

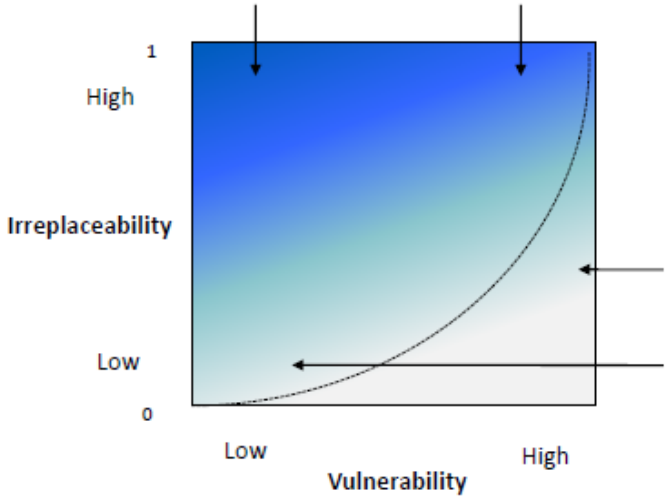
Vulnerability is defined by Pressey et al. (1996) as 'the likelihood or imminence of biodiversity loss (e.g., of a particular species) due to current or impending threatening processes'. These threats may be habitat loss, degradation, or fragmentation, over-harvesting or hunting, and other factors that compromise the amount, condition and functionality of this type of biodiversity and therefore its continued representation and persistence in the landscape. Vulnerability can be specified at the level of a particular site and its biodiversity (e.g., an industrial complex is proposed to be built on the site) or for biodiversity components (e.g., a species is globally or regionally threatened due to the fragmentation of its habitat). The IUCN Red List ( ) is a globally accepted system for listing vulnerable species (i.e., those that are threatened or endangered) according to agreed criteria. While the Red List is designed to detect the risk of species extinction, the concept of vulnerability can also be extended to ecosystems (see Rodriguez et al., 2007, 2011, also IFC, 2012). Note that in practice precise definitions of vulnerability may vary, as do the criteria for determining the vulnerability of particular biodiversity components or sites (e.g., see Wilson et al., 2005; Nicholson et al., 2009).

Vulnerability indicates both risk and opportunity - by adding conservation value - for offsetting (see below, Figure 3).

Figure 3. Relationship between Irreplaceability and Vulnerability and the Feasibility of Offsets.

Biodiversity offsets are more difficult to achieve and there is a higher risk that offset not feasible where (above curve; darker blue area):

- High irreplaceability: There is a scarcity of sites/opportunities presenting offset options for affected biodiversity components; and/or
- Low vulnerability: There may be little conservation value to add through an offset; OR
- High vulnerability, yet insufficient knowledge or no tractable means to counter decline.



Biodiversity offsets generally most feasible, lower risk where (below curve; greyish, greenish areas):

- Low to moderate irreplaceability: Multiple site/opportunities present offset options; and
- Vulnerability moderate to high: There is opportunity to add conservation value through an offset, provided there are appropriate and tractable conservation measures (averted risk and/or restoration); OR
- Vulnerability low but biodiversity in question is restorable and this adds value to conservation.

Offsetting is likely to be straightforward where much remains (e.g., regionally or globally) of the biodiversity type affected (so that any particular site characterised by this biodiversity will have low or moderate levels of irreplaceability), and where some of what remains is vulnerable or degraded (so there is opportunity to enhance or restore it, provided that effective and tested methods are available) and/or where some of the remaining biodiversity is not well protected and still declining (plenty of opportunity for averting future loss and degradation).The risk that impacts may be non-offsetable is high where affected biodiversity features/sites are of high irreplaceability. These impacts should be, in the first instance, avoided. Similarly, impacts on biodiversity components that are highly vulnerable should be in the first instance avoided (see Guidance Notes for Principle 1 and Principle 2, BBOP, 2012a).

While the emphasis in Principle 2 is on ecological 'limits to what can be offset', several other factors (scientific, technical, socio-cultural, financial and legal) influence the practical feasibility of achieving no net biodiversity loss. Collectively, these factors (set out below in Table 1) need to be considered and evaluated to determine the risk of non-offsetable impacts. A case then needs to be made (see Table 2) by the developer for how these factors will be addressed to minimise risk and ensure a no net loss (or net gain) outcome for biodiversity.

Ecological factors (see Table 1): These factors need to be assessed to determine the likelihood that a project's residual impacts can be offset (and the level of risk that some impacts may be non-offsetable):

a. *The (estimated) proportion and condition of biodiversity predicted to be affected by a project (residual impacts),* measured at an ecologically meaningful scale that reflects representation and persistence requirements;

b. *The irreplaceability of the biodiversity (see Box 1, Figure 3)*: High irreplaceability indicates high risk for offsetting due to a scarcity of options - the likelihood of finding suitable offset sites is restricted. If it were possible *effectively to re-create* the impacted biodiversity elsewhere, the likelihood of designing and implementing an offset would be higher. However, most biodiversity characterising areas of high levels of irreplaceability will have extremely low potential for being re-created from scratch. So it is important to assess whether the affected

biodiversity is in a unique ecological (and/or spatial) context that cannot be replicated and/or which is critical to the persistence of that biodiversity, or whether there are many options in the landscape for conserving this type of biodiversity (low irreplaceability) and for achieving gains. Impacts on biodiversity features and sites that are of high irreplaceability should be, in the first instance, avoided as part of applying the mitigation hierarchy (Principle 1, BBOP 2012a).

c. *The vulnerability of affected biodiversity* and the nature of the threats causing this vulnerability *(see Box 1, Figure 3):* A satisfactory offset for *highly vulnerable* biodiversity features (e.g., regionally or globally highly threatened species or ecosystems) will generally be difficult and involve high risk for biodiversity, especially where the cause of decline is unknown, or not tractable with current knowledge. Therefore, impacts on highly vulnerable biodiversity features should be, in the first instance, avoided as part of applying the mitigation hierarchy (see Principle 1, BBOP 2011a). However, higher levels of vulnerability also indicate the opportunity to add significant value (i.e., biodiversity gains) through an offset, provided that there are known ways of successfully improving its condition and conserving it. In this case, it is important to establish whether the affected biodiversity is sufficiently resilient to tolerate any level of impact and associated reduction, including what the effects of any time lags may be between the impact occurring and the offset becoming functional (see Bekessy et al., 2010; Maron et al., 2010).

d. *Opportunity for* adding conservation value by improving the condition and/or protection status of the biodiversity in question in order to deliver adequate biodiversity gains to balance the predicted losses.

Other non-ecological factors determining the practical feasibility of successful offsetting may be grouped under social, cultural, technical, legal and financial headings. They play a significant role, not only in deciding which offset approach would be most appropriate in a given situation, but also in assessing the level of risk associated with a set of predicted impacts and the feasibility of achieving a successful offset (see Table 1).

Box 2: Actions to deliver no net loss/net gain conservation outcomes for a specific development project

Actions to deliver no net loss/net gain conservation outcomes for a specific development project will include one or several of the following interventions:

- *Improving the condition of affected biodiversity* through conservation management actions, such as restoration, enhancement, threat reduction, breeding enhancement, or arrested degradation at suitable offset sites to produce measurable biodiversity gains. As for all offsets, the long-term conservation status of the offset area needs to be secured. This option presents itself when opportunities to improve the condition of degraded biodiversity of like type exist in the landscape, and where restoration is known or likely to produce effective outcomes for biodiversity.

- *Improving the protection status of* an area demonstrated to be under threat of imminent or projected loss to avert the loss and/or degradation of its biodiversity. Actions may include giving statutory protection status to unprotected land, arranging for private land on-title agreements, etc. The biodiversity gains are predominantly derived from raising the conservation status of the land (a 'security gain'). This option presents itself when biodiversity is threatened and declining (i.e., vulnerable, as indicated by high background rates of loss).

- Since 'no net loss' includes socioeconomic and cultural uses of biodiversity, many biodiversity offsets also include *the provision of compensation packages to stakeholders* affected by the development project and offset.

2. Assessing the offsetability of impacts, risk of non-offsetable impacts

There are certain factors (Table 1) to estimate risk and measures to limit the risk and demonstrate that impacts are capable of being offset (Table 2):

The key factors that should be assessed to estimate the risk that project impacts will be non-offsetable are summarised in Table 1 (below). The most demanding of these factors determines the indicated level of risk (low-moderate-high) associated with a particular set of project impacts and the strength of the presumption against offsetting these impacts. The presumption places the evidentiary burden (stricter as risk increases, see Table 2) on the developer to show that full delivery of the offset can be achieved.

- The 'green category' (Table 1) is for situations where there is a comparatively low risk associated with achieving no net loss, i.e., a project's residual impacts are likely to be straightforward to offset.
- The 'amber category' is for situations with a moderate level of risk that offsets may not succeed. There are some real challenges that will require focus and a coordinated effort to overcome. Here, a precautionary approach would be a presumption against anticipating success with an offset. Nevertheless, impacts in this category can generally be expected to be offsetable given proper commitment, good planning and adequate resources.
- The 'red category' is for circumstances that merit a strong presumption against offsetting. It is appropriate for cases where there is a high risk that some impacts will be non-offsetable. In these cases it is the developer's responsibility to prove that an offset has already been provided in advance of any impacts or to show detailed and strong evidence that an offset can be fully delivered.

We emphasise that Table 1 is indicative, not definitive, and that the categories are broadly defined rather than on the basis of any clear-cut thresholds.[9] Note that there may be 'red category' situations where impacts are fully offsetable and there may be 'green category' situations where impacts are not capable of being offset. However, the presumption against offsetability is always stronger for red than for green category situations. Any given project may be associated with a range of predicted impacts on biodiversity and will be subject to specific legal, financial and social circumstances, so that it may comprise factors or particular impacts in all three categories of risk - red, amber and green (e.g., green and amber for ecological factors, but red for financial resources, or green and amber for impacts on almost all biodiversity components, but red for impacts on a particular endangered species).In this case, the expectation would be that specific measures are defined (specific to the level of risk and to the factor or biodiversity component triggering this designation– ecological, financial, social) to ensure that all impacts are capable of being offset so that the project as a whole will achieve no net loss.

To overcome the presumption and to minimise the risk of non-offsetable impacts, regionally specific standards, actions and commitments along with anticipated consequences for affected biodiversity need to be fully documented. These actions and commitments should be targeted to the specific factor in question and to the level of risk (i.e., where an ecological factor such as irreplaceability triggers 'high risk' designation for a set of impacts, the actions and evidence provided need to relate directly to this ecological factor and the risk rating). The term we use for the evidence to justify the feasibility of these commitments is 'verifiers'. Table 2 summarises the kinds of 'verifiers' that would be needed to demonstrate that a proposed offset is feasible, i.e., that the specific set of impacts can be offset; that the proposed offset is achievable from an ecological, socioeconomic, cultural and practical perspective, and that sufficient arrangements are in place to ensure sound design and successful

[9] Thresholds will differ from place to place, and according to the specific context. The aim here is to give generally applicable guidance on determining the risk/likelihood of non-offsetable impacts. **Information on context- or policy-specific thresholds that may help with the interpretation of the red/amber/green categories is given in Section 3 and Appendix A.**

implementation. The burden of proof to demonstrate that the proposed offset can deliver the required NNL outcome lies with the developer.

In general, the risk is high that impacts will not be successfully offset where:

- Affected biodiversity is specialised and restricted in its distribution; uniquely adapted to one or a few locations; slow to regenerate and relatively immobile; or already highly vulnerable; and/or where
- No tried-and-tested conservation techniques are available to achieve the offset outcomes required; or no sites or legal mechanisms are available to secure the use of land for the offset.

These factors indicate that on-site conservation through avoidance[10], rather than an offset elsewhere, may be necessary to enable the persistence of affected biodiversity (see Principle 1, BBOP, 2011a). Where an offset is nevertheless proposed to address predicted residual impacts, there is a need to demonstrate, with high levels of certainty justified by evidence, the feasibility of offsetting these impacts. One way to do this is to deliver an appropriate offset in advance of any impacts. Alternatively, as mentioned above, strong evidence will need to be provided to show that a no net loss or a net gain outcome for biodiversity is assured within specified timeframes (Table 2).

3. Considering thresholds

While there are currently no globally accepted numerical thresholds that explicitly define when impacts are to be regarded as non-offsetable, some indicative thresholds have recently been suggested and published in guidance linked with specific policies (see also Treweek et al., 2010, Pilgrim, 2011, Appendix A for more detail). Examples include:

- International: The International Finance Corporation (IFC) in its revised Performance Standard 6 (PS6; IFC, 2012) includes biodiversity offsets with a no net loss goal for impacts on 'Natural Habitat' and with a net gain for impacts on 'Critical Habitat'. In the Guidance Note (GN6; IFC, 2012) associated with PS6, 'Critical Habitat' that is identified on the basis of Criteria 1-3 (species level criteria) is divided into a 'Tier 1' and a 'Tier 2' category according to numerical thresholds for species populations. Impacts on Tier 1 Critical Habitat are indicated as likely to be non-offsetable[11].
- Regional (province/state-level): The Western Cape and KZN's (South Africa) draft guidelines for biodiversity offsets identify impacts on Critically Endangered (CR) ecosystems as generally non-offsetable (DEADP, 2007 EKZN, 2010). These ecosystems are nationally defined as having 'undergone severe degradation of ecological structure, function or composition as a result of human intervention and subject to an extremely high risk of irreversible transformation'. They have been mapped across South Africa on the basis of quantitative criteria linked with irreplaceability and vulnerability measures (i.e., in CR ecosystems the remaining extent of natural area is less than the biodiversity target set to maintain its persistence and

[10] This need not equate to a 'no go' decision for a whole project proposal - the aim is to relocate elements of infrastructure or to modify the location of the project to avoid such areas.

[11] GN108 (IFC, 2012) states: '*In general, projects with large, expansive footprints in either Tier 1 or Tier 2 habitats will find it difficult (or impossible) to comply with paragraph 17 of Performance Standard 6. With respect to project-related impacts in Tier 1 habitats for Criteria 1 through 3, most impacts are not considered to be offsetable. Impacts on critical habitat per Criteria 4 and 5 might also be very difficult (or impossible) to offset. In either case, this would be determined on a case-by-case basis.*' And GN61: '*Both a Tier 1 and a Tier 2 habitat would qualify as critical but the likelihood of project investment in a Tier 1 habitat is generally considered to be substantially lower than in a Tier 2 habitat. Given the sensitivity of Tier 1 habitats, however, if a development is located in such a habitat, or a habitat of comparative importance for Criteria 4 and 5, it is considered unlikely that the client will be able to comply with paragraphs 17–19 of Performance Standard 6*'.

representation, and threatened species associations are high, as more than 80 threatened Red Data List plant species are present, DEAT, 2009).

- Regional (province/state-level): New South Wales (Australia), in its Native Vegetation Act (2003) states that any broad scale clearing of indigenous vegetation, if approved, needs to 'improve or maintain environmental outcomes', including for example through biodiversity offsets (see Gibbons *et al*., 2009). Thresholds pertain to 'red flag areas' where clearing of native vegetation is not permitted (and impacts are essentially considered as not capable of being offset) unless their condition is low or they are not viable. These areas include:
    - Ecological communities listed as threatened under federal legislation (listed if highly cleared, of limited extent and or vulnerable to threatening processes at the national scale);
    - Ecological communities listed under the State's threatened species legislation; and
    - Vegetation communities and ecosystems at the catchment/landscape scale, which are >70% transformed.

Other thresholds are available, for example, those that indicate conservation priorities. While they have not been set with the explicit intention of identifying a 'boundary' between offsetable and non-offsetable impacts, these thresholds can help with identifying situations where there is a high risk that impacts may be non-offsetable for ecological reasons. Examples include (see Appendix A for more detail on some of these systems):

- IUCN Red List criteria used to track the extinction risk of species (IUCN, 2001, 2010). The IFC's Guidance note for Performance Standard 6 draws on these thresholds to indicate likely offsetable/non-offsetable thresholds.
- A system proposed to be valid at the international level for the identification of ecosystems at risk of irreversible loss, using IUCN-type categories (i.e., Least Concern, Vulnerable, Endangered and Critically Endangered) and a set of explicit criteria and thresholds (Rodriguez et al., 2007, 2011; DEAT, 2009).
- The EU Habitats and Birds Directives (EC, 1992; 2009), which set out guidelines with indicators and thresholds for determining the conservation status of listed habitats and species (according to red, amber, green categories) and the EU Water Framework Directive, with guidelines on indicators and thresholds for the ecological condition of wetlands and other aquatic habitats (EC, 2000).
- Various methods and systems to identify conservation priorities and schedule actions according to vulnerability and irreplaceability-based criteria (e.g., using systematic conservation planning approaches, Margules and Pressey, 2000; see also Wilson et al., 2005 for a review of methods to assess vulnerability; and Pressey and Bottrill, 2009).
- Some national interpretations of the concept of 'High Conservation Value' HCV Areas have set indicative thresholds for irreplaceable resources in areas designated as fundamental to meeting the basic needs of local communities (HCV5) and/or areas critical to local communities' traditional cultural identity (HCV6) (Jennings et al., 2003, Proforest, 2008).

Many of these systems and their indicative thresholds are intended to be widely applicable and focus predominantly on features associated with biodiversity patterns (e.g., species and their habitats or ecosystems) rather than on ecological processes or functions (e.g., nutrient cycling, regulation of water quality, etc.). This may be partly because quantitative thresholds relating to the many different facets and levels of ecological functioning are especially difficult to develop so as to have broad applicability (e.g., at the international level, see note on thresholds for key evolutionary processes in IFC, 2012). In addition, scientific understanding of ecosystem functioning, critical thresholds and feedback loops is far from fully developed. Note, however, that much work has been done on quantitative measures relating to ecological functions for aquatic systems (streams, wetlands, etc.,

e.g., see EC, 2000; Rowe et al., 2009 and references therein). These developments will be relevant for determining critical levels of ecological processes and functioning in these systems, and for assessing limits for likely offsetable/non-offsetable impacts in specific settings.

Note: In general, however, even where quantitative thresholds are available to guide the risk assessment of likely non-offstable impacts, it is important to apply the precautionary principle when evaluating likely impacts on biodiversity. This is to cater for uncertainties in biotic responses to impacts, given our limited knowledge of ecological functioning and the non-linear nature of biodiversity (see e.g., Suding et al., 2004 on alternative states in restoration ecology).

Using Tables 1 and 2:

Working through Table 1 helps establish:

- Whether offsets are likely to be possible and either straightforward or comparatively straightforward to achieve (i.e., whether project impacts and other project aspects, such as financial provisions for the offset, fall into the Green or Amber categories, respectively); or
- Whether offsets are likely to particularly difficult or impossible to achieve (i.e., where some or all of the project impacts and/or other aspects such as financial provisions trigger the Red category, because there is a relatively high risk that some impacts may be non-offsetable).

Working through Table 2 helps:

- Match the individual factors identified and assessed (ecological, social, financial etc., as in Table 1) with the relevant verifier in each case; and
- Establish the kind of evidence that will be needed to show that a biodiversity offset could be achieved for project with impacts and characteristics that trigger the Green, Amber and Red categories above.

Table 1. Factors for assessing the level of risk relating to the offsetability / non-offsetability of project impacts

These factors are used for assessing the level of risk relating to the offsetability/non-offsetability of project impacts on biodiversity components (e.g., species, habitats, plant/animal communities, ecosystems, and/or ecological and evolutionary processes, and associated ecosystem services).
The level of presumption should be determined by the most demanding of the factors. Note: Where figures are given, these are illustrative not definitive.

Risk that residual impacts may be non-offsetable	**Offset likely to be achievable** provided that conditions (set out in the Table 2) can be met.		**Offset likely to be difficult, and in some cases impossible,** to achieve. There is a relatively high risk that some impacts may be non-offsetable. To limit that risk, a proposed offset would need to meet conditions in Table 2.
	Low risk ----------→	**Moderate ----------→ High risk**	**High ----------→ Very high risk**
Presumption against offsetting	**Weak**	**Moderate**	**Strong----------→ Extreme**
ECOLOGICAL FACTORS			
Proportion of biodiversity component affected by project impacts[12]	**Very low** (e.g., <0.1 %) - **low** (e.g., < 1%), measured at an appropriate scale	**Moderate to high** (e.g., 1-10%), measured at an appropriate scale	**High – very high** (e.g., >10%), measured at an appropriate scale

[12] The proportion of affected biodiversity could be measured at the local, regional, national and/or global scale (extent). Specialist advice is generally needed to guide this process, including the selection of the right scale/s. It is critical that the scale is ecologically meaningful and appropriate for the type of biodiversity affected – i.e., relates to its representation and persistence requirements. This is important, as a project's impacts may be predicted to affect a 'low' proportion of the 'global population' of a particular species, but when measured at a regional or national level, this proportion may be 'high' or 'very high' so that the likelihood of that species' regional or national persistence may be compromised.

Irreplaceability of affected biodiversity components (at the project site and beyond)	**Low to moderate:** Affected biodiversity is regionally ubiquitous, well-represented on many sites. There are plenty of viable options for conserving this biodiversity elsewhere. <u>Examples could include:</u> • Areas of a regionally common vegetation type or ecosystem, where parts of this are degraded and effective restoration techniques are available.	**Moderate to high:** Affected biodiversity is not commonplace but there are still several (e.g., > 5) viable options for conserving this type of biodiversity elsewhere. <u>Examples could include:</u> • Areas functioning as broad ecological process corridor (spatially flexible) where conservation goals can be met in various places; • Areas that provide ecosystem services for which adequate substitutes can be identified.	**High:** Affected biodiversity is restricted to few sites or populations, and/or is limited in extent so that there are few or no viable offset site locations outside the area affected by the development impacts. <u>Examples could include:</u> • Endemic/ range-restricted species and/or their habitats, rare/regionally unique ecosystems; • Areas providing ecosystem services that are critical for the survival or resilience of local communities or cultures.
Vulnerability of affected biodiversity components at the project site and beyond[13]	**Low to moderate:** • Few sites, populations, or processes are listed as, or known to be threatened and declining, or at risk of further degradation or loss. • Species, communities, ecosystems are widespread, and/or they are well-conserved in statutory protected areas, so that their continued persistence in the landscape is highly likely. • There is at least some opportunity to add conservation value elsewhere through a proposed offset.	**Moderate to high:** • Negative trends (regional, global) are affecting impacted biodiversity, so that a significant proportion of sites, populations, or processes, is under threat of further loss or degradation.	**High:**[14] • Little remains of the affected biodiversity (e.g., less than 10-30% remains[15]), and/or a high proportion of what remains is threatened with further loss and/or additional degradation. In extreme cases (highly vulnerable biodiversity) there is a high risk of extinction within the next 50-100 years. Examples: • Endangered (EN) or Critically Endangered (CR) species and/or their habitats; • A heavily transformed ecosystem reduced to a fraction (e.g., <10% to 30%) of its original extent (thus Endangered/ Critically Endangered).
Condition of affected biodiversity at the project site	• Biodiversity at the project site is reduced or degraded (**low – moderate** condition). • There are many viable opportunities to add value through an offset.	• Biodiversity at the project site is in **moderate** condition. • There are several viable opportunities to add value through an offset.	• Biodiversity is **in good to very good** condition (e.g., in a near pristine state). • There are few or no opportunities to add value through an offset elsewhere.

[13] Vulnerability here refers to specific biodiversity components in their broader context, rather than just at the project site, as this -by definition – is highly vulnerable.

[14] Moderate to high vulnerability does not only indicate moderate or high risk for offsetting, but it can also indicate opportunities for offsetting, provided there are known means to halt or reverse the decline (see Figure 3 and accompanying text, Box 1).

[15] See for example, Gibbons et al., 2009; Norton, 2010; Brownlie et al., 2007, Rodriguez et al., 2011 - Appendix A.

Examples of commonly used and quite broad 'classifications' of biodiversity to illustrate how these could fit into the risk categories (see **Appendix A** for more detail.)	1. IFC categories[16]: Some 'Modified' and some 'Natural habitat' associated with low risk for offsetting. 2. IUCN Red List-type categories[17] Species or ecosystems in 'Least concern' or 'Least threatened' categories Some 'near threatened' species N.B.: For impacts on biodiversity at the very lowest end of this category, an offset may not be justified or necessary, esp. if impacts are very limited.	1. IFC categories: Some 'Natural habitat'. 2. IUCN Red List-type categories Species or ecosystems in 'Vulnerable' category, some species in the 'Near threatened' category	1. IFC categories: Most 'Critical habitat', some 'Natural habitat' 2. IUCN Red List-type categories Species or ecosystems in 'Endangered' or 'Critically endangered' categories.
Ref. to quantitative thresholds	There are indicative numerical thresholds (for example to identify whether an ecosystem is Critically Endangered or Endangered) that can be useful to help differentiate between these categories (see Section 3 above, and **Appendix A**).		
Opportunity for adding sufficient and additional conservation **value through an offset** (either through positive management or averted loss mechanisms)	• There is abundant opportunity to add value through a proposed offset involving restoration (shown to be feasible and successful), or averted risk interventions: • Predicted residual impact is negligible in relation to the range of normal inter-annual variability; and/or • Biodiversity is easy to restore, and/or the same biodiversity regenerates spontaneously; • Abundant source populations of species are available; • Temporal delays between impacts on biodiversity and offset delivery can be accommodated; • There is plenty of opportunity for protecting biodiversity of like or higher[18] conservation value through averted loss offsets; • Additionality of outcomes is assured.	• There is a range of opportunities to add conservation value through a proposed offset involving restoration or enhancement methods known to be feasible /successful, and/or through averted risk interventions: • Biodiversity can be restored, but the cost may be very high, or techniques have had very mixed success; and/or • Residual impact will not affect population sizes or ecosystem extent or condition beyond the range of inter-annual variability; • Some source populations of species are available; and/or • Temporal delays between impacts on biodiversity and offset delivery may be possible to accommodate; and/or • There are few opportunities for securing biodiversity through averted loss offset mechanisms; and/or • Additionality uncertain/needs to be proven.	• Little or no demonstrable opportunity to add conservation value through a proposed offset: • Predicted residual impact is such that the proportion of affected biodiversity remaining post-impact may be non-viable or at high risk of irreversible loss; and/or • Predicted residual impact exceeds normal inter-annual variation in population size or ecosystem extent &/or condition; and/or • No known restoration or enhancement techniques exist or have been effective; and/or • No source populations are available; and/or • Temporal delays between impacts and offset delivery may result in the extinction of biodiversity components; and/or • Background rates of loss for affected biodiversity are low, and there is no or little opportunity for protecting biodiversity through an averted loss offset. • Additionality cannot be achieved, or assured.

[16] The IFC (2010, 2011) notes that there is no 'prescriptive set of metrics' for determining whether an area would be classified as modified habitat, or natural habitat, but that this will vary from place to place, and needs to be based on credible scientific analysis, and best available information, as assessed by competent specialists (see e.g., G37, G 43).

[17] This depends on the scale of assessment, as some species / ecosystems that are near-threatened or vulnerable at the global level may be endangered or critically endangered at the national or regional level (which is the appropriate scale in this case). See **http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria**. See also Rodriguez et al., 2011 (for preliminary classification of ecosystems according to criteria that indicate levels of extinction risk).

[18] Provided a defensible method for 'trading up' is available/given (see also technical factors)

OTHER FACTORS			
Socio-cultural considerations			
Dependence on those ecosystem services underpinned by the biodiversity in question	• Affected people have low levels of dependence on the ecosystem goods and services underpinned by biodiversity in question; and/or many alternatives are available to them and this has been demonstrated through a transparent and participatory process of stakeholder engagement. • Access to these ecosystem services is not a critical factor determining livelihoods of affected communities. • There is plenty of opportunity to compensate for the losses.	• The level of affected people's dependence on the ecosystem goods and services varies. • There is some (but possibly uncertain) opportunity for adequately compensating people for the losses in ecosystem goods and services	• The level of affected people's dependence on ecosystem goods and services underpinned by the biodiversity in question is very high – e.g., a local community relies on these services to meet their basic and fundamental needs. • The biodiversity in question is of very high social or cultural significance to local communities. • There is no or very little opportunity for adequately compensating losses: The ecosystem services which would be lost or degraded cannot (easily) be substituted and/ or alternatives are inaccessible, unaffordable or unacceptable to affected communities.
Level of stakeholder support	• Affected stakeholders support the project and the proposed offset.	• Affected stakeholders are indifferent or divided in their support for the project and offset, but their support can be gained through demonstrating meaningful benefits.	• Affected stakeholders are opposed to the proposed offset.
Legal, financial, institutional considerations			
Availability of offset sites to achieve additional conservation outcomes	• Sites for delivering the offset are readily identifiable and available (i.e., willing landowner/resource owners)	• Offset sites where the persistence of affected biodiversity can be readily identified, but their availability is uncertain or doubtful.	• No or very few feasible offset sites can be identified (beyond the area potentially impacted) or secured for a NNL outcome.
Legal mechanisms and land tenure for securing offsets	• Legal mechanisms for securing conservation land (and in this case biodiversity offsets) in the long term are available, and they are tried and tested and straightforward. • A variety of effective conservation and management mechanisms is in use to protect priority biodiversity areas on land under different types of ownership.	• Legal mechanisms for securing conservation land in the long term are available, but they require testing and/or adaptation to be effective for biodiversity offsets. • Legal mechanisms allow the right to some types of development (e.g., mining) to take precedence over any other land use/ rights, and the land to be protected may be at some risk of being developed in future.	• The legal mechanisms (e.g., the property rights regime) do not provide suitable options for maintaining the long term security of offsets. • Alternative means for protecting land lack stakeholder support. • Legal mechanisms allow the right to some types of development to take precedence over any other land use/rights, and the land to be protected is in an area with development potential (e.g., mining, within urban edge, etc.)

Financial arrangements	• The funds required to design and implement a biodiversity offset using best practice have been verifiably committed and secured, and • Financial mechanism to support the process for the duration of the offset (e.g., as long as impacts last and preferably in perpetuity) is established, and is appropriate and adequate.	• The funds required to design and implement the offset have been ascertained and partially secured, but full resources depend on additional future commitments, and/or • The financial mechanism to be used to support the process is not entirely clear, or it has not been established.	• The financial resources required to design a biodiversity offset using best practice cannot be assured, or the resources needed to implement the biodiversity offset cannot be secured or assured. • Doubts exist as to whether appropriate financial mechanisms have been or can be established, and secure.
Technical factors	• A defensible method for trading up to biodiversity of higher conservation value (out of kind exchange) can be devised. • High quality data and contextual information are available at the appropriate scales to design and implement the offset.	• Some information is available but this needs to be complemented with data collected at local/regional scales to enable offset design and implementation.	• The information required to specify a defensible offset is not obtainable. This may be the case where an out-of-kind (trading up) offset is proposed, but where contextual biodiversity data are inadequate or unavailable in the necessary timeframes.
Governance and capacity of regulators	• Governance at local, regional and national levels is strong and transparent. • Adequate capacity and resources to support biodiversity offset initiatives is available and forthcoming.	• There are formal governance structures at local to national levels but support for biodiversity offsetting is limited. • Confused agency accountabilities or multiple roles in one agency complicate smooth offset planning, design, and implementation.	• Governance is limited, as are capacity and resources of regulators, and there is corruption, and/or limited support for biodiversity initiatives.

Table 2. Some suggested 'verifiers' and evidence required to demonstrate the feasibility of achieving a satisfactory biodiversity offset

The' burden of proof' should rest with the developer to demonstrate that no-net-loss (NNL) or a net gain in biodiversity can be achieved through a proposed offset. The appropriate responses or measures are linked with the relevant factor in Table 1, e.g., where the irreplaceability of biodiversity affected by a set of project impacts results in a high risk situation (Table 1), the corresponding verifiers relating specifically to irreplaceability in the 'red column' in Table 2 need to be met.

Note that there may well be some overlap of verifiers relating t the ecological factors (e.g., irreplaceability andvulnerability).

Risk that residual impacts may be non-offsetable	**Low risk ----------→**	**Moderate ----------→ High risk**	**High----------→Very high risk**
Overall response indicated	Assurance rests on verifying that the condition of equivalent or more threatened biodiversity can be enhanced or that a sufficient amount of like vulnerable biodiversity can be secured to avert loss of an amount equivalent to the impact over a defined, acceptable timeframe.	Assurance rests demonstrating that stringent conditions have been met relating to achievement of a no-net-loss/net gain in the biodiversity outcome.	**'No loss' rather than 'no net loss' of biodiversity is favoured** in the first instance, unless strong assurance is given that there will be no decline in persistence of affected biodiversity and that a no net loss or net gain outcome is feasible, **OR** **An appropriate offset is in place before the predicted impact occurs**.

VERIFIERS (evidence needed) that demonstrate offsetability from an ecological perspective			
Irreplaceability, Vulnerability	**Ecological equivalence: The type of biodiversity exchange (losses and gains) needs to be appropriate, as indicated by:**		
	• 'Like for like[19]: In general, offset should be of same kind of physical environment and species, but there is some flexibility to deviate from applying a strict 'like for like' approach; including by: • 'Trading up' to conserve an equal or greater quantity of more threatened or irreplaceable biodiversity (i.e., of higher conservation priority), which may be an option.	• 'Like for like': Offset should be of same kind of physical environment, same community type and species (but offset may cater for different population from that affected by impacts). • 'Trading up' by conserving an equal or greater quantity of more threatened or irreplaceable biodiversity may be an option.	• Stringent 'like for like' (in-kind) requirement should be applied: Same kind of physical environment, same community type and seral stage, composition and same species' population (offset must cater for same population).
Irreplaceability Vulnerability	**Temporal context: The ecological implications of delays in offset delivery/maturity** have been identified and the timing of biodiversity exchange (losses relative to achieving gains) neither causes bottlenecks nor deprives people of benefits, for example by ensuring that:		
	• Offset is underway within five years after impact or as otherwise appropriately identified.	• Offset is delivering measurable outcomes prior to impact or within three years of the impact and no affected biodiversity is at risk of bottleneck impacts.	• Offset outcomes are fully delivered and sustainable before impact begins for those biodiversity components that may suffer bottlenecks due to any impacts.
Irreplaceability, Vulnerability	**Spatial and functional context: The relative location** in the broader landscape of the biodiversity losses and gains is appropriate, as indicated below:		
	• The offset is within the same broad ecological region as the impact. (e.g., globally defined WWF ecoregions, or more detailed level) • It is theoretically possible to establish (through management interventions) the required ecological processes at the proposed offset site/s.	• Offset preferably in nearest neighbouring 'patch' (vegetation / habitat) of sufficient size within same ecological region (nationally or regionally defined), and/or level of connectivity. • Proximity to key source populations is maintained. • The proposed offset location/s has ecological processes established, OR • Key ecological processes at the site can and will be restored using tried-and-tested techniques.	• Same or adjacent 'patch' (vegetation / habitat) within the same ecological region (nationally or regionally defined), and connectivity. • Proximity to key source populations is maintained. • The full suite of ecological processes required to sustain biodiversity at the proposed offset site in the long term is already established at the site/s.

[19] One of the key requirements for achieving a no net loss outcome is that the biodiversity gains delivered by an offset are of the same kind ('like for like') as the biodiversity that is predicted to be lost. Closer equivalence (i.e., a very strict definition of 'like for like' biodiversity exchange) is required for higher value losses and more flexible equivalence may be appropriate for lower value losses. However, as yet, no method for quantifying the biodiversity exchange when 'trading up' has been agreed at the international level or in many countries. In many settings, a method for defining and quantifying offsets that 'trade up' will need to be developed to allow for defensible out of kind loss/gain exchanges.

Functional context: The ecological functionality and likelihood of persistence of affected biodiversity are retained, as indicated by:			
Irreplaceability	• The level of irreplaceability does not increase (in the case of a like for like offset), OR • Irreplaceability of impacted (low irreplaceability) biodiversity may increase somewhat, if an offset contributes to a lowering of the irreplaceability of biodiversity of greater conservation priority (trading up).	• The level of irreplaceability does not increase.	• The level of irreplaceability of affected biodiversity and of supporting ecological processes does not increase at any time during the life of the project. • The range/extent of affected biodiversity does not decrease at any time.
Vulnerability	• The level of vulnerability remains the same (like for like exchange) or decreases (like for like or better, if trading up is proposed).	• The level of vulnerability remains the same (like for like exchange) or decreases (like for like or better, if trading up is proposed)	• The level of vulnerability is shown not to increase at any time, or is shown to decrease.
Opportunity to add sufficient and additional conservation value through an offset	• Opportunities for creating sufficient and additional conservation value through an offset have been identified and have been or can be secured. • Additionality can be demonstrated.	• There is abundant opportunity to add conservation value through a proposed offset involving restoration or enhancement methods that have been shown to be feasible and successful, or through averted loss interventions. • Additionality can be demonstrated.	• The requisite offset is already in place; OR • A range of viable and appropriate opportunities for creating sufficient and additional conservation value through an offset has been identified and secured. • The site/s and activities ensure spreading of risk to biodiversity, employ various mechanisms for conserving biodiversity (combine restoration, enhancement and averted risk, where suitable). • Additionality is demonstrated.
Verifiers for legal, financial, institutional considerations			
Social and culturally relevant verifiers			
Dependence	• Affected stakeholders/communities can sustain their livelihoods if levels of access to or provision of affected ecosystem services alter and there are acceptable alternatives or compensation for services lost. • This must be demonstrated through a transparent and participatory process.	• Affected stakeholders/communities can sustain their livelihoods if levels of access to or provision of affected ecosystem services alter. • This must be demonstrated through a transparent and participatory process of stakeholder engagement.	• Affected stakeholders/communities can sustain their livelihoods if levels of access to or provision of affected ecosystem services alter. • This has been demonstrated through a transparent, rigorous and participatory process of stakeholder engagement.
Support	• All affected stakeholders fully support the project and offset, and are as well off as a result of these developments as they were before.	• All affected stakeholders fully support the project and offset, and are at least as well or better off as a result of these developments than they were before.	• All affected stakeholders fully support the project and offset, and are at least as well better off as a result of these developments than they were before.

Legal, financial, institutional considerations			
Availability of offset sites	• Offset sites are known to be available and can be secured through relevant agreements.	• Offset site/s have been secured, or are in the process of being secured, or	• The offset is preferably provided in advance, e.g., through a habitat bank, and offset site/s have been secured under formal protection agreements, or this process is underway, with guarantees for its completion.
Legal mechanisms for securing offsets (and land tenure)	• Appropriate mechanisms exist to secure land use tenure for offsetting activities.	• Appropriate formal, long term agreements have been reached for securing and managing the proposed offset site/s.	• Access to the land needed to provide the offset is assured, either through purchase or long term agreement with the landowner and/or a restrictive covenant/servitude registered on land title. A management agreement is in place and is of sufficient duration to ensure biodiversity values will be sustained.
Financial arrangements	• Offset activities for the duration of the offset (e.g., duration of project impacts and preferably in perpetuity) are fully funded and secured for long term use, e.g., through a trust fund, so that: • The funds required to deliver the offset are allocated and are sufficient to deliver the required outcome. • Financial mechanisms and plans are in place to ensure the flow of funds that will support offset management and activities.	• Offset activities for the duration of the offset (e.g., duration of project impacts and preferably in perpetuity) have been adequately costed and are fully funded, with funds secured for long term use, e.g., through a trust fund, so that: • The funds required to deliver the offset are allocated and are sufficient to deliver the required outcome. • Financial mechanisms and plans are in place to ensure the flow of funds that will support offset management and activities for the duration of project impacts.	• Offset activities for the duration of the offset (e.g., duration of project impacts and preferably in perpetuity) have been adequately costed and integrated into a strategy for sustainable conservation. They are fully funded, with funds secured for long term use, e.g., through a trust fund, so that: • The funds required to deliver the offset are allocated and are sufficient to deliver the required outcome. • Financial mechanisms and plans are in place to ensure the flow of funds that will support offset management and activities at least for the duration of project impacts.

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Useful Data Resources

Please note: This is just a small selection of (generally no-cost) information sources on spatially explicit data on biodiversity, conservation significance, landscapes that is available on the internet and that could be used as a starting point. Even a rapid web-based search for more data and information should uncover a large amount of additional useful material.

- **IUCN Red List of Threatened Species** (**http://www.iucnredlist.org/**) has a spatial data download section with data on about 28,000 species (of close to 56,000 assessed species). The data is for taxonomic groups such as amphibians, mammals, threatened birds, reef-building corals, groupers, wrasses, angelfish, butterflyfish, seasnakes, seagrasses and mangroves. Spatial data is also provided for many of the reptile species that have been assessed. Other groups will be added to this collection once they are mapped.
- **Integrated Biodiversity Assessment Tool** (IBAT, **https://www.ibat-alliance.org**; **https://www.ibatforbusiness.org/**) has collated spatial information on areas of high conservation significance, including Key Biodiversity Areas, Important Bird Areas, IUCN categories of Protected Areas, etc. Developed by BirdLife International, Conservation International, IUCN Nature and UNEP-WCMC. [Note: Much of the information is at a very COARSE scale]
- **The 'A-Z' of Areas of Biodiversity Importance** (**http://www.biodiversitya-z.org/**) has been developed by the UNEP World Conservation Monitoring Centre (WCMC) and partners and provides information on various systems that prioritise areas of biodiversity importance, including protected area frameworks supported by national or regional institutions, international conventions and programmes, and areas identified by prioritisation schemes that are developed by academic and conservation organisations.
- **http://csntool.wingsoverwetlands.org** – A website by Wetlands International, BirdLife International and the UNEP World Conservation Monitoring Centre (UNEP-WCMC) showing spatial information on migratory birds, critical sites, protected areas, etc.
- Global Biodiversity Information Facility (GBIF: **http://www.gbif.org/**)
- Google Earth (**http://www.google.com/earth/index.html**)
- LandSat images (**https://zulu.ssc.nasa.gov/mrsid/mrsid.pl**)

Appendix A. Extracts from Policies or Guidelines that describe biodiversity according to various measures of irreplaceability or vulnerability

The following tables are extracts from existing guidance documents mentioned in the main text (e.g., IFC's Performance standards, IUCN Red List Criteria, Rodriguez et al., 2011). These provide more detailed descriptions of biodiversity according to its indicated irreplaceability or vulnerability status

1. Guidance published by the International Finance Corporation (IFC) as part of its Performance Standards

1.1 Definitions of Modified, Natural and Critical Habitat (IFC PS6 and GN6, 2012):

- 'Modified habitat' is defined as 'areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species compositions. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.'
- 'Natural habitat' is defined as 'areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species compositions.'
- 'Critical habitat' is defined as 'Areas with high biodiversity value, including:
    - Habitat of significant importance to Critically Endangered and/or Endangered[20]species;
    - Habitat of significant importance to endemic and/or restricted-range species;
    - Habitat of significant importance to globally significant concentrations of migratory species and/or congregatory species;
    - Regionally significant and/or highly threatened or unique ecosystems; and/or
    - Areas which are associated with key evolutionary processes.

Paragraph 56 of the Guidance Note states: "Other aspects might also support a critical habitat designation, and the appropriateness of this decision would be evaluated on a case-by-case basis." Examples are as follows:

- Areas required for the reintroduction of CR and EN species and refuge sites for these species (habitat used during periods of stress [e.g., flood, drought or fire])
- Ecosystems of known special significance to EN or CR species for climate adaptation purposes.
- Concentrations of Vulnerable (VU) species in cases where there is uncertainty regarding the listing, and the actual status of the species may be EN or CR. Areas of primary / old-growth / pristine forests or other areas with especially high levels of species diversity.
- Ecosystems that are of high importance to species for climate adaptation purposes (an important aspect of Criterion 5).

[20] IFC defines this: *"As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with recognized experts; and (ii) In instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as 'protected' or 'restricted'), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment*".

- Landscape and ecological processes (e.g., water catchments, areas critical to erosion control, disturbance regimes [e.g., fire, flood]) required for maintaining critical habitat
- Habitat necessary for the survival of keystone species[21]
- Areas of high scientific value such as those containing concentrations of species new and/or little known to science.

Paragraph 57 of the Guidance Note: In general, internationally and/or nationally recognised areas of high biodiversity value will likely qualify as critical habitat; examples include the following:

- Areas that meet the criteria of the IUCN's Protected Area Management Categories Ia, Ib and II, although areas that meet criteria for Management Categories III-VI may also qualify depending on the biodiversity values inherent to those sites.
- UNESCO Natural World Heritage Sites that are recognised for their Global Outstanding Value.
- The majority of Key Biodiversity Areas (KBAs)[22], which encompass inter alia Ramsar Sites, Important Bird Areas (IBA), Important Plant Areas [IPA] and Alliance for Zero Extinction Sites [AZE].
- Areas determined to be irreplaceable or of high priority/significance based on systematic conservation planning techniques carried out at the landscape and/or regional scale by governmental bodies, recognised academic institutions and/or other relevant qualified organisations (including internationally-recognised NGOs).
- sAreas identified by the client as High Conservation Value (HCV) using internationally recognised standards, where criteria used to designate such areas is consistent with the biodiversity values listed paragraph 16 of Performance Standard 6.

1.2 Information on Tier 1 and Tier 2 categories of Critical Habitat (IFC GN6, 2012):

Table 3. Quantitative thresholds for Tiers 1 and 2 of Critical Habitat Criteria 1, 2 and 3.

The thresholds below, as presented in IFC GN6 (2012), are based on globally standardised numerical thresholds published by the International Union for Conservation of Nature (IUCN) as Best Practice Protected Area Guidelines.

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Species	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species / subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species / subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally / regionally-important concentrations of an EN, CR or equivalent national/regional listing.

[21] Defined by IFC as a species that has a disproportionate effect on its environment relative to its biomass and whose removal initiates significant changes in ecosystem structure and loss of biodiversity.

[22] Noted by IFC: Key Biodiversity Areas are nationally mapped sites of global significance for biodiversity conservation that have been selected using globally standard criteria and thresholds based on the framework of vulnerability and irreplaceability widely used in systematic conservation planning. See Langhammer, P. F. et al., 2007 in the Bibliography.

Criteria	Tier 1	Tier 2
2. Endemic/ Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and /or based on expert judgement.
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and /or based on expert judgement. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.

1.3 Information on the links between High Conservation Value and Critical Habitat (IFC GN6, 2012)

Table 4. High Conservation Value designations against IFC's PS6 (and other relevant PS) and IFC's habitat designations.

(Text as in GN6, 2012, G35)

HCV Type	Performance Standards
HCV 1: Areas containing globally, regionally or nationally significant concentrations of biodiversity values	Critical habitat in most cases. See paragraphs GN55–GN112 for further guidance.
HCV 1.1: Protected areas	
HCV 1.2: Rare, threatened or endangered species	
HCV 1.3: Endemic species	
HCV 1.4: Seasonal concentrations of species	
HCV 2: Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.	Natural habitat, and may be critical habitat if areas contain high biodiversity values as identified in paragraph 16 of Performance Standard 6.
HCV 3: Areas that are in or contain rare threatened or endangered ecosystems	Critical habitat
HCV 4: Areas that provide basic ecosystem services in critical situations	Priority ecosystem services as defined by paragraph 24 of Performance Standard 6. See paragraphs GN126–GN142 for further guidance.
HCV 4.1: Areas critical to water catchments	
HCV 4.2: Areas critical to erosion control	
HCV 4.3: Areas providing critical barriers to destructive fire	

HCV 5: Areas fundamental to meeting basic needs of local communities	Priority ecosystem services as defined by paragraph 24 of Performance Standard 6. Client requirements defined in Performance Standard 5 are also applicable. See paragraphs GN126–GN142 for further guidance.
HCV 6: Aras critical to local communities' traditional cultural identify (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities.	Priority ecosystem services as defined by paragraph 24 of Performance Standard 6. Client requirements defined in Performance Standard 8 are also applicable. See paragraphs GN126–GN142 for further guidance.

2. Guidance published by the IUCN on criteria and numerical thresholds for categorising taxa according to their vulnerability status

IUCN's categories for vulnerability status are: Critically Endangered, Endangered or Vulnerable[23] (IUCN, 2001, 2010).

Table 2.1. Summaryof the five criteria (A-E) used to evaluate if a taxon belongs in a threatened category(Critically Endangered, Endangered or Vulnerable).

Use any of the riteria A-E	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Delines measured over the longer of 10 years or 3 generations		
A1	> 90%	> 70%	> 50%
A2, A3 & A4	> 80%	> 50%	> 30%
B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy)			
B1. Either extent of ourrene	< 100 km^2	< 5,000 km^2	< 20,000 km^2
B2. or area of oupany	< 10 km^2	< 500 km^2	< 2,000 km^2
and 2 of the following 3:			
(a) severely fragmented or # loations	= 1	5	10

A1. Population redution observed, estimated, inferred, or suspeted in the past where the auses of the redution are learly reversible AND understood AND eased based on and spefying any of the following:

(a) diret observation
(b) an index of abundane appropriate to the taxon
((a deline in area of oupany (AOO), extent of ourrene (EOO) and/or habitat quality
(d) atual or potential levels of exploitation
(e) effets of introdued taxa, hy bridisation, pathogens, pollutants, ompetitors or parasites.

A2. Population redution observed, estimated, inferred, or suspeted in the past where the auses of redution may not have eased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1

A3. Population redution projeted or suspeted to be met in the future (up to a maximum of 100 years) based on any of (b) to (e) under A1.

A4. An observed, estimated, inferred, projeted or suspeted population redution (up to a maximum of 100 years) where the time period must inlude both the past and the future, and where the auses of redu(on may not have eased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1.

(b) ontinuing deline in (i) extent of ourrene (ii) area of oupany, (iii) area, extent and/or quality of habitat, (iv) number of loations or subpopulations and (v) number of mature individuals.
((extreme fluuations in any of (i) extent of ourrene, (ii) area of oupany, (iii) number of loations or subpopulations and (iv) number of mature individuals.

[23] Definitions of selected IUCN Red List Categories (IUCN, 2001, 2010):

CRITICALLY ENDANGERED (CR): A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN): A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU): A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

NEAR THREATENED (NT): A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC): A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
and either C1 or C2:			
C1. An estimated continuing decline of at least	25% in 3 years	20% in 5 years	10% in 10 years
up to a maximum of 100 years	or 1 generation	or 2 generations	or 3 generations
C2. A continuing decline and (a) and/or (b)			
(a i) # mature individuals in largest subpopulation	< 50	< 250	< 1,000
(a ii) or % mature individuals in one subpopulation =	90-100%	95-100%	100%
(b) extreme fluctuations in the number of mature individuals			
D. Very small or restricted population			
Either (1) number of mature individuals	< 50	< 250	< 1,000
or (2) restricted area of occupancy	na	na	typically: AOO < 20km^2 or # locations 5
E. Quantitative Analysis			
Indicating the probability of extinction	50% in 10 years	20% in 20 years	10% in 100 years
in the wild to be at least	or 3 generations (100 years max)	or 5 generations (100 years max)	

3. Proposed criteria and thresholds

The criteria and thresholds in Table 5 (shown here as proposed and presented in Rodriguez et al., 2011: Table 1) are for classifying ecosystems according to their vulnerability status (CR= Critically Endangered, EN=Endangered, VU=Vulnerable).

Note: The scheme is presented by the authors as a first attempt to classify ecosystems according to Red List criteria, with the intention of obtaining broad, scientific input. It is not an agreed and finalised classification system. Please refer to the original reference for further details.

Table 5. Possible categories and criteria for use in developing a red list of ecosystems[a]

[a] Based on the IUCN Red List (IUCN 2001) and other systems proposed to date (Nicholson et al. 2009).
[b] Abbreviations: CR, critically endangered; EN, endangered; VU, vulnerable.
[c] See IUCN (2001, 2010b) for guidelines on measuring extent of occurrence and area of occupancy.
[Correction added after publication 5 November 2010: Errors in the second column of Criterion D were amended.]

Criterion	Subcriterion	Status[b]
A: Short-term decline (in distribution or ecological function) on the basis of any subcriterion	1. observed, estimated, inferred or suspected decline in distribution of ≥80%,	CR
	≥50%, or	EN
	≥30% over the last 50 years	VU
	2. projected or suspected decline in distribution of ≥80%,	CR
	≥50%, or	EN
	≥30% within the last 50 years	VU
	3. observed, estimated, inferred, projected, or suspected decline in distribution of ≥80%,	CR
	≥50%, or	EN
	≥30% over any 50-year period, where the period must include both the past and the future.	VU
	4. relative to a reference state appropriate to the ecosystem, a reduction or likely reduction of ecological function that is (a) very severe, in at least one major ecological process, throughout ≥80% of i extant distribution within the last or next 50 years;	CR

	(b1) very severe, throughout ≥50% of its distribution within the last or next 50 years;	EN
	(b2) severe, in at least one major ecological process, throughout ≥80% of its distribution within the last or next 50 years;	EN
	(c1) very severe, in at least one major ecological process, throughout ≥30% of its distribution within the last or next 50 years;	VU
	(c2) severe, in at least one major ecological process, throughout ≥50% of its distribution within the last or next 50 years.	VU
	(c3) moderately severe, in at least one major ecological process, throughout ≥80% of its distribution within the last or next 50 years	VU
B: Historical decline (in distribution or ecological function) on the basis of either subcriterion 1 or 2	1. estimated, inferred, or suspected decline in distribution of	
	≥90%,	CR
	≥70%,	EN
	or ≥50% in the last 500 years	VU
	2. relative to a reference state appropriate to the ecosystem, a very severe reduction in at least one major ecological function over	
	≥90%,	CR
	≥70%,	EN
	or ≥50% of its distribution in the last 500 years	VU
C: Small current distribution and decline (in distribution or ecological function) or very few locations on the basis of either subcriterion 1 or 2	1. extent of occurrence [c] estimated to be	
	≤100 km^2,	CR
	≤5,000 km^2, or	EN
	≤20,000 km^2	VU
	and at least one of the following:	
	(a) observed, estimated, inferred, or suspected continuing decline in distribution,	
	(b) observed, estimated, inferred, or suspected severe reduction in at least one major ecological process,	
	(c) ecosystem exists at	
	only one location,	CR
	5 or fewer locations, or	EN
	10 or fewer locations.	VU
	or	
	2. area of occupancy estimated to be	
	≤10 km^2,	CR
	≤500 km^2, or	EN
	≤2000 km^2	VU
	and at least one of the following:	
	(a) observed, estimated, inferred, or suspected continuing decline in distribution,	
	(b) observed, estimated, inferred, or suspected severe reduction in at least one major ecological process,	
	(c) ecosystem exists at	
	only one location,	CR
	5 or fewer locations, or	EN
	10 or fewer locations.	VU
D: Very small current distribution, and serious plausible threats, but not necessarily evidence of past or current decline in area or function.	Distribution estimated to be	
	≤5 km^2,	CR
	≤50 km^2, or	EN
	≤100 km^2	VU