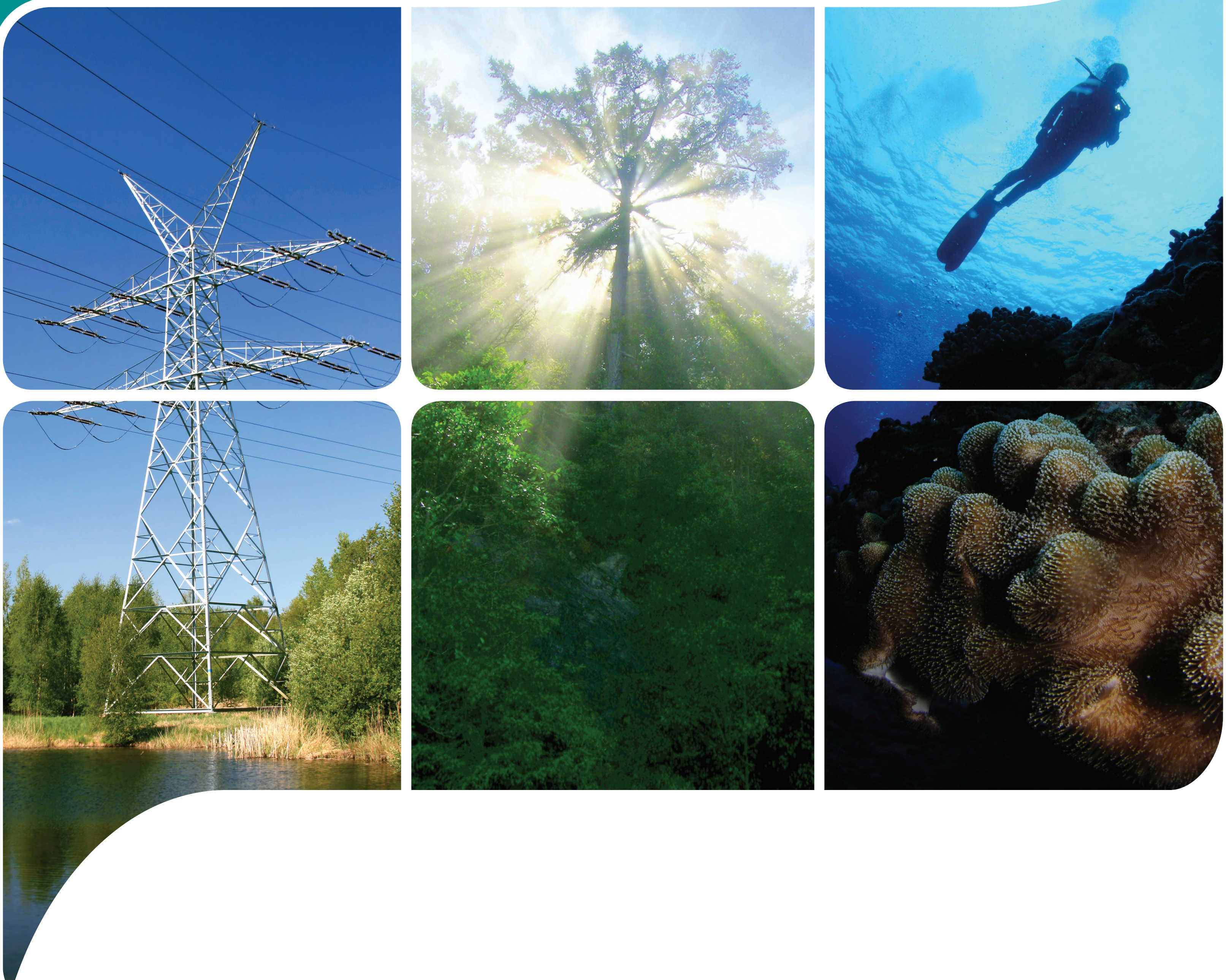
Business and Biodiversity Offsets Programme (BBOP)

Biodiversity Offset Design Handbook



BBOP

Business and Biodiversity Offsets Programme

Forest Trends, Conservation International and the Wildlife Conservation Society provided the Secretariat for BBOP during the first phase of the programme's work (2004 - 2008).

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About this document

The Principles on Biodiversity Offsets and accompanying supporting materials[1] such as this Biodiversity Offset Design Handbook[2] have been prepared by the Business and Biodiversity Offsets Programme (BBOP) to help 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 Committee[3] during the first phase of the programme's work (2004 – 2008) and have benefited from contributions and suggestions from many of the 200 people who registered on the BBOP consultation site and numerous others who have joined us for discussions in meetings.

The Advisory Committee members support the Principles and commend the other working documents to readers as a source of interim guidance on which to draw when considering, designing and implementing biodiversity offsets. Best practice in biodiversity offsets is still in its infancy, and the concepts and methodologies presented here need to be further discussed, developed, tested and refined based on more practical experience and broad debate within society.

All those involved in BBOP are grateful to the companies who volunteered pilot projects in this first phase of our work and for the support of the donors listed overleaf, who have enabled the Secretariat and Advisory Committee 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, to test and develop these and other approaches to biodiversity offsets more widely geographically and in more industry sectors. BBOP is a collaborative programme, and we welcome your involvement. To learn more about the programme and how to get involved please:

See: **www.forest-trends.org/biodiversityoffsetprogram/**

Contact: **bbop@forest-trends.org**

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1 The BBOP Principles, interim guidance and resource documents, including a glossary, can be found at: **www.forest-trends.org/biodiversityoffsetprogram/guidelines/**. To assist readers, a selection of terms with an entry in the BBOP Glossary has been highlighted thus: BIODIVERSITY OFFSETS. Users of the Web or CD-ROM version of this document can move their cursors over a glossary term to see the definition.

2 This paper was prepared by Jo Treweek and Kerry ten Kate, with contributions from Susie Brownlie, Jon Ekstrom, Conrad Savy, Bambi Semroc, David Parkes, Theo Stephens, Jack Tordoff, Toby Gardner, Joe Kiesecker, Marc Stalmans and William Milliken, and reflecting comments received during the public consultation period.

3 The BBOP Advisory Committee currently comprises representatives from: Anglo American; Biodiversity Neutral Initiative; BirdLife International; Botanical Society of South Africa; Brazilian Biodiversity Fund (FUNBIO); Centre for Research-Information-Action for Development in Africa; City of Bainbridge Island, Washington; Conservation International; Department of Conservation New Zealand; Department of Sustainability & Environment, Government of Victoria, Australia; Ecoagriculture Partners; Fauna and Flora International; Forest Trends; Insight Investment; International Finance Corporation; International Institute of Environment and Development; IUCN, The International Union for the Conservation of Nature; KfW Bankengruppe; Ministry of Ecology, Energy, Sustainable Development, and Spatial Planning, France; Ministry of Housing, Spatial Planning and the Environment, The Netherlands; National Ecology Institute, Mexico; National Environmental Management Authority, Uganda; Newmont Mining Corporation; Private Agencies Collaborating Together (Pact); Rio Tinto; Royal Botanic Gardens, Kew; Shell International; Sherritt International Corporation; Sierra Gorda Biosphere Reserve, Mexico; Solid Energy, New Zealand; South African National Biodiversity Institute; Southern Rift Landowners Association, Kenya; The Nature Conservancy; Tulalip Tribes; United Nations Development Programme (Footprint Neutral Initiative); United States Fish and Wildlife Service; Wildlife Conservation Society; Wildlands, Inc.; WWF; Zoological Society of London; and the following independent consultants: Susie Brownlie; Jonathan Ekstrom; David Richards; Marc Stalmans; and Jo Treweek.

During Phase 1 of BBOP, the BBOP Secretariat was served by Forest Trends, Conservation International and the Wildlife Conservation Society.

We thank those organisations that have provided financial support for BBOP's work[4]: the Alcoa Foundation; Anglo American; City of Bainbridge Island, Washington, USA; Conservation International; Department for International Development, United Kingdom; Department of the Environment, Water, Heritage and the Arts, Australia; Forest Trends; International Finance Corporation; KfW Bankengruppe; Ministry of Housing, Spatial Planning and the Environment, The Netherlands; Newmont Mining Corporation; the Richard and Rhoda Goldman Fund; Rio Tinto; Shell International; Sherritt International Corporation; Solid Energy New Zealand; the Surdna Foundation; the United Nations Development Programme/Global Environment Facility; United States Agency for International Development[5]; and Wildlife Conservation Society.

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

5 This document is made possible in part by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Forest Trends, Conservation International and the Wildlife Conservation Society and do not necessarily reflect the views of USAID or the United States Government.

Contents

The Offset Design Handbook presents information on a range of issues, approaches, methodologies and possible tools from which offset planners can select the approaches best suited to their individual circumstances when designing a biodiversity offset. It describes a generic process that offset planners could use in designing a biodiversity offset, from initial conception of a development project to the selection of offset sites and activities. This involves describing the project; exploring the policy context; engaging stakeholders; undertaking biodiversity surveys and applying the MITIGATION HIERARCHY; quantifying RESIDUAL IMPACTS; identifying and comparing potential offset sites; calculating conservation gains for preferred offset sites; and deciding upon the final scope, scale, nature and location of offset.

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APPENDICES to the Biodiversity Offset Design Handbook (for information – available in a separate document[6])

6 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh-appendices.pdf**.

Using the 'click-through' feature in this PDF document

To use the click-through feature of this PDF document, please note the following:

You can click on text that is blue and underlined (hypertext) to navigate within and between sections (e.g. from summary text to detailed text). And then you can return to your original place. You can also click on links to access material on external websites.

To jump back to the hypertext link where you clicked from, check the 'Previous View' and 'Next View' arrows are showing on your toolbar. If they are not, go to the 'View' drop down menu at the top of your screen and select 'Toolbars.' Make sure the 'Web' or 'Navigation' toolbar is selected, or 'Customise' and pick:

Part 1: Introduction

1.1 Background and purpose of this Handbook

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development[7] 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.

The Business and Biodiversity Offsets Programme (BBOP) is a partnership between companies, governments, conservation experts and financial institutions that aim to explore whether, in the right circumstances, biodiversity offsets can help achieve better and more cost effective conservation outcomes than normally occur in infrastructure development, while at the same time helping companies manage their risks, liabilities and costs. BBOP has been researching and developing best practice on biodiversity offsets and beginning to test it through a portfolio of pilot projects in a range of contexts and industry sectors, aiming to demonstrate improved and additional conservation and business outcomes. BBOP's expectation is that biodiversity offsets will become a standard part of the development process when projects have a significant residual impact on biodiversity, resulting in long term and globally significant conservation outcomes.

The Principles on Biodiversity Offsets and accompanying supporting materials such as this Handbook on Biodiversity Offset Design have been prepared by BBOP to help developers, conservation groups, communities, governments and financial institutions that wish to consider and develop best practice biodiversity offsets.

They were developed by members of the BBOP Secretariat and Advisory Committee during the first phase of the programme's work (from November 2004 – December 2008). They reflect discussion by members of the BBOP Advisory Committee, some practical experience through trials at the BBOP pilot project sites, and have also benefited from contributions and suggestions from many of the 200 people who registered on the BBOP consultation website and numerous others who have participated in workshops and meetings.

BBOP started its work at the end of 2004, when the Shell Pearl project and Newmont Akyem project were the first pilot projects to join the programme. Early meetings of the BBOP Advisory Committee discussed different approaches to offset design and participants commented on early prototype drafts of offset methodologies that the BBOP Secretariat prepared with input from Advisory Committee members. Methods following the basic steps outlined in this Handbook have been available as drafts since 2006, but evolving in parallel with early progress at the pilot projects. Similarly, potential elements of principles for biodiversity offsets have been discussed since September 2006, but the set of principles laid out in Part 1 of this document was only prepared in February 2008, since when it has been the basis for consultation culminating in final text in December 2008. Consequently, the methodologies described here were not available in their entirety to the pilot projects when they started work on the design of their offsets, nor were the underlying principles.

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7 While biodiversity offsets are defined here in terms of specific development projects (such as a road or a mine), they could also be used to compensate for the broader effects of programmes and plans.

Some of the pilot projects joined BBOP comparatively recently (e.g. Solid Energy New Zealand only joined with its Strongman project in October 2007) and, for others, project authorisation has taken longer than initially anticipated, which has slowed the process of offset design. None of the companies has yet worked through all the steps involved in offset design and described in this Handbook. It is also important to bear in mind that Phase 1 of BBOP has involved just five pilot projects with large companies (Shell, Newmont, AngloAmerican, Sherritt, Solid Energy New Zealand), and a sixth involving local government (the City of Bainbridge, USA) working with a small real estate developer. Best practice on voluntary biodiversity offsets is best described as experimental and evolving. Many of the approaches described and offered here as options have not yet been robustly tested in practice and may not be the most useful or appropriate approach in some specific contexts. The methodologies presented here should therefore be viewed as a 'work in progress', to be used with judgement, acknowledging their limitations. Once they have been adapted and more widely used in practice, it will be possible to revise and improve the guidance in this Handbook based on experience.

With these caveats, this Handbook on Biodiversity Offset Design offers some optional guidance on which developers planning biodiversity offsets can draw, alongside other guidance they may find. It provides suggestions on a range of optional methodologies that could be used to design offsets in line with the Principles on Biodiversity Offsets, and is intended to be pragmatic and flexible (see Box 1). It focuses on the design of biodiversity offsets in the context of individual development projects, rather than at a more strategic planning level, but policy makers could use a similar approach to design a plan or programme to achieve no net loss or a net gain of biodiversity.

Throughout this document, the importance of effective stakeholder PARTICIPATION to the ultimate success of biodiversity offsets is noted. The best designed offsets will fail if they are not developed with the support and involvement of key STAKEHOLDERS, including government officials, non-governmental organisations (NGOs), scientists and particularly indigenous peoples and local communities. The companion Cost-Benefit Handbook[8] is designed to be used in parallel with this one. It covers the identification and involvement in biodiversity offset design of communities affected either by the development project or by the biodiversity offset, or both. It is supplemented by the Resource Paper on Biodiversity Offsets and Stakeholder Participation[9], which outlines current best practice on this topic.

After completing the offset design process described here, an offset planner may wish to refer to a separate document, the Biodiversity Offset Implementation Handbook[10], to find information on giving practical effect to offsets. This information includes establishing the roles and responsibilities, agreements, financial and monitoring arrangements needed to start OFFSET ACTIVITIES and ensure their long-term success. Figure 1 outlines the content of the Biodiversity Offset Design, Cost-Benefit and Implementation Handbooks.

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8 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**.

9 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/participation.pdf**.

10 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/oih.pdf**.

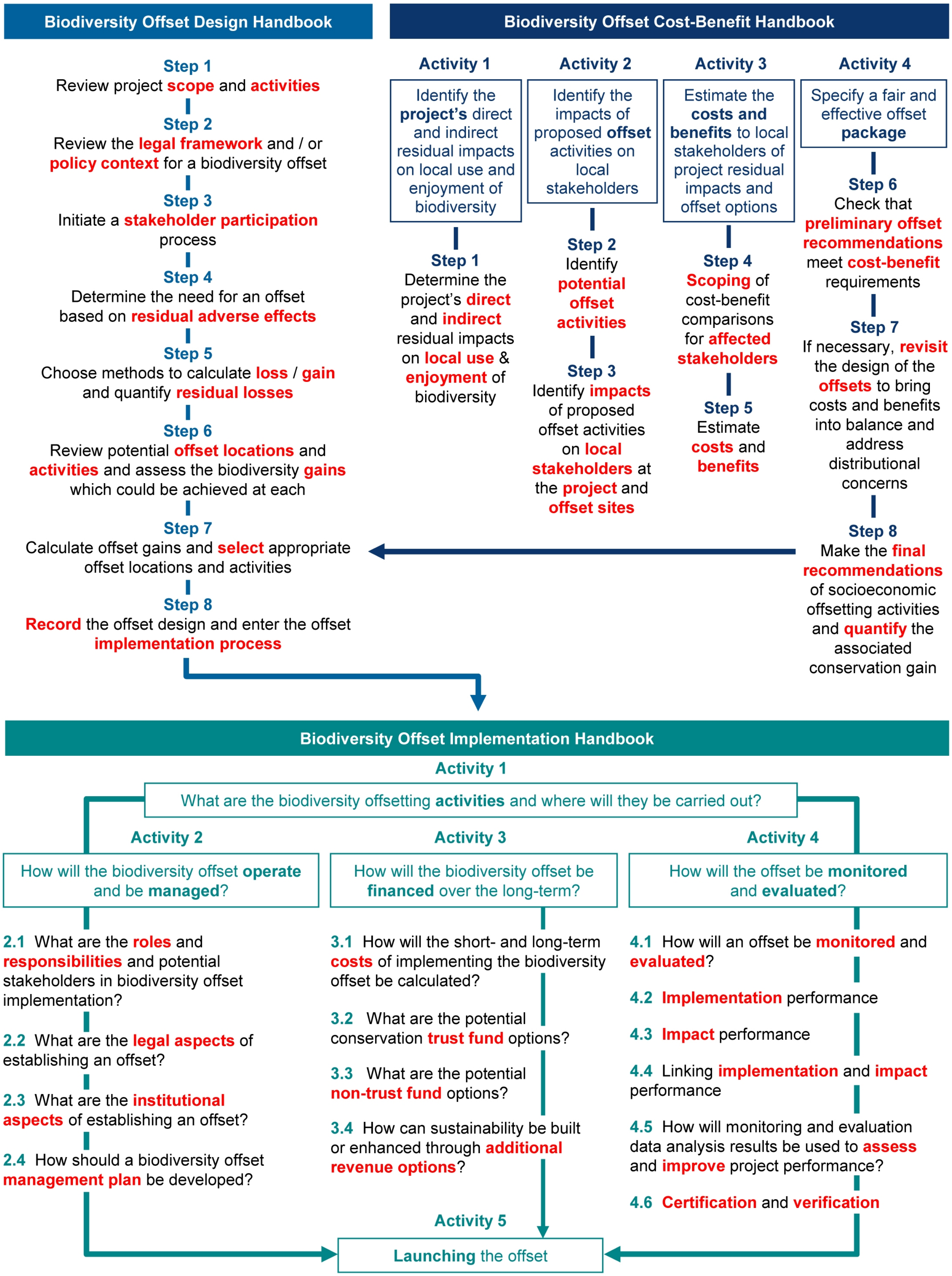
Box 1: Offsets in the 'real world' and critical success factors

Factors contributing to the success of offsets in delivering no net loss or a net gain of biodiversity include:

- Political support;
- A stable and predictable socioeconomic situation;
- Willing and supportive stakeholders;
- Adequate funds and time to devote to the design process;
- Reliability and accountability of GOVERNANCE and financing;
- Institutional capacity and resources for implementation and maintenance;
- Accessible and detailed information on affected biodiversity;
- Recently compiled spatial development or land use plans;
- Clearly defined biodiversity priorities;
- Human needs integrated into the natural landscape, and;
- Fair benefit-sharing and sustainability for local biodiversity users.

In reality, the circumstances in which biodiversity offsets are considered and designed may be less conducive than the ideal, in which all the success factors described above are demonstrably present and strong. There is no ‘one size fits all’ approach to designing and implementing biodiversity offsets. The challenge in each situation will be to navigate the practical realities and adapt the methods described in the BBOP Handbooks and other sources in a way that best allows the principles on biodiversity offsets to be applied. The Handbooks offer some guidance, but it will be up to offset planners to evaluate the specific context in which an offset is to be considered, designed and implemented, and to work with stakeholders to draw on that information and find solutions that would be most likely to work in practice.

Figure 1: The scope of the Biodiversity Offset Design, Cost-Benefit and Implementation Handbooks



1.2 Who should use this Handbook?

The Handbook is intended for use by anybody involved in the design of a biodiversity offset, including:

- Practitioners responsible for the design of biodiversity offsets for proposed development projects, who might be environmental managers or consultants;
- Regulators concerned with the acceptability of offsets in meeting legal or policy requirements;
- Planners concerned with the potential contribution of offsets to policy goals / objectives;
- NGOs or community-based organisations which may be affected by, or interested in, the offset design;
- Researchers interested in the science of biodiversity offsets, including those proposing, testing and publishing new advances that may benefit current practice.

There are several countries where regulations govern the design and implementation of biodiversity offsets (see Part 2, Step 2). In these cases, a developer will be following the regulations and in dialogue with government authorities. This Handbook, however, has been designed to support the design of voluntary biodiversity offsets. In such circumstances, the companies responsible for the development project will lead in the design of the voluntary offset. Given the importance of stakeholder participation and the technical biodiversity issues involved, companies may choose to establish a small working group of stakeholders and other experts to support them in the design of the offset. Throughout this Handbook, the term 'offset planner' is used to refer to the staff or consultants of the company planning a voluntary biodiversity offset, and any members of the team they assemble to support them.

1.3 Scope and contents

The Handbook offers suggestions on how to go about designing a biodiversity offset and information on a range of approaches and methodologies that were developed for, or can be adapted to, the design of biodiversity offsets. It also highlights the main considerations and issues with which offset planners and other stakeholders may need to grapple as they consider whether a biodiversity offset is an appropriate approach for a particular development project and, if so, what is the best design of offset for the individual circumstances concerned.

This guide focuses primarily on biodiversity, but there is an important link to ecosystem function and services, as described in Box 2. A good offset design process will take into consideration the loss and gain of biodiversity at all levels of organisation, and also how changes in the composition, structure and functioning of biodiversity might influence the provision of ECOSYSTEM SERVICES to different stakeholders. There are numerous ways of doing this, as outlined in the Handbook and exemplified by some of the different approaches described in the Appendices. For instance, the approach being developed through experience at the BBOP pilot projects (see Appendix C.1 – **www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh-appendices.pdf**) concentrates on the following:

- Area x quality METRICS selected to include KEY BIODIVERSITY COMPONENTS at the species, ecological communities/assemblages and ecosystem level, based on their INTRINSIC, use and cultural values chosen to represent overall biodiversity.
- Supplementary measures of particular species' populations, where necessary for a more accurate determination of 'no net loss'.
- The development of a package of benefits to local communities to compensate them for the residual impact of the development project and the offset on their use and enjoyment of biodiversity, and to secure their support and involvement in the implementation of the offset. These benefits could range from provision of biodiversity components (e.g. medicinal plants, fuel wood) to financial compensation.

Such a combined approach is underpinned by the concepts outlined in Box 2 below, relating to biodiversity and associated ecosystem services. However, the approach does not set out to quantify the loss and gain of all ecosystem services (particularly supporting services such as soil formation and nutrient cycling). Methods for doing so are still largely in their infancy, but a number of leading methods under development are described in Appendix C. These could be used by offset planners wishing to expand beyond direct biodiversity considerations to a full suite of ecosystem services.

Box 2: Biodiversity, BIODIVERSITY LOSS and ecosystem services

Biodiversity is the total variety of all life. It is the full range of natural variety and variability within and among living organisms, and the ecological and environmental complexes in which they occur. It encompasses multiple levels of organisation, including genes, species, communities, ecosystems and biomes. Its complexity derives from its sheer variety combined with dependencies, feedbacks and variability within and across these different levels.

The term 'biodiversity component', which is used throughout this Handbook, refers to a unit of biodiversity at any level, for instance, the western population of the giant Otago skink (population level), oribi (species level), the Paulpietersberg moist grassland (community level), lowland peat bog (ecosystem level), or boreal forest (biome level).

Biodiversity loss is usually observed as one or both of: (1) reduced area occupied by species and COMMUNITY TYPES and (2) reduced abundance of species or condition of communities & ecosystems. The likelihood of any biodiversity component persisting – or surviving – in the long term declines with both lower abundance and reduced habitat area. The relationship is far from linear and is highly variable across different biodiversity components. The loss of a species is the fundamental example of an irreversible loss of biodiversity.

Priorities for BIODIVERSITY CONSERVATION are influenced by the concepts of IRREPLACEABILITY and VULNERABILITY as defined by Margules and Pressey in a seminal paper on conservation planning and priorities in the scientific journal, Nature in 2000. Biodiversity components that are highly irreplaceable and highly vulnerable are a top priority for conservation effort. Irreplaceability (or uniqueness) relates to the existence of additional spatial options available for conservation if the biodiversity at a particular site were irreversibly lost. Vulnerability indicates risk of imminent loss and so reflects the loss of conservation opportunities over time. The scientific concept of vulnerability includes a consideration of loss as the result of past, ongoing or future threats, and with irreplaceability, could be considered equivalent to the concept of 'hazard' used in corporate risk assessment. THREAT STATUS (of a species or community type) is a simple but highly integrated indicator of vulnerability.

Biodiversity supplies the ecosystem services upon which human life depends. Ecosystem services are the benefits people obtain from functioning ecosystems composed of species and ecological communities. They are commonly classified as being either 'provisioning' (food, fibre, water, fuel, genetic resources, etc), 'regulating' (air quality, climate regulation, pest and disease control, etc), 'cultural' (spiritual, aesthetic, educational, etc), or 'supporting' (soil formation, nutrient cycling, etc). Biodiversity both supplies ecosystem services and depends upon them for its persistence. Human survival and well-being depends utterly on ecosystem services, and thus also on the health of ecosystems and the biodiversity on which they are based.

The rest of Part 1 of this Handbook identifies some of the key concepts that are useful to understand in order to design a biodiversity offset. It also outlines a number of important principles that provide a robust frame of reference for offset design.

Part 2 outlines a generic process for designing a biodiversity offset that and sets out some typical steps found in offset design methodologies around the world.

Part 3 provides more detail about some possible approaches to these steps. (This section can be accessed from Part 2 by clicking on the hypertext links, as described on page 5).

The Appendices offer some supplementary related information, including a brief description of a range of offset methodologies used and under development around the world (including the approach being developed and trialled by BBOP), and information on offset policies and requirements by governments and banks for biodiversity offsets in some circumstances.

1.4 Key concepts and principles

This section highlights briefly some of the main concepts that arise when designing a biodiversity offset, such as when a biodiversity offset should be considered, how it should be measured, how suitable offset locations and activities can be selected, and how the offset should dovetail with companies' project lifecycles and countries' biodiversity priorities. These are described in more detail in the rest of the Handbook. It also presents the BBOP PRINCIPLES ON BIODIVERSITY OFFSETS, which should be used to guide the design and implementation of offsets.

1.4.1 Key concepts

Last resort, residual impacts: The role of biodiversity offsets is effectively as a 'last resort', after all reasonable measures have been taken first to avoid and minimise the impact of a development project and then to restore biodiversity on-site. Consequently, biodiversity offsets should only be applied to the residual adverse impacts of a project. The application of this mitigation hierarchy, and how far each step should be pursued before turning to the next is one of the key issues for consideration in biodiversity offset design.

Only worthwhile for 'significant' impacts? 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). As this Handbook will illustrate, the design of a biodiversity offset involves a considerable level of thought and planning, so it may not be an appropriate approach for project where impacts on biodiversity will be comparatively trivial (e.g. building a house on a previously developed but vacant lot in a city centre).

Not-offsetable thresholds: Where the residual negative impacts of a proposed project are likely to be so great as to lead to irreplaceable loss of biodiversity (e.g. global EXTINCTION of a species), no biodiversity offset could compensate for such loss. In these circumstances, biodiversity offsets would be impossible. Similarly, biodiversity offsets may be an inappropriate approach for a species or ecological community that is currently or has already undergone a significant decline, as the risk that the offset will fail could be too high. Government policies and banks' lending conditions often describe, sometimes in general terms and sometimes in detail, what are considered the thresholds of severe impacts beyond which an offset is inappropriate. While there is broad agreement on the need for clear guidance on such thresholds, it is not available for those developing voluntary biodiversity offsets around the world. Beyond global species extinction, the guidance in this Handbook avoids suggesting that there are clear 'bright line' thresholds (i.e.

firm dividing lines between what can be offset and what cannot) because, as yet, there is no consensus on these. Some initial approaches based on best available knowledge are emerging, but this is an area that needs more discussion and consensus in society.

When to decide on offsets in the planning lifecycle and context: The design of biodiversity offsets is often integrated as far as possible with the impact assessment practice, in order to ensure biodiversity considerations are considered as early as possible in the project decision-making process and to avoid duplication of effort and delay. However, many civil society organisations have expressed concern that consideration of biodiversity offsets as part of the initial project 'Go-No go' decision may lead to the authorisation of projects that are inappropriate because of the severity of their impacts on biodiversity. Less controversially, there is growing recognition that it is important for the spatial planning of biodiversity offsets and the selection of offset activities to be guided by and contribute to national conservation and development priorities, and their implications for planning at the landscape scale.

Quantified loss and gain: A feature that distinguishes offsets from other forms of ecological COMPENSATION (such as compensatory conservation, biodiversity enhancement) is the requirement to demonstrate 'no net loss' or a 'net gain'. What this means and how to measure it lies at the heart of biodiversity offsetting. It is not always easy to determine what should be measured or accounted for in an offset. Biodiversity in its entirety is impossible to measure, so the process of offset design involves decisions about suitable 'metrics' or 'currencies'. As it is impossible to count every individual in every population of every species, and as no two sites are identical in biodiversity terms, the choice of metrics often involves selecting 'surrogates' or 'proxies' which can be quantified and which can be considered representative of 'overall' biodiversity. The extent to which the selected measures are genuinely representative of biodiversity overall may be difficult to demonstrate. It is also important to consider how similar the biodiversity structure, composition and function at an offset site needs to be to that affected by the development project for no net loss to be achieved. Exchange rules may be used to determine what levels of difference might be acceptable and to show how exchange between different sites will be accounted for in the metrics. Loss and gain also encompasses impacts on people's uses and cultural values associated with biodiversity. There are many possible approaches to designing, selecting and applying metrics appropriate for a given situation, and several are under development.

What activities count as an offset? There are many different possible kinds of offset, but in practice they generally fall into the following categories:

- *Undertaking positive management interventions to restore an area or stop degradation*: improving the conservation status of an area of land by restoring habitats or ecosystems and reintroducing native species. Where proven methods exist or there are no other options, reconstructing or creating ecosystems. Also, reducing or removing current threats or pressures by, for instance, introducing sustainable livelihoods or substitute materials.
- *Averting risk*: Protecting areas of biodiversity where there is imminent or projected loss of that biodiversity; entering into agreements such as contracts or covenants with individuals in which they give up the right to convert habitat in the future in return for payment or other benefits now.
- *Providing compensation packages* for local stakeholders affected by the development project and offset, so they benefit from the presence of the project and offset and support them. (This is the subject of the Cost-Benefit Handbook, but the issues need to be drawn into the overall offset design).

Most offset policies explicitly or implicitly require in situ conservation results that match the project's impacts. Capacity building, education and research to support this can be extremely valuable but are generally not regarded as part of the calculation of the core offset, unless they also give rise to measurable on the ground CONSERVATION OUTCOMES.

Additionality: An offset should deliver CONSERVATION GAINS over and above what is already taking place or planned. A fundamental precept of biodiversity offsets is that they deliver results that would not have happened anyway in the absence of the offset. This means that calculations of loss and gain need to take into consideration the biodiversity BASELINE and trends.

Multipliers: Offset multipliers and TIME DISCOUNTING may be applied to increase the offset area in order to be confident of achieving no net loss, given the simplifications that are made in measuring biodiversity and the uncertainties involved and the likely time lags between the development project's impact and the offset achieving its objectives. While multipliers are a common feature of offset policies, their application to voluntary offsets is a recent phenomenon, and more research, societal debate and practice experience are needed to establish best practice. In addition to the scientific and mathematical aspects of offset multipliers lies the broader policy question of whether the developer alone should bear the total risk of the offset's failure, or whether that risk should be shared with society (in which case there may be more modest multipliers for developers).

1.4.2 Principles

The following Principles on Biodiversity Offsets were developed by members of the BBOP Advisory Committee, who support them and recommend them as the basis for the design and implementation of biodiversity offsets. The Principles represent the central plank of the BBOP products to date, and the other documents such as this one should be read as optional additional guidance to give them effect.

Principles on Biodiversity Offsets supported by the BBOP Advisory Committee

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development[11] 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.

These principles establish a framework for designing and implementing biodiversity offsets and verifying their success. Biodiversity offsets should be designed to comply with all relevant national and international law, and planned and implemented in accordance with the Convention on Biological Diversity and its ecosystem approach, as articulated in National Biodiversity Strategies and Action Plans.

1. **No net loss:** A biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.
2. **Additional conservation outcomes:** A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.
3. **Adherence to the mitigation hierarchy:** A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate AVOIDANCE, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.
4. **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.
5. **Landscape context:** A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.
6. **Stakeholder participation:** In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation and monitoring.
7. **Equity:** A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.
8. **Long-term outcomes:** The design and implementation of a biodiversity offset should be based on an ADAPTIVE MANAGEMENT approach, incorporating MONITORING AND EVALUATION, with the objective of securing outcomes that last at least as long as the project's impacts and preferably in PERPETUITY.
9. **Transparency:** The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.
10. **Science and traditional knowledge:** The design and implementation of a biodiversity offset should be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.

11 While biodiversity offsets are defined here in terms of specific development projects (such as a road or a mine), they could also be used to compensate for the broader effects of programmes and plans.

Part 2: The Offset Design Process

2.1 Introduction

There are many possible ways to design a biodiversity offset based on the principles described in Part 1, and the approach presented here is not intended to be prescriptive, but rather to offer some ideas and source materials that may be of use to offset planners, alongside other materials. This part of the Handbook offers general guidance on typical steps involved in designing a biodiversity offset, from the beginning (understanding the scope, nature and likely impacts of the project and who should be involved) to the selection of suitable offset locations and activities.

For each step, there is guidance on:

- The purpose of the suggested step (the intended outcome);
- The rationale behind the step (why a step of this kind may be helpful); and
- The questions it might be useful to answer in this step to be satisfied that an appropriate outcome has been achieved and to help focus on key issues.

This is linked to further information in Part 3 and the various Appendices, which offer possible approaches to answering these questions and thus to designing the offset.

Each group of people ('offset planners') setting out to explore the appropriateness of a biodiversity offset and perhaps to design one for their development project will need to adapt this and any other guidance they use to the specific policy, legal and practical contexts of the development project concerned. Many different methodologies can be used to answer the questions presented for each step. The important thing is for offset planners to be able to demonstrate a clear rationale for whichever methodology they choose, and communicate this to stakeholders, explaining how the offset has applied the principles described in the preceding section.

2.2 Overview of the offset design process

The offset design process is presented in a broadly chronological order and some later steps depend upon the outcomes from earlier steps. Nevertheless, it is recognised that some of these activities and steps are interdependent and may be addressed in parallel, rather than sequentially. This is particularly the case for the first four steps, all of which are necessary to understand a project's context, its likely implications for biodiversity, the likely need for and appropriateness of an offset, and who should be involved at what stage in the process of offset design.

Offset planners can also look for opportunities to bundle steps to achieve greater efficiency without undermining the quality of the offset design process. As there are often several ways of undertaking a particular step, we have tried to provide information and resources about alternative approaches in Part 3 and the Appendices. For instance, there are a number of different ways to quantify biodiversity loss and gain and this aspect of offset design is the subject of considerable ongoing debate among practitioners. Offset planners should choose the method most applicable to their specific project site and context, and best suited to available time and resources, provided that this enables them to apply the principles described in Part 1 and explain how this has been done. Table 1 summarises general steps, which can be adapted as necessary.

Table 1: Summary of steps in the offset design process

Step in offset design		Purpose
1	Review project scope and activities	To understand the purpose and scope of the development project and the main activities likely to take place throughout the different stages of its life cycle. Identify key decision 'windows' and suitable 'entry points' for integration of biodiversity offsets with project planning.
2	Review the legal framework and / or policy context for a biodiversity offset	To clarify any legal requirement to undertake an offset and understand the policy context within which a biodiversity offset would be designed and implemented. The policy context would cover government policies, financial or lending institutions' policies, as well as internal company policies.
3	Initiate a stakeholder participation process	To identify relevant stakeholders at an early stage and establish a process for their effective involvement in the design and implementation of any biodiversity offset.
4	Determine the need for an offset based on residual adverse effects	To confirm whether there are residual adverse effects on biodiversity remaining after appropriate application of the mitigation hierarchy, for which an offset is required and appropriate.
5	Choose methods to calculate loss / gain and quantify residual losses	To decide which methods and metrics will be used to demonstrate that 'no net loss' will be achieved through the biodiversity offset and to quantify the residual loss using these metrics.
6	Review potential offset locations and activities and assess the biodiversity gains which could be achieved at each	To identify potential offset locations and activities using appropriate biophysical and socioeconomic criteria, to compare them, and to select preferred options for more detailed offset planning.
7	Calculate offset gains and select appropriate offset locations and activities	To finalise the selection of offset locations and activities that should result in no net loss of biodiversity. Applying the same metrics and methods that were used to quantify losses due to the project, calculate the biodiversity gains that could be achieved by the shortlist of preferred offset options, check they offer adequate compensation to any communities affected so they benefit from both the project and the offset, and select final offset location(s) and activities.
8	Record the offset design and enter the OFFSET IMPLEMENTATION process	To record a description of the offset activities and location(s), including the final 'loss / gain' account which demonstrates how no net loss of biodiversity will be achieved, how STAKEHOLDERS will be satisfied and how the offset will contribute to any national requirements and policies.

The rest of this Handbook and its Appendices offer sources of information on how these steps might be taken in practice. As Box 3 explains, it will be important for offset planners to design their own approach that is 'fit for purpose', and practical for their individual circumstances.

Box 3: Developing a 'fit for purpose' approach to offset design – key practical considerations

In some situations, the information, time, or technical back-up and human resources to gather detailed baseline data to apply a comprehensive offset design process may be lacking.

In these situations, a carefully planned but simple approach drawing on expert opinion at each step may offer a practical basis for using the best available information. The approach taken should be based on a realistic appraisal of resources and should be 'fit for purpose', given the scale of the proposed project and the likely significance of its effects, without sacrificing the necessary rigour to ensure no net loss of biodiversity is achieved.

In situations where it is difficult to obtain comprehensive data, scientists from local research or academic institutions, government or non-government organisations, respected naturalists and community members with local knowledge may be able to help identify key biodiversity components, measure anticipated residual impacts and select suitable offset locations and activities.

When drawing on expert opinion, it is advisable to use more than one expert to increase the reliability of the information obtained and objectivity of the opinions that form the basis of decisions. It also helps to use a systematic approach, based on defensible criteria for choices, and to communicate transparently the process, information and opinions that shaped the offset design and the basis for the decisions taken.

Where there is uncertainty as to the adequacy of information on which the design of biodiversity offsets is being based, it may be appropriate to apply a MULTIPLIER or other precautionary approach when determining the size of offset that would be required to achieve at least a 'no net loss' outcome.

Step 1: Review project scope and activities

Purpose

To understand the purpose and scope of the project, and the main activities likely to take place throughout the different stages of the project life cycle. To identify suitable 'entry points' for considering the appropriateness of a biodiversity offset and integrating its planning with the project life-cycle.

Rationale

A good understanding of proposed activities is necessary to identify associated direct and indirect 'drivers of change' which might give rise to impacts on the composition, structure or functioning of biodiversity (Box 4). This requires information on the types and scale of activities in the development project, where they would occur and their timing, frequency and duration. This information can be used to identify environmental / biophysical changes that might translate into impacts on biodiversity.

Box 4: Drivers of change for impacts on biodiversity

The Millennium Ecosystem Assessment framework identifies direct and indirect drivers of change in ecosystems and associated ECOSYSTEM SERVICES. Direct drivers include changes in land use or land cover and biophysical changes such as might occur within a project FOOTPRINT. Indirect drivers include demographic, economic and socio-political changes such as might be induced indirectly or which might influence the significance of impacts. The CBD uses direct and indirect drivers of change as the framework for its guidance on biodiversity inclusive impact assessment (**www.cbd.int**). Changes in the direction or magnitude of these drivers caused by a project, give rise to impacts on biodiversity which then need to be assessed and evaluated (see Step 4).

In order to give appropriate consideration to biodiversity offsets during the project planning and / or impact assessment process, it is important to understand the proposed timeframe for project design and implementation and to be aware of any decision 'windows' or key milestones which might have a bearing on the decision as to whether a biodiversity offset is appropriate, and how its planning would be integrated with the project development process / lifecycle.

Questions to answer during this step

1. Is sufficient information available concerning the proposed project activities, including their type, location, magnitude, timing, frequency and duration for the various stages of the project lifecycle?
2. Is this information already available, or will it become available, as part of an ENVIRONMENTAL IMPACT ASSESSMENT (EIA)?
3. Are there obvious stages in the design process when this information will become available (e.g. 'design freezes' when project design parameters are fixed for a period, final investment decisions, etc)?
4. Are there key 'decision windows' by which certain offset steps might have to be completed to support project design / development?

Possible approaches to answering the questions and completing this step

There are many possible approaches to this step, depending on the corporate ENVIRONMENTAL MANAGEMENT SYSTEMS and associated procedures in place, as well as on the timeframes and processes for project development. Part 3 provides further guidance and tools which might be used to help understand the scope of a project and how best to integrate the processes of project development, ENVIRONMENTAL ASSESSMENT and biodiversity offset design, including:

- Reviewing the project development process and timeframe, including any environmental assessment processes [...more details]
- Identifying project activities / elements for each stage of the project lifecycle [...more details]

Step 2: Review the legal framework and / or policy context for a biodiversity offset

Purpose

To clarify any legal requirement to undertake an offset and to understand the policy context within which a biodiversity offset would be designed and implemented. The policy context would cover government policies and financial or lending institutions' policies, as well as internal company policies.

Rationale

It is useful to undertake a review of legal and policy frameworks that may influence a biodiversity offset prior to developing and implementing it.

Some national and local governments have enacted legislation or introduced policy guidelines for the design and implementation of biodiversity offsets. Also, financial or lending institutions may require compensation or offsets for impacts on biodiversity, as may the proponent's internal policies or standards. In addition, some more general law and policy, such as EIA and land rights, governs or affects project planning and can have a bearing on the procedure for designing a biodiversity offset as well as the nature of the offset likely to be required.

It may be helpful to conduct a high level review or preliminary assessment of biodiversity risks (and opportunities) at an early stage in project development and offset design. This would normally be based on existing information and would be used to highlight or 'red flag' any biodiversity issues associated with a project of this type in this location which might represent a significant business risk, for example operating in a global BIODIVERSITY HOTSPOT, a national park or an area where the project will have a significant bearing on how local people access and use biodiversity. If any 'red flag' issues emerge, the company may be able to dedicate additional resources to investigating them further, and undertake further steps such as those outlined in this Handbook earlier in the project lifecycle than might otherwise happen.

Questions to answer during this step

Biodiversity context / risks

1. Are there any relevant international agreements with implications for the conservation and use of biodiversity in the development project's area of influence?
2. Is the project located in an area that is particularly significant for biodiversity, e.g. a protected area, an area which is habitat for globally threatened or endemic species, or any other area of recognised biodiversity importance?
3. What are the key policy commitments to biodiversity at the national level? What bearing might these have on managing the project's impacts on biodiversity, including the use of biodiversity offsets?
4. Are there national or regional targets which might guide / help to focus priorities for offsets?
5. Have you read the National Biodiversity Strategy and Action Plan (NBSAP), and any regional development strategies, spatial plans, biodiversity conservation plans or other relevant policy documents that prioritise biodiversity areas in the landscape and suggest areas where biodiversity offsets are most likely to be acceptable and to endure successfully in the long term?

6. What information on biodiversity status and threats is given in the NBSAP? Could these and the priorities for conservation set out in the NBSAP provide guidance for the kind of biodiversity offsets that are desirable in the country?

Corporate policy / standards

7. Does the company proposing the project have any internal policies or standards relevant to biodiversity and / or biodiversity offsets, e.g. a company policy of 'no harm to the environment', 'NO NET LOSS of biodiversity' or a 'net positive impact' on biodiversity that might require or support biodiversity offsets or COMPENSATION for impacts on biodiversity?

8. Have you checked the loan conditions, policies or performance standards of any financial institutions responsible for assisting with funding the proposed project? Do these require or support the use of biodiversity offset or compensation requirements?

Policy / legal requirements

9. Are there any laws in the country or region that require, promote, facilitate or constrain the use of biodiversity offsets, remediation or compensation for negative impacts on biodiversity? Are you fully acquainted with their procedural and substantive requirements?
10. Is there a specific legal requirement to undertake an offset for residual adverse effects associated with this kind of project in this context and what requirements does it make concerning offset design and implementation?
11. Have you reviewed any existing law and policy that may have relevance to the design and location of biodiversity offsets, e.g. planning, land rights, human rights, natural resource rights of indigenous peoples and local communities?

Planning / development context

12. Do you have access to national and regional development strategies and poverty reduction strategies? These may reveal where there will be impacts that may be worthy of biodiversity offsets and they may also offer priorities for addressing livelihood needs through biodiversity offsets.

Possible approaches to answering the questions and completing this step

Part 3 provides further guidance on sources of information about legislation, policy and how to carry out a preliminary, high level or early review of biodiversity risks and opportunities and the availability of tools to assist in this, including IBAT:

- National legislation on biodiversity offsets […more details]
- Policies on biodiversity offsets and other relevant policies […more details]
- Early review of strategic biodiversity risks and opportunities […more details]

Step 3: Initiate a stakeholder participation process

Purpose

To identify relevant stakeholders at an early stage and establish a process for their effective involvement in the design and implementation of any biodiversity offset.

Rationale

From initial conception to long-term implementation, the success of a biodiversity offset depends on the involvement of stakeholders. Development projects have many different direct, indirect and CUMULATIVE IMPACTS on biodiversity, some of which affect a wide range of stakeholder interests. Stakeholders include persons or groups who are directly or indirectly affected by a development project or the related offset, or who have the ability to influence its outcome, either positively or negatively. These include persons or groups who hold rights over land and resources that might be affected (such as indigenous peoples and local communities) as well as institutions and organisations with authority for biodiversity planning and expertise in conservation (such as government departments, conservation NGOs and scientific organisations). The biodiversity and socioeconomic contexts for every project and offset differ, given varying levels of dependence on biodiversity for livelihoods, for instance, different values that people place on biodiversity and a variety of regulatory frameworks. Consequently, stakeholders and their interests will vary widely, as will appropriate ways to involve them in the review of development projects and offset design.

Questions to answer during this step

1. Is there an established stakeholder PARTICIPATION or community engagement programme for the development project, perhaps as part of the social or environmental impact assessment process or other initiative in the project area? Could this be used or expanded upon to accommodate key biodiversity stakeholders?
2. Are there existing stakeholder engagement plans or results from previous stakeholder engagement? If so, do these identify all relevant stakeholders, including those who currently use affected areas (for instance, those with regular access or rights to biodiversity and those responsible for managing or regulating its use) and also those further afield who may be affected by changes in biodiversity associated with the project?
3. Are the principal authorities responsible for biodiversity conservation involved in the project planning and EIA process (where relevant)? Could they advise or be involved in the design of the biodiversity offset design?
4. Have the main non-government organisations and scientific organisations with an interest and expertise in the affected biodiversity been earmarked for inclusion in stakeholder engagement?
5. Have all parties such as indigenous peoples and local communities, who may be negatively affected either by the project's impacts on biodiversity, or proposed activities at a POTENTIAL OFFSET SITE, and who may help to implement them, been included in stakeholder engagement? Are measures in place to pay particular attention to vulnerable groups (e.g. the poorest; the disabled; those without land or access rights; in some cases, women, young people or the elderly) or indigenous peoples?
6. What level of involvement do identified stakeholders wish to have in the offset design process?
7. Are there any particular requirements for effective communication with stakeholders, e.g. relating to language?

8. Have you considered undertaking additional surveys of indigenous peoples and local communities affected by or who should be involved in the project and offset, if gaps are identified?
9. Is it possible to communicate effectively with indigenous peoples, local communities and other key stakeholder groups, or would it be better to engage local specialists to do so?

Possible approaches to answering the questions and completing this step

It is important to ensure that all stakeholders with an interest in, or who could be affected by a proposed project's impacts on biodiversity or the offset itself, are involved in the offset design process. In the early stages of this process, it is important to ascertain the values of biodiversity to stakeholders since this will have a bearing on how 'BIODIVERSITY LOSS' is measured. Later, stakeholders' input with regard to the evaluation of potential offset sites and activities is generally essential to the success of the offset design process. Clearly, the level of engagement with stakeholders will change during the course of the offset design process, and it may be necessary to expand the stakeholder groups involved once offset options have been identified.

The Cost-Benefit Handbook provides guidance on working with local stakeholders to assess the implications for them of the project and any proposed offset, to arrive at a package of activities and compensation that benefits them and engages them in the design and implementation of the offset. In addition, a separate document, the Resource Paper on Biodiversity Offsets and Stakeholder Participation (see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/participation.pdf**) offers offset planners a brief overview of current best practice, listing source materials on this subject. The extent to which stakeholder participation is integrated with project planning and EIA varies considerably. In addition, existing procedures may not focus sufficiently on biodiversity (and those who need and use it) for the purposes of offsetting.

Part 3 provides advice on:

- Identifying stakeholders […more details]
- Developing a process for stakeholder participation / involvement […more details]

Step 4: Determine the need for an offset based on residual adverse effects

Purpose

To determine whether there are residual adverse effects on biodiversity remaining after appropriate application of the mitigation hierarchy, for which an offset is required and appropriate.

Rationale

The need for an offset depends fundamentally on whether to the earlier steps in the MITIGATION of adverse impacts on biodiversity associated with a project are sufficient for no net loss to be achieved. Before any offset is considered, the mitigation hierarchy should have been followed to ensure that all reasonable efforts have been taken to avoid and reduce harm to biodiversity caused by the project. This involves identifying opportunities to avoid, minimise and / or rehabilitate or restore affected biodiversity (in this order). Establishing that this has been done appropriately is an important step in biodiversity offset design, as it provides the basis for identifying the RESIDUAL IMPACTS for which an offset may be appropriate. It may also be helpful at this stage for the offset planner to determine whether the project will result in any impacts that cannot be offset (‘NON-OFFSETABLE IMPACTS’) and decide what steps to take in this case.

There are a number of issues that need to be considered in this step:

- Ensuring sufficient information is available about the composition, structure and functioning of biodiversity that might be affected;
- Selecting and applying criteria to identify ‘important’ biodiversity or ‘key biodiversity components’ to guide selection of methods to calculate loss and gain and site selection;
- Identifying key ecological dependencies for these;
- Reviewing / identifying the project’s adverse impacts;
- Ensuring the mitigation hierarchy has been appropriately applied; and
- Identifying residual adverse impacts and considering whether these can and should be offset.

The order and scope of activities within this step can vary considerably depending on whether and how offset design is integrated with other procedures for project environmental management and assessment. For instance, there are well established procedures for collecting and interpreting information on biodiversity and ecosystem services in Environmental Impact Assessment (EIA), and these can be used to provide a ‘before and after’ picture of the distribution, status and condition of biodiversity affected by a proposed plan or project. In development projects where an EIA has already been conducted and baseline assessments of biodiversity have been undertaken, this information can serve as a strong basis for beginning to consider biodiversity offsets. Ideally, offset considerations will have been included in the EIA, minimising the need for additional work, as much of the necessary information needed for the offset can be obtained in this way. Further biodiversity assessment work may be required if offset considerations were not part of the EIA process or if the EIA provides insufficient information about biodiversity. EIAs also vary according to local legislation and investors’ lending requirements, so any information gathered as part of the EIA process should be reviewed to check to what degree it provides the information needed to understand baseline trends in the distribution and status of biodiversity within the zone of influence of the project and within the wider landscape. If conducted independently from the offset design process, the EIA may not have been structured within a framework based on the goal of no net loss of biodiversity and may not have obtained the necessary data and quantified impacts on biodiversity using metrics suitable for purposes of offsetting. It is therefore helpful to assess the scope and quality of available data. It may be necessary to undertake supplementary field surveys to fill any data gaps identified.

Regardless of whether an EIA has been carried out, the offset planner will need:

- Comprehensive information on biodiversity which might be affected and its sensitivity and exposure to project activities (refer back to Step 1);
- An understanding of the conservation priority, importance or value of affected biodiversity;
- An understanding of key ecological dependencies for biodiversity that might be affected;
- An understanding of adverse effects on biodiversity that are likely to be caused by the project, and their magnitude and significance;
- Evidence that the mitigation hierarchy has been applied so that impacts are avoided, minimised or addressed through RESTORATION to the extent feasible;
- Information on the residual adverse effects which would remain following mitigation (this information will need to be quantified in order to carry out Step 5); and
- An analysis of whether residual adverse impacts can and / or should be offset.

It is important to take the particular context of the project into account when evaluating the potential significance of impacts and, more importantly, to consider the background rate of loss of, and pressures on, biodiversity. For example, where it is known that conversion of a particular ecosystem to commercial plantations has accelerated, impacts on remaining areas of that ecosystem would become increasingly significant. Also, where indigenous peoples or local communities are heavily dependent on biodiversity for their livelihoods, impacts are particularly significant and may be complex to offset. Any baseline information on biodiversity therefore needs to be considered within its wider context in terms of status, trends and key threats.

If the residual impacts are so significant that they cannot be offset (an extreme example would be project activities likely to cause the EXTINCTION of a species) it is highly advisable to face this issue squarely and openly. A well managed process will generate adequate information to make this determination very early, so that it can feed into the company's broader decision on whether to proceed and also any government authorisation or project consent process. This is why an early risk scoping exercise was recommended in Step 2 There is a scenario, however, in which information revealing that a project's residual impacts on biodiversity cannot be offset only comes to light after project approval. If the project does proceed in these circumstances, it will be important for the developer to be open about the fact that not all impacts can be offset, and to consider other contributions to conservation.

If the residual impacts can be offset, doing so then becomes the goal of the biodiversity offset and the subject of the next step (Step 5).

Questions to answer during this step

1. If an EIA has been carried out, are the results sufficiently comprehensive, detailed and robust to support effective offset design?
2. Regardless of whether an EIA has been conducted, have comprehensive surveys been carried out to identify biodiversity that might be affected, including information at the gene, species, assemblage and ecosystem level and in terms of composition, structural and functional aspects?

3. What is the conservation status of the key biodiversity components that will be affected at different spatial or geographic scales? Are there established criteria for reviewing this status or is it necessary to derive some?
4. Have impacts been identified for any known priorities such as populations of threatened or endemic species, significant concentrations and source populations and / or unique communities and habitats that may exist in the area?
5. Has sufficient BASELINE information been obtained about biodiversity composition, structure and function to understand ecological dependencies and relationships?
6. What proportion of overall ranges and population distribution might be affected?
7. Have impacts already been quantified in terms of biodiversity response and using 'CURRENCY' that can also be used to calculate LOSSES and GAINS for the purposes of designing an offset in Step 5?
8. To what extent can each impact be avoided, minimised, restored or offset?
9. Have mitigation requirements been fully integrated into the project's Environmental Management Plan?
10. Are there any impacts that would lead to irreplaceable loss of biodiversity? Check that none of the residual impacts are so significant that they can't be offset. Do relevant laws or policies refer to any thresholds e.g. for non-offsetable impacts?
11. If there are residual impacts that cannot be offset, have you planned an appropriate response? Options include either taking further steps than were initially planned avoid / minimise those impacts, to reconsider the project, or to proceed, acknowledging that it is impossible to offset the impacts. (In this case, other compensatory conservation measures could be very worthwhile, but it is important to be open with stakeholders about the fact that it is impossible to offset all the impacts).

Possible approaches to answering the questions and completing this step

Part 3 provides some guidance on:

- Ensuring sufficient information is available about the composition, structure and functioning of biodiversity that might be affected […more details]
- Selecting and applying criteria to identify 'important' biodiversity or 'key biodiversity components' to guide selection of methods to calculate loss and gain and site selection […more details]
- Identifying key ecological dependencies for these […more details]
- Reviewing / identifying the adverse impacts that have been identified […more details]
- Ensuring the mitigation hierarchy has been appropriately applied […more details]
- Identifying residual adverse impacts and considering whether these can and should be offset […more details]

Step 5: Choose methods to calculate loss / gain and quantify residual losses

Purpose

To decide which methods and metrics will be used to demonstrate that 'no net loss' will be achieved through the biodiversity offset and to quantify the residual loss using these metrics.

Rationale

This step is about establishing a robust and transparent 'accounting' process to demonstrate how biodiversity losses and gains will be balanced to deliver no net loss or a NET GAIN of biodiversity. It draws on information from Step 4 to establish how much loss of biodiversity would result from the project's residual impacts.

Each offset should demonstrate additional, measurable CONSERVATION OUTCOMES that at least balance or go beyond redressing biodiversity losses associated with a project. What sets a biodiversity offset apart from other forms of ecological compensation is that the project's residual impact on biodiversity is quantified and used to determine the amount, nature and scale of conservation outcome realistically required to offset that impact. Quantifying the loss caused by the project and the additional gain in conservation outcome required from the offset is thus inherent to a biodiversity offset.

The underlying theoretical assumption is that the offset should address all residual losses for all affected biodiversity, but it is rarely either possible or practical to document and quantify losses for every component of biodiversity or for all dimensions of structure and function. Most approaches therefore demonstrate no net loss using METRICS based on SURROGATES for the entirety of biodiversity which can realistically be measured. These metrics are used in the calculations used of 'no net loss'. The use of surrogates is a practical approach. It cannot do justice to all components of biodiversity, but has the benefit of being workable. In order to build understanding and support for this approximate approach to quantifying loss and gain, it is very valuable for offset planners to select, develop and apply the metrics with the participation of stakeholders and to report the approach used and results transparently.

There are qualitative and quantitative aspects which need to be taken into account to decide whether gains through an offset are commensurate with the losses of biodiversity due to a project and thus balance them:

What should be offset (no net loss of what?)

It might be necessary to define and limit (for example through 'exchange rules'):

Which components, or aspects of structure and function of biodiversity might be exchanged for others within the same habitat and still result in 'no net loss' (i.e. trading biodiversity components within an 'IN-KIND' offset);

Whether the components of biodiversity provided through an offset are equivalent (or better) than those affected (i.e. TRADING UP to an 'OUT-OF-KIND' offset).

How to measure the amount of biodiversity that needs to be gained for 'no net loss' to be achieved?

It is necessary to define ***metrics or currencies*** (at least in part quantitative, with some qualitative elements) which can be used to consider how much biodiversity will be lost through a project's residual impacts or gained as a result of a biodiversity offset in terms of the amount, distribution and persistence of biodiversity.

It is generally necessary to identify suitable surrogates for the composition, structure and function of biodiversity as the basis for metrics for the loss and gain of biodiversity at species, community, ecosystems or landscape level as not all aspects are measurable. Populations or other measures of SPECIES DIVERSITY and abundance may be directly measurable for some species. For others, availability of suitable habitat can serve as a good surrogate measure for populations of different species and also the communities or assemblages that occupy the habitat.

There is no single, best way to measure loss / gain and a wide range of 'metrics' for quantifying biodiversity have been developed to address policy requirements for 'no net loss' over the last 40 years. These include various measures of area, ECOSYSTEM FUNCTION or structure and population status. The majority use some measurement of land area as a basic unit for calculating the CONSERVATION GAIN that must be achieved, but vary in terms of how land measurements are adjusted to account for differences in the composition, structure and function of biodiversity, and thus its condition.

Habitat is a useful concept for loss / gain calculations, because it lends itself to identification of areas of land and uses these as a PROXY for 'carrying capacity' with respect to individual or multiple species. Most offset methods consider the areas of land available to key species, species populations or communities / assemblages and also the capacity of these areas to support them in a viable condition (generally referred to as 'habitat quality'). In this case, measures of area are generally combined with some measure of quality, health or condition of the habitat,

There are also situations where measures of habitat area and quality are not a good proxy for losses at the species level, and it is necessary to carry out more detailed population assessments. There are several approaches currently under development which are intended to deal more effectively with the viability of species populations and their persistence in space and time. Species-specific assessments may be advisable for key species, particularly where these are highly threatened or where significant residual adverse impacts are not directly linked to amount, structure or configuration of habitat, but are expressed more directly at population level (for example through disturbance or roadkill).

Questions to answer during this step

1. Have residual losses of biodiversity been quantified through EIA in a suitable way or is it necessary to quantify impacts further in order to be able to demonstrate no net loss through a biodiversity offset?
2. Have you clarified, in a statement, what is understood by the goal of 'no net loss' (or a 'net gain') of biodiversity for your offset project?
3. Have you reviewed the advantages, disadvantages and applicability of different loss / gain metrics (for instance: area based; area x quality; species density and occupancy)?
4. Have you determined which metric or set of metrics are most suitable within the specific context of the project to demonstrate 'no net loss'? Can these be measured in a way that would demonstrate this outcome clearly?
5. Are you satisfied that the metrics will adequately quantify the losses at the species, communities and assemblages, habitats, and ecosystem levels?
6. While the aim of the offset should be to ensure no net loss of all biodiversity components, have you decided which components of biodiversity to use to quantify loss and gain (as surrogates for biodiversity in its entirety) using the metrics you have chosen?

7. Have you established the most appropriate metrics to calculate the residual loss of use and CULTURAL VALUES of biodiversity? Will you be measuring components of biodiversity alone for this purpose, or supplementing them with economic valuation methods?

8. Have you captured, in a statement, the rationale for your choice of metric?

Possible approaches to answering the questions and completing this step

Some selected examples of possible approaches to measuring losses and gains are outlined in Part 3 and described in more detail in the Appendices to the Offset Design Handbook (separate document – available at **www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh-appendices.pdf**). Some are already in use to meet existing legal or policy requirements, including:

- The United States' HABITAT EVALUATION PROCEDURE (HEP) (see Appendix A.2).
- The State of Victoria's (Australia) HABITAT HECTARES method (see Appendix A.6).
- The South Australia SIGNIFICANT ENVIRONMENTAL BENEFIT (SEB) approach (see Appendix A.8).
- The Western Cape of South Africa Provincial Guideline on Biodiversity Offsets (Final Draft Edition 2) (see Appendix A.9).

Most of these use some measure of habitat adjusted by measures of 'quality' and are designed to make an explicit contribution to regional or national objectives for BIODIVERSITY CONSERVATION and sustainable use. Others have been developed for voluntary application or are still under development. These include:

- The approach used in the BBOP Pilot Projects (see Appendix C.1).
- REMEDE Toolkit (see Appendix C.2).
- New Zealand Risk Index Method (see Walker *et al.* 2008) (see Appendix C.3).
- Zonation (Moilanen *et al.*, in prep.) (see Appendix D.1).

Part 3 provides more guidance on how to select suitable methods and on:

- Deciding how 'NO NET LOSS' will be determined […more details]
- Deciding what metrics and methods will be used to quantify losses due to a project and gains required through an offset […more details]
- Using a BENCHMARK […more details]
- Using appropriate methods to calculate gains required […more details]

Step 6: Review potential offset locations and activities and assess the biodiversity gains which could be achieved at each

Purpose

To identify potential offset locations and activities using appropriate biophysical and socioeconomic criteria, to compare them, and to select preferred options for more detailed offset planning.

Rationale

Once the biodiversity that will be lost as a result of a project has been defined and quantified, a typical next step in the offset design process is to identify a list of possible locations and activities that could offset these losses. Potential locations that do not offer reasonable opportunities to provide an equivalent or greater gain in biodiversity than will be lost through the project's impacts can then be screened out as early as possible. To focus efforts, it often helps to compare potential locations using appropriate biophysical and socioeconomic criteria and pick a short-list of suitable sites, bearing in mind whether these sites are likely to be feasible in reality, in terms of their availability and social and political support. The potential 'additional' gains in biodiversity through conservation and sustainable use activities at each of the shortlist sites can then be assessed and compared in the next Step in order to pick one or more sites that will deliver the intrinsic, use and cultural values of biodiversity needed to offset the development project's impacts adequately and ensure the motivation and involvement of stakeholders.

There are a number of issues that need to be considered in this step:

- Whether the offset should be 'in-kind' or 'out-of-kind'.
- Being satisfied that the offset will provide 'additional' conservation outcomes and that the offset isn't simply displacing harmful activity to elsewhere.
- Being satisfied that the offset will make a contribution to relevant biodiversity goals and targets.

First it is likely to be necessary to decide whether an 'in-kind' or 'out-of-kind' offset is most appropriate, since this establishes the criteria for identification of suitable sites and activities to offset the loss of INTRINSIC, use and cultural values of biodiversity. Biodiversity offset policies around the world are often based on the principle of 'LIKE-FOR-LIKE or better'. The most desirable outcome is generally to offset the biodiversity components to be impacted by targeting the same biodiversity components elsewhere (an 'in-kind' offset). In certain situations, however, the biodiversity to be impacted by the project may be neither a national nor a local priority, and there may be other areas of biodiversity that are a higher priority for conservation and sustainable use and under imminent threat or need of protection or effective management. In these situations, it may be appropriate to consider an 'out-of-kind' offset that involves 'trading up'; i.e. where the offset targets biodiversity of higher priority than that affected by the development project.

The concept of 'ADDITIONALITY' is a fundamental principle for biodiversity offsets. An offset should deliver conservation gains over and above planned or predicted conservation actions being taken by other parties (otherwise the offset is making no difference). So, it is important to check that the conservation gains planned through the activities at the offset site(s) would not have happened anyway, in the absence of the offset. By comparing how the biodiversity components are predicted to change under the *status quo* scenario with how they would change under the offset scenario, offset planners can calculate the expected conservation gain. This can enable them to compare the relative value of the potential offset site(s) and the level of potential conservation gains that could be achieved at each.

In practice, biodiversity gains can be achieved in a number of ways, such as:

- **Undertaking positive management interventions to restore an area or stop degradation**: improving the conservation status of an area of land by restoring habitats or ecosystems and reintroducing native species. Where proven methods exist or there are no other options, reconstructing or creating ecosystems. Also, reducing or removing current threats or pressures by, for instance, introducing sustainable LIVELIHOODS or substitute materials.
- **Averting risk**: Protecting areas of biodiversity where there is imminent or projected loss of that biodiversity; entering into agreements such as contracts or covenants with individuals in which they give up the right to convert habitat in the future in return for payment or other benefits now.
- **Providing compensation packages** for local stakeholders affected by the development project and offset, so they benefit from the presence of the project and offset and support them. (This is the subject of the Cost-Benefit Handbook – see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf** – but the issues need to be drawn into the overall offset design in a Step such as this one.)

Decisions on all of these issues can be guided by national biodiversity and sustainable development priorities and LANDSCAPE LEVEL PLANNING. National biodiversity strategies and action plans (NBSAPs) and other biodiversity mapping, conservation and development planning documents that describe goals, targets and priorities of a country or region or local area may be helpful at this stage. They can offer a good basis for reviewing biodiversity that will be affected and deciding whether an ‘in-kind’ offset or an ‘out-of-kind’ offset conserving components of higher conservation priority is likely to be appropriate.

Questions to answer during this step

1. Have you determined whether it is more appropriate to achieve no net loss of biodiversity through an ‘in-kind’ offset (i.e. conserving substantially the same kinds of biodiversity components in a similar ecosystem to that affected by the project) or whether to ‘trade up’ to a higher conservation priority ‘out-of-kind’ offset (i.e. to conserve biodiversity components that are different from (and higher conservation priority than) those affected by the project)?
2. Similarly, have your discussions with stakeholders, particularly local stakeholders such as indigenous peoples and local communities, established what kind of OFFSET ACTIVITIES are appropriate to address impacts on the use and cultural values of biodiversity? (See Step 2 of the Cost-Benefit Handbook – **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**).
3. Have you identified a set of conservation targets for the offset and used these to identify a list of potential sites and activities?
4. Have you considered the socioeconomic and biodiversity planning context for potential offset location(s) and activities?
5. Have you identified a range of offset activities that support sustainable use and conservation of cultural as well as intrinsic values of biodiversity?
6. Have you checked whether the offset locations(s) or activities would meet any regulatory requirements?
7. Are the offset activities and locations you are considering likely to be able to give rise to a gain in conservation status (i.e. ‘additionality’) sufficient to merit more detailed consideration in the next step? Is there room for improvement in conservation status (i.e. gain of biodiversity) at each potential offset site sufficient to achieve no net loss or net gain?

8. Would the offset be viable in terms of size, and appropriate in terms of landscape level (ECOREGIONAL) PLANNING? Spatially, could the offset make a valuable contribution to corridors, CONNECTIVITY, buffer zones, and adaptation to climate change?
9. Have you considered a number of options for biodiversity offset locations and activities and narrowed them down to a small shortlist of promising options, based on your answers to the questions above?
10. Have you captured an explanation and justification for your decision?

Possible approaches to answering the questions and completing this step

Part 3 provides more guidance on:

- Deciding how to go about selecting potential offset locations and activities […more details]
- The role of landscape level planning […more details]
- Criteria for site selection […more details]
- Selecting suitable activities […more details]
- Determining whether the offset should be IN-KIND or OUT-OF-KIND […more details]
- Being satisfied that the offset will provide 'additional' conservation outcomes and that the offset isn't simply displacing harmful activity to elsewhere […more details]
- Tools that can be used to guide offset site selection […more details]

Step 7, which involves quantification of potential gains, would generally only be carried out for shortlisted options.

Step 7: Calculate offset gains and select appropriate offset locations and activities

Purpose

To finalise the selection of offset locations and activities to ensure no net loss of biodiversity. Applying the same metrics and methods that were used to quantify losses due to the project, to calculate the biodiversity gains that could be achieved by the shortlist of preferred offset options, check they offer adequate COMPENSATION to any communities affected so they benefit from both the project and the offset, and select final offset location(s) and activities.

Rationale

Having developed a shortlist of potential offset sites, offset planners typically conduct a more detailed comparative review of relative advantages and disadvantages of the options before they make a final choice as to one of more offset locations and activities. This step builds on the results of the previous step and helps to ensure that the offset sites and activities ultimately chosen (whether these are conservation, livelihood or AMENITY activities) will meet the offset's objectives and stand a good chance of success.

In the final stages of offset design, the key goal is to establish that the conservation and livelihood activities planned through the offset would be sufficient to offset the losses caused by the project's impacts, taking into account the probability of the offset being fully implemented, and the likelihood that the offset will be feasible, accepted by stakeholders, and likely to succeed in the long term.

This step involves:

- Checking that KEY BIODIVERSITY COMPONENTS would be represented in the offset;
- Calculating the amount of biodiversity that could be gained through the offset(s) at the preferred location(s), and considering which (if any) 'MULTIPLIERS' may be appropriate to use to plan a 'no net loss' offset in the face of risk and uncertainty;
- Checking that the offset will be viable and able to support key biodiversity components, for example that it provides minimum viable habitat or is of adequate scale for key ecological processes;
- Checking that the offset would be compatible with any broader spatial and conservation plans (see also previous step);
- Integrating the conservation activities with sustainable use projects and compensation addressing use and cultural values;
- Determining whether a single offset location or a 'COMPOSITE' OFFSET is preferable; and
- Checking acceptance, stakeholder support, feasibility and likelihood of success.

Calculation of potential biodiversity gain

The possible conservation gains that can be achieved at a given site will depend on the biodiversity already at the site, its restoration potential, the background rate of loss and drivers of this loss, the likely success of any intervention and the level of commitment, support and resources available. As explained earlier in this Handbook, there are many possible ways to calculate loss and gain of biodiversity, but whatever method has been used to quantify residual losses should be applied in this step to compare the possible gains that could be achieved through offset activities at shortlisted locations.

Additionality

The importance of 'additionality' – demonstrating that the offset interventions are bringing about conservation gains that would not otherwise happen – was explained in Step 6. As the shortlist of potential offset sites and activities are assessed, one major criterion for the final decision on offset design is whether the proposed offset will deliver sufficient additional offset gains to balance the project's impacts.

Use of multipliers

Once the basic calculation as to the potential biodiversity gain through the offset has been undertaken, there is an additional aspect of the gain calculation to consider: the use of 'multipliers'. Offset multipliers may be applied to increase the offset area in order to be confident of achieving no net loss. For instance, it may be necessary to adjust the area and amount of biodiversity that needs to be gained through the offset to take account of factors such as uncertainty about outcome (e.g. restoration methods are not always reliable) or to compensate for temporal loss of biodiversity in cases when there is a time lag between the impact and the offset achieving its objectives.

Offset policies around the world offer several rationales and different approaches to r employing multipliers, including:

- Multipliers to deal with uncertainty in offset success.
- Multipliers to ensure no net loss with respect to conservation targets and rare / threatened biodiversity components.
- Multipliers to deal with time discounting and time preference.
- Multipliers to deal with out-of-kind offsets.

Even in the absence of regulation or guidelines stipulating particular multipliers, the planners of a voluntary offset may wish to consider whether multipliers should be used to ensure that the offset will deliver no net loss, addressing the questions described below. While regulatory models often prescribe the multipliers (or 'ratios') to be used, the basis for developing multipliers for voluntary offsets is very new, so the introduction and guidance offered in this Handbook is tentative and preliminary.

Viability and landscape context

When the potential offset sites were first identified and assessed, as proposed in Step 6, it may have been possible to check whether an offset in the potential locations would be appropriate in terms of landscape level (ecoregional) planning and could make a valuable contribution to LANDSCAPE CONNECTIVITY, buffer zones and adaptation to climate change. At this point, the final offset site or sites is being selected, so it is advisable to check that it will be viable in terms of size and will fit well within the LANDSCAPE CONTEXT. The minimum area required to support key biodiversity components needs to be considered as well as any scale-dependent ECOSYSTEM PROCESSES. The area required may vary depending on its landscape context. An offset location might need to function independently or it could be located next to an existing area of habitat or form part of a connected network of habitats that are already at a sufficient scale to function viably. This step therefore involves checking that the offset area is adequate for key biodiversity components to persist and function viably in the long term, considering its context within a broader landscape, such as connectivity to other sites.

Livelihoods and stakeholder buy-in

In this step, the shortlist offset options will need to be carefully assessed to check that they address not only the intrinsic but also the use and cultural values of biodiversity, to compensate local stakeholders for the development project's impacts on local their cultural and USE VALUES and to motivate them to support the offset's conservation activities (See also the Cost-Benefit Handbook).

Single-site or composite offsets?

It may be possible to offset loss of use or cultural values of biodiversity in the same location and through the same activities as planned to offset intrinsic values. However, in some situations it may be necessary to consider additional offset areas and activities (a 'composite offset') to ensure that there is no net loss of intrinsic, use and cultural values, and that the interests of different stakeholder groups are addressed.

Final selection and reality check

Some offset design methodologies continually assess the feasibility and probability of success of offset options from the outset and throughout the offset design process. For instance, in the modified habitat hectare and species approach developed by BBOP and tested at its pilot sites, the chances of success of each offset intervention on the different components of biodiversity used to calculate loss and gain is factored into the equation. Also, the extent to which individual offset options present a practical reality and will enjoy the necessary political support at the national and local levels is considered at the earliest stages of identifying offset options. However, regardless of the design methodology used it is vital for offset planners to check the feasibility and chances of success of the offset before making the final choice as to its location and activities. The offset must stand a good chance of succeeding in practice, and not just on paper.

Questions to answer during this step

1. Have you verified that the offset site(s) or activities would meet any regulatory requirements?
2. Have you selected the offset site(s) and activities needed to achieve the offset objective of no net loss or a net gain of biodiversity, including biodiversity components of intrinsic value, as well as use and cultural values?
3. Does the offset meet the requirements of an 'in-kind' offset (i.e. conserves substantially the same kinds of biodiversity components in a similar ecosystem to that affected by the project)? Are the key biodiversity components present at the offset site(s) and can their conservation status can be improved?
4. Where 'out-of-kind' offsets are proposed (i.e. offsets which conserve biodiversity components that are different from those affected by the project), have you demonstrated that the biodiversity gain at the 'traded up' offset site(s) would fully compensate for the residual negative impacts on biodiversity components on the project site?
5. Have you checked that the biodiversity gains that can be achieved through the offset are sufficient to achieve no net loss or a net gain'?
   - Have you compared how the biodiversity components are predicted to change under the *status quo* scenario with how they would change under the offset scenario, in order to calculate the expected conservation gain? Is there sufficient room for improvement in conservation status (i.e. gain of biodiversity) at the offset site sufficient to achieve no net loss or net gain?
   - Have you applied a reliable methodology for calculating the amount of biodiversity that can be gained as a result of the offset?
   - Where activities to divert or reduce current pressure on priority biodiversity have been identified as a way of achieving biodiversity gain, is there a high level of confidence that they would be effective? If there is any doubt, have you adjusted the scope, intensity or nature of activities accordingly to minimise risks?

6. Would the offset be beneficial from the perspective of stakeholders, particularly local communities?
    - Would the offset site(s) provide full compensation to affected parties for the residual negative impacts on the use and cultural values associated with loss of biodiversity at the project site?
    - Do local stakeholders such as indigenous peoples and local communities support the offset and have you developed an appropriate package of benefits for them in order to deliver the offset's objectives?
7. Is it possible for the offset activities to contribute to the priorities established in the National Biodiversity Strategy and Action Plan, and, with respect to the cultural and use values of biodiversity, to any broader national strategies on sustainable development?
8. Where the proposed offset could displace existing pressure on biodiversity at the offset site to another location ('LEAKAGE'), have you planned appropriate activities to rectify this additional biodiversity impact?
9. Have you checked that the site(s) and activities finally selected for the offset are viable in terms of size, and appropriate in terms of landscape level (ecoregional) planning? Are you sure that:
    - The potential offset location would be sufficient (alone or in combination with others) to support into the long term the key biodiversity components for which an offset is being sought, considering area and context within a broader landscape (i.e. connectivity to other sites)?
    - The offset would provide a viable area for the key biodiversity components to persist in the long term?
    - The best possible locations have been selected to optimise contributions to landscape level conservation goals?
10. Is it advisable or required to use a 'multiplier' to increase the ratio of area conserved to area impacted to help account for the risk that some offsetting activities will not achieve their full conservation potential? In that case, have you studied the rationale for using multipliers in different circumstances, defined an appropriate multiplier for the offset and applied it to the area to be conserved to arrive at the final offset area.
11. Have you checked that these offset options will also be feasible logistically and the there will be support from all the necessary stakeholders?
12. Have you recorded the rationale and supporting evidence for your choices and answers to the questions above?

Possible approaches to answering the questions and completing this step

Part 3 provides further guidance on how to check whether:

- The selected offset locations and activities will deliver gains sufficient to achieve no net loss or net gain and will be viable and appropriate within the landscape […more details]
- It is necessary to use any multipliers […more details]
- Local stakeholders support and benefit from the presence of the projects and the biodiversity offset […more details]

Step 8: Record the offset design and enter the offset implementation process

Purpose

To record a description of the location and offset activities and location(s), including the final 'loss / gain' account which demonstrates how no net loss of biodiversity will be achieved, how stakeholders will be satisfied and how the offset will contribute to any national requirements and policies.

Rationale

In the final step of the offset design process (before the emphasis switches to implementation), offset planners will generally wish to complete a document detailing the specifics of the proposed offset site and the activities involved. This can help them check that all the necessary aspects of offset design have been fulfilled and capture tidily in one place an explanation of the decisions they have taken, which can be used to communicate internally within the company and with stakeholders.

This initial description of the proposed offset can then be used for the more detailed consultative and planning process needed to move to implementation of the offset. (This latter process is described in the Offset Implementation Handbook[12]).

Questions to answer during this step

1. Have you clarified and captured in writing the overall objective, location(s), activities and stakeholders who will be involved in the offset?
2. Have you recorded the rationale for your decisions and the evidence to support this?

Possible approaches to completing this step

Part 3 provides two tools which could potentially used to document the results of the offset design process and to check that all necessary steps have been undertaken. These are an Offset Planner's Checklist and a Summary Table of Offset Design Activities.

12 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/oih.pdf**.

Part 3: Tools and Guidance

This part of the guide is structured around the steps outlined in Part 2. It provides further information on possible approaches to these steps and provides some possible tools and guidance to apply in carrying them out.

Step 1: Review project scope and activities

Understand the purpose and scope of the development project and the main activities likely to take place throughout the different stages of its life cycle. Identify key decision 'windows' and suitable 'entry points' for integration of biodiversity offsets with project planning.

This step covers:

- Reviewing the project development process and timeframe, including any ENVIRONMENTAL ASSESSMENT processes.
- Identification of project activities / elements for each stage of the project lifecycle.

Reviewing the project development process and timeframe, including any environmental assessment processes

It is important to be aware of important project deadlines and to understand the likely process and timeframe for project development so that the consideration of biodiversity offsets and their design can be integrated at appropriate stages. It is likely to be necessary to review the project development process and timeframe, including review of any Health, Safety and Environment Management Systems (HSEMS) the company uses, so that suitable 'entry points' for integration of biodiversity offsets with assessment and / or risk management procedures can be identified.

It is advisable to start this as early as possible in the project life cycle: late consideration of the possible need for biodiversity offsets, or lack of clarity about when key information might be required, can result in collection of the wrong or inadequate information or failure to allow sufficient time and resources for offset design, causing delays. If certain impacts on biodiversity are not capable of being offset, it is far preferable to understand these limitations from the earliest 'pre-feasibility' stage of the project, so this can be considered alongside other issues in the project approval process and the investment decision by the company.

Figure 2 illustrates one common relationship between the planning of biodiversity offsets and the impact assessment process. It may be helpful to consider a flow diagram that reflects the specific circumstances of the project concerned in order to determine the 'entry points' and 'decision milestones' for the project, and how the consideration and planning of a biodiversity offset might fit with these.

Table 2 shows how the steps in this Handbook might be integrated with typical stages in project development and with typical stages in environmental assessment.

Figure 2: Integrating biodiversity offsets with project planning

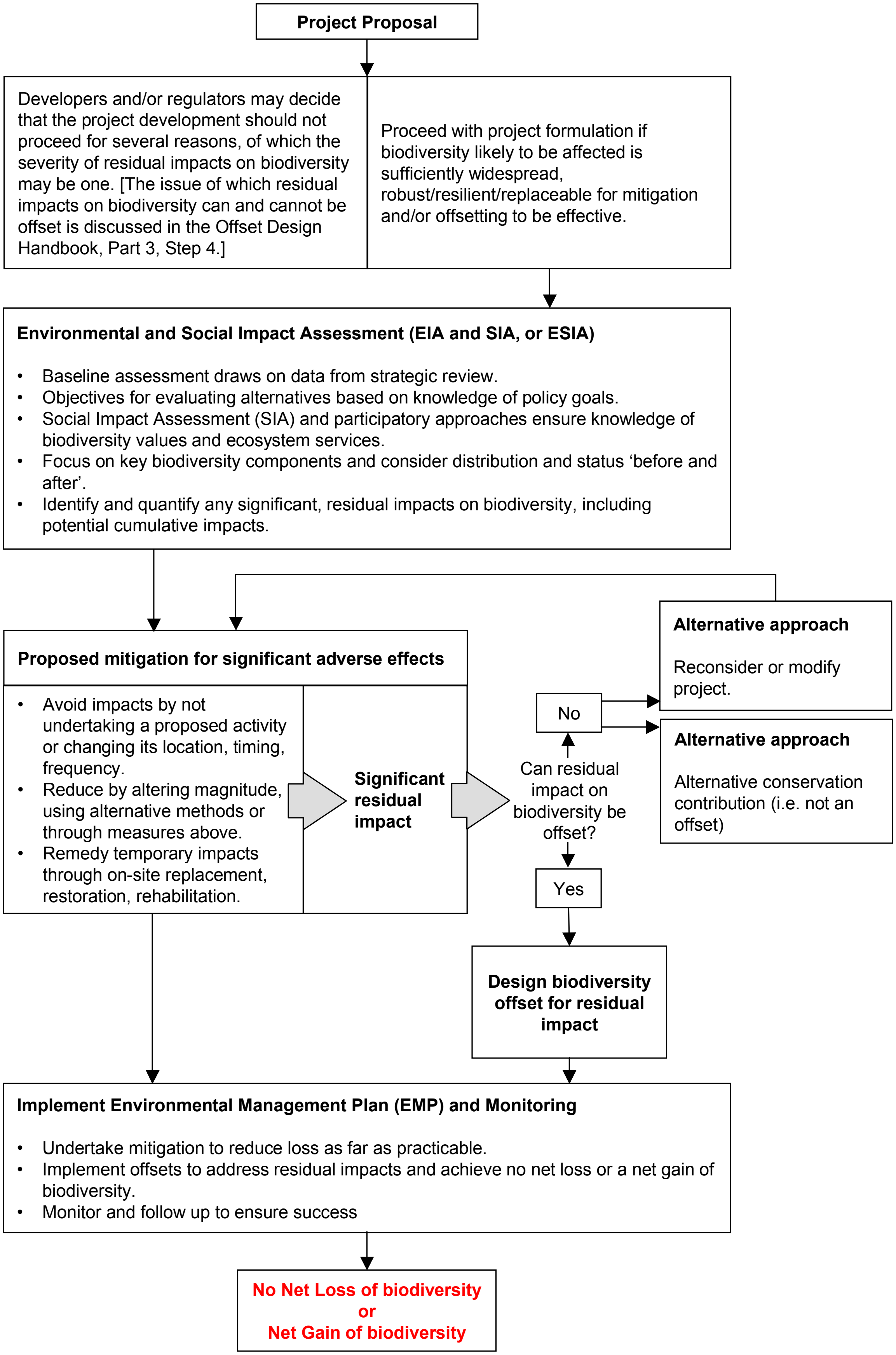


Table 2: How typical stages in project development might be integrated with environmental assessment activities and the steps in this Handbook

Stage in planning of development	Environmental assessment activities	Possible opportunities to integrate offset design steps
During BUSINESS CASE development / pre-feasibility	• Strategic review (through SEA or strategic risk assessments) • Environmental constraint studies • Strategic risk assessments	Gain understanding of: • Project lifecycle and key milestones and decision windows (Step 1). • Main activities likely to be associated with a development of this type (Step 1). • Biodiversity policy and goals may be reviewed at this stage if country of operation and possible broad locations have been identified (Step 2).
During inception phase for project proposal	Possible baseline assessment or preliminary baseline reviews	• Background trends in threats and rate of loss of biodiversity associated with this type of activity, e.g. level of cumulative impact due to previous projects of this type in this country / context (Step 2). • Potential role of offsets and availability of implementation frameworks, e.g. to meet policy goals (Step 2). • Stakeholders who should be involved and level of involvement required for key stakeholders (Step 3).
Project development or design	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) / EIA screening	• Whether or not the need for EIA is confirmed has a bearing on whether other procedures might be required to obtain information (Consider requirements under Step 4). • Presence of biodiversity triggers for EIA (e.g. risks to protected biodiversity) may also suggest / indicate possible need for offsets (Step 2).
Project feasibility or design	ESIA / EIA scoping	• Possibility of offsets informs scope (draw on results of Step 2). Stakeholder engagement is a key component for offset planning (Step 3). • Consider possible needs for finances to support offsets as well as possible need for land procurement negotiations with landowners. • Consider whether EIA scoping studies have identified the need for additional information to consider.
Detailed design	Assessment of impacts within the ESIA / EIA	• Impact assessment must quantify losses (Step 4). • The MITIGATION HIERARCHY should be followed before identifying residual adverse effects (Step 4). • Ideally impacts are assessed and quantified in such a way as to support the loss / gain calculations required to complete Step 5.
Detailed design	Identification of mitigation measures within the ESIA / EIA	• Include identification of need for offsets in cases where residual adverse effects remain after mitigation hierarchy is followed (Step 4). • Plan offsets to achieve 'no net loss' (Step 5): possible gains through offsets need to be quantified to demonstrate this (Steps 5, 6 and 7).
Project development / construction	EMP implementation and follow up	• Implement offsets and monitor their success / effectiveness. A balance sheet showing losses and gains may need to be produced so that the contribution made by the offset is clear (Step 8).

Identification of project activities / elements for each stage of the project lifecycle

The purpose of this task is to gain a preliminary understanding of what the development project is likely to entail. If possible, the offset planners should work with engineers and / or the project design team to review project activities / elements for each stage of the project lifecycle (e.g. from pre-feasibility through to CLOSURE). It may be useful to prepare a checklist of typical project activities as shown in Table 3 for an oil development. Another is included in the fictional Letabeng Worked Example[13]. When developing such a list, it is important to include both obvious and less obvious structures and activities that may be involved, and which could alter the bio-physical environment or context for biodiversity. Initial lists of project activities might be very broad.

If a biodiversity offset is considered during the pre-feasibility stage of a project, it is possible that a clear project description may not yet be available, due to remaining uncertainties in the project design and location. In this case, the planner will need to work with the best available data, and consider each of the various options under consideration for the scale and siting of the various elements of the project. Subsequent steps will enable the final design specifications and precise estimation of the project's impact on biodiversity to be more accurately assessed.

Table 3: Checklist of typical activities at different project stages for an oil development

Project stage	Project activity
Exploration seismic, drilling etc.	***Onshore:*** Provide access (airstrips, temporary roads) Set up and operate camps and fly camps Use of resources (water, aggregate) Storage of fuel Clear lines and layout geophones Shot hole drilling Use of explosives Closure of shot holes, mud pits, camps and access infrastructure Mobilise drill rig Drilling operations Well testing / flaring
	Marine: Vessel mobilisation and movement Vessel emissions and discharges Seismic operation Anchor rig / lower legs Use of chemicals Mud and cuttings discharge Fuelling and fuel handling Blow out risk

13 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/example.pdf**.

Project stage	Project activity
Construction	***Onshore:*** Set-up and operate construction camps Provide construction access Resource use (water, timber, aggregate) Import of heavy plant and machinery Vehicle movements Earthmoving, foundations, excavation Storage / use of fuel and construction materials Generation of construction wastes
	Marine: Mobilisation and movement of vessels Vessel emissions and discharges Anchoring, piling
Operation / production	***Onshore:*** Footprint Visible presence Import and export of materials and products Product handling, storage, use of chemicals and fuel Solid wastes arising Liquid effluent Emissions to atmosphere Noise Light
	Marine: Direct footprint Chemicals storage, handling and use Emissions to atmosphere Operational noise, helicopter supply and standby vessel movement Discharges to sea Oil spill risk Light

Source: Adapted from Shell's *Integrated Impact Assessment: Environmental Impact Assessment Module*, EP 95-0370, May 2002, as presented in the Energy & Biodiversity Initiative's 'Integrating Biodiversity into Environmental and Social Impact Assessment Processes.' The EBI document can be downloaded from **www.theebi.org/pdfs/esia.pdf** (August 2007).

When possible to do so, depending on the stage in the project development process, a complete description of the development project components (e.g. mine, port, quarry, roads) and activities (e.g. forest clearance, alteration in watercourses) will be required, including information on possible timing, frequency, duration, location. This can be refined as more information becomes available. Understanding of the boundaries or limits of project components and activities is also required to identify the project's area of influence and to help delimit study areas for impact assessment. It may be useful to map these (the fictional Letabeng Worked Example includes a sample map).

The Energy & Biodiversity Initiative has identified ten categories of SECONDARY IMPACT, along with a guidance question for each, to help ensure potential INDIRECT IMPACTS are identified during this step. These are summarised in Table 4:[14]

Table 4: Guidance on identifying activities likely to cause indirect impacts

Impact Category	Guidance Question
Access roads	Will the project result in the construction of new access roads to the site?
Increasing access to new areas	Could the construction of access roads lead to increased human access to the area?
Introduction of non-native species	Could the project result in the introduction of non-native species to the area?
Immigration	Could the project result in immigration into the area? (Note, this could take the form of workers and their families, but also can be the result of increased access to the area).
New settlement	Could the project result in the establishment of new settlements, either in the form of worker settlements, or the indirect result of increased access to the area?
Cultivation	Could the project result in increased levels of cultivation in the area?
Hunting and / or poaching	Could the project result in increased hunting or poaching levels in the area?
Gathering of non-timber forest products	Could the project result in increased gathering of non-timber forest products in the area?
Local commerce with communities	Could the project result in increased local commerce with communities in the area?

In addition to the potential for generating indirect impacts, a project may also contribute to cumulative impacts caused by the presence of a range of activities by several different developers ‘in combination’. Analysis of a project’s incremental impacts combined with the effects of other projects can often give a more accurate understanding of the likely results of the project’s presence than just considering its direct impacts in isolation. The project developer may therefore wish to establish a dialogue with other relevant projects and develop collaborative plans to address cumulative impacts if appropriate (on a voluntary basis or in response to a regulatory requirement). Potential in combination effects are an important consideration for offsets as the presence of other development projects may constrain availability of suitable offset locations.

Simple lists of activities can be developed further by categorising project activities and elements in terms of what is known about their location, timing, frequency and duration, as well as associated levels of certainty as shown in Table 5. It is important to do this from the perspective of likely implications for biodiversity, so it is preferable to avoid using terminology like ‘short’ duration as what seems short may nevertheless be significant from an ecological point of view if it coincides with a whole breeding cycle for example. The next step is to consider the types of environmental change that might result. The Millennium Ecosystem Assessment refers to these as direct and indirect drivers of change and they are considered further in Step 4.

14 Energy & Biodiversity Initiative Good Practice in the Prevention and Mitigation of Primary and Secondary Biodiversity Impacts available at **www.theebi.org/pdfs/practice.pdf** (August 2007).

The following Sample Project Activities and Elements Summary (Table 5) may offer ideas for a way to present the range, location, duration, timing and likelihood of the range of project activities throughout the project lifecycle.

Table 5: Sample project activities and elements summary

Lifecycle stage	Activity or element	Location	Duration*	Timing / frequency	Degree of certainty**
e.g. *Exploration* seismic, drilling etc.	Provide access (airstrips, temporary roads)	e.g. grid reference	3 months	In summer	High
	Set up and operate camps				
	Use of resources (water, aggregate)				
	Shot hole drilling				
	Use of explosives				
	Closure of shot holes, mud pits, camps and access infrastructure				
	Mobilise drill rig				
	Drilling operations				
	Testing of ore				
Construction	Vegetation clearance / soil stripping				
	Set-up and operate construction camps				
	Provide construction access				
	Resource use (water, timber, aggregate)				
	Import of heavy plant and machinery				
	Vehicle movements				
	Earthmoving, foundations, excavation				
	Storage / use of fuel and construction materials				
	Generation of construction wastes				
Construction *Operation / Production*	Vegetation clearance / soil stripping				
	Direct footprint				
	Visible presence				
	Import and export of materials and products				
	Product handling, storage, use of chemicals and fuel				
	Solid wastes arising				
	Chemicals storage, handling and use				
	Liquid effluent				
	Emissions to atmosphere				
	Noise				
	Light				

Lifecycle stage	Activity or element	Location	Duration*	Timing / frequency	Degree of certainty**
Decommissioning / Closure	Closure of mining pits and underground excavations.				
	Closure of storage sites				
	Demolishing of construction camps				
	Closure of access roads				
	Rehabilitation of mining pits				
	Rehabilitation of waste sites (slack dumps etc.)				
	Rehabilitation of access roads				
	Monitoring of site for liquid and gaseous emissions				

* Duration relates to the activity or component. If possible avoid use of categories like ‘permanent’, ‘long term’ etc. It is better to specify duration in terms of days, months or years so that it can be interpreted from an ecological perspective (e.g. 1 month can be a long time in the life of an invertebrate with a very short lifecycle).

** Degree of certainty relates to one or more of: the activity or component, its location and its duration (in certain cases the exact nature of some aspects of the project may be unconfirmed, uncertain or unknown). A qualitative assessment of certainty should be made (e.g. high, medium and low). Where uncertainty exists, the table should be revised as additional information becomes available.

Step 2: Review the legal framework and / or policy context for a biodiversity offset

To clarify any legal requirement to undertake an offset and / or understand the policy context within which a biodiversity offset would be designed and implemented if required, including government or authority policies financial or lending institutions' policies as well as internal company policies.

This step covers:

- National legislation on biodiversity offsets.
- Policies on biodiversity offsets and other relevant policies.
- Early review of strategic biodiversity risks and opportunities.

Reviewing national legislation

To determine whether or not biodiversity offset legislation exists in the country of operation, developers should generally begin by identifying those government agencies that may have offset policies and regulations and accessing any existing relevant legislation. This should then be thoroughly reviewed to obtain a good understanding of the requirements that will need to be met. These requirements should be incorporated within the offset design process to ensure full compliance.

If there are established laws and / or policies requiring offsets, it is helpful to clarify the circumstances which might trigger this requirement and to consider whether the proposed project is of such a type and in such a context that an offset might be required. It may therefore be helpful to conduct a high level review or preliminary assessment of biodiversity risks (and opportunities) at an early stage in project development. This would normally be based on existing information and would be used to highlight or 'red flag' any biodiversity issues associated with a project of this type in this location which might represent a significant business risk, for example operating in a global BIODIVERSITY HOTSPOT, a national park or an area where the project will have a significant bearing on how local people access and use biodiversity. If any 'red flag' issues emerge, the company may be able to dedicate additional resources to investigating them further, and undertake further steps such as those outlined in this Handbook earlier in the project lifecycle than might otherwise happen.

There are two basic types of laws or policies on biodiversity offsets:

- Laws that require biodiversity offsets in certain circumstances, such as in the United States, European Union, Brazil, Australia and South Africa; and
- Laws that may facilitate biodiversity offsets or trigger negotiations on offsets between developers and regulators, such as ENVIRONMENTAL IMPACT ASSESSMENT laws or planning laws.

While actual regulations will vary in terms of both geographic scope and the types of targets set, most offset legislation tends to include:

- A definition of the term offset and a high-level goal (e.g. no net loss) for guiding the development of offsets.
- Guidelines for determining when an offset may be required and when it may be inappropriate, due to the significance of the biodiversity impact.
- Reference to the mitigation hierarchy and guidance on the extent to which mitigation should be pursued before offsets can be considered.

- Guidelines or rules for the types of methodologies and / or metrics accepted in the calculation of BIODIVERSITY LOSSES and GAINS at the offset and IMPACT SITES.
- Ratios or multipliers established for critical impacts to ensure no net loss of biodiversity, or guidance for establishing such ratios.
- Guidelines or rules on setting geographical limits for screening POTENTIAL OFFSET SITES.
- Guidelines or rules on what types of activities constitute a biodiversity offset (e.g. financial contributions to funds vs. land purchases).

It should be noted that offset legislation and guidelines can be passed at both the national and sub-national, regional levels. For instance, in South Africa, the Western Cape state has developed offset legislation, but other states have not. Similarly, several Australian States have their own offset policies, but there is no detailed, national-level law on biodiversity offsets. It may also be necessary to look at legislation related to specific habitats, as some countries have developed offset programs targeted to specific ecosystems (e.g. the United States wetland banking programme).

Several publications on offset requirements around the world can be found in the BBOP Library: **http://www.forest-trends.org/biodiversityoffsetprogram/library.php**.

In countries such as the United States, EU and Australia that require a biodiversity offset or other forms of compensatory conservation, the offset will need to comply with the related regulatory requirement. If you are planning an offset in such a setting, a table like the one below may be helpful to review the typical major topics covered by such laws that may be relevant to your project, in order to better understand how they may affect the design of the offset.

A checklist of issues that are frequently covered in offset regulation is given in Table 6.

Table 6: Legislative review checklist

Issue often covered in offset regulation	What does the legislation say on this topic?	How does this affect your biodiversity offset design?
Definition & goal		
'Principles' for biodiversity offsets espoused in the policy instrument		
When an offset is required; when it is inappropriate		
Mitigation hierarchy and how it should be followed		
CURRENCY and metrics: How impacts and offsets are quantified? Structural, compositional, functional, socioeconomic aspects?		
Additionality and leakage: How are they dealt with?		
Ratios: Mitigation replacement ratios		
Geographical limits and site selection: Where should the offset take place? On-site, off-site, how far from the impacts can the offset take place? Watershed? Bio-geographical limits? Corridors?		
Activities: What counts as an offset, measurable CONSERVATION OUTCOMES only, or capacity building and research, too?		
Temporal issues: Timing of impacts vs. benefits. Duration of offset.		
Offset management, monitoring and compliance		

In many countries, there is no requirement for an offset *per se*, but laws on environmental impact assessment and project planning approval processes require the minimisation of environmental (including biodiversity) impacts and mitigation measures that can go as far as biodiversity offsets and offset RESIDUAL IMPACTS. Fiscal incentives, such as tax breaks, may even be available for companies implementing such measures.

In addition to legal provisions that require or facilitate biodiversity offsets explicitly, other areas of law are likely to shape the legal and institutional arrangements for an offset and the structure it will take. These include:

- Law on NGOs, civil associations and foundations.
- Law on trusts and CONSERVATION TRUST FUNDS.
- Land law.
- Law on conservation and protected areas.
- Law on legal status, legal personality, and contract.
- Law on the rights of indigenous peoples and local communities.

Section 2 of the Offset Implementation Handbook[15] offers a little information on these.

Reviewing policies on biodiversity offsets and other relevant policies

The policy framework for biodiversity offsets can be complex and it may be necessary to be aware of the implications of several relevant policies, including those of governments, authorities and any financial institutions that are involved, as well as corporate biodiversity policies of developers themselves. There are several possible sources of information:

- Enquiries of the Ministry of Environment of the country concerned and any local conservation agency should offer a good understanding of the regulatory authorities, legal requirements and policies relevant to biodiversity offsets.
- At the national level, enquiries of Ministries of Environment, Sustainable Development or Planning should identify copies of the country's current national sustainable development strategy, spatial and regional development plans, etc. In addition, the UN Department of Economic and Social Affairs' Division for Sustainable Development contains information on member countries' national sustainable development strategies and national reports: see **http://www.un.org/esa/sustdev/natlinfo/natlinfo.htm**.
- The requirements of any financial or lending institutions should be ascertained at project inception. The list of banks that have adopted the EQUATOR PRINCIPLES (which require biodiversity offsets in some circumstances) can be found at **http://www.equator-principles.com/index.shtml**.
- Review the biodiversity or environmental policy of the company undertaking the development project itself and consider whether voluntary offsets might be considered appropriate for significant adverse residual effects on biodiversity. Check whether specific requirements are included with respect to thresholds or criteria for deciding when offsets are appropriate.

15 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/oih.pdf**.

Early review of strategic biodiversity risks and opportunities

It may be helpful to gain a broad understanding of biodiversity goals, objectives and targets, (possibly through strategic risk assessment or similar procedures) to flag biodiversity related sensitivities, risks and opportunities and to ensure that these are recognised at an early stage, on a par with other design constraints. This is only possible at a stage when country of operation and possible broad locations have been identified. Possible 'red flag' factors are listed in Box 5. Project developers and offset planners can check the on-line Integrated Biodiversity Assessment Tool (IBAT) for some of this information: **http://ibatforbusiness.org/ibat/**.

Background trends in threats and rate of loss of biodiversity associated with this type of activity can also be reviewed (e.g. level of cumulative impact due to previous projects of this type in this country / context) to help gauge the extent to which biodiversity (including the potential need for an offset at some stage) is likely to represent a key issue for a development of this type.

Box 5: Possible biodiversity 'red flags'

Sites / areas

Is the project located in, adjacent to or near:

- An area recognised as having global or national biodiversity significance?
- An ALLIANCE FOR ZERO EXTINCTION SITE?
- A Key Biodiversity Area, including IMPORTANT BIRD AREAS?
- A Protected area, including nationally recognised sites, Man and Biosphere Reserves, Ramsar Sites and World Heritage sites? (see, for instance, http://ibatforbusiness.org/ibat/)

Species

- Are any globally threatened species (IUCN RED LIST CR, EN, VU) known to occur within the project area?
- Are any nationally threatened species or other species under legal protection (e.g. CITES) known to occur within the project area?

Communities / ecosystems

- Does the project area contain any nationally threatened communities or ecosystems?

Cultural / use values

- Does the project area contain any culturally and / or economically significant species or habitats?
- Are there local communities (including indigenous peoples) in the project area that rely on the biodiversity of the region for subsistence living (e.g. harvesting)?
- Are there communities that rely on the biodiversity of the region to provide ECOSYSTEM SERVICES (e.g. water availability and quality, air quality, climate stability)?
- Are there local communities (including indigenous peoples) that hold certain biodiversity features as culturally significant?
- Is the project area known to be important for archaeological, spiritual or historical reasons?

Step 3: Initiate a stakeholder participation process

To identify relevant STAKEHOLDERS at an early stage and establish a process for their effective involvement in the design and implementation of any biodiversity offset.

This step covers:

- Identifying stakeholders.
- Developing a process for stakeholder participation / involvement.

Identifying stakeholders

Achieving an early understanding of the full range of stakeholders who might have an interest in any potential offset is instrumental in the development of a credible, widely accepted and successful biodiversity offset. Stakeholders are persons or groups who are affected by, or can affect the outcome of a project. It is important to initiate an effective approach to PARTICIPATION as early as possible in the process of project development and offset design, to learn about the goals and roles of different groups with respect to biodiversity, to begin identifying appropriate methods of engagement with these groups and to confirm any critical stages at which various stakeholders should be engaged in the offset design process. This knowledge will prove instrumental in designing and implementing a biodiversity offset that stands a good chance of long-term success and sustainability. Stakeholders will vary from project to project as will the appropriate level of participation. They may be local communities, individuals, interest groups, government agencies or corporate organisations. They may include politicians, commercial and industrial enterprises, labour unions, academics, religious groups, national and international social and environmental groups, public sector agencies, citizens' organisations, and the media. It is especially important to seek out stakeholders who may be marginalised or not represented in formal structures, for example indigenous people, youth or women.

Developing a process for stakeholder participation / involvement

The stakeholder participation process should begin with a review of any existing stakeholder information already collected as part of any social and environmental impact assessment or existing general stakeholder engagement strategy. Depending on the scale of the project and level and complexity of participation required, it may be helpful to produce a STAKEHOLDER PARTICIPATION PLAN to identify who should be involved at each stage of the offset design and implementation process and to outline the resources needed to ensure effective participation.

The Table below (Table 7) is offers one way in which to capture such information. Participation plans may also include explanations of methods or approaches required and assign responsibilities and milestones for achieving key tasks. They may also be designed to track results and responses and to summarise any commitments that are made to stakeholders.

Table 7: Table describing potential roles of stakeholders during offset design and implementation

Name of stakeholder / group	Interest	Key stages for engagement	Required timing	Approach and resources required
NGOs / scientific organisations				
Government organisations				
Communities and individuals				
Private sector				

There is a great deal of guidance available on stakeholder participation and how to engage with different groups. BBOP has prepared a Resource Paper explicitly to capture current best practice on this subject (see Resource Paper on Biodiversity Offsets and Stakeholder Participation[16] and the Cost-Benefit Handbook also provides sources on a range of participatory methods. Local communities and indigenous peoples living within, adjacent to or near the project site deserve particular attention in the development of a stakeholder engagement strategy for the offset design process. Development projects can impact local communities in a variety of ways, but for the purposes of offset design it is important to focus attention on biodiversity related impacts that will affect local stakeholders and not to become distracted by other broader community impacts which fall outside the sphere of biodiversity offsets and should be included in other corporate responsibility programs.

Project planners will quickly need to identify those groups who should be involved in the initial stages of the design process, to allow project planners to begin scheduling preliminary meetings with each group. Stakeholders important to involve early on in the design of an offset project include communities living in or around the project site, government agencies and local authorities with oversight of the area, non-governmental organisations and conservation and socioeconomic experts with local knowledge of the area, and other companies operating within the region.

16 See **www.forest-trends.org/biodiversityoffsetprogram/guidelines/participation.pdf**.

Step 4: Determine the need for an offset based on residual adverse effects

Confirm whether there are residual adverse effects on biodiversity remaining after appropriate application of the mitigation hierarchy, for which an offset is required and appropriate.

This step covers:

- Ensuring sufficient information is available about the composition, structure and functioning of biodiversity that might be affected.
- Selecting and applying criteria to identify 'important' biodiversity or 'key biodiversity components' to guide selection of methods to calculate loss and gain and site selection.
- Identifying key ecological dependencies for these.
- Reviewing / identifying the adverse impacts that have been identified.
- Ensuring the mitigation hierarchy has been appropriately applied.
- Identify residual adverse impacts and considering whether these can and should be offset.

The principal activities in this step include reviewing EIA BASELINE data (where available) and / or completing a biodiversity assessment to obtain up to date and reliable information on the composition, structure and function of biodiversity that might be affected. For purposes of designing offsets, biodiversity assessments may need to cover wider areas than might be strictly necessary for EIA, in order to understand the landscape context of areas exposed to impacts and of potential offset locations. It is important to check that mitigation hierarchy has been appropriately applied to identify significant residual adverse effects for which an offset might be appropriate. Following application of the mitigation hierarchy residual adverse impacts should be reviewed to identify any which are so significant that they can't be offset.

Ensuring sufficient information is available about the composition, structure and function of biodiversity that might be affected

Determining the residual biodiversity impacts that need to be offset requires an understanding of the composition and structure of biodiversity affected, key aspects of ecosystem function and the project's impacts on biodiversity. This information may be available through existing or planned Environmental Impact Assessments or supplementary desktop and field-based research may be necessary. Box 6 lists some criteria for deciding when this might be the case. For projects where an EIA has already been conducted and baseline assessments of biodiversity at the site have been undertaken, existing information can serve as a strong basis for beginning to consider biodiversity offsets. Because EIA requirements vary according to local legislation and lending requirements, however, the information gathered as part of the EIA process should be reviewed / a gap analysis carried out to ensure that it is fit for purpose.

Box 6: Criteria for when supplementary fieldwork might be necessary

Although existing EIA information and desktop assessments can provide a good beginning for the key biodiversity components identification process, it will often be necessary to conduct additional field surveys, to fill in any identified gaps in the available data. The following criteria can help determine when additional field surveys may be needed:

- Data are not available for the entire project area.
- Contextual data are insufficient to enable interpretation of project area data.
- Data are not available for a complete set of seasons.
- Data for indirect and cumulative impact areas are not available.
- Data are clearly out of date and / or not relevant to current conditions (e.g. the site has changed significantly since the date of the most recent survey).
- Only qualitative data have been collected.
- Data gathering did not involve stakeholder engagement.

There are many different ways in which biodiversity data can be stored, managed and presented. It is very useful to have a good understanding of spatial context. If resources allow, geographic information systems (GIS) are particularly useful to support offset design as they support ready quantification of areas affected by impacts and can assist in identifying suitable offset locations.

Selecting and applying criteria to identify 'important' biodiversity or 'key biodiversity components'

It is necessary to consider the importance of biodiversity that might be affected and in some approaches to biodiversity offset design, 'KEY BIODIVERSITY COMPONENTS' are identified which form the focus of more detailed assessment. Many different criteria may be used to evaluate biodiversity, including the conservation status of species, the health or integrity of sites or ecosystems or associated values. Table 8 summarises some of the INTRINSIC, USE and CULTURAL VALUES that may be identified. The evaluations required can often be undertaken by the same practitioner, but input from local experts is advisable.

Table 8: Examples of intrinsic, use and cultural values

Intrinsic value / ecological role	Use value	Cultural value
Species (populations and habitat)		
• Protected species • Highly threatened species, e.g. IUCN Red Listed species • Keystone species or species performing a key ecological role, e.g. key predator, primary producer • Large or congregatory species populations • SITE ENDEMIC or restricted range species • Previously unknown species	• Species providing fuel, fibre, food, medicines, etc. • Alien invasive or pest species	• Totem species
Communities and ecosystems		
• Distinct or diverse communities or ecosystems (e.g. cave-dwelling invertebrates) • Locally adapted communities or assemblages • Species-rich or diverse ecosystems (tropical forest) • Communities with a high proportion of endemic or restricted range species • Communities with a high proportion of threatened and / or declining species	• Ecosystems with traditional uses, or which provide food or other resources • e.g. Primary tropical forests providing bushmeat, species-rich hay meadows or pastures, coral reefs used for eco tourism, wetlands used for fishing	• Sacred sites (e.g. sacred groves, burial grounds); sites of aesthetic importance
Whole landscapes / ecosystems		
• Key ecological processes such as seed dispersal; pollination, primary production, carbon sequestration • Areas with large congregations of species and / or breeding grounds • Migration routes / corridors	• Areas used for recreation or AMENITY, air and water quality regulation; soil fertility; pollination	• Sacred mountains or other landforms

Box 7 gives an example of some of the criteria used to prioritise biodiversity in the context of biodiversity offsets in South Africa.

Box 7: Example of how biodiversity is prioritised for offset design in South Africa

From Brownlie, 2005, De Villiers *et al.* 2005 and Department of Environmental Affairs and Development Planning 2007.

Evaluating biodiversity: which biodiversity components and features are considered particularly 'significant'?

- Significance of the affected biodiversity in a global context: its broad, 'bigger picture' status (e.g. global status, centre of endemicity, biodiversity 'hotspot', World Heritage Site);
- Significance of the affected area in a national context: its national status (e.g. priority area in NBSAP, protected area at national, provincial or local level, catchment or other regulated area);
- The threatened status of affected biodiversity in terms of the National Spatial Biodiversity Assessment and relevant biodiversity legislation (the National Spatial Biodiversity Assessment[17] should be a 'first stop' reference for any biodiversity assessment, as should the NBSAP which prioritises areas for action);
- IRREPLACEABILITY and significance in terms of any applicable biodiversity / bioregional / systematic conservation plans at national, provincial and local levels with regard to meeting conservation targets;
- Any unique or 'special habitats' or features (elements of significant biodiversity that would not be covered by considering coarser INDICATORS like threatened ecosystems) such as quartzitic patches, wetlands, calcrete outcrops, or habitat known to be important for migratory species, for particular life-stages of threatened or commercially important species etc.;
- The presence of protected or threatened species, 'keystone' species to an ecosystem (e.g. large predators), species on which ecosystem services rely (e.g. pollinators), and / or use of the site by threatened species at certain times (information from RED DATA BOOKS, provincial conservation agencies);
- Importance as a link or corridor to other fragments of the same habitat, to protected or threatened or valued biodiversity areas;
- Importance and role in the landscape with regard to a range of 'spatial components of ecological processes', comprising processes tied to fixed physical features (e.g. soil or vegetation interfaces, river or sand movement corridors, upland-lowland interfaces) and flexible processes (e.g. upland-lowland gradients and macro-climatic gradients), as well as important movement or migration corridor for species;
- The main uses and users of the area and its ecosystem goods and services: important ecosystem services (e.g. important water yield area, coastal buffer), valued ecosystem goods (e.g. harvestable goods important for lives and / or LIVELIHOODS), valued cultural areas;
- Its condition (e.g. extent of degradation or transformation);
- Any elements known to be particularly sensitive to change, dynamic or unstable elements;
- The main 'drivers' of ECOSYSTEM PROCESSES (e.g. fire, large herbivores) that must be maintained;
- Any trends in terms of land use pressures, increasing threats, degradation or deterioration.

17 Driver *et al*. 2005. This paper refers to the National Spatial Biodiversity Assessment (NSBA) of 2004. The NSBA gives the national ecosystem status (i.e. critically endangered, endangered, vulnerable or not currently threatened) for terrestrial, river, marine and estuarine ecosystems; wetlands are to be included in future.

Many development banks and many private companies have their own internal definitions for identifying 'important' biodiversity or 'natural habitat', expressed through various safeguard policies, such as the World Bank's Operational Policy 4.04, the International Finance Corporation's (IFC) Performance Standard 6 and the Inter-American Development Bank (IADB) Policy Directive B.9 (see Box 8).

For example, the IFC definition for critical habitats states: 'Critical habitat is a subset of both natural and MODIFIED HABITAT that deserves particular attention. Critical habitat includes areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for ENDEMIC or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or which are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic or cultural importance to local communities.' The significance of this terminology and whether the IFC considers impacts on 'critical habitat' could be offset is discussed in Appendix B.2.

Box 8: Websites with relevant safeguard policies

World Bank:
http://www.worldbank.org/html/fpd/em/power/wbpolicy/404OP.stm.

International Finance Corporation:
www.ifc.org/ifcext/sustainability.nsf/Content/EnvSocStandards.

EBRD:
http://www.ebrd.com/about/policies/enviro/policy/index.htm.

InterAmerican Development Bank:
http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=665902.

Asian Development Bank:
http://www.adb.org/documents/policies/environment/default.asp?p=policies.

For further information, see also Appendix B of this Offset Design Handbook (available as a separate document).

The information gathering process required for a given project will vary according to the stage within the project life cycle when it is undertaken. Generally, the process will consist of a desktop literature review, biological field surveys to identify species, habitats and ecological processes, and stakeholder interviews to identify use and cultural values and ecosystem service components. Ideally, the assessments should be carried out by socioeconomic specialists and biodiversity / natural resources specialists working together. As there is a subjective value to biodiversity, adequate stakeholder consultation is vital to ensuring that the use and cultural values of biodiversity components are identified alongside the intrinsic values. The valuing of biodiversity is an extremely important aspect of the concept of NO NET LOSS, and different people (be they scientists, government officials, local walking clubs or indigenous communities) value biodiversity in different ways. In cases where a biodiversity baseline has already been established as part of the EIA process and field surveys have already been conducted, assessing the intrinsic value of species, habitats and ecosystem services may involve reviewing the data collected. For use and cultural values, sources of information may include previous community surveys, interviews with local communities and consultation with local experts. When surveying local stakeholders, the team may use a variety of methods including PARTICIPATORY APPRAISAL, semi-structured interviews, etc. Specialist ecological / taxonomic work may be required to confirm intrinsic values. Some guidance on working with local stakeholders to understand use and cultural values may be found in the Cost-Benefit Handbook and the Resource Paper on Biodiversity Offsets and Stakeholder Participation[18].

Use of such criteria can prioritise biodiversity for which detailed impact assessment is required. It is also possible to 'flag' biodiversity components that constitute a 'must have' in the offset at this stage. It is important to explain which criteria have been used to identify key biodiversity components and to specify the geographic scale at which importance has been determined, as this may have a bearing on the location of suitable offsets in the landscape.

Table 9 shows how information on particularly 'important' or 'significant' components of biodiversity might be tabulated for ease of reference. The table includes information on the status, condition or background trends which are relevant to evaluation of impact significance and may also be taken into account when making judgements about whether impacts are likely to be OFFSETABLE (impacts on species which are threatened and declining throughout their range, for example, are more likely to be significant than those on species which are stable or increasing. Key ecological dependencies (see following section) need to be understood in order to predict impacts as they determine how key biodiversity components will respond to the project 'drivers' identified in Step 1.

Being aware of these important aspects can help to check that the best METRICS are chosen for the loss / gain calculation (see Step 5) and that the components are present and can be benefited at the offset site. A 'Key Biodiversity Components Matrix' very similar to this has been used at the BBOP pilot project sites (see Appendix C.1 and the BBOP pilot project case studies).

18 For the Cost-Benefit Handbook see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**.
For the Resource Paper on Biodiversity Offsets and Stakeholder Participation see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/participation.pdf**.

Table 9: Sample table for summarising information on 'important' biodiversity

'Key biodiversity component'	Why it is considered important (should include intrinsic, use and cultural values)	Geographic scale of importance (e.g. global, national, local)	Status / condition / background trends	Key ecological dependencies / requirements / attributes
e.g. *Species*				
Forest elephant	IUCN Red Listed Nationally protected Endemic Flagship species	Global and National	Declining throughout its range Threatened by poaching	Availability of closed canopy forest with low disturbance (forest elephant density is correlated with the size of 'remote forest core' i.e. numbers greatest where disturbance is lowest and distance to sources of disturbance is highest[19])
Rudd's Lark	Critically endangered (IUCN Red List) Endemic Nationally protected Flagship species	Global and National	Declining due to habitat loss and FRAGMENTATION, as a result of agricultural intensification	Suitable pasture management to maintain short, dense grass cover (>80% cover, avg. inter-tuft distance <50 mm, elevation > 1,800 m)
Ogilby's duiker	Hunted for bushmeat	local	Declining due to over-hunting	Protection from hunting and suitable forest habitat
Communities and ecosystems				
Breeding bird assemblage	High proportion of threatened and endemic species	Global, national	Species richness stable but abundance declining	Suitable mix of habitat at the landscape scale
Wetland	Important local fishery	National and local	Declining throughout country due to drainage	Hydrological regime is key 'driver'

Identifying key ecological dependencies

Understanding ecological requirements is necessary to predict and quantify impacts on biodiversity. This does not necessarily imply that detailed ecological studies are always required, but it is essential to understand the critical factors which are likely to cause conditions for a key biodiversity component to improve or deteriorate and whether this change is likely to have significant implications for the condition or status of that component. Box 9 gives some examples of key ecological dependencies or requirements. Ecological dependencies and relationships are also an important consideration in Steps 6 and 7 where it is necessary to ensure that potential offset locations will be viable, for example in terms of minimum area to support key ecological processes.

19 Blake *et al*. 2007.

Box 9: Examples of key ecological dependencies

Examples of key ecological dependencies / requirements:

- Availability of suitable habitat.
- Minimum viable habitat or home range size.
- Protection from hunting.
- Availability of breeding sites.
- Availability of suitable food (e.g. food plants for herbivores, prey for predators).
- Suitable biophysical conditions, e.g. with respect to water supply or quality, climate, levels of nutrients.
- Mobility / lack of barriers.
- Appropriate disturbance regime (lack of disturbance, presence of frequent fires).

Reviewing / identifying the adverse impacts that have been identified

This Handbook does not set out to provide a detailed explanation of how to conduct impact assessments and other guidance is available on biodiversity inclusive impact assessment (for example Slootweg *et al.* 2006). However, design of offsets involves the explicit quantification of losses and gains, and this can require more information about the magnitude and duration of effects on biodiversity than might normally be obtained for purposes of impact assessment. As a minimum, most methods for calculating losses and gains require the offset planner to be able to:

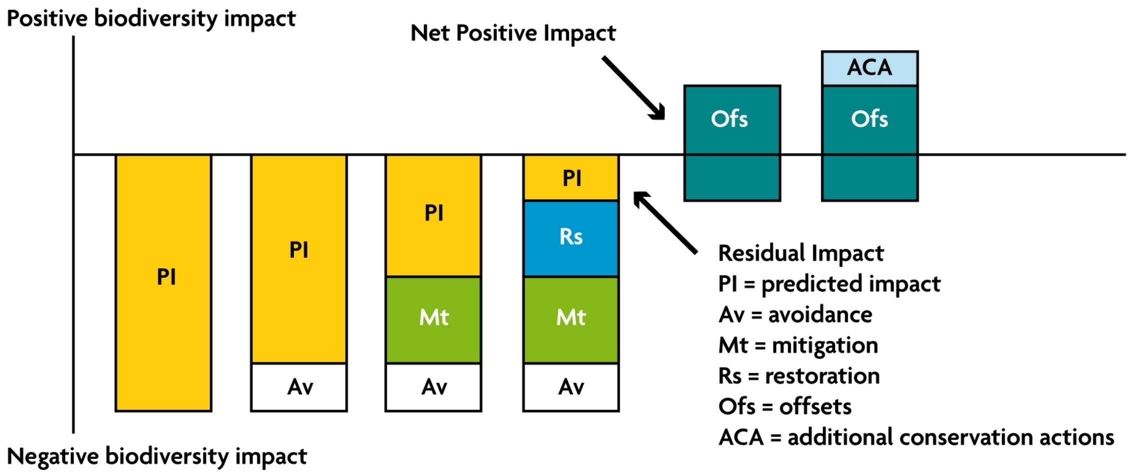
- Quantify areas of habitat lost, e.g. due to vegetation removal.
- Quantify areas of habitat degraded, e.g. due to disturbance or pollution.
- Quantify the numbers of species associated with areas of habitat.
- Quantify any important aspects of structure and function (e.g. minimum dispersal distances, average range size, minimum viable habitat.

If possible, quantify the changes in biodiversity composition, structure and key processes in terms of their consequences for key biodiversity components, for example in terms of the status of a population, its breeding success, the availability of feeding habitat.

Applying the mitigation hierarchy and deciding which residual impacts can be offset

Once the potential impacts on biodiversity have been identified, developers should follow the MITIGATION HIERARCHY to ensure that everything advisable is done to address potential impacts before an offset is considered. The mitigation hierarchy describes a step-wise approach that first seeks to avoid impacts, and then to minimise them and to take on-site measures to rehabilitate or restore biodiversity before finally offsetting residual, unavoidable impacts. Any residual impacts that remain after application of the mitigation hierarchy become the focus of the offset as illustrated in Figure 3.

Figure 3: Mitigation hierarchy and offsets



Sources: adapted from Rio Tinto and Western Australia EPA

To some extent, the appropriate level of emphasis given to AVOIDANCE in the hierarchy depends on the conservation importance and status of affected biodiversity. Thus avoidance might be the only appropriate solution for biodiversity components which are found largely in the area affected by a project, are already declining and threatened throughout their range, are exposed to impacts which would result in further decline or for which practical techniques for RESTORATION or REHABILITATION are untried / untested. For example if the area affected by a project is the only known place on earth where a certain frog is found, then particularly strenuous emphasis should be placed on avoiding or minimising impacts. If, however, the frog is found at other forests outside of the project FOOTPRINT, then later stages in the mitigation hierarchy may be applicable (e.g. rehabilitating the forest and reintroducing the frog or doing an offset in a forest elsewhere where the same kind of frog is found).

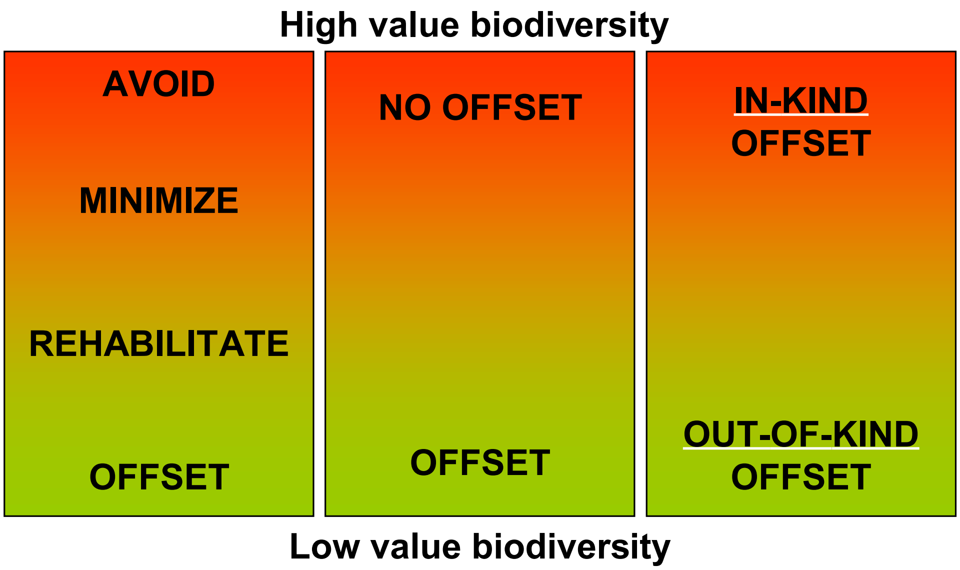
Which impacts should be avoided, which minimised, which corrected through on-site rehabilitation and which offset?

Most legislators and experts place greater emphasis on earlier steps in the mitigation hierarchy when dealing with extremely important components of biodiversity in order to reduce the risk of losing them. Figure 4 illustrates this philosophy. While some initial guidance has been proposed on how or when to advance through the mitigation hierarchy, no universally accepted consensus currently exists. Some key considerations might be:

- The importance or value of the biodiversity in question.
- The extent to which it can be substituted or replaced using known techniques.
- The level of investment / effort associated with different steps and whether this is proportional and appropriate to the benefits that would be gained for biodiversity.
- The benefits that would be gained for biodiversity in relation to the costs incurred indifferent approaches to applying the steps in the mitigation hierarchy.

An important part of applying the mitigation hierarchy is open discussion with stakeholders in order to gain agreement on when it is appropriate to move to the next level of the hierarchy.

Figure 4: Identifying residual impacts and considering whether these can and should be offset



The question of whether a residual impact can be offset is ultimately determined by the ability to achieve no net loss of the biodiversity component in question. Achieving no net loss can be difficult under two related scenarios:

- Significant loss: Where a component undergoes a massive loss that is difficult to reverse through rehabilitation or offset e.g. a widespread unthreatened component of biodiversity is reduced to a highly threatened single site endemic. As a result of one or more factors (e.g. no remaining habitat, insufficient financing for a specialised intervention, population lower than minimum required to breed or avoid inbreeding effects), it may be simply impossible to invest in sufficient mitigation to return the component to its original status and thus achieve no net loss.
- Lack of spatial options for offset: Simply put, if the component in question is irreversibly impacted or lost at the project site, can we find alternative examples of that component elsewhere where a successful offset involving adequate CONSERVATION GAINS ('ADDITIONALITY') could be undertaken and which would satisfy relevant stakeholders? There may be few other similar sites, or they may be unavailable for conservation activities. When the component is restricted to one or few sites, offsets may therefore be impossible, whereas offsets may be a feasible mitigation option when there are more suitable offset sites available.

In addition to considering broad circumstances that make offsets difficult, unsuitable or impossible – such as significant loss and lack of spatial options – it may be necessary to consider the specific levels of impact ('thresholds') above which it may not be possible to offset an impact on a particular biodiversity component. This is the subject of the next few paragraphs.

What is the basis for determining whether impacts on intrinsic values of biodiversity can or cannot be offset?

The ultimate basis for determining whether an impact on the intrinsic (or existence) value of biodiversity can be offset or not, is driven by the risk of irreversible global loss of any biodiversity component, referred to as EXTINCTION. The ultimate example of this is the global extinction of a species. No scientist has yet been able to bring a species back from a confirmed extinction. Intrinsic value, as indicated by BIODIVERSITY CONSERVATION priorities, is influenced by the concepts of irreplaceability and VULNERABILITY as defined by

Margules and Pressey (2000) in a seminal paper on conservation planning and priorities in the scientific journal, Nature. Important factors to consider are therefore:

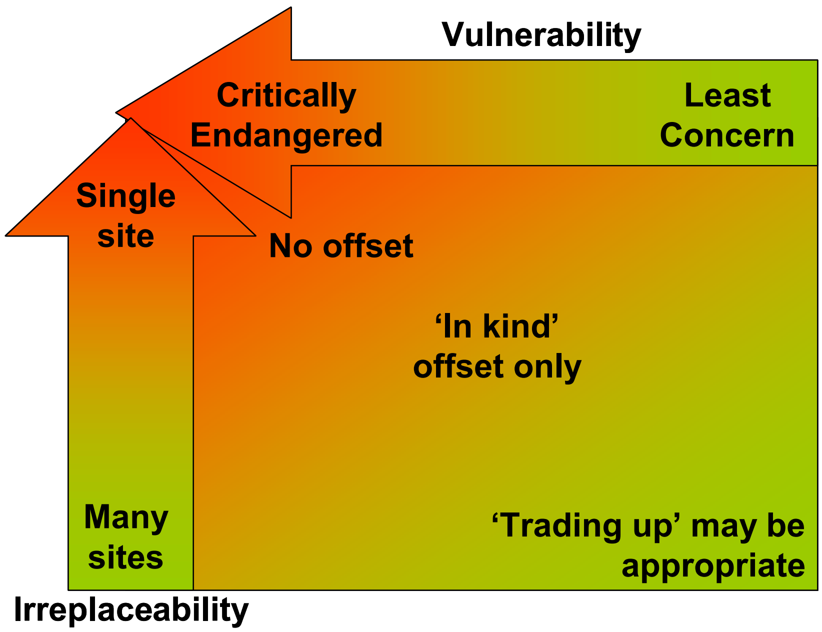
- Irreplaceability (or uniqueness) relates to the existence of additional spatial options available for conservation if the biodiversity affected by the project were irreversibly lost. Where biodiversity occurs at many sites (low irreplaceability), many options exist for conservation, whereas where biodiversity is restricted to one or few sites (high irreplaceability), no options exist for conservation elsewhere. Measures of irreplaceability must be clearly referenced to geographic scale.
- Vulnerability reflects the likelihood that a component of biodiversity will disappear (i.e. become extinct, in the case of species) over a defined timescale. For example a species undergoing rapid and ongoing population losses over time is under higher threat of extinction than a species which has a stable or increasing population with no associated threats. Where the likelihood that biodiversity will be lost is low (low vulnerability), alternative options will exist into the longer term. Where the likelihood of loss is much higher (high vulnerability), biodiversity must be protected now or never.

An example of how irreplaceability and vulnerability / threat might be used to assess whether an offset is appropriate is shown in Figure 5.

Where more time and more alternatives exist for conserving a component of biodiversity, offsets will be more feasible. Where there is no time (due to very severe extinction risk) or where no alternative sites for doing an offset exist, offsets will not be feasible.

Another key consideration is whether an ecosystem or habitat for a key species can be replaced (i.e. restored or re-constructed) within a reasonably short timeframe irrespective of whether an ecosystem / species is rare and threatened or not, for example bogs or primary forests can not be replaced within a lifetime and these might therefore be considered 'no-offset' ecosystems.

Figure 5: An example of how irreplaceability and vulnerability / threat might be used to determine an offset threshold



As discussed above (see Which impacts should be avoided, which minimised, which corrected through on-site rehabilitation and which offset?) the greater the irreplaceability and vulnerability of the impacted component of biodiversity, the more strenuous should be the effort to avoid impacts altogether and to minimise them then restore the component on-site, prior to considerations of an offset.

Several government policies have described conditions, based on such principles, in which offsets may not be appropriate. These are usually in relation to definitions of 'CRITICAL HABITATS', threatened species or other related terminology that identifies vulnerable and / or irreplaceable biodiversity. The Appendices describe descriptions of these 'NON-OFFSETABLE' THRESHOLDS in various laws, policies and approaches, and Box 10 describes the approach taken to defining impacts that are not capable of being offset in some guidelines in the Western Cape of South Africa.

Box 10: Defining impacts on biodiversity that are 'not offsetable' in the Western Cape of South Africa

In the Western Cape of South Africa, offsets would not be considered when residual negative impacts would result in:

- Irreversible and irreplaceable loss of ecosystems or species (generally involving impacts on critically endangered ecosystems or species, or leading to a change in the status of ecosystems or species from endangered to critically endangered).
- Irreplaceable loss of areas constituting priority corridors or process areas at national or provincial level.
- Irreversible or irreplaceable loss of valued ecosystem services at national or provincial scale.

Offsets would be critically evaluated to determine whether or not they should be considered, in circumstances where they could result in:

- Irreversible impact, leading to substantial change in ecosystem or species status within the endangered category, or from vulnerable to endangered, with high impact on national or provincial biodiversity.
- Irreversible loss of areas constituting important corridors or process areas at provincial or local levels.
- Loss or deterioration of valued ecosystem services at provincial level.

In addition, biodiversity offsets would not be considered by the authorities when:

- All reasonable and feasible alternatives to the proposed development that would meet the stated needs of that development have not been considered.
- All measures to avoid, minimise, repair or restore biodiversity impacts have not first been considered.
- Inappropriate use is made of offsets as a negotiation tool to leverage environmental authorization.
- Residual impacts are of very high significance; in other words, ecological integrity would be compromised (for example when critically endangered ecosystems or ecosystems containing irreplaceable biodiversity or irreplaceable ecosystem services are proposed to be developed).
- Residual impacts are of low significance (and therefore there are no meaningful impacts to be compensated).
- Biodiversity losses would not be adequately compensated by offsets.
- The long-term security and viability of the proposed offset cannot be guaranteed.
- Offsets come at too high a cost to society.

Source: Provincial Guideline On Biodiversity Offsets. Final Draft – April 2007, Edition 2

There are also a number of conservation science-based approaches to defining areas of particularly high significance for biodiversity conservation which overlap appreciably with these definitions and which could be used to indicate or alert offset planners to situations where offsets would be very difficult or may be inappropriate. One example is the set of criteria used by over 100 international, national and local NGOs in the Alliance for Zero Extinction (AZE) which identify the last known occurrences of the world's most highly threatened species. A related approach may be to consider the application to 'offsetable thresholds' of global intrinsic values based on best practice guidelines recently published by IUCN, the international conservation body representing governmental agencies and non-governmental organisations from international to local scales. These guidelines[20] represent a consistent methodology for identifying and mapping important natural habitats at a site scale — the scale of individual protected areas, concessions and land management units. Sites are identified at a national level by local stakeholders using a set of transparent and globally standardised criteria, building from well known approaches such as the IUCN RED LIST OF THREATENED SPECIES™, BirdLife International's Important Bird Areas, Plantlife International's Important Plant Areas, IUCN's Important Sites for Freshwater Biodiversity, and sites identified by the ALLIANCE FOR ZERO EXTINCTION. To meet the these criteria, a site must contain one or more globally threatened species; one or more endemic species which are globally restricted to the site or surrounding region; significant concentrations of a species (e.g. important migratory stops, nesting sites, nurseries or breeding areas); and / or globally significant examples of unique HABITAT TYPES and species assemblages. These IUCN guidelines are based on over 20 years of application in over 170 countries to identify sites of biodiversity importance according to clearly defined criteria. As a result, they help to identify irreplaceable and vulnerable biodiversity, and serve as good approximations of prioritised national intrinsic values of biodiversity.

The application of these conservation prioritisation tools to thresholds for what can be offset has not yet been widely discussed or agreed. Further scientific and societal debate on thresholds is needed, but until clear guidance is available, offset planners may find some of the thresholds used in identifying such sites useful when they are considering, on a case by case basis, whether a project's residual impacts can be offset.

Species remain the most well defined unit of biodiversity, and so have been the first component of biodiversity to have recognised standards for conservation prioritisation through the annually released IUCN Red List of Threatened Species™. A visual representation of how IUCN Red List categories for the red-listing of species might be applied to the consideration of 'OFFSETABLE thresholds' is given in Figure 6. As consensus emerges on how to consistently define important ecological communities and ecosystems, methods for defining 'offsetable thresholds' for these components of biodiversity is likely also to emerge. The general principle is likely to apply, namely that the more threatened and concentrated a component of biodiversity is, the less susceptible it will be to a successful offset, while the less threatened and more widespread it is, the more feasible it will be to undertake a biodiversity offset that can achieve no net loss.

In addition to considering internationally agreed approaches such as the criteria for AZE sites and the IUCN categories of threat, there may be additional regional, national or local considerations and approaches to determining importance which need to be taken into account, particularly when considering use and cultural values of biodiversity. Some have suggested that it might be possible to consider globally significant values as a minimum consideration for which impacts are likely to be capable of being offset, with further consideration of regional, national or local values in the analysis as necessary[21]. As noted above, this is an area where more work is needed. Developing an approach that could be applied in many countries would be beneficial, by helping to promote consistency in describing offsets and offering standard best practice guidance for

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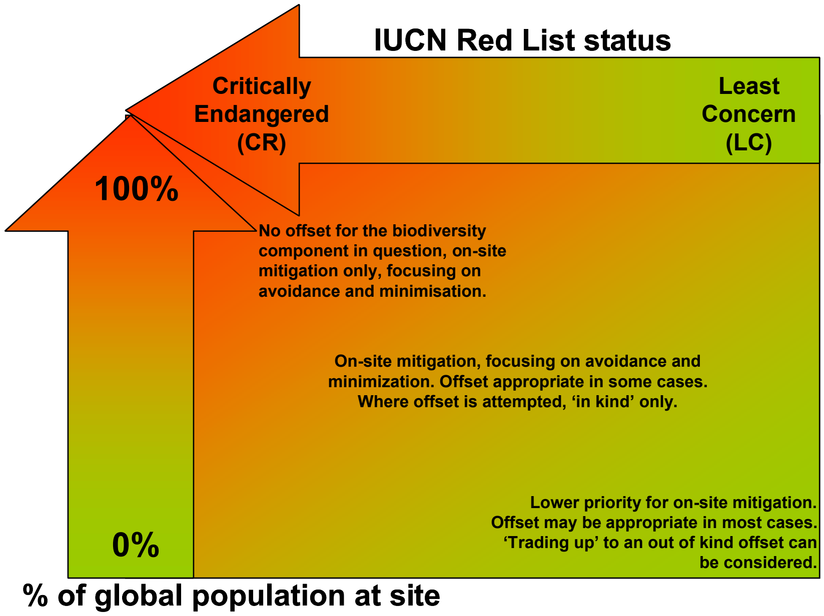
20 IUCN World Commission on Protected Areas, 2007.

21 See, for example, the consultation paper prepared by some individuals on the BBOP Advisory Committee: **http://www.forest-trends.org/biodiversityll/consultation/thresholds**.

companies operating globally. Consistency would also facilitate comparative review, exchange of experiences and dissemination of best practices.

Figure 6: Use of IUCN Categories to determine offsetable thresholds



Being certain that 'residual' impacts really are residual

This depends on three critical considerations relating to certainty about 'residual' impacts:

- The predictions about impacts are reliable (i.e. sufficient information, appropriate approach to assessing impacts, acceptable assumptions, etc.);
- Planned mitigation would have a predictable effect (i.e. assurance that it would be implemented and would result in the intended outcome);
- Where there is uncertainty with predicting impacts and evaluating MITIGATION, then a precautionary approach should be taken to determining RESIDUAL IMPACTS.

If any of these are missing, then the measure of residual impacts would be questionable.

Whether impacts are avoided in practice typically depends on a mixture of the following:

- Financial considerations (i.e. how much can the developer avoid without making the project economically unviable);
- Which impacts are proscribed by regulation and whether this regulation is enforced;
- The level of stakeholder engagement and pressure, and associated risk to proponents' 'LICENCE TO OPERATE'; and
- Trade offs made at a political / societal level with regard to the overall benefits of the proposed development in relation to its social and environmental impact.

Determining whether impacts on use and cultural values can or cannot be offset

Some projects' impacts on social and cultural aspects of biodiversity simply may not be possible to offset or compensate in financial terms, because of the uniqueness of the service provided that will be impacted by the project. While it may be possible to offset loss of access to medicinal plants through provision of an alternative source, a sacred site, for instance, may not be so easy to replace or move to another site. A well managed process will generate adequate information to make the determination as to whether impacts can be offset very early, so that it can feed into the company's broader decision on whether to proceed and also any government authorisation or project consent process. (This is sometimes known as the 'GO / NO GO' decision).

Local stakeholders' use and cultural values are core to understanding the severity of the impacts from their perspective, so their involvement in understanding which impacts can and cannot be offset is critical. However, even if such 'non-offsetable' impacts are identified very early, a government may decide that there are reasons of overriding public interest for a project to go ahead. There is also a scenario in which information revealing that a project's residual impacts on social and cultural uses of biodiversity cannot be offset only comes to light after project approval. In this case, it may be possible to make more strenuous efforts to avoid the impact in the first place. If, however, the impacts cannot be avoided, mitigated of offset, it is important that the developer should acknowledge that the COMPENSATION measures in this case cannot be considered a biodiversity offset.

Non-biodiversity issues that could influence whether to proceed with an offset

In addition to the ecological constraints and those related to local people's biodiversity values, discussed above, there are several others quite unrelated to biodiversity that could also jeopardise the potential success of an offset. These include political turmoil or risks, threats to the success of earmarked offset areas due to anticipated land use planning policies, upstream development plans, or a significant risk that key stakeholders such as indigenous peoples, local communities and local or central government authorities would not support the development project or offset. Where such risks are material, offset planners are well advised to think carefully as to whether it is realistic to plan a biodiversity offset.

Step 5: Choose methods to calculate loss / gain and quantify residual losses

To decide which methods and metrics will be used to demonstrate that 'no net loss' will be achieved through the biodiversity offset and to quantify the residual loss using these metrics.

This step covers:

- Deciding how 'no net loss' will be determined.
- Deciding what metrics and methods will be used to quantify losses due to a project and gains required through an offset.
- Deciding when species-specific assessment might be required.
- Using a benchmark.
- Using appropriate methods to calculate GAINS required.

This step involves using accounting approaches to identify and quantify predicted or actual residual impacts on biodiversity. Most approaches are based on quantified measures or 'metrics,' which enable comparisons to be made between BIODIVERSITY LOSSES due to a development project and what can be gained through an offset, in order to demonstrate no net loss and show additional, measurable CONSERVATION OUTCOMES.

Unlike the case of carbon offsetting, where both emissions and offsets are measured in a single 'currency' (tonnes of carbon dioxide equivalent), there is no single measure that can adequately capture the diversity of life at all levels of biological diversity. Rather, it is necessary to choose from a suite of measures which are a suitable PROXY or SURROGATE for biodiversity overall.

Deciding how 'no net loss' will be determined

The need to determine what constitutes 'no net loss' lies at the heart of offset design and determines the basis for calculating losses and gains. This is made all the more challenging by the inherent non-fungibility of biodiversity components: planting an oak cannot compensate for the loss of a bird and a hectare of habitat in one place may be more valuable than an equivalent hectare elsewhere.

It is important to have a clear rationale for selecting proxies or surrogates to represent the overall biodiversity affected. If a clear CURRENCY can be identified (for example hectares of habitat of a measurable quality), 'no net loss' is reached when the losses caused by a project and the gains delivered by an offset are balanced.

No net loss might be defined in terms of 'an equivalent number of hectares of equivalent quality of suitable habitat before and after a development', for example, but this is only valid if it is possible to demonstrate that habitat suitability can be described and measured with respect to associated biodiversity. This is something that can be considered under Step 4 which covers the identification of key ecological dependencies and linkages.

Definition of no net loss should take account of spatial context, geographic scale and the state of associated biodiversity at a wider landscape scale. In order to be confident of achieving no net loss, an offset planner should aim to achieve no net loss at the same geographic scale as that at which the loss has been incurred. The discussion of MULTIPLIERS under Step 7 raises the potential need for the definition of no net loss to take account of gradual loss of suitable habitat from the landscape and possible time lags before no net loss would be achieved.

Some examples of how no net loss has been defined in practice include equivalency with respect to:

- Suitable or viable habitat (e.g. US HEP, Appendix A.2).
- Hectares of habitat of similar composition and structure (e.g. Victoria HABITAT HECTARES method, Appendix A.6).
- Numbers of individuals (e.g. REA in REMEDE, Appendix C.2).
- Population viability.
- Persistence of populations or species (e.g. New Zealand Risk Method, Appendix C.3).

When defining 'no net loss' it is important to confirm which, if any, biodiversity components are 'non- tradable'. In order to understand the concept of 'non-tradable' components, consider a metric that combines the amount of quality of a grassland habitat, a bird species and a mammal. An exchange rule could be set to say that 'no net loss' requires an offset to demonstrate a certain amount of gain for all three components, rather than an overall combined 'gain' which could in fact involve a large grassland gain, but no gain for the particular bird or mammal species.

Methods for calculating loss and gain vary in the extent to which they distinguish between biodiversity components such that what is known as a 'LIKE-FOR-LIKE' exchange can be achieved. Of course, there are differences in composition and genetic diversity even at the very small scale, but 'like-for-like' is usually understood to require achievement of broad comparability in terms of biodiversity structure, composition and function, although this is rarely tightly defined in policy documents. There is a balance to be struck between ensuring that important individual components are catered for and achieving functional ecosystems in which the needs of all components are balanced. The Letabeng Worked Example (see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/example.pdf**) shows how 'non-tradable' biodiversity components might be identified. Steps 6 and 7 explore in more detail how identification of 'non-tradable' components influence decisions about the extent to which a 'like-for-like' offset might be required and at what geographic scale it would be appropriate for it to be delivered. Rules about what is tradable should reflect conservation policy, but in the absence of legally or policy-defined rules it may be necessary for the planners of a voluntary offset to define them for the purposes of the offset in question. For example, many would consider it unacceptable to allow reduced security for an already threatened TAXON to be compensated by improved security for a different, non-threatened taxon (i.e. 'trading-down'). In this case an exchange rule might be set to the effect that 'impacts on each threatened taxon must be compensated by equal or greater benefit to the same taxon, or perhaps a more threatened taxon.

Table 10: Some examples of what to measure and consider for species and for communities or habitats in order to achieve no net loss

For species:	For communities / assemblages or for habitat types:
Which will be affected.	Which will be affected.
Structure of populations / METAPOPULATIONS for key TAXA affected.	Area (extent), distribution, 'health' or 'quality' (composition, structure, function).
Balance of recruitment / mortality for affected populations.	Condition, as indicated by key structural and functional relationships such as height of vegetation, wetland hydrology, predator-prey relationships, etc.
Distribution, abundance and levels of occupancy in landscape.	Strategic and functional context in the wider landscape context (e.g. CONNECTIVITY, continuity).
Scale or location required to maintain or enhance viability or persistence.	Scale or location required to maintain or enhance functional representation, viability, or persistence.

Deciding what metrics and methods will be used to quantify losses due to a project and gains required through an offset

Operational practice is still predominantly based on identification of practical surrogates for the 'amount of biodiversity' (structural, compositional and functional) affected by a project or gained through an offset. However, there is increasing research on dynamic representation measures for species and on species 'occupancy' or 'persistence' models which can provide a stronger evidence base for design and delivery of offsets to meet policy targets. These approaches reflect the fact that the greater the proportion of habitable area already lost, the more an additional hectare lost or gained matters. Similarly, the RESILIENCE of species' populations depends on whether they are in a healthy functioning state, or in a declining condition. Thus a large reduction in population abundance from near carrying capacity might result in a small loss of persistence probability, but a similar (large) reduction to an already reduced population would causes a much greater loss of persistence probability. (See Appendix C.3 – New Zealand Risk Method).

As described below, there are already well over 100 different loss / gain assessment methodologies being used and more under development. A sample of a few of those that involve some level of objective measure of biodiversity quality and condition beyond simple area are summarised in Table 11. More detailed explanations of each are given in the Appendices. They include some approaches which have been formulated to meet existing legal or policy requirements and some (including the approach used at the BBOP pilot projects) which are still under development.

Table 11: Metrics for loss / gain used in different approaches to biodiversity offsets

Method	Area	Structural Quality	Condition of species populations & communities	How No Net Loss is defined / measured	Comment
Approaches to loss / gain calculations in existing law and policy					
Victoria / Australia habitat hectares method	✓	✓	×	Habitat hectares: area x quality units for selected COMMUNITY TYPES.	Focused on native vegetation and based on features of BIOTOPES which reflect condition, usually measures of structure.
US Habitat Evaluation Procedure	✓	✓	×	Habitat Units: area x suitability for selected species.	Area of habitat for individual species adjusted by habitat suitability index which reflects species' requirements and carrying capacity.
South Australia SEB Method	✓	✓	×	Hectares of land adjusted by an SEB ratio. Seeks a significant NET GAIN by: a) requiring an offset area to be determined either as a function of the area cleared multiplied by a factor (ratio) of 1:1 (e.g. degraded) to 10:1 (e.g. intact) – i.e. higher ratio for higher value land cleared, or, b) requiring an offset area to relate to the habitat value of the vegetation (tree) to be cleared multiplied by a factor which increases commensurate with an increasing tree score.	The SEB ratio method reflects levels of human modification of native vegetation and can be adjusted to take account of management costs and mitigation effort. Similar to the habitat hectares approach with the vegetation to be cleared and the potential offset receiving a habitat value score.
Western Cape of South Africa Provincial Guideline	✓	✓	×	Hectares of similar biotope adjusted by OFFSET RATIOS based on expert opinion and directed to achieve conservation policy outcomes beyond compensation for project-specific impacts. Presence of threatened species and special habitats given particular attention.	Offset ratios pre-determined in relation to the proportion of habitat remaining and its THREAT STATUS. The ratios are calculated to ensure that defined areas of ecosystems remain protected to meet conservation targets for each ECOSYSTEM TYPE. Presence of threatened species and special habitats given particular attention in evaluating whether or not impacts could be offset and how (in terms of not causing any change in threat status).

Method	Area	Structural Quality	Condition of species populations & communities	How No Net Loss is defined / measured	Comment
Methods under development					
Approach used in BBOP pilots	✓	✓	✓ (under develop-ment)	Biotopes: Area x quality units. Expanded version of habitat hectares: measurements of area adjusted by reference to a benchmark to take the quality and amount of biodiversity into account. Species: Population persistence adjusted by reference to a species benchmark.	Key ATTRIBUTES are selected to represent composition, structure and function. Each attribute is weighted according to its relative % contribution to the biotope's overall 'health'. A level (score) for each attribute is recorded at the benchmark site. Pre- and post-project attribute scores are assigned for the areas affected. Losses and gains are compared to the benchmark to determine the- number of 'habitat hectares' required from the offset to achieve no net loss. Further population studies carried out for key species as appropriate. Metric depends on availability of population data and models, e.g. minimum VIABLE POPULATION, level of species occupancy, population size.
Zonation	✓	×	✓	Retention of biodiversity features in the landscape over time.	Looks at area of site, condition of site for that feature and change in abundance and connectivity of feature under different scenarios.
New Zealand Risk Index Method	✓	×	✓	Susceptibility to biodiversity loss measured by regional habitat loss, population decline and community condition.	Based on species-area relationships and on persistence-abundance relationships. Looks at effects on susceptibility to loss of habitat and population numbers gained or lost.
REMEDE	✓	×	✓	Habitat Equivalency (losses and gains measured in terms of habitat of similar type) and Resource Equivalency Analysis (REA), in which losses are expressed in terms of resource units (such as numbers of fish or birds).	The REMEDE toolkit is new and in draft form, but Habitat Equivalency Analysis (HEA) is an accepted methodology that has been used widely in the US.

Few methods use area alone as the basis for determining the nature and scale of biodiversity offsets, since area does not describe the quality and amount on biodiversity, which can vary enormously from hectare to hectare, even within one particular landscape type. Most often, some kind of combination of area and quality of biodiversity makes for a sound currency to measure no net loss, and it is advisable to supplement this with population data on particular species of interest, where possible. The following section explains the circumstances under which such an assessment might be necessary.

It is interesting to note that, after thirty years of experience with wetland and CONSERVATION BANKING, the United States is home to perhaps the world's most comprehensive set of methods for assessing projects' impacts and offsets' gains on wetlands, streams and listed endangered species. Many of these assessment methodologies involve rigorous and repeatable frameworks for analysis of ecosystem functionality that involve, and can demonstrate, consistent application not only at impact and offset sites, but across many projects. They allow practitioners in the field to use rapid assessment methods to come to consensus on the BASELINE status of sites and also on projects' impacts and offsets' conservation gains using rapid protocols. However, while there is a trend towards the more common use of these more rigorous methods, in the large majority of cases (and the US authorities process some 70,000 to 80,000 decisions on wetland and stream mitigation a year) and particularly for small projects, loss / gain calculations are based on the acres of land impacted, coupled with a simple ratio / multiplier and sometimes with an approximate estimate of the acres' condition, based on expert review. This is testimony to the fact that, in practice, detailed ecological assessments are not always possible. The resources required for in depth survey and modelling may be limited or the scale of the proposed project might be such that comprehensive assessments are considered inappropriate. It is not unusual for assessments of 'quality' to be made on the basis of expert opinion. In the case of voluntary biodiversity offsets, such simple approaches may be quite appropriate in some circumstances, provided they can demonstrably apply the principles. (For more information on US methodologies, see Appendices A.1, A.2 and A.3.)

The need for species-specific assessment

Quantifying biodiversity losses with respect to certain species of particular conservation significance is especially useful where these species may experience impacts other than, or in addition to, habitat degradation and conversion, such as intensified hunting pressure, increased disturbance or interruption to migration or dispersal. In such cases, metrics based on habitat proxies may not be particularly informative, and it may be preferable to use metrics which give a more direct reflection of population viability or persistence and which are specifically tailored to the species concerned. It should also be noted that, while habitat accounting approaches can detect losses with respect to individual species (i.e. where metrics based on individual species are selected as attributes), the fact that these approaches aggregate scores for different attributes into an overall metric of habitat 'health' means that losses with respect to a particular species could be masked by gains with respect to other attributes (including other species). As discussed above, 'exchange rules' are commonly used to address this problem. However, where an offset planner wishes to demonstrate that no net loss has been achieved with respect to individual species of conservation concern, species-specific quantification of losses is recommended. This may be especially relevant where there are species of global conservation concern and / or particular concern to local stakeholders.

Key species and residual impacts remaining after mitigation are likely to have been identified if the offset planner has undertaken a step such as Step 4. For offset planners following the steps outlined in this Handbook, the first step towards identifying any species that might merit species-specific quantification of losses is, therefore, to review results from Step 4 to identify key species that are predicted to experience residual adverse impacts following AVOIDANCE and mitigation measures. For potential impacts which manifest themselves through loss and / or degradation habitat(s), there may be no need to assess losses and gains at population level: habitat accounting approaches, such as habitat hectares, are sufficient in this case. However, if the species' population may be negatively impacted without its habitat(s) necessarily being adversely impacted, species-specific quantification of losses will need to be undertaken. Such impacts could include increased mortality due to accidental road kill, decreased reproductive success due to disturbance to breeding animals, or reduced population viability due to barriers to dispersal among sub-populations.

Using a benchmark

Some approaches, including that developed by BBOP and trialled at its pilot projects (Appendix C.1 and Box 11), use a BENCHMARK against which to reference losses and gains, whether in species populations or for communities / habitat.

Box 11: Approach adapted from habitat hectares and supplemented with species occupancy measures developed by BBOP and partially applied at pilot project sites

One possible approach using an Area x Quality metric that has been adapted, developed and tried at the BBOP pilot sites involves establishing a benchmark comprising surrogate attributes against which biodiversity losses and gains at the impact and offset sites can be consistently and transparently measured. One principal loss and gain calculation is required:

- For key habitats (in order to calculate, through proxies, the losses of all species and communities / assemblages).

Where necessary, this can be supplemented:

- For specific key species to ensure they will be properly addressed by the offset.

This approach uses a benchmark to express the amount and quality of particular attributes of biodiversity, such as habitat condition or species density, in a relative manner to allow comparisons between different sites, including:

- A site in the best condition available (to serve as the reference benchmark);
- The project site before and after the project impact; and
- The offset site(s) before and after the planned offset.

See Appendix C.1

A benchmark can be used to provide a standard against which losses due to a project and gains through an offset can be quantified and compared consistently and transparently and usually comprises a number of representative and characteristic ‘ATTRIBUTES‘ used to represent the type, amount and quality of biodiversity which will be lost / gained. BENCHMARK ATTRIBUTES may be to do with structure, composition and function of individual species, features of communities / assemblages, or even characteristics that operate at the landscape scale, such as connectivity. Box 12 gives some examples. As used in the Victoria HABITAT HECTARES method and adapted for use at the BBOP pilot projects (Appendices A.6 and C.1 respectively) the benchmark is based on a representative example in a good condition of the type of biodiversity that will be affected by the proposed development project, but hypothetical benchmarks can also be used if no relatively undisturbed areas still remain.

Box 12: Examples of benchmark attributes

- Occurrence of specific vegetation types.
- % Cover of structural forms / stages (e.g. canopy cover).
- Height or density of vegetation.
- Measures of structural organisation (indices of FRAGMENTATION, isolation, connectivity) that reflect ability of individuals or populations to interact.
- Presence of functional groups (e.g. characteristic herbivores, detritivores, top predators, aquatic plants, parasitic wasps).
- Levels of disturbance.
- Key ECOSYSTEM PROCESSES.

These methods weight attributes according to their relative importance to the overall health or integrity of the biotope being benchmarked. WEIGHTINGS may be assigned, for example, on the basis of expert opinion. A level or score for each attribute can be recorded, possibly using a table such as the one shown in Table 12.

Table 12: Sample table for recording benchmark attributes

Attribute	Reference level (units or bands)	Weight	Tradable or non- tradable?	Rationale and methods

Since practical methods for dealing with ecosystem processes and ECOSYSTEM SERVICES are still under development, ECOSYSTEM FUNCTION is generally covered by selecting more readily measurable attributes that are good proxies for ecological process and function, for example representation of key functional groups. As some benchmark attributes may be more significant to the overall health of the biotope than others, the different attributes are weighted accordingly. (In total, the weighted attributes of the benchmark will add up to 100%).

There may be circumstances where there is insufficient information to use a ‘benchmark approach’ with meaningful results. These include:

- Where there is insufficient understanding of biodiversity components to identify meaningful benchmark attributes that can be used for calculating equivalence.
- Where the risk factors and background rates of change are insufficiently well known to justify the type of explicit calculations used in the benchmark process.
- Where conversion and degradation of related habitats has been so comprehensive that there is no remaining site in a semi-natural state.

Alternative approaches which do not involve benchmarks might be more appropriate in such circumstances. These might include methods which rely more heavily on expert opinion concerning habitat suitability / equivalency, the condition of communities, assemblages of habitat or the acceptability of trade offs between losses in one location and gains in another.

Using appropriate methods to calculate gains required

Once offset planners have decided which approach to take to measuring loss and gain and which METRICS to use, they should use them to calculate how much gain in biodiversity is needed to offset the losses due to the project's residual impacts. Whichever approach an offset planner decides to take, it is important to explain clearly why this approach was chosen and what has been taken into consideration in the definition of no net loss and metrics for quantifying losses and gains.

Put simply, losses and gains are calculated as follows:

loss = predicted situation for affected area's biodiversity with no project impact minus predicted situation for affected area after impact and restoration.

gain = (predicted situation for offset area's biodiversity with no offset intervention minus predicted situation for offset area after RESTORATION or management), **adjusted for risk factors associated with these predictions**.

It would be undesirable for offset methodologies to be too complex to be attractive to offset planners, or for the vast majority of the investment in an offset to be taken up with measuring and monitoring rather than in actually delivering the conservation outcomes in the field. On the other hand, if metrics are too simple to be a credible way of determining no net loss of biodiversity, based on sound science, they will be rejected by offset planners and their STAKEHOLDERS. Consequently, a balance needs to be struck between exhaustive quantification of many components at all levels (genes, species, communities / assemblages, habitats and ecosystems) and superficial approaches that offer no realistic, scientific basis for determining 'no net loss'. Many practitioners are currently seeking the 'happy medium', and taking a range of different approaches to do so (see Appendix B).

Step 6: Review potential offset locations and activities and assess the biodiversity gains which could be achieved at each

To identify potential offset locations and activities using appropriate biophysical and socioeconomic criteria, to compare them, and to select preferred options for more detailed offset planning.

This step covers

- Deciding how to go about selecting potential offset locations and activities;
- The role of LANDSCAPE LEVEL PLANNING;
- Criteria for site selection;
- Selecting suitable activities;
- Determining whether the offset should be IN-KIND or OUT-OF-KIND;
- Being satisfied that the offset will provide 'additional' conservation outcomes and that the offset isn't simply displacing harmful activity to elsewhere; and
- Tools that can be used to guide offset site selection.

Step 7, which involves quantification of potential gains, would generally only be carried out for shortlisted options.

This step entails comparative analysis of potential sites to focus efforts on a shortlist in the next step. In order to focus further research on the most promising POTENTIAL OFFSET SITES and activities, it can help to undertake an initial comparison of the potential offset locations and activities using appropriate biophysical and socioeconomic criteria, to compare their advantages and disadvantages. Qualitative or quantitative methods can be used to select a shortlist of the most promising options and rule out those that, individually or in combination with others, do not appear to be feasible and would not meet the offset's objectives of achieving NO NET LOSS and winning the support of stakeholders. The shortlist will be the subject of more detailed 'gain calculations' and logistical checks in the next step in order to make the final selection of offset sites and activities.

Deciding how to go about selecting potential offset locations and activities.

Drawing on the results of previous steps, the purpose of this step is to identify a list of sites that could potentially offset residual adverse impacts. Selection of suitable activities and locations for offsets should consider biological, socioeconomic and geographical 'real world' opportunities and constraints identified through both stakeholder consultation and biological field studies.

Depending on the biodiversity components involved and the nature of residual adverse impacts, there are various approaches that may be used to identify potential locations, alone or in combination:

1. Use regional plans or results of landscape-scale spatial biodiversity planning to narrow the options based initially on conservation priority. In the absence of existing plans, use biological criteria at a broad scale to identify locations that will optimise conservation outcomes;
2. Take an opportunistic approach to identify suitable sites based on availability of land, its proximity to areas affected and its similarity to the area affected by a proposal, starting with promising, known sites near the IMPACT SITE and then widening the area of search until sites are identified which could deliver the biological and social outcomes needed;
3. Identify suitable locations to offset impacts on community and cultural use by searching for locations local to or accessible by communities affected.

The need to find suitable offset sites to deliver CONSERVATION GAINS of key biodiversity components also influences the scale at which site options should be considered. For instance, if a certain species to be offset were only found outside the immediate project zone of influence, the project developer may need to look at the wider landscape to identify options for the offset.

Ultimately the decision as to which approach to use will depend on the nature of the biodiversity impacts to be offset and the availability of data, local capacity, and time. In cases where securing legal title to land will be important to assure the long-term success of the offset, ability to purchase suitable land is likely to be a key factor. In other cases, where PAYMENTS FOR ECOSYSTEMS SERVICES are used to secure conservation gains on individuals' and communities' land without purchasing the land itself, the willingness of those individuals to participate in the long term will be key. The practical likelihood of implementing a successful offset because of support by stakeholders will always be a crucial consideration. Another key factor will be the capacity of potential partners in government and conservation organisation partners to provide assistance. Whether taking a regional planning approach or a more opportunistic approach, it is prudent for the developer to start seeking potential offset sites as early as possible, particularly when using the impact site-based approach, as the total time required will vary substantially and unpredictably from location to location. A crucial consideration in the evaluation of alternative offset sites is the socioeconomic and land use context of the sites.

Existing and predicted pressures on natural habitat may increase both VULNERABILITY to loss and management or 'policing' costs (e.g. areas known to have mineral wealth or earmarked for urban or agricultural expansion, etc.). Opportunity may be based on land TENURE (e.g. a company may already own land in the area and see an opportunity to set it aside for conservation), meeting socioeconomic needs of local communities, proximity to the impact site, as well as other factors. Opportunity and feasibility will always be important factors in deciding among the range of sites that may be present, but are just some of the typical criteria for site selection (see below).

The role of landscape level planning in site selection

Landscape level planning, whether conducted to guide conservation, sustainable land use or development, provides a framework within which individual offsets can be planned, taking account of the region's conservation priorities (see Box 13). Multiple approaches to landscape level planning have been developed. They may identify sites where significant species or ecosystems are located, corridors where important ecological or evolutionary processes occur and / or ecosystems on which local communities depend for health and / or livelihoods (Dinerstein 2000; Groves 2003).

Box 13: Landscape level planning and the BBOP PRINCIPLES ON BIODIVERSITY OFFSETS

The BBOP Principles recognise the importance of landscape level planning for the design and implementation of biodiversity offsets. Whether conducted to guide conservation, sustainable land use or development, landscape level planning sets out to tackle issues that aren't tractable at the very local scale by taking a multi-stakeholder perspective at a wider, landscape scale. It encompasses a diverse range of practices that seek to link grassroots and community based actions at the site, farm or forest levels to the broader landscape or ecosystem level, taking into consideration national and regional perspectives.

The third BBOP principle on biodiversity offsets is as follows:

Landscape context: Biodiversity offsets should be designed and implemented in a landscape context to achieve the best measurable conservation outcomes, taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ECOSYSTEM APPROACH.

And the explanatory notes accompanying this principle recommend that offset design and implementation should:

a) Be informed, where these are available and as appropriate, by the strategies identified in regional conservation and development plans, including information on threats and targets. This can support consideration of issues such as connectivity in the siting of offsets.

b) Address issues of scale.

c) Secure additional conservation outcomes that would not have been achieved without the offset.

d) Avoid displacing harmful activities that impact biodiversity to another location.

e) Consider issues of local GOVERNANCE, institutional capacity and resources.

Landscape level planning can be used to guide planned economic and infrastructure development. Its scope can thus be narrow (e.g. a strict conservation or ECOREGIONAL plan) or broad (e.g. plans to guide land use and sustainable development in which competing uses and potential uses can be reconciled). Landscape level or regional plans are extremely useful in reducing the risk of impacting important biodiversity (by understanding its regional significance), for ensuring the offset fits within the broader plan for the region, for optimising the offset's conservation benefits and for providing a framework for multi-stakeholder involvement. Working within the context of such plans reduces the potential for conflict and may reduce the effort required to select and compare offset sites. Integrated landscape management, or ILM, is increasingly used in Canada as a way of planning how land will be used and resources managed. It looks at planning from the 'whole landscape' perspective, taking into account all activities, in order to reduce CUMULATIVE IMPACTS. Planning and managing at the landscape scale is seen as an effective way to allow people with diverse interests to develop a shared vision for their public lands and resources, a vision that includes environmental, economic, social, cultural, aesthetic and recreational objectives[22]. In another example of landscape level planning, the Canadian federal government has developed methodologies to integrate biodiversity concerns and mineral resource potential in land use planning, specifically for national parks. The Mineral and Energy Resource Assessment (MERA) process[23] has been operating since 1980 to minimise conflicts between *in situ* conservation objectives and mineral development, both of which are seen as desirable land uses by government.

One of the benefits of landscape level planning is that it provides a basis for taking into account the full range of past and present activities and land uses and considering the shared responsibility for cumulative impacts by all those who have had or continue to make an impact on biodiversity. This can make it easier to determine the limits of responsibility for mitigating or compensating for RESIDUAL IMPACTS. Appropriate individual contributions to a biodiversity offset by single private entities can be determined within the context of the full range of background pressures and trends affecting biodiversity, so that a single individual, organisation or community is not held responsible for impacts beyond its individual contribution.

Landscape level planning processes almost invariably result in maps which can help offset planners understand the context of the impact area and the range of offset site options that may currently exist and assess the likelihood of an offset enduring in the long-term, in the face of planned development. They can be initiated by various stakeholders including government agencies and conservation organisations. Plans may already exist for the region or country where the project occurs. For instance, some countries have carried out spatial biodiversity assessments at a national or regional level, producing an explicit synthesis of both the

22 For example **http://canadaforests.nrcan.gc.ca/articletopic/122**.

23 See **http://www.icmm.com/page/915/canadas-mineral-and-energy-resource-assessments**.

VULNERABILITY and IRREPLACEABILITY of different ecosystems, and their relative priority for conservation action. In a sense, these plans give a strong indication of 'desired offset receiving areas'. Also, the particular country's National Biodiversity Strategy and Action Plan (NBSAP) may highlight the conservation priority areas in which offsets could make the biggest contribution to BIODIVERSITY CONSERVATION. In some instances, global or local NGOs may have prioritised different areas for conservation, providing useful focal areas for consideration in selecting offset sites. Forest Landscape Restoration, for example, is an approach promoted by IUCN and WWF that aims to get the right activities in the right places in order to conserve biodiversity and enhance options for people's livelihoods at the landscape level.[24] One of the stated objectives of this approach is to connect forest fragments and create links between protected areas and well-managed forests. Finally, STRATEGIC ENVIRONMENTAL ASSESSMENTS (SEAS) are increasingly undertaken for sectoral and or regional development planning purposes. SEAs may include valuable spatial information for use in locating potential offset sites, and have the added advantage (in most cases) of examining trends in land use and potential future pressure on remaining natural habitats. They also provide a platform for stakeholder involvement.

Site selection can draw on regional plans such as those outlined above that have identified conservation priorities and areas within the region where the impact will occur, and use these to select sites for further consideration. This approach, starting with biological criteria at the broader scale, helps ensure that all potential offset sites within the wider landscape are considered and the most appropriate site(s) are selected. In many cases there is some historical information on the distribution of the impacted ecosystems from which the current vulnerability and status of those ecosystems may be determined (e.g. by using Google Earth). In addition, potentially valuable landscape linkages (gradients, corridors between existing protected areas, etc.) or opportunities to consolidate or expand existing protected or priority conservation areas can be identified in this manner. A well constructed landscape plan can provide a framework to assess the value of and guide the implementation of biodiversity offsets greatly reducing risk associated with an offset investment.

However, there are many cases where such government plans do not yet exist and conservation priorities have not yet been identified. In this case, the offset planners may be able to work with local stakeholders to map conservation priorities and request help from conservation groups which may have developed conservation priorities for the area. In order to ensure buy-in of a wide set of stakeholders, it helps for such efforts to be led by governments or qualified conservation organisations working closely with local groups.

Criteria for site selection

Typical criteria for site selection include:

1) Ability to provide requisite biodiversity gains for the USE, cultural and INTRINSIC values identified.
   - Potential gains: Will the site adequately compensate for the losses accrued at the impact site in terms of amount and 'quality'?
   - Proximity of the offset site to the impact site (for use and CULTURAL VALUES in particular): Will local communities affected by the project benefit from activities at the offset site? To support the ecological integrity of the area where the impact is taking place, is it possible for the offset to be located close to the impact site, within the same watershed? (For typical spatial boundaries for offsets, see the 'Site selection and landscape level planning' box in the tables in the Appendices.)
   - Viability of the site to conserve the biodiversity into the future: Are there pressures that threaten the viability of the offset in the long term?
2) Ability to produce conservation 'additionality'.

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24 See **http://cms.iucn.org/about/work/programmes/forest/fp_our_work/fp_our_work_thematic/fp_our_work_flr/fp_forest_landscape_about/fp_forest_landscape_about_mission/index.cfm**.

3) Local capacity to implement the OFFSET ACTIVITIES and practical likelihood of success. Are there local communities and institutions working in the area available to assist in the design and implementation of the offset? Are they likely to be supportive? Should it be possible to establish workable legal, institutional and financial arrangements for the sites and activities concerned?
More detail on all these topics can be found in the Cost-Benefit Handbook (**www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**) and Offset Implementation Handbook (**www.forest-trends.org/biodiversityoffsetprogram/guidelines/oih.pdf**).

Selecting suitable activities

In practice, biodiversity gains can be achieved in a number of ways, including:

- *Undertaking positive management interventions* to restore an area or stop degradation: Improving the conservation status of an area of land by restoring habitats or ecosystems and reintroducing native species. Where proven methods exist for successful RECONSTRUCTION or creation of ecosystems these may be undertaken. In other instances, a project might reduce or remove current threats or pressures by, for instance, introducing alternative sustainable livelihoods or substitute materials.
- *Averting risk*: Protecting areas of biodiversity where there is imminent or projected loss of that biodiversity; entering into agreements such as contracts or covenants with individuals in which they forego the right to convert habitat in the future in return for payment or other benefits received now.
- *Providing compensation packages* for local stakeholders affected by the development project and offset, so they benefit from the presence of the project and offset and support these initiatives. (This is the subject of the Cost-Benefit Handbook, but the issues need to be drawn into the overall offset design in a Step such as this one.)

Box 14 summarises some of the issues associated with these alternatives.

Some offset activities ensure conservation through suitable management (e.g. removing invasive alien species to protect endangered ENDEMIC species), while others reduce pressure on biodiversity and provide socioeconomic benefits for people through sustainable use and livelihood options. Both need to be considered and brought together at this stage in offset design. Offset activities that address people's uses and cultural values for biodiversity have two purposes. This first is to ensure compensation for a development project's impacts on the biodiversity related use and cultural values of affected stakeholders, particularly indigenous peoples and local communities. The second is to ensure the success of the offset by defining a package of benefits such as sustainable use projects and financial compensation for stakeholders local to the offset activities, and also involving them in the implementation of the offset. Addressing the underlying causes of loss of biodiversity at the offset sites and ensuring that local stakeholders are motivated to support conservation activities there can be an essential part of the offset package. This topic is the subject of the separate Cost-Benefit Handbook, which can be used in parallel to this Offset Design Handbook. Whatever methods and tools offset planners use, they will need to bring together the full set of potential offset activities at this point, including both conservation and sustainable use activities and potential compensation packages, to check they deliver the needed results and to pick the most viable options as a shortlist.

Wherever possible and appropriate to the specific context of the project and its residual impacts, offset locations and activities should be chosen to contribute to the long-term priorities for conservation and sustainable use of biodiversity and sustainable development, as identified in the country's national or regional biodiversity strategy and action plan and national sustainable development strategy.

Box 14: The significance of 'restoration and 'reconstruction' versus 'AVERTED RISK / ARRESTED DEGRADATION' offsets for the concept of no net loss

Biodiversity offsets can involve restoration / reconstruction of ecosystems or arrested degradation and averted risk. Which approach is preferable, and what are their implications for a 'no net loss' policy at the landscape scale in the longer term?

At the level of an individual development project, it can be argued that both types of offset might achieve no net loss through compensating for residual impacts (depending, of course, on the success of the different offset interventions). However at the landscape level, in which policy makers and conservationists are particularly interested, important differences emerge as summarised below:

Arrested degradation and averted risk offsets:

- **Real 'gain'?** Arrested degradation and averted risk offsets simply reduce the rate at which biodiversity is being lost from the landscape. They maintain but don't improve the biodiversity at the current level within the landscape. Stopping something from degrading is not a 'net gain', unless you take into consideration the (very likely) degradation and downward baseline trend of biodiversity without the offset because of cumulative and INDIRECT IMPACTS (many development projects, pollution, climate change).
- **Landscape scale results:** Assume a scenario in which for every hectare lost to a development project, one is conserved through an arrested degradation or averted risk offset. Over time, all the remaining natural habitat) will be occupied for either a development project or protected by an offset., leading to a 50% net loss of biodiversity, all other factors being equal.

Restoration and reconstruction offsets:

- **Real 'gain'?** Theoretically, restoration and reconstruction offsets add to the total amount of biodiversity present in the landscape. However (as detailed in Box 20), there are profound restrictions on our ability to restore and reconstruct ecosystems to the level of complexity, structure, composition and function that they enjoyed before they were degraded.
- **Landscape scale results:** Assume a scenario in which for every hectare lost to a development project, one is conserved through a restoration or reconstruction offset. Within the limitations of our ability to restore biodiversity, over time, the landscape should theoretically have experienced a 0% net loss of habitat, with biodiversity in the same state as it was before any development started: no net loss.

Conclusions:

At the project level, no net loss appears to be achieved with either approach. However, at the landscape level, restoration and reconstruction offsets (if they work) lead to a true gain in biodiversity, whereas avoided degradation and averted risk offsets can only be regarded as achieving no net loss if this is judged against the degrading biodiversity baseline. Which is preferable? In reality, biodiversity around the world is being lost at an unprecedented rate. Comparing the complexity of ecosystems in good conservation status with the relative simplicity of restored ecosystems, and considering the limitations on the success of restoration and reconstruction, offsets that serve to keep genuinely threatened ecosystems intact and avert their degradation and loss would appear to be the first choice. However, it is important that additionality can be demonstrated. At the same time, restoration and reconstruction activities can achieve significant conservation outcomes in suitable settings and properly managed. There are probably two core conclusions: First, the offset that is best suited to the specific circumstances and stands the best chance of long term success in securing additional conservation outcomes should be chosen. Second, the key issue is how much continued loss of biodiversity society is prepared to accept and what policies it will put in place to give effect to its decisions. This is a profound question for society, and one whose answers lie as much with policy makers and individuals as they do with individual developers.

Determining whether the offset should be in-kind or out-of-kind

It is important to establish a clear link between the biodiversity components that will experience a negative residual impact at the impact site and the biodiversity components that will be conserved and benefited through conservation and sustainable use projects. Biodiversity offset policies around the world are often based on the principle of 'LIKE-FOR-LIKE or better' (see, for example Western Australia EPA 2008, Appendix A.7). The most desirable outcome is generally to offset the biodiversity components to be impacted by targeting the same biodiversity components elsewhere (an 'in-kind' offset). In certain situations, however, the biodiversity to be impacted by the project may be neither a national nor a local priority, and there may be other areas of biodiversity that are a higher priority for conservation and sustainable use and under imminent threat or need of protection or effective management. In these situations, it may be appropriate to consider an 'OUT-OF-KIND' offset that involves 'TRADING UP'; i.e. where the offset targets biodiversity of higher priority than that affected by the development project.

An early step in offset site selection is often to check which biodiversity components identified as priorities for the offset are found at potential offset locations, and to begin eliminating potential sites because they do not support the biodiversity components for which in-kind offsets are considered essential. However, if the plan is to 'trade up' to an 'out-of-kind' offset, a direct match between biodiversity components would not be as important. In this case it will be important to justify the trading up decision and ensure that the amount of biodiversity to be conserved through the out-of-kind offset is adequate in nature and scale to offset the impacts.

In Victoria State, Australia, the presumption is that offsets should be 'in-kind' based on the Victoria State Vegetation Classification. However 'trading up' is specifically allowed and can be 'rewarded' by affirmative ratios, which reduce the area the developer is obliged to conserve in the offset. Use of a BENCHMARK for each vegetation type on its own terms allows for trading equivalence. In Victoria, the comparative conservation value of different HABITAT TYPES has been determined, based on threat and conservation priority, enabling offset planners to establish whether it would be acceptable for an impact on Type A habitat to be offset by gains to Type B habitat. If so, a loss of 1 habitat hectare of Type A could be offset by 1 habitat hectare of Type B, since the metric ensures a similar quality, and the exchange restriction allows 'trading up'. In the absence of clear conservation policy such as this, an offset planner would need to demonstrate why losses of one type of biodiversity might be TRADABLE with gains in another. This could be, for instance, because the habitat gained is more diverse and will support more abundant populations of threatened species than the one lost. It is important to set out clear criteria for making such a decision, to take account of stakeholder opinion, and to document the resulting decision. LANDSCAPE LEVEL PLANNING can help understand the significance of the project impact area for conservation within the wider landscape and identify potential offset sites that either enable the developer to offset those biodiversity components impacted by the project or 'trade up' and conserve a higher priority site.

Demonstrating additional conservation outcomes ('additionality')

The concept of 'ADDITIONALITY' is a fundamental principle for biodiversity offsets. An offset should deliver conservation gains over and above planned or predicted conservation actions being taken by other parties (otherwise the offset is making no difference). So, it is important to check that the conservation gains planned through the activities at the offset site(s) would not have happened anyway, in the absence of the offset. By comparing how the biodiversity components are predicted to change under the *status quo* scenario with how they would change under the offset scenario, offset planners can calculate the expected conservation gain. This can enable them to compare the relative value of the potential offset site(s) and the level of potential conservation gains that could be achieved at each. It may be costly in terms of time and resources to calculate the biodiversity gains for many different potential offset sites, but should be feasible for the shortlist that this step will develop. At this stage, the offset planner could undertake an initial, qualitative assessment of whether the offset options should be able to achieve a significant additional conservation gain. (The gain can be calculated more rigorously for a shortlist of preferred offset options in the next step, using the same methods and metrics used to calculate the 'loss' in Step 5.)

Tools that can be used to guide offset site selection

A variety of methods and supporting tools are available to assist in the offset site selection process, the majority of which were developed either to identify areas for conservation that deliver the best conservation returns per unit of investment, or to support landscape level or spatial planning. Many of these methods, however, are easily adapted for the purposes of selecting sites for biodiversity offsets (see Table 13). Selection of an appropriate approach to support offset site selection will likely be determined by the context in which the project occurs, specifically:

- The priority biodiversity components identified for their intrinsic, use and cultural values that require offsetting, based on a completed KEY BIODIVERSITY COMPONENTS matrix or other method to record priority outcomes for the offset;
- The existence of the necessary data or baseline information; and
- The capacity, time and resources available to support its application.

The types of tools available to assist in offset site selection range from basic GIS overlays and analysis, to more spatial modelling exercises. In addition, expert opinion, drawing on local and regional conservation agencies and institutions, in combination with local indigenous or community knowledge and mapping, can be a reliable and relatively inexpensive way of identifying potential offset sites, in combination with the use of satellite imagery (e.g. Google Earth). In all three cases, the project developer will most likely rely on partners to conduct the analysis.

The different tools require a certain degree of knowledge and data to ensure their effective application. The GIS and spatial modelling approaches tend to require more data and expertise than the others mentioned above. Some approaches may be better suited to certain components of biodiversity at the species, communities or ecosystem levels, while others may be easily adapted to include one or more of these. For instance, in regions lacking data on ecosystem service provision (e.g. value and importance of watersheds, productive lands, biodiversity based livelihood resources, etc.) the use of matrices and spreadsheets more effective, but where spatial data is available, it can be included in GIS analyses and spatial modelling programs. Finally, some approaches may only be relevant to certain regions, biomes or countries.

For regions with good spatial data on biodiversity, including biodiversity or systematic conservation plans, or regional land use plans that include conservation, GIS analysis and / or spatial modelling can be implemented more easily. In some projects, a simple GIS overlay may be sufficient to identify appropriate sites. For projects impacting multiple key biodiversity components, however, it may be more efficient to use spatial modelling software using optimisation algorithms to identify the offset site that would provide the highest return on investment in terms of biodiversity gains. This is especially the case for projects unable to identify a single site that meets all of the offset requirements. However, this would rely on the availability of capacity and resources to access and run such software. Stakeholder consultation and consideration of the local context can help with selection of the approach and tools to use.

Selection of suitable activities and locations for offsets will be determined by both biological and 'real world' opportunities and constraints, including results of both stakeholder consultation and biological field studies. The potential for alternative sites to contribute to national biodiversity and other relevant strategies should also be considered. Zonation, Marxan and Marzone are software tools used for spatial conservation planning. None of these tools was designed specifically to design biodiversity offsets, but they can help locate offsets in the most appropriate places in the landscape in order for them to make the best possible contribution to biodiversity conservation in the long term. In essence, they prioritise parcels of land or planning units for conservation; what could be considered as suitable 'offset receiving areas'. They can be described as follows:

- Zonation can be used to prioritise parcels of land for conservation, conservation assessment, reserve selection and reserve network design. It focuses on species and their habitats and retention of biodiversity features in the landscape over time. Its aim is to address regional scale requirements to achieve certain levels of persistence or occupancy. It has the potential to deal with trade offs at the landscape scale and can be used to rank prospective offset areas. (Moilanen *et al*. in prep. See Appendix D.1)
- Marxan is target-based; i.e. it helps to identify the most cost- effective and efficient spatial location of protected land parcels to meet conservation objectives and targets. Information on species and environmental features (e.g. vegetation types), existing reserve or protection status, land-price (etc.) must be supplied. Different from Zonation, Marxan allows the incorporation of land prices and conservation management costs which can help guide an offset strategy. (For an example of the use of Marxan in developing a biodiversity offset, see Box 15, below.)
- Marzone is a new program, based on Marxan, that allows consideration of multiple management zones for different planning units, so that conservation objectives can be achieved through a wider suite of management options than reservation alone. Given this feature, it applies more readily to 'real world' situations and may offer advantages over earlier models to biodiversity offset planners.

For further information on these tools, please see Appendix D.2.

Box 15 illustrates the use of spatial modelling to select offset sites for a natural gas development in the United States.

Box 15: Application of spatial modelling to select offset sites for the Jonah Natural Gas Field Development in Wyoming USA

Over the past 10 years the Jonah natural gas field in Wyoming has become one of the richest gas fields in the United States. In 2006 approval was granted to BP to construct an additional 3100 wells in this region, a requirement of which was to establish a mitigation fund of over US $24 million. To develop a strategy for dispersing these funds across the landscape, BP partnered with The Nature Conservancy to design a strategy for locating the offsets close to the impact sites and achieving the greatest conservation benefits to the region.

The project used the Marxan spatial planning algorithm software to identify potential offset sites meeting biological targets for the offset. The first step in this process was to assemble a mitigation design working group to provide guidance on developing the mitigation strategy. This group then identified a set of biodiversity components that would guide site selection based on their ability to be measured, represent biodiversity within the landscape and contribute significantly to conservation in the area. These components represented both course filter and fine filter components and ranged from ecosystems to species and their habitat requirements. The project designers drew from the Wyoming Basin Ecoregional Plan (Freilich *et al.* 2001) and cross walked this information with that gathered as part of the Environmental Impact Assessment undertaken for the project. The next step was to collect spatial data for each of the targets to ensure the ability to quantify the project impacts.

Once this was completed, goals for each of the biological targets were established. The software also allowed for the inclusion of additional criteria such as cost (e.g. landscape integrity, conservation cost in dollars, size of the reserve) and areas of high oil and gas development potential to identify the most optimal sites for the offset. All of this data was fed into the Marxan application and a set of sites were identified based on these requirements.

Recognizing that the project impacts would extend beyond the project site, the analysis used the full gas field as the boundary for the analysis and thus doubled the overall area for inclusion in the planning exercise. The analysis was run at broader and broader scales until all of the biodiversity components were met. In the end over 62,000 hectares were selected to meet the offset goals for all of the biodiversity targets identified. The working group then identified activities and strategies for restoring or conserving these sites into the future.

Source: Kiesecker *et al*. in press.

Table 13: Comparison of analytical approaches to assist in site selection

Type of Analysis	Advantages	Disadvantages	Circumstances when this approach may be appropriate
Expert and local community input and advice combined with satellite imagery (Google Earth)	Cheap, reliable, local, can be relatively quick. Enables the analysis of biodiversity values when very little data is available.	May not be seen as sufficiently 'scientific'. Additional surveys may be necessary to verify presence of the key biodiversity components. May lack of information on the LANDSCAPE CONTEXT, including future changes that may devalue the offset.	Very little information available. Few key biodiversity components impacted. Major impacts are on use and cultural biodiversity values.
GIS overlays and analysis	Enables offset designer to see how the site fits within the broader landscape. Can spatially show other actors or pressures on the potential site.	Requires spatial data and knowledge of GIS software applications.	Spatial data available for species, habitat and ecosystems within the landscape. Several key biodiversity components impacted, some of which are intrinsic values.
Spatial modelling	Enables user to prioritise among different potential sites. Can incorporate key decision-making criteria such as cost into the analysis.	Requires spatial data for biodiversity components at the scale used to identify offset sites. Requires capacity in GIS analysis and algorithm software.	Spatial data available for biodiversity targets to be included in the offset. Multiple biodiversity components to be offset, including intrinsic values.

Step 7: Calculate offset gains and select appropriate offset locations and activities

To finalise the selection of offset locations and activities that should result in no net loss of biodiversity. This involves calculating the biodiversity gains that could be achieved by the shortlist of preferred offset options; considering the scale needed for the offset to deliver 'no net loss' and applying 'multipliers', where appropriate. Also to ensure that the offset offers adequate compensation to communities affected so they benefit from both the project and the offset and are motivated to support the offset's long term implementation, and selecting the final offset site(s) and activities.

This step covers how to check whether:

- The selected offset locations and activities will deliver gains sufficient to achieve no net loss or NET GAIN and will be viable and appropriate within the landscape;
- It is necessary to use any multipliers; and
- Local stakeholders support and benefit from the presence of the development project and the biodiversity offset.

Checking that the selected offset locations and activities will deliver gains sufficient to achieve no net loss or net gain and will be viable and appropriate within the landscape

The process of selecting final offset locations and activities is iterative and builds on the results of the previous step. Whereas the previous step involved broad comparisons, this step draws on specific information to calculate possible gains of biodiversity through offset activities. The final selection of the offset sites and activities will be influenced by many factors, including:

- To what extent locations shortlisted for the offset already support key biodiversity components;
- Background rates of loss, drivers of this loss, and what actions would be required to reverse any adverse trends at these sites; and
- Restoration potential at the sites and the potential to avert future loss (i.e. is a CONSERVATION GAIN possible at shortlisted locations?).

The offset sites and activities finally selected should:

- Conserve substantially the same biodiversity components in a similar ecosystem to that affected by the project ('in-kind') or result in biodiversity gain for biodiversity components of higher priority, if this is consistent with relevant conservation policy;
- Allow for improvement in conservation status for key biodiversity components beyond that which would happen in the absence of the offset and sufficient to achieve no net loss or a net gain;
- Be viable in terms of size (for example sufficiently large to provide a viable home range for a key species or to allow key processes to function)
- Be appropriate in terms of any relevant landscape level of ECOREGIONAL PLANNING.

At this stage, the key is to ensure that the kind of biodiversity that can be delivered by the offset sites and activities is appropriate, and that the additional amount (in terms of area, quality, and / or species occupancy) that can be gained through the offset is adequate to achieve no net loss. The first step is to check that the site or sites ultimately selected for the offset will be able to deliver conservation outcomes for all the key biodiversity components affected by the development project, or higher priority alternatives if an out-of-kind offset is justified. As described in Step 6, a variety of tools (e.g. Zonation, Marxan, Marzone) exists to compare different offset sites and check whether they are appropriate for the conservation of key biodiversity components. A simpler table for comparative analysis such as that below (Table 14) could also help.

The second step is to check the amount of biodiversity gain that can be achieved for each shortlisted offset site. As explained earlier in this Handbook, there are many possible ways to calculate loss and gain of biodiversity, but whatever method was used to quantify residual losses (in a step such as Step 5) should be applied now to calculate the possible gains that could be achieved through offset activities at shortlisted locations. This will guide the decision as to whether one site will be enough to achieve no net loss, or a COMPOSITE OFFSET is required.

The amount of biodiversity gain that can be achieved depends considerably on landscape context. An offset located adjacent to an existing protected area may complement existing habitat for key species whereas a more isolated location will have to meet all habitat requirements in order to support the same species. It is necessary to make sure either that:

a) The offset is sufficiently large for it to support key biodiversity components in a viable condition independent of surrounding land (i.e. as a closed system); or

b) It is located to complement existing, viable habitat nearby.

In this step, it can help to refer back to results of earlier steps (for instance, Step 4 for offset planners using this Handbook) in which ecological dependencies and relationships were explored. It may also be helpful to define conditions required to achieve viability or 'integrity' for key components. The European Habitats and Birds Directives use the concepts of integrity and conservation status, for example (See Appendix A.4 and De Leo and Levin 1997). Some approaches to the development of habitat networks use measures of landscape 'permeability' to determine where sites should be located to support colonisation by key species, based on their dispersal distances. It may be useful to consider whether key species associated with an ecosystem will be able to colonise restored areas spontaneously or whether reintroductions may be required. One of the main advantages of approaches to offset design based on assessing levels of occupancy and persistence in the landscape is that they can be used to select locations which optimise the outcome for key biodiversity components (see Appendix C.1).

Table 14: A table or spreadsheet such as this could be used to record and compare whether shortlisted sites could deliver conservation gains for key biodiversity components during site selection

	A	B	C	D	E	F	G	H
1	**Offset Components Evaluation**							
2	Biodiversity Component	**Offset Type**		**Site Selection******				**Rationale** *(Insert comments here explaining data entered in columns D to G)*
4		In-Kind Necessary	Out of Kind is an Option	Site 1	Site 2	Site 3	Site 4	
5				*[Insert Name]*	*[Insert Name]*	*[Insert Name]*	*[Insert Name]*	
6	**Species (TO EDIT CONTENTS OF GREY CELLS, GO TO WORKSHEETS "(1) Biodiversity Assessment" and "(2) Impact Ass & Mit Hierarchy")**							
7	(e.g. Bird)							
8								
9								
10								
11								
12								
13								
14								
15								
36	To add more rows…							
37	**Habitats**							
38	(e.g. Degraded Forest)							
39								
40								
41								
42								
43								
44								
45								
46								
67	To add more rows…							
68	**Whole Landscapes/Ecosystems**							
69								
70								
71								
72								
73								
74								
75								
76								
77								
78								
98	To add more rows…							
		**** Add qualitative assessment of likely gain						

Checking whether it is necessary to use any multipliers

Once the potential biodiversity gain through the offset has been calculated, it is typical in offset policy to consider adjusting the scale of the offset to take account of factors such as uncertainty and temporal loss. Policy measures on offsets often use 'MULTIPLIERS' and 'discounting' to deal with uncertainties about outcome (e.g. restoration methods are not always reliable) and temporal loss of biodiversity when there is a time lag between the impact and the offset achieving its objectives. There are several reasons for employing multipliers and this section attempts to provide a brief review of them in offset policy and approaches to using them. The application of multipliers to voluntary offsets is a new area, and one in which there is little experience from which to draw, so the ideas presented here are tentative. However, as multipliers form an important part in most offset policy regimes and their aim to ensure the offset's objective of no net loss or a net gain is met, those planning voluntary offsets may be glad to consider whether and how they could improve their chances of success.

The offset 'ratio' is simply an observation of the area occupied by an offset divided by the area affected by an impact. Use of a 'multiplier' represents a decision made by an offset planner to increase the area of an offset by a certain factor, with the aim of improving the chances of achieving no net loss. However, the terms ratio and multiplier are often used interchangeably.

Offsets constituting multiples of the area impacted may be used to account for a range of factors which might influence success in achieving no net loss. The main types of multiplier are summarised in Table 15.

Table 15: The main types of multiplier and their function

Name	Function
CURRENCY-based multipliers	These are used to measure and balance the different amounts (and quality) of biodiversity per hectare lost due to a project or gained through an offset.
Uncertainty-based multipliers	These are used because of uncertainty about the amount of biodiversity gain which can be achieved through the offset: this may be due to uncertain restoration techniques or the fact that it may take a long time before the offset matures, resulting in STOCHASTIC issues creating risk.
Conservation outcome multipliers	These may be used to help ensure the conservation in the long term of a certain area of land containing priority biodiversity components, considered necessary to ensure representation and persistence. The approach takes into consideration cumulative impacts and may require a developer to undertake an offset at a scale greater than that associated with its individual project.
TIME DISCOUNTING multipliers	Time preference and time discounting multipliers may be used to account for the lack of equivalence between immediate loss and future gain.
Out-of-kind multipliers	Also known as 'trading up' multipliers. Where the offset promotes a different and higher priority type of biodiversity to that impacted, fraction multipliers may occasionally be warranted. Theoretically, positive (whole number) multipliers could be used to trade down (e.g. an impact on 1 ha of high priority habitat could only be offset by an offset of 10 ha of lower priority habitat). However, offset policy does not support 'trading down', so this kind of multiplier is not considered here.

Currency-based multipliers

All credible offset projects require development of appropriate currencies to calculate the 'amount' of biodiversity likely to be lost as a result of a development and therefore the gains required (see Step 5). These are often quantified in terms of area (hectares) and adjusted by some measures of 'quality'. However, areas affected by impacts and those selected for offset delivery are highly unlikely to ever be equivalent in terms of 'quality' or 'condition' such that loss of 100 ha due to a development can be directly offset through 100 ha somewhere else. Currency based multipliers can be used to adjust the offset area to account for this, e.g. if 100 ha of a '50% optimum quality'-ecosystem is lost completely (e.g. by concreting it over), and the offset site promises the potential for a 25% gain (say from a pre-project baseline of 40%, to 65% quality habitat after the offset intervention), then 200 ha of offset area are required. Hence the currency-based multiplier in this example is 2x. Hence the currency-based multiplier doesn't need to be applied, but *emerges* from most loss / gain calculations that use a metric based on area x quality. Other multipliers, to account for risk and time discounting may then be applied on top.

Multipliers to deal with uncertainty in offset methods and degrees of success

Uncertainty-based multipliers can be used because there is a less than 100% probability of success for offset interventions. It is important to consider the type of uncertainty in question. Uncertainty multipliers are not appropriate where it is the feasibility of the offset method that is in question such as untried restoration techniques (will / won't it work? – see for example Box 16). If an ecological restoration technique is methodologically uncertain, attempting to implement it over twice the area is unlikely to reap twice the benefits. On the other hand, uncertainty multipliers are appropriate where uncertainty relates to the probable degree of success of a method. Where the probability of each seedling growing into a mature tree is on average 50%, clearly it is necessary to plant at least twice as many seedlings to achieve the desired outcome, such as planting twice the area, for example. This would result in a 2x multiplier based on levels of uncertainty which are quite precisely understood.

Box 16: Carefully consider restoration potential of the habitats in question

The potential for restoration to replace biodiversity values in mature, old growth or diverse and complex habitats requires careful attention and is likely to be very limited. One example is tropical forests. Optimistic claims have been made that the recovery of tropical forest biota following land-clearance may be relatively rapid (Wright and Muller-Landau 2006). However, these claims lack any strong empirical support and a recent review of the scientific literature illustrates that the future of tropical forest vertebrates in regenerating areas remains extremely uncertain – few data exist, and those that do are often of poor quality (Gardner *et al*. 2007). Where data do exist, they demonstrate that secondary forests consistently lack a significant proportion of native forest species (e.g. 25 – 40% for sites in the Brazilian Amazon: Barlow *et al*. 2007). These limitations mean that it is not yet possible to show that a restoration project in an impacted tropical landscape can generate a biodiversity offset that even approaches the replacement of the original primary forest species assemblage.

Non-multiplier ways of dealing with uncertainty

There are ways to manage uncertainty and risk other than multipliers. These can be used in combination with multipliers, or may remove the need for some uncertainty multipliers in offset calculations. Two possible mechanisms are covered here: insuring against failure (insurance and bonds, see Box 17); and ensuring offset gains exist before most impacts occur (such as biodiversity banks and AVERTED RISK projects, see Box 18).

Box 17: Insurance and bonds

Offset developers can investigate the use of insurance and bonds in tackling issues such as restoration uncertainty. For example, risk products are now available for REDD carbon where the avoided deforestation gains may not be secure in PERPETUITY (Skutsch *et al.* 2007) and for natural forests and plantations in general (e.g. ForestRe). A broader discussion is required on insurance for biodiversity offsets because biodiversity is (very much) less fungible than carbon, and sometimes its loss is uninsurable. A regulatory example is the Restoration Security Bonds required of developers by the state government of South Australia. These are used as an enforcement tool to encourage compliance with legislative obligations and to minimise risk to the State from financial liabilities of insolvent operators. The Restoration Security Bonds encourage compliance with the relevant Acts, regulations and license conditions; minimise the potential financial liability for the State arising from financial failure of licensees; and encourage compliance with requirements for mine / facility abandonment and decommissioning, and encourage progressive REHABILITATION.

Box 18: Reducing uncertainty by establishing offset gains before project impacts occur

There are a number of ways to ensure that offsets mature prior to project impacts:

a) National or State Biodiversity Banks. Developers and policy makers could work together to encourage the establishment of national biodiversity banks in major habitat types for which offsets are appropriate. This could reduce the need for large uncertainty multipliers in individual offset projects. Biodiversity banks – parcels of land set aside for conservation in some form or another – are currently operating in countries including the US, Germany and Australia. However it should be noted that biodiversity banks are not a panacea and many challenges exist for their useful application. These include appropriate compensation of local cultural values as well as intrinsic values, thin markets, and problems of degrees of biodiversity similarity between impact areas and offset bank sites

b) Pre-emptive risk aversion. Developers could invest in, or undertake, offsets which remove currently degrading impacts (such as avoided deforestation) to accrue early gains, even prior to project impacts. As with biodiversity banks, pre-emptive offsets would result in more certain biodiversity outcomes and lower costs for business than offsets instigated after project impacts. Some mine projects, for instance, already purchase land adjacent to the mine for ancillary purposes, and these may be suitable sites for pre-emptive offsets.

Multipliers to ensure no net loss with respect to conservation targets and rare or threatened biodiversity components

Conservation outcome or ‘endgame‘ multipliers are can be required by policy makers where the impacted biodiversity in question is subject to a conservation target or desired outcome within the landscape. Multipliers such as this can achieve a particular conservation target for a biodiversity component – such as the maintenance of 50% of remaining hedgerows, 70% of a remaining species' population, or conservation of a certain area of an ecosystem, calculated to be needed to maintain long term persistence and representation.

These multipliers are based on the logic that where an ecosystem (or habitat or species range) is limited in extent, at some point in the future (the ‘endgame’) all the ecosystem land area will have been used up for either development or conserved through an offset. In this endgame scenario, a 1x multiplier will eventually result in a 50% net loss of habitat, and a 2x multiplier a 33% net loss of habitat. These two scenarios are drawn in Figure 7. Hence the multiplier required for any specified endgame net loss of habitat can be calculated, as shown in Figure 8. For example, if for the purposes of viable long-term conservation, no more than 10% of an ecosystem can be lost in total at endgame, then this in itself defines the offset multiplier required. Figure 8 shows how a 10x multiplier leads to a 9% endgame net loss of habitat; 20x multiplier leads to a 5% endgame net loss of habitat; and a 30x multiplier leads to a 3% endgame net loss of habitat.

Figure 7: Diagrammatical representations of threatened ecosystem or habitat at 'endgame' when it has all been used for either development or offset.

Dark squares are those developed; the lighter ones are those offset. The total area of the light squares is the remaining area of threatened ecosystem or habitat; one dark square is a unit area of development; one light square is a unit area of offset. In the first example, 1x multiplier leads to a 50% net loss of the ecosystem at endgame; in the second, a 2x multiplier leads to a 33% net loss of habitat at endgame. The red ellipses indicate the outcome of a single 'development and offset' interaction.

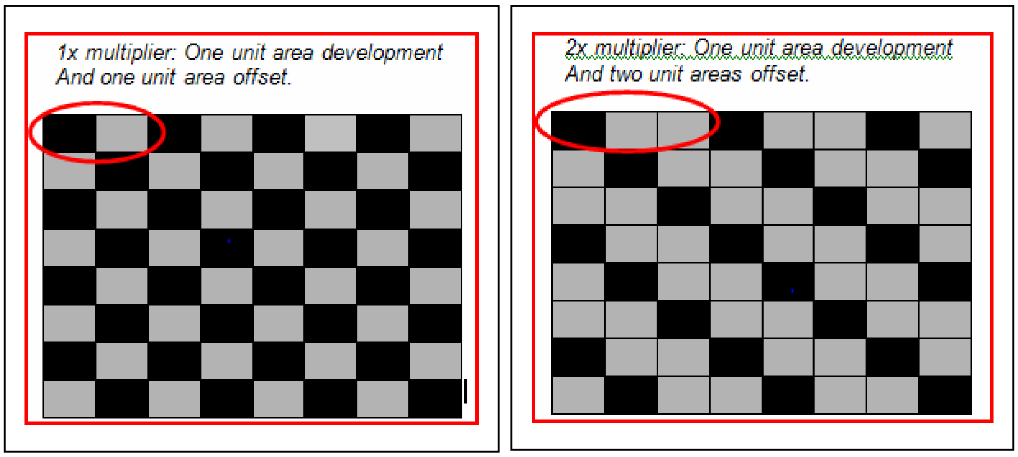
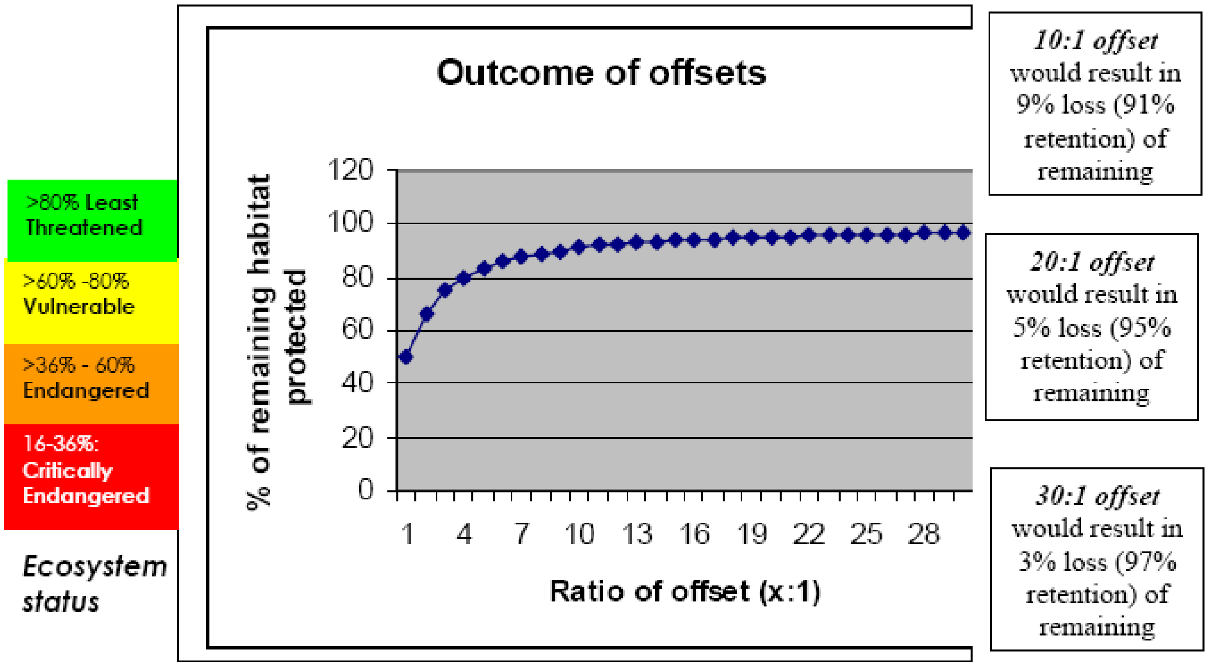


Figure 8: The effect of different offset ratios on the percentage of habitat in a given ecosystem persisting over time.

The amount of habitat retained at endgame increases with the offset ratio at an exponentially decreasing rate. It is assumed that the offset would secure areas of habitat for protection in the long term. Depending on the exact percentage of the original ecosystem remaining, offset multipliers of from 4x to 10x could lead to the change in status of vulnerable to endangered respectively over time.



Multipliers to deal with time discounting and time preference

Why consider DISCOUNT RATES? Empirical evidence suggests that people value immediate or near term resources more highly than those acquired in the distant future (e.g. Frederick *et al.* 2002[25]). This is generally known as 'Time Preference', and is generally ascribed to human impatience or the fact that those that bear the cost of the resources want to benefit from them as early as possible in case they or the resources do not exist in the future. In addition to time preference there are a number of other justifications for discounting the value of future benefits and costs, including inflation, the OPPORTUNITY COST of capital and uncertainty. Just as with other goods and services, future gains in biodiversity are therefore not equivalent to immediate losses for a host of reasons, even when the future gains are certain. Hence biodiversity offsets require some kind of discount rate if their benefits accrue after the impacts occur. Several offset and mitigation systems, such as those of the US government agencies, use a standard discount rate (for example, 3%[26] and 7%[27]) in calculating mitigation requirements for residual losses of development projects. Although some conservationists, ethicists and a recent well known climate change report have used zero or low discount rates on account of intergenerational equity, the existence of time preference, inflation and the opportunity cost of capital suggests that a positive discount rate better reflects society's preferences. Developers wishing to develop no net loss offsets may therefore wish to consider the use of a discount rate in measuring losses and gains.

Simple equations are available for calculations of NET PRESENT VALUE of biodiversity offsets whose benefits accrue some time in the future. Habitat Equivalency Analysis (commonly used in the USA by a number of private and public sector mitigation and offset agencies) provides some of the best examples of how this may be done[28]. The significance of a lag in the compensation of impacted biodiversity cannot always be assumed to follow a standard discount rate. The temporal lag or loss is either insignificant or conversely highly significant. For instance, many conservationists would not be concerned by the temporary loss of some non-threatened species and habitats for which mitigation or offset capacity was known to be relatively reliable. Conversely, where a threatened species of beetle only breeds for 10 days each year and the impact period is indeed 'only 10 days' but which happen to coincide with the breeding period, unmitigated impacts may be too severe to offset.

Multipliers for out-of-kind offsets

Where the offset is a different but higher priority type of biodiversity from that which will be lost, fraction multipliers may occasionally be warranted, if other factors such as habitat quality are equal between the sites. In essence this is because the perceived gains per hectare through the offset are greater than the losses per hectare due to the development. However, planners of voluntary offsets may be well advised not to use fraction multiplier when trading up, largely because the general public may feel that offsets smaller than IMPACT SITES do not represent a fair exchange. For further ideas on multipliers of the different kinds mentioned here, please refer to the BBOP Consultation paper on Multipliers, prepared by some members of the Advisory Committee as the basis for discussion (see **http://www.forest-trends.org/biodiversityll/toolkit/multipliers.pdf**). There is little information and experience of applying multipliers to voluntary offsets, and this is an area that merits more discussion and practical experience. In addition, the manner in which multipliers are used in a number of countries' policies is described in Appendix A.

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25 Frederick *et al.* 2002.

26 NOAA 2006.

27 OMB 1992.

28 **http://www.darrp.noaa.gov/library/pdf/heaoverv.pdf**.

Checking that local stakeholders support and benefit from the presence of the development project and biodiversity offset

If a set of steps such as those outlined in this Handbook have been followed, local stakeholders will have been consulted and involved in the design of the biodiversity offset from the outset, for instance, identifying key biodiversity components including those important for use and cultural values, advising on metrics to quantify loss and gain and contributing to the process during which POTENTIAL OFFSET SITES and activities are identified and compared.

The separate Cost-Benefit Handbook, designed to be used in parallel to this Offset Design Handbook, will have elicited a set of potential offset activities involving local stakeholders, both to compensate them for impacts on their use and enjoyment of biodiversity in the area affected by the project's impact and at the offset site(s). These can be listed alongside other potential offset sites and activities in the preceding Step 6, and in this step it is important to check that the final package of offset activities and sites selected will indeed benefit local stakeholders and compensate them for the effects of the development project. (This marks the last steps in the parallel Cost-Benefit Handbook (Steps 7 and 8), which contribute to the final decision here. This will be vital to secure stakeholders' support for the offset and involvement in its implementation).

Step 8: Record the offset design and enter offset implementation process

To record a description of the location and offset activities and location(s), including the final 'loss / gain' account which demonstrates how no net loss of biodiversity will be achieved, how stakeholders will be satisfied and how the offset will contribute to any national requirements and policies.

A final step such as this can help ensure that there is a clear description of the proposed offset and a record of the principal decisions made with respect to its design, explaining the rationale for these decisions and how they were made. This can be useful to communicate with stakeholders and to carry forward into the OFFSET IMPLEMENTATION process. It is useful to record information on the proposed offset activities, their intended outcome, the location(s) in which they will be carried out and key responsibilities and resources needed to ensure delivery. The practicalities of implementation are considered in the Offset Implementation Handbook, but it is important for all parties involved to have a good understanding of the general requirements, roles and responsibilities at the outset from which a more detailed implementation plan can be developed.

Table 16 and Table 17 are examples of tools that might be useful. They are a table in which offset activities, locations and practical requirements can be summarised and a checklist which can help offset planners ensure that they have completed necessary design tasks.

Table 16: Illustration of a possible format for a Biodiversity Offset Design Summary

BIODIVERSITY OFFSET DESIGN: SUMMARY										
OBJECTIVE	[Enter here a short narrative listing the goals of the offset, as defined using the Offset Design Handbook:] • Goal of offset • Brief description of key elements of the offset, including some key biodiversity components to be conserved • Location and identity of offset site(s) • Summary of nature of offsetting activities • Whether some or all of the offset is in kind or whether it involves trading up • Summary of the proposed partners and stakeholders who will be involved in implementation • Summary of the legal and institutional arrangements needed to implement the offset									
DESIRED OUTCOMES FOR EACH COMPONENT OF THE BIODIVERSITY OFFSET	OFFSET ACTIVITIES AND LOCATION			OFFSET GAINS			IMPLEMENTATION ISSUES PREVIEWED			
	ACTIVITIES	LOCATION	RATIONALE	IN KIND OR OUT OF KIND	PRINCIPAL BIODIVERSITY COMPONENTS CONSERVED	PRE-DICTED GAINS	REQUIREMENTS / BUDGET	HUMAN & INSTITUTIONAL RESOURCES NEEDED	REQUIREMENTS / EQUIPMENT	REQUIREMENTS / PROFESSIONAL ADVICE
COMPONENT 1: Improved land management in Area 1 (Protected Area)	Pay protected area guards (including recruiting new guards from local communities) to increase surveillance of illegal and unsustainable activities in core area and buffer zone Pay local community members to: a) Plant and tend native seedlings in degraded patches; b) Strip invasive alien species.	Area 1 (core and buffer zones of existing protected area – see Map)	Economic incentive for conservation provided by providing jobs for local people formerly involved in illegal activities.	In kind	o Species A o Habitat B o Ecosystem service C	x habitat hectares	• Annual budget to pay guards • Funds to cover contracts with local communities • Investment funds to purchase plant material and gardening equipment	• Institution designated to manage the site • Training	Wood and tin roof to build potting shed for seedlings, seedling trays and pots, bags of compost.	Legal assistance to support establishment of community associations
COMPONENT 2: Conservation corridor created in Area 2 (between X National Park and Area 1).	Purchase and manage land in Area 2 Develop integrated management plan with Area 1	Area 2 (see Map)	• Add more high biodiversity values to protected area estate. • Address fragmentation which threatens viability of key species.	Out of kind. Traded up to higher priority ecosystem.	o Species A o Habitat D o Ecosystem service E o Species A o Habitat D o Ecosystem service C	y habitat hectares	• Capital to finance purchase of land • Funds to develop business plan	· Training in business planning and in biodiversity management		Legal assistance to ensure title to the land
COMPONENT 3: Reduce pressure on Area 1 from local communities and ensure provision of ecosystem services.	Reduce pressure on Area 1 from local communities and ensure provision of ecosystem services. Support local NGO providing agroforestry extension services to help local communities sell organic produce to local and national markets.	Area for PES scheme marked 'Area 3' on Map. Criteria for eligibility for PES and extension support in Annex.	• Compensate for project at impact site and provide incentives for conservation on offset sites. • Improve conservation status of watershed's biodiversity (particularly key freshwater biodiversity values identified).	In kind	o Species A o Habitat B o Ecosystem service C	z habitat hectares	• Funds to launch PES scheme and make annual payments	• Mechanisms in place to ensure flow of funds between buyers and sellers and appropriate monitoring systems.		• Legal assistance to create the contacts between buyers and sellers

Table 17: Offset planner's checklist

Issue / Questions		Done?
1.	Did you identify the **location and scope** of all aspects of the development project and the main activities likely to take place throughout the different stages of its life cycle? Has the biodiversity offset been designed to address them all?	
2.	Have you **integrated** the design of the biodiversity offset into the **development project's planning** and assessment process? Are there key decision 'windows' and suitable points where the implementation of the offset can be integrated with the project planning and development process?	
3.	Has the design of the biodiversity offset been informed by any relevant **laws and regulations** that require and / or influence it?	
4.	Has the design of the biodiversity offset been informed by any relevant **policies** (government policies, financial or lending institutions' policies, and / or internal company policies)?	
5.	Have relevant **stakeholders** been involved in the offset design? (They include those who own, hold rights over, use, manage or regulate the area affected by the development project and the offset area, those who could be affected by the development project and offset activities and those whose involvement is needed to make the offset a success.)	
6.	Do you have an appropriate **plan for engaging these stakeholders** in the rest of the offset design and implementation process?	
7.	Have you checked that the **mitigation hierarchy** has been applied to avoid, minimise and / or restore potential adverse effects, clarified the residual negative impacts on biodiversity and determined whether a **biodiversity offset** is appropriate and possible, based on the significance of residual adverse effects on biodiversity?	
8.	Did you establish whether or not there are residual negative impacts that **cannot be offset**, and identify an appropriate response?	
9.	Have you determined which **key components of biodiversity** are priorities to be conserved through the offset?	
10.	Have you used an **appropriate method** to calculate losses at the project site and quantify the gains required through the offset to achieve 'no net loss'?	
11.	Did you decide whether an **'IN-KIND' or 'OUT-OF-KIND'** offset is appropriate?	
12.	Have you satisfied yourself that the area and activities[29] selected for as the offset will provide **'additional' conservation outcomes** of the key biodiversity components and would not have occurred in any event, and that the offset isn't simply displacing harmful activity to elsewhere? Is this offset in a **single location** or is it a '**composite'**, comprising more than one area?	
13.	Have you satisfied yourself that the offset will make a **contribution to relevant biodiversity goals and targets**?	
14.	Have you checked that the offset will be viable in the context of **broader landscape planning**, and consistent with spatial and conservation plans?	

29 Averting risk, making positive management interventions and / or providing compensation packages for lost biodiversity use value to affected parties.

	Issue / Questions	Done?
15.	Do the offset activities link to any current or planned **sustainable use or livelihoods** projects in the area?	
16.	Have you checked that the offset will offer **adequate compensation to any communities affected** by the project and / or the offset with regard to use or cultural values, to ensure a net benefit?	
17.	Have you checked that the proposed offset is **acceptable** to stakeholders, **feasible** and **likely to succeed**?	
18.	Did you determine whether it would be appropriate to apply **multipliers** to the offset, to deal with uncertainty or risks of failure, time lags, to address conservation targets and / or 'out-of-kind' offsets? If so, does the scale of the final offset reflect the multiplier(s) applied?	
19.	Have you **recorded** a final description of the offset, answering the above questions, and explaining the basis for your answers and how you arrived at them? Has this been **communicated** to stakeholders?	

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