

DOCUMENT COVER SHEET

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Title:	<i>Biodiversity offsets: policy options for government</i>
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Abstract:	<p>This paper draws on the experience of governments that have already developed and implemented biodiversity offsetting policies. It also takes into account the practical experience of businesses in putting offsets into place on a voluntary basis, including those undertaken in collaboration with BBOP as pilot projects. Its purpose is to serve as a very basic introduction to some key issues, which certainly deserve to be considered in more depth subsequently, and thus to contribute to the consideration of biodiversity offset policy options by governments and their advisors. The paper examines the principles underlying offsetting policy, identifies the various roles of government in offsetting schemes, looks at the connections to other policy areas and considers the significant implementation issues.</p> <p>Following this introduction, section 2 sets out the fundamentals of biodiversity offsets and biodiversity offset policy, including the principles for best practice biodiversity offsets, the different approaches available to governments when considering an offset scheme and the different policy options for biodiversity offsets. Various ways of implementing offset policies, including through markets and existing permitting or consent use systems tied to environmental impact assessment are discussed.</p> <p>Section 3 explores the possible roles for governments in developing and implementing policies on biodiversity offsetting. The roles include those of policy maker, regulator, market maker, broker and monitoring and compliance agency.</p> <p>Section 4 looks at the ways in which biodiversity offsetting policy can be integrated with other policy areas including environmental impact assessment, strategic environmental assessment, industry policy and whether offsets can be designed to offer multiple benefits (for instance, carbon and water).</p> <p>Section 5 covers capacity issues, reviewing the requisite skills and resources a government may require to establish a biodiversity offsetting scheme. This section also discusses cost recovery for situations where government services are provided.</p> <p>Finally Section 6 looks at experiences in a range of situations around the world where biodiversity offsetting has been attempted, in order to draw out the key lessons for success.</p>

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Biodiversity Offsets: Policy options for governments
A draft for discussion
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Biodiversity Offsets: Policy Options for Government

Executive summary

Biodiversity offsets are designed to achieve no net loss (or a net gain) of biodiversity in the context of development projects. This goes beyond traditional mitigation, and encourages business to take responsibility for its impacts. Interest in this approach is growing as the potential of biodiversity offsets to help achieve wider goals of conservation; wise land-use planning and sustainable development are increasingly appreciated. Governments face the challenge of balancing economic development with a public interest in protecting biodiversity.

By contributing to regional conservation and land-use planning, biodiversity offsets can help the 193 government parties to the Convention on Biological Diversity who committed to ‘achieve by 2010 a significant reduction of the current rate of biodiversity loss’.

The purpose of this paper is to contribute to the consideration of biodiversity offset policy options by governments and their advisors. The paper examines the principles underlying offsetting policy, identifies the various roles of government in offsetting schemes, looks at the connections to other policy areas and considers the significant implementation issues.

The paper is intended as a basic introduction to biodiversity offsets policy. We recognise that many of the issues presented are complex and will benefit from more in-depth and detailed discussion. The main aim of this initial draft is to identify policy options at a general level in the anticipation of subsequent papers based on further research and consultation.

BBOP’s definition of offsets includes reference to ‘no net loss of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people’s use and cultural values associated with biodiversity’.

There are broadly two kinds of biodiversity offsets:

- (a) **Voluntary biodiversity offsets**, which a developer undertakes in circumstances where there is no legal requirement to do so, because it perceives a business advantage (such as license to operate, reputational benefits, competitive advantage, market share, etc); or
- (b) **Regulatory biodiversity offsets**, which are required by law.

Governments can introduce biodiversity offsetting policy and regulation in two basic ways. The first is through specific provisions on biodiversity offsets (and perhaps other aspects of biodiversity conservation) and the second is to incorporate offsetting provisions into other laws and policies that deal with environment impact assessment (EIA), land use planning, strategic environmental assessment (SEA), sectoral policies or broader environmental policies.

The decision on which approach to take depends to some extent upon the legal customs of the jurisdiction concerned, and also upon the scope of the other laws relative to the intended scope for biodiversity offset requirements. For example, in a particular jurisdiction the EIA laws may only cover large projects or projects in particular industry sectors (for instance, construction and extractives, but not agriculture). If the intention is to introduce offsetting for a wider range of projects, it may be necessary to introduce a specific law requiring offsets for the desired scope.

The main policy options for government seeking to implement an offsets arrangement are focussed on the processes for specifying biodiversity offsets in relation to defined impacts. However, specifying an offset in terms such as size, type, quality and locality is only half of the task. The next challenge is for the developer to discharge the obligation to implement the offset. There are three main approaches to this task of implementing biodiversity offsets: developer-initiated, in lieu fees and market mechanisms.

Under *developer initiated offset implementation*, while policy may encourage or require offsets, the government generally takes a non-intervention stance on the manner of their implementation, and the onus rests with the developers to find their own offsets (whether voluntary or required by regulation).

Under *In lieu fees* a government agency stipulates a payment from the developer with the intention of deploying the funds at a later date to find a suitable offset.

Markets can also be used to supply biodiversity offsets for developers. Such markets do not usually develop spontaneously, but require government intervention to set up the key components. Properly designed and operated, markets can be very effective in supplying offsets in a timely and cost-effective manner.

The basic elements for an offset market are units of trade (credits), trading rules and credit registers.

Credits are units of gain that can be traded in an offset market. The key consideration for the utility of credits is that they meet all the requirements for gain as specified in the offset policy of the jurisdiction. Government can engender market confidence by establishing the property status of credits through legislation.

Biodiversity credit registers are another important component of an offset market. Registers serve two main functions:

- To be the authoritative record of the number, location, characteristics and ownership of biodiversity credits in the jurisdiction;
- To provide quality assurance for the registration (creation) of credits.

Governments can also assist the establishment of biodiversity offsets markets by facilitating the establishment of marketplaces. A marketplace for biodiversity credits will comprise brokers and traders.

The degree of segmentation and the level of demand in the market can interact to influence the types of offset supply mechanism that evolve in the market. These mechanisms include conservation banks, aggregated offsets, bespoke trades and 'over-the-counter' arrangements.

The different possible roles of government in relation to biodiversity offsets policy are described. These are:

- Policy-maker or regulator
- Provider, curator and source of authoritative biodiversity data
- Buyer of offsets
- Seller of offsets
- Broker
- Operator of register of credits, standard setting
- Provider of processes to ensure the permanence of offsets
- Monitor and enforcer
- Identifying and managing conflicts of interest between these roles (probity)
- Creating the market

The main sources of the cost of developing and implementing biodiversity offsets policy are identified. The costs associated with these various processes and services will vary from country to country and need to be

estimated on a case-by-case basis. However, experience in jurisdictions that have already established policies and offset schemes of varying design and complexity has demonstrated that these are not trivial tasks. It can be anticipated that it would take several years and the input of a variety of expertise to develop a policy and establish an operating scheme. While there are many costs to be considered, a government could recover these costs in part or in full. This is done by charging fees for the services provided to the users of the offset scheme.

Some of the lessons that have been learnt from the experience in various countries from designing and operating biodiversity offset policy and programmes are noted.

Finally the paper outlines suggested ways forward for governments interested in exploring biodiversity offset policy options. The recommended steps are:

- Fact-finding and gap analysis – policy
- Fact-finding and gap analysis – biodiversity data
- Fact-finding– cost-benefit analysis
- Pilot projects
- Integrating biodiversity offsets with land-use planning at the national or regional levels:
- Identify, analyse and evaluate policy options
- Policy formulation and system design
- Implementation of policy, monitor and review.

Biodiversity Offsets: Policy options for governments

Michael Crowe and Kerry ten Kate

1. Introduction

1.1 Context and outline

About biodiversity offsets

While new construction and infrastructure are essential for development, they are currently a significant cause of today's unprecedented loss of biodiversity, which is recognised as one of the most critical global issues facing humankind.¹ Biodiversity is lost as natural habitats are destroyed and fragmented for agriculture, fisheries, forestry, oil and gas, mining, transport, tourism and the construction of infrastructure all play their part in the loss. In the search for sustainable development, companies, financial institutions, governments and civil society are seeking innovative mechanisms to compensate for unavoidable losses to biodiversity and impacts on human well-being and to attract more investment in conservation.

Biodiversity offsets are designed to achieve no net loss (or a net gain) of biodiversity in the context of development projects. This goes beyond traditional mitigation, and encourages business to take responsibility for its impacts and to internalise environmental costs. Interest in this approach is growing as the potential of biodiversity offsets to help achieve wider goals of conservation; wise land-use planning and sustainable development are increasingly appreciated. Governments face the challenge of balancing economic development with a public interest in protecting biodiversity. By contributing to regional conservation and land-use planning, biodiversity offsets can help the 193 government parties to the Convention on Biological Diversity who committed to 'achieve by 2010 a significant reduction of the current rate of biodiversity loss'².

Interest in biodiversity offsets continues to grow. There are four main drivers for their broader uptake:

- More governments introducing or exploring policy on biodiversity offsets;

¹ The Global Biodiversity Outlook 3 (UNEP, 2010) finds that:

- Species which have been assessed for extinction risk are on average moving closer to extinction.
- Amphibians face the greatest risk and coral species are deteriorating most rapidly in status. Nearly a quarter of plant species are estimated to be threatened with extinction.
- The abundance of vertebrate species, based on assessed populations, fell by nearly a third on average between 1970 and 2006, and continues to fall globally, with especially severe declines in the tropics and among freshwater species.
- Natural habitats in most parts of the world continue to decline in extent and integrity, although there has been significant progress in slowing the rate of loss for tropical forests and mangroves, in some regions. Freshwater wetlands, sea ice habitats, salt marshes, coral reefs, sea grass beds and shellfish reefs are all showing serious declines.
- Extensive fragmentation and degradation of forests, rivers and other ecosystems have also led to loss of biodiversity and ecosystem services.
- Crop and livestock genetic diversity continues to decline in agricultural systems.
- The five principal pressures directly driving biodiversity loss (habitat change, overexploitation, pollution, invasive alien species and climate change) are either constant or increasing in intensity.
- The ecological footprint of humanity exceeds the biological capacity of the Earth by a wider margin than at the time the 2010 target was agreed.

² For information on the 2010 target, please see <http://www.cbd.int/2010-target/>. The Parties to the Convention on Biological Diversity accept that the 2010 target has not been met. UNEP/CBD/COP/10/8 provides a report on implementation of the Strategic Plan and progress towards the 2010 biodiversity target, drawing upon information from Parties' fourth national reports. UNEP/CBD/COP/10/9 by the CBD Executive Secretary offers an updated technical rationale for the proposed goals and targets of the Strategic Plan. See <http://www.cbd.int/cop10/doc/>

- More companies undertaking biodiversity offsets voluntarily for business reasons. (The business case for companies is described in Box 5 on page 18);
- More banks and investors requiring biodiversity offsets as a condition for access to credit or investment; and
- More NGOs and civil society groups encouraging developers to undertake biodiversity offsets.

A growing number of governments are introducing or planning law and policy related to biodiversity offsets. Many governments are committed to a target to achieve significant reductions of the current rate of biodiversity loss within their jurisdictions. Some have gone further and made policy commitments aimed at no net loss or a net gain of biodiversity. Biodiversity offsetting is a key policy measure that governments can adopt as part of the implementation of these policy targets.

Offsetting provides a way of pursuing a no net loss outcome for biodiversity for development projects and programs in the context of the 'mitigation hierarchy': ('avoid, minimise, restore, offset').

Biodiversity offsets can achieve more and better conservation outcomes than typically result from the planning of mitigation measures for development projects. They are also a tool for companies to manage biodiversity risk and opportunity, and for society to mainstream considerations of biodiversity into economic decision-making, through governments' planning processes, licenses and permits and financial institutions' lending and investment decisions. As biodiversity offsets involve working with land managers to address underlying causes of biodiversity loss, they offer indigenous peoples and local communities an opportunity to be involved in project planning, and to establish offset activities that contribute to sustainable livelihoods. Indigenous peoples and local communities sometimes object to development projects, feeling their permission and involvement in decisions were not sought, that they will not benefit fairly and that the project will have negative environmental impacts on their way of life. The process of designing and implementing a biodiversity offset should involve affected and interested people to ensure they benefit, which builds community support for regional and project development plans.

Properly planned at the landscape scale, biodiversity offsets can contribute to regional conservation and land-use planning, and to the priorities set out in national biodiversity strategies and action plans.

Government policy on biodiversity offsets (whether voluntary or mandatory) can facilitate better relationships between governments and developers with regard to the mitigation of biodiversity impacts. Where developers are operating under clear guidelines, they can plan and implement their offsets in an orderly and efficient way as part of the development project. This certainty can be beneficial not only for development projects, but is also characteristic of a jurisdiction that is a 'good place' in which to do business.

Where the design and implementation of biodiversity offsets are established as an active and on-going activity, businesses centred on the provision of offsets are likely to evolve. These industries can comprise new companies set up explicitly to undertake offsets through habitat establishment and restoration and can also allow existing companies such as those in the nursery trade and pest and weed control to expand their activities. Governments appreciate that these activities can benefit the economy and local communities by generating employment and revenue. For instance, the market for conservation banking in the US is estimated at approximately US \$1bn per annum³.

Biodiversity offsets generate additional private sector investments in conservation that add to the available resources contributing to conservation by governments' overall objectives for biodiversity conservation.

³ Madsen et al, 2010

Taken together, these advantages mean that biodiversity offsets offer not only a risk management tool and potential business opportunity for companies, but a possible source of new and additional source of funding for biodiversity conservation and sustainable use activities. In this model that provides for the internalisation of environmental costs, public and private sector developers bear the costs of the conservation actions needed to offset their impacts, and this investment in conservation may be considered additional to national budgetary support for protected area networks and other *in situ* biodiversity activities.

However, biodiversity offsets should be treated with great caution: they should not be misused to allow inappropriate projects to proceed, and are only appropriate in some circumstances, where the mitigation hierarchy has been followed and the residual impacts are capable of being offset. Biodiversity offsets only succeed where there is adequate capacity to design and implement them, and adequate monitoring, evaluation and enforcement. In addition, it is important that national policy on biodiversity offsets results in additional investment in conservation, and that government does not simply reduce public sector commitments to conservation finance, transferring the costs of national conservation priorities to the private sector. A number of publications illustrate the danger of inappropriate use of biodiversity offsets and inadequate policy.

Some older and more biologically specialised components are more difficult to replicate or replace. There are species whose habitat may be impossible to re-create and some compensatory measures may never succeed⁴. The time scales required for restored sites to match the target state may be extremely long, in some cases ranging from several decades to centuries⁵.

There are also limitations on the metrics used to quantify losses and gains mainly reflecting the need to limit their complexity in order to achieve a process that can be operationally practical⁶. Further, surrogate measures of biodiversity can obscure what is exchanged, allowing loss of rare and difficult to conserve biodiversity to be replaced by more commonplace biodiversity.

The likelihood that offset areas based on re-creation (for example revegetation) will follow a predicted ecological path has also been questioned, given that outcomes can be influenced to some degree by stochastic events⁷.

Offset policies can also be compromised by inadequate implementation. Offset outcomes are heavily dependent on the long-term management and protection of the offset site. Adequate standards, monitoring and compliance are critical to success. Non-compliance can lead to significant failure rates for offsets⁸. Sometimes the interests of agencies can be more aligned with those of development rather than the environment, resulting in poor compliance and over-simplified biodiversity measurement.

Offsetting may fail to protect biodiversity due to the requirement for trading to use simple commodities or units of trade and the inability of these to capture the complexities of biodiversity.⁹

⁴ Morris et al, 2006

⁵ Wilkins et al, 2003

⁶ McCarthy et al, 2004

⁷ Hilderbrand et al, 2005

⁸ Race and Fonseca, 1996

⁹ Walker et al, 2009

About this paper and BBOP

This paper is a contribution to the Business and Biodiversity Offsets Programme (BBOP)¹⁰, a partnership of over 50 leading organisations and individuals including companies, governments, conservation experts and financial institutions from around the world working together to explore biodiversity offsets. The BBOP Advisory Group members represent groups in society (government, business, intergovernmental organisations, financial institutions, civil society) with diverse perspectives on environment and development from many different countries. This paper is an initial draft prepared on behalf of the BBOP Secretariat by the authors. It does not necessarily represent the views of the members of the BBOP Advisory Group. The authors recognise that many of the issues presented are complex and will benefit from more in-depth and detailed discussion. The main aim of the paper is to identify policy options at a general level in the anticipation of subsequent papers based on further research and consultation.

The paper offers a basic introduction to biodiversity offsets policy, describing a range of options open to governments and their advisers interested in establishing policy on biodiversity offsets. It draws on the experience of governments that have already developed and implemented biodiversity offsets policies. It also takes into account the practical experience of businesses in putting offsets into place on a voluntary basis, including those undertaken in collaboration with BBOP as pilot projects. The paper examines the principles underlying offsetting policy, identifies the various roles of government in offsetting schemes, looks at the connections to other policy areas and considers the significant implementation issues.

Following this introduction, section 2 sets out the fundamentals of biodiversity offsets and biodiversity offset policy, including the principles for best practice biodiversity offsets, the different approaches available to governments when considering an offset scheme and the different policy options for biodiversity offsets. Various ways of implementing offset policies, including through markets, are discussed.

Section 3 explores the possible roles for governments in developing and implementing policies on biodiversity offsetting. The roles include those of policy maker, regulator, market maker, broker and monitoring and compliance agency.

Section 4 looks at the ways in which biodiversity offsetting policy can be integrated with other policy areas including: environmental impact assessment, strategic environmental assessment, industry policy and whether offsets can be designed to offer multiple benefits (for instance, carbon and water).

Section 5 covers capacity issues, reviewing the requisite skills and resources a government may require to establish a biodiversity offsets scheme. This section also discusses cost recovery for situations where government services are provided.

Finally Section 6 looks at experiences in a range of situations around the world where biodiversity offsetting has been attempted, in order to draw out the key lessons for success.

1.2 Definitions

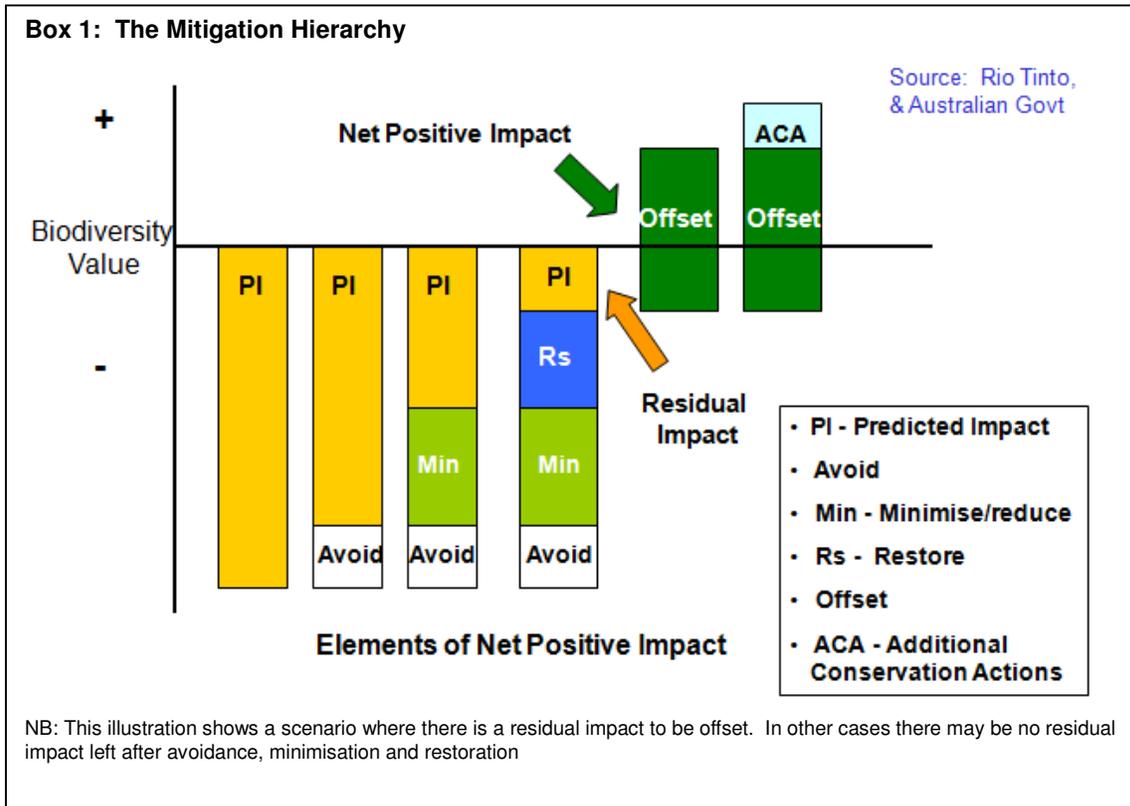
Biodiversity offsets

Drawing on law, policy and experience around the world, the BBOP partners have defined biodiversity offsets as measurable conservation outcomes resulting from actions designed to compensate for significant residual

¹⁰ <http://bbop.forest-trends.org/>

adverse biodiversity impacts arising from project development 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.

A key part of the definition is that offsetting should only apply after developers have taken steps to avoid and minimise the biodiversity impacts of their projects. Biodiversity offsets address any residual significant impacts after the appropriate avoidance, minimisation and restoration. This is illustrated in Box 1.



Biodiversity offsets compared with compensation

Following four years of work and an analysis of the basis for biodiversity offsets in national and regional policies around the world, BBOP agreed ten fundamental principles (see Box 3 on page 14) that define biodiversity offsets, and these can be summarised briefly as follows. Biodiversity offsets are: designed and implemented to achieve no net loss or a net gain of biodiversity; will achieve additional conservation outcomes; adhere to the mitigation hierarchy; recognise limits to what can be offset; are planned in a landscape context; involve stakeholders effectively in design and implementation; are designed and implemented in an equitable manner; are planned to secure outcomes that last at least as long as the project’s impacts and preferably in perpetuity; are undertaken and communicated transparently; and document the appropriate use of sound science and traditional knowledge. Biodiversity offsets that follow these principles should achieve the best outcomes for biodiversity and manage the risks associated with using this tool. The principles are discussed further in section 2.1.

Essentially, there are two categories of response to projects' impacts on biodiversity:

- (a) **Biodiversity offsets**, which meet the definition and adhere to the principles above; and
- (b) **Compensatory conservation**, which involves some investment in biodiversity conservation as a result of a project, but does not satisfy these requirements. For instance, the compensation may only partially offset the impact, involve some net loss, conserve a different kind of biodiversity to that affected in a manner that doesn't meet the 'like for like or better' approach to ecological equivalence, or not be secured for the long term.

Market-based approaches: conservation banking and credits

Biodiversity is infinitely variable. Given the philosophy embraced in biodiversity offset policy all around the world of 'like for like or better', the goal of 'no net loss' and the necessity for equity and respect for the rights of indigenous peoples and local communities, biodiversity offsets are essentially a local and bioregional tool. Biodiversity offsets are generally required and planned within the same bioregion as the area impacted, to contribute to conservation of essentially the same biodiversity components and with a strong emphasis on ensuring local communities' needs are met. This means that biodiversity offsets are uniquely tailored to local circumstances and cannot be traded internationally, unlike carbon, where there is a single, global metric and unit (i.e. tonnes of carbon dioxide equivalent). Some countries establish conservation banking and designate a set of biodiversity credits as a means of defining offset requirements. These generally define the 'service area' within which credits can be purchased and traded, within a watershed or local bioregion and vegetation class.

A developer can provide its own biodiversity offset, for example on land the developer owns. Alternatively, a developer can enter into an arrangement with a third party for the provision of the required offset. These arrangements are generally made by purchasing biodiversity credits from a conservation bank (usually operated by a company), or from individuals and organisations that can provide biodiversity credits to the requisite standard. The developer pays the third party an agreed price in return for the requisite number and type of biodiversity credits that comprise the offset. Credits are quantified gains in biodiversity usually generated by actions that increase the extent, quality or security of habitat or species.

A conservation bank is an area of land where biodiversity credits are established in advance of any actual trading of credits for offsets. A conservation bank is thus an entrepreneurial project where an investor establishes credits in anticipation of future sales. Conservation banks are usually large relative to the size of the anticipated individual offsets. Banks have the characteristic of combining a number of individual offsets onto a single site.

Thus national or local trading in biodiversity credits and the use of conservation banks represent one way of implementing biodiversity offsets.

1.3 A brief history of biodiversity offsets

Over 30 countries or states have enacted laws or introduced policies that specifically require biodiversity offsets or compensatory conservation for particular sets of impacts (for instance, on wetlands, on certain nationally listed species, or on biodiversity in its entirety)¹¹. In addition, biodiversity offsets or compensatory conservation is sometimes included in the conditions for project approval as a result of dialogue between the

¹¹ These countries include the USA, Australia, the European Union, Brazil and South Africa.

proponent of a project and the permitting authority, typically following an environmental impact assessment process. There is also a small but growing incidence of companies undertaking biodiversity offsets voluntarily.

Research in 2010 by the Ecosystem Marketplace, a sister programme to BBOP at Forest Trends, found 39 existing compensatory mitigation programmes around the world, ranging from programmes with active mitigation banking of biodiversity credits to programs channelling development impact fees to policies that drive one-off offsets. (See Box 2.) There are another 25 programmes in various stages of development or investigation. Within each active offset programme, there are numerous individual offset sites, including over 600 mitigation banks worldwide. The global annual market size is \$1.8-\$2.9 billion at a minimum, and the market is likely much greater, as 80% of existing programmes are insufficiently transparent for the Ecosystem Marketplace to have included their market size in this estimate. The conservation impact of this market includes at least 86,000 hectares of land under some sort of conservation management or permanent legal protection per year¹².

Box 2: Excerpt from State of Biodiversity Markets Report: Offset and Compensation Programs Worldwide, by Madsen, Carroll and Moore Brands, 2010, Ecosystem Marketplace.

Some countries are in early stages of adoption or investigation of compensatory mitigation,* while others have sophisticated and mature systems. But in all regions, compensatory mitigation is developed or developing around unique economic, political, institutional, and cultural circumstances that give rise to a variety of programmes.

In **North America**, biodiversity offset and compensation programmes are well-developed, particularly the US wetland and species compensation programmes and Canada's fish habitat compensation program. In total there are 14 active programmes and 5 in development in North America. The region sees a minimum of US\$1.5-\$2.5 billion in compensation payments per annum. This region also hosts the most offset credit banks of any region in the world.

The United States has seven active programs and three in development. Payments total US\$1.5-\$2.4 billion annually. Around 700,000 cumulative acres (283,280 hectares) have been restored or protected through US programmes. The two largest offsetting programmes, wetland and species mitigation, offer three mechanisms for achieving compensation: do it yourself, pay into a fund, or buy a third-party credit. Within this third form of offset credit banking there are 615 active and sold-out banks in the country.

Canada's compensation programmes are focused on fish habitat and wetland compensation, driven by a combination of compliance with federal and provincial policies, with varying levels of implementation. Six programmes exist in Canada, with one in development. These programmes cover five ecosystem/species types and protect around 180 hectares per year. Regional investment totals \$6-\$145 million annually, and there are currently 17 active and sold-out banks.

Offset programmes in Mexico are not as developed as those of its neighbours in North America. Yet, with programmes compensating landowners for conserving forest cover and requiring payment for deforestation due to industrial development, Mexico is well on its way to developing a sophisticated programme, ensuring a more direct link between development impacts and biodiversity conservation.

Five compensation programmes exist in **Central and South America**, with two in development. Most South American countries have developed Environmental Impact Assessment (EIA) laws that address impact mitigation, including Brazil, Argentina, and Chile. However, the majority of Central and South America has not developed biodiversity offset programmes. The exception is Brazil, with Colombia and Paraguay in the early

¹² Madsen et al, 2010.

stages of development. These programmes have varying degrees of enforcement, market infrastructure and institutional capacity.

There are currently no active offset programmes in **Africa**, but six are in development. South Africa is the leader in African offset policy development, with a national and two provincial policies in the works. While other countries have developed EIA law and some voluntary offset projects, the majority of the continent has little in the way of offset and compensation programme creation.

In **Europe**, biodiversity markets are still a developing idea. Four programmes have had offsets implemented, and an additional three programmes are in early stages of development. The largest European programme, Germany's Impact Mitigation Regulation, has at least 2,600 hectares conserved in compensation pools. Habitat banking has been piloted in France and is under investigation in the United Kingdom and in the European Union.

Four offset programmes exist in **Asia**, with another four in early development. Annual payments equal US\$390 million and roughly 26,000 hectares are protected or restored annually. Asian offset-like programmes come mostly under the Environmental Impact Assessment, with EIA laws in Japan, South Korea, China, Mongolia, Pakistan, Thailand, Malaysia, Russia and India. The presence of EIAs in the region may lay a framework for biodiversity markets - two offset programmes/projects already in existence are located in Malaysia and Saipan. In addition to government-led actions, voluntary and industry initiatives, driven by increasing public criticism, are arising. At least one industry group has been exploring the use of biodiversity offsets in the agricultural industry.

Between **Australia and New Zealand**, there are twelve biodiversity offset programmes and five in development; the majority of those are compliance-based State or regional programmes implemented at the project level during the planning process, although two programmes offer in-lieu fee payment. About US\$1.3 million goes to regional payments annually, with 523 habitat hectares restored or preserved each year; there are 42 ecosystem/species credit types in Australia's offset programs.

Overall, our research shows significant activity around the world with many compensatory mitigation programs in early stages of development. The global economic downturn of 2008 may have slowed market growth in regions with developed mitigation systems, but they continue to see credit sales; while regions without developed mitigation laws and markets are showing strong interest.

* In the State of the Biodiversity Markets Report, compensatory mitigation means the restoration, creation, enhancement, and/or in certain circumstances preservation of natural resources for the purposes of offsetting adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. For the purposes of the SBM Report, compensatory mitigation represents a spectrum of practices that range from rigorous and measurable biodiversity offsets to less direct efforts to compensate for impacts through financial donations and land protection.

Wetland and conservation banking has been a feature of biodiversity policy in the USA for at least three decades, while biodiversity offsets and credit trading are comparatively new in Australia and Brazil. In other countries, such as South Africa, policy is already under development, and in a suite of other countries (e.g. Ghana, Uganda, Namibia, Vietnam, Malaysia, Mongolia) work is just starting.

Historically, the nature and scale of biodiversity offsets or compensatory conservation were calculated based on simple metrics such as area, the financial investment involved in the investment project, on some formula that identifies a subset of biodiversity values (timber value on the land, for instance), or simply negotiated as a financial package that the developer was prepared to invest, irrespective of whether the amount was adequate to cover the costs of sufficient offsetting activities. However, the last 10-15 years have seen a

growing interest in better metrics that endeavour to assess the nature, amount and quality of biodiversity lost as a result of the project and gained through the offset and to ensure properly quantified approaches to 'no net loss'. Recent metrics generally represent a combination of area and quality or condition of biodiversity. Some assess particular functions of biodiversity and others look at species viability assessments. Many assessment methods and different metrics exist worldwide. For example there are about 40 different wetland assessment methods in the United States.¹³

2. The basics of biodiversity offset policy

2.1 The basic principles of biodiversity offsets

Some core principles of biodiversity offsetting: objective, metrics and additionality

National laws and circumstances vary widely around the world, so there is no single 'correct' approach to designing and implementing a biodiversity offset, or to introducing national policy and regulation on this topic. In recognition of this, the Business and Biodiversity Offsets Programme has developed a set of basic principles that provide a framework for best practice biodiversity offsets. Provided these principles are adhered to, there is tremendous flexibility and any number of different ways in which biodiversity offsets can be designed and implemented and their success verified. These ten principles are shown in Box 3, below.

The foundation of a biodiversity offsets policy is the requirement for no net loss of biodiversity. The most basic objective of offsetting policy is that losses are mitigated by commensurate gains. Biodiversity value that already exists does not represent a gain and hence cannot provide an offset.

BBOP's definition of offsets includes reference to 'no net loss of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity.' A policy statement on no net loss will generally specify the values to which the policy applies. The key to implementing a no net loss policy is to specify units by which changes in these values can be measured. Given the complexity of biodiversity and its different aspects, such as species composition, habitat structure and ecological function, these metrics are usually surrogate measures, aimed at capturing some crucial elements of the overall value while keeping the measurement task relatively simple and cost effective. Nevertheless this is a difficult task as surrogate measures can involve problems of scaling and lack of transparency. These issues are not well understood and require further research.

Most biodiversity has been affected by human activity to some degree or other. The condition, quality and amount of biodiversity vary enormously, even within the same habitat type. One hectare may be pristine, with high levels of diversity and functionality, and another hectare of the same type may be highly degraded, depauperate and with few of its ecological functions intact. Because of this variability, area alone makes a poor measure of biodiversity, and loss and gain metrics often include a quality component.

Biodiversity offsets involve exchanging a residual biodiversity loss at one place for a biodiversity gain at another place. An important part of a policy is to define the 'rules' of this exchange process, usually referred to as the 'like-for-like-or-better' criteria. The biodiversity in one place is never exactly the same as the biodiversity in any other place, so setting like-for-like criteria becomes an exercise in categorising biodiversity into classes or types within which exchange will be permitted. The design tension here is that high resolution classification with many but small types can provide a closer match between the loss and the gain, but also introduce less flexibility into the offsetting process, so it is more difficult to locate a matching offset.

¹³ Salzman and Ruhl, 2005

Box 3: Principles on Biodiversity Offsets, developed and supported by BBOP Advisory Group members

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development¹ 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, minimization 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.

This dilemma can be eased by grading the like-for-like-or-better criteria according to some measure of the significance of the biodiversity components suffering the impacts. Thus the like-for-like criteria for a very significant biodiversity component may be set such that a close match is required for the offset while for lower significant losses the criteria may be quite flexible, allowing exchange within a wider range of biodiversity types, or higher conservation value.

The exchange process inherent in biodiversity offsets (i.e. the approximation of 'like-for-like') means that the metrics used to measure losses and gains must be capable of providing equivalence between different biodiversity components.

This type of like-for-like-or-better design also allows the introduction of an arrangement that provides further flexibility while at the same time allowing a biodiversity benefit. 'Trading up' refers to the ability to match a loss with a gain in a different kind of biodiversity, provided that it is of higher conservation value than the loss. It is important that the level of segmentation of biodiversity types, and the 'trading up' options (for biodiversity types of higher conservation value), are primarily based on conservation drivers rather than on the convenience of locating matching offsets.

Like-for-like-or-better policies can include the following criteria:

- Type of biodiversity component (e.g. vegetation type, habitat type, species type)
- Vicinity (where the offset can be located e.g. within the same bioregion)
- Timing (to address time gaps between the impact and the offset)
- Ecological function
- Quality or condition requirement

Box 4: Introduction to the concept of 'gain' in biodiversity offsets:

'Gain' is an increase in the extent and/or quality of biodiversity. Three categories of gain can be distinguished – improvement gain, maintenance gain and security gain. It is useful to distinguish these types of gain because they arise from different actions and commitments. Commitments to undertake such activities may be made by different parties, so the categorisation allows the overall gain to be calculated, and parts of it attributed to separate parties.

- *Improvement Gain* results from management commitments beyond existing obligations under legislation to improve the current habitat condition. Typical actions leading to an improvement gain include reducing or eliminating weeds, enhancement planting or the reintroduction of fauna species.
- *Maintenance Gain* results from commitments that contribute to the maintenance of biodiversity quality and condition over time (i.e. avoiding any decline). It includes foregoing entitled activities that could otherwise damage or remove biodiversity, such as grazing or firewood collection¹.
- *Security Gain* results from actions to enhance the security of biodiversity (i.e. avoiding loss through clearing or conversion), either by entering into an on-title agreement, by transferring private land to a secure public conservation reserve or by upgrading the protected status of public land. (Just as a decision to elevate the security arrangements for a site can generate security gain, a decision that increases the risk of loss through clearing could be considered to generate a security loss.)

Metrics for gain can include area, combined area and condition, population levels of particular species and species persistence. The calculation of security gain and loss requires estimates of the long-term risk of loss of vegetation through clearing under the different security arrangements available in the jurisdiction. In any given offsetting scheme, the gains and losses are measured in the same units.

For more information on the calculation of loss and gain, see the Biodiversity Offset Design Handbook Step 5*, and its Appendices** that describe a number of different metrics and methods for loss/gain calculations.

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

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

For example the like-for-like rules may allow the clearing of an area of grassy woodland to be offset by gains in an area of lowland forest through a trading up provision, provided the grassy woodland is generally well conserved within its bioregion and the lowland forest is a higher conservation priority.

To be effective, biodiversity offsets need to be secure and in place for as long as the loss exists. Often the loss is permanent meaning that the offset must also be permanent. In jurisdictions where private property rights are well defined and protected area legislation is in place, security and permanence can usually be established through the use of legal devices such as covenants, easements and new conservation reserves. In other circumstances, for example where customary land is found, more innovative approaches, such as long-term agreements with communities, will be required.

An important factor in the development of biodiversity offset policy is the underlying body of biodiversity information. A biodiversity offset scheme is reliant on the information base in a number of ways including:

- To inform the measures of loss and gain
- To enable categorisation of biodiversity significance (priorities)
- To enable the like-for like-or-better exchange

Typically the basic information required for biodiversity offsets includes the extent and type of ecosystems, biotopes or habitats, their quality or condition, conservation status (e.g. 'threatened'), evolutionary significance/ centre of endemism, migratory or aggregatory species records and ranges/distributions, and species' habitat requirements. Some information is required at a regional scale to provide context (for example in order to consider the relative significance of a site, importance of connectivity and corridors in the landscape, priority areas for protection or protected area expansion, etc.), while some may be collected at a site level. In addition, information on national or regional conservation plans, strategies and priorities is invaluable in focusing offset efforts. Information on the cultural and use values of biodiversity is also important.

Where the available biodiversity information is relatively limited, a biodiversity offsets policy can still be implemented, but its complexity will reflect the nature of the information.

2.2 Different kinds of offsets

There are broadly two kinds of biodiversity offsets or compensatory conservation:

(a) Voluntary biodiversity offsets or compensation, which a developer undertakes in circumstances where there is no legal requirement to do so, because it perceives a business advantage (such as license to operate, reputational benefits, competitive advantage, market share, etc); or

(b) Regulatory biodiversity offsets or compensation, which are required by law.

Biodiversity offset policy can be implemented in several different ways at a country or state level. In some cases the initiative for offsetting may be left to the private sector, as a voluntary choice (see option (a), above). In other situations (option (b)), a government may choose to support the private sector with official policy, which may offer incentives or set out requirements for biodiversity offsets for certain activities or impacts. Each of these approaches will be discussed in turn.

Voluntary offsets

Companies may choose to undertake biodiversity offsets voluntarily, based on a business case. Voluntary offsets are part of corporate responsibility and good environmental practice and can help to secure a license to operate. Good working relationships with government and local communities can save companies time and money through early permit approval. Many large banks place biodiversity conditions on their loans for development projects. These and other elements of the business case are summarised in Box 5.

While it is perfectly possible for companies to undertake voluntary biodiversity offsets in the absence of any formal government intervention, some government policy can be very beneficial. As a minimum such policy can address:

- General recognition of the benefits of biodiversity offsetting;
- General statement of support for companies to undertake voluntary offsets;
- Facilitation of access to biodiversity information;
- Government willingness to consult with companies on the facilitation of voluntary biodiversity offsets.

Box 5: The business case for voluntary biodiversity offsets

A company's biodiversity impacts can lead to significant regulatory, financial and reputational risks. Governments, financial institutions, and civil society increasingly expect developers to take full responsibility for such impacts. In many cases, biodiversity offsets offer companies a way to demonstrate no net loss of biodiversity, improve outcomes for local communities, and reduce operational and project development risks. Companies voluntarily developing biodiversity offsets forge good relationships with regulators and stakeholders, which can contribute to securing permits and broader social license to operate. Adherence to internationally recognized best practice principles (e.g. those developed by BBOP), can help businesses build their reputations as leaders, manage biodiversity-related risks, and shape the regulatory requirements increasingly being developed by governments.

Elements of the business case:

License to operate and regulatory goodwill; managing risk and liability; strengthening reputation:

Designing and implementing high quality biodiversity offsets can help companies work effectively with local, national and international stakeholders. Showing efforts to achieve no net loss of biodiversity improves a company's reputation and reduces anti-project sentiments and project risk. Adopting best practice helps streamline permit approval, thereby lowering the risk of project delay and significant unanticipated start up and operational costs.

Operational efficiency and cost savings: Biodiversity offsets may provide a more cost-effective solution than a sole focus on on-site mitigation measures. By working through a structured approach to avoidance, minimisation, restoration and offsets, companies may reduce overall costs while achieving greater conservation results. Companies with good relationships with regulators and local communities will also enjoy the financial benefits of operational efficiency, avoiding the costs associated with revoked licenses or blockaded facilities.

Access to finance: Companies seeking project finance from the International Finance Corporation, or from the more than 60 major banks that have subscribed to the Equator Principles, are encouraged to consider biodiversity offsets. Applying best practice can help developers secure credit and investment.

Competitive advantage: Through voluntary adoption of best practice on biodiversity offsets, companies can distinguish themselves from competitors who may be bidding for the same licenses or seeking market share. Leadership companies position themselves favourably in an environment where regulator and financier expectations are increasing and competitive advantage may be necessary to win concessions, attract finance and gain market share.

Shape policy: Companies undertaking biodiversity offsets gain 'first mover' advantage and a seat at the table where national policy and international best practice standards on biodiversity offsets and compensation are being developed. They can contribute to the international adoption of policies that work well for business.

Standards: Adopting voluntary standards helps companies demonstrate the quality and effectiveness of their biodiversity offsets, which helps avoid controversy and uncertainty. BBOP is working with as many stakeholders as possible to develop (by 2015) standards on biodiversity offsets that enjoy broad societal support.

Policy and incentives

Under this approach a government would develop a policy aimed at positively encouraging biodiversity offsetting within its jurisdiction. Such a policy would often be part of a broader biodiversity conservation policy that could also include provisions such as setting aside protected areas and the development of plans for the protection and recovery of threatened species.

An offsetting scheme can be introduced in the absence of highly detailed biodiversity information systems as long as there is sufficient information to enable these mechanisms to function in even a basic way. As time goes on, the information base can be improved and the offsetting mechanisms can be enhanced accordingly.

Beyond the basic biodiversity informational needs for offsetting policy (such as data and mapped classifications of biodiversity, biodiversity condition, threatened species records, and species' habitat requirements), broad land use plans that include biodiversity conservation can be helpful where there is an objective to locate and aggregate offsets strategically at the landscape scale.

In addition to setting out objectives and core principles, biodiversity offset policy usually addresses the requirement for technical standards and methodologies. The policy may not contain these standards and methodologies, but would generally at least establish the processes by which these subsidiary documents will be prepared and authorised. Typical subjects for these documents are:

- Methods for measuring losses and gains
- Standards for habitat management
- Standards for habitat re-creation
- Methods for classifying biodiversity components by significance

As part of a biodiversity offsetting policy a government may choose to offer incentives for developers to implement offsets according to the policy. These incentives can influence the business case through factors such as an enhanced case to government for project approval, facilitated access to government-held biodiversity information and assistance with local community relations. Alternatively, more direct incentives such as tax breaks and development bonuses could be offered within the policy framework.

An incentive policy could also extend to facilitating third party offsets for developers. This facilitation could include assistance with finding areas that meet to like-for-like criteria, helping with landowner negotiations and addressing any associated land use planning issues.

Regulatory approaches

Under regulatory approaches, biodiversity offsets are made mandatory for certain defined activities or impacts. Regulatory approaches are generally introduced in circumstances where the government concerned recognizes that ongoing biodiversity losses are unsustainable and are compromising the integrity of natural resources and the community benefits flowing from these resources. The aim of regulatory approaches is to provide a response to biodiversity losses within the jurisdiction that sets a level playing field for all entities with impacts on biodiversity, introduces clarity and legal certainty on their rights and responsibilities and achieves a greater and more consistent biodiversity outcome than will occur through purely voluntary approaches.

The regulatory requirement for biodiversity offsets is usually integrated into the development approval processes. Development approval processes can include environmental impact assessments, land use planning laws and legislation covering permitting for specific industry sectors such as exploration and development within the extractive sectors. The availability of an offset should not be seen as an automatic green light of approval, regardless of the significance of the impacts. Furthermore the unavailability of an appropriate offset may in some cases be sufficient reason to modify or reject a proposal.

The standards and methodologies that back up offset policy can be given a statutory basis in a regulatory approach. In most cases this is done by a basic and very simple reference to the requirement for offsets and 'no net loss' within the governing law, so that policy or guidance documents can be prepared and amended from time to time through an administrative process without constant recourse to Parliament. This allows improvements to standards and techniques to be incorporated without the necessity of amending the original legislation.

2.3 Different kinds of policy and legal provisions on offsets

The different kinds of regulation

Governments can introduce biodiversity offsetting policy and regulation in two basic ways. The first is through specific provisions on biodiversity offsets (and perhaps other aspects of biodiversity conservation) and the second is to incorporate offsetting provisions into other laws and policies that deal with environment impact assessment (EIA), land use planning, strategic environmental assessment, sectoral policies or broader sustainable development or environmental policies.

The decision on which approach to take depends to some extent upon the legal customs of the jurisdiction concerned, and also upon the scope of the other laws relative to the intended scope for biodiversity offset requirements. For example, in a particular jurisdiction the EIA laws may only cover large projects or projects in particular industry sectors (for instance, construction and extractives, but not agriculture). If the intention is to introduce offsetting for a wider range of projects, it may be necessary to introduce a specific law requiring offsets for the desired scope.

2.3.1 Specific policy and law on biodiversity offsets.

Biodiversity offset regulation will generally deal with the main matters of offsetting policy as discussed above, either directly or through incorporation by reference. Other provisions that are often included in these laws include:

Exemptions for certain impacts on the basis that they are very small, the biodiversity is highly degraded or for safety and hazard reduction reasons;

- Situations of temporary loss of biodiversity such as sustainable timber harvesting;
- Reference to entitled or customary uses that do not require approval and hence are outside the offsetting regime;
- Reference to provisions that establish a 'duty of care' to the environment (such as the control of pests and weeds as such fall below the additionality requirement.

2.3.2 Integrating provisions on biodiversity offsets into impact assessment, planning requirements and other relevant policy and law

There are many different frameworks for biodiversity offset policy and law, depending upon the existing institutional and legal arrangements prevailing in the jurisdiction. The most common settings for biodiversity offset policy are EIA, SEA, planning law, sectoral law and as part of a suite of environmental offset policies. In some cases, biodiversity offsets may be included in broader policy frameworks established to promote sustainable development.

Biodiversity offsets and EIA

In many countries, Environmental Impact Assessments (EIAs) provide the necessary framework for governments to negotiate biodiversity offsets with developers, particularly for larger scale projects. In others where EIA is not a regulatory tool, or where activities having a significant negative impact on biodiversity do not trigger the need for EIA (typically small projects in some countries), other approaches would need to be used. BBOP has prepared a resource paper on biodiversity offsets and impact assessment that offers more detail than this short summary.¹⁴

From a company's perspective, a project's final design and associated environmental management plan is generally linked to issues and risks identified during the EIA. However, in order for the EIA to act as a trigger for biodiversity offsets, the requirements of the EIA system itself need to be robust and transparent: to ensure that the full mitigation hierarchy is followed; that there is a reliable measure of residual impacts on biodiversity and their significance; that biodiversity offset negotiations take place with stakeholders; and that realistic and practicable offset proposals are prepared. Offsets should not be seen as attempts by the developer to 'buy-off' officials.

There are some challenges to integrating consideration of biodiversity offsets within the EIA process: depending on the available information, EIAs may need to be conducted on a timescale that does not synchronize with the biodiversity being studied. For instance, it may take more than a year to understand potential seasonal impacts and to consider which aspects of a site's biodiversity are priorities for conservation

¹⁴ <http://bbop.forest-trends.org/guidelines/eia.pdf>

efforts. By contrast, EIAs are often completed within a period of six to nine months. In addition, some conservation organizations have expressed concerns that, since EIAs are usually paid for and approved by the companies causing the environmental damage, they may underestimate the damage caused or the offsets needed to compensate for the damage.

However, from an efficiency perspective, and where EIAs are required by law, it can make very good sense from the company, stakeholder and government perspectives to integrate biodiversity offsets with regulatory requirements. However, for 'good practice', it is important to ensure that:

- EIA or its supporting policy framework includes targets to achieve 'no net loss' of biodiversity, translated into country and context-specific indicators
- EIA requires the avoidance and minimization steps for all impacts on valued biodiversity.
- EIA requires that significant residual impacts are offset.
- EIA should address all components of biodiversity affected, including ecological and evolutionary process and functional aspects
- EIA should address the use of cultural values of biodiversity to affected parties.
- EIA needs to consider impacts beyond the site boundaries, at the landscape scale.
- EIA needs to address indirect and cumulative impacts.
- EIA should evaluate the effectiveness and risks of proposed measures to minimize and restore/ repair impacts; that is, it must provide a reliable measure of residual negative impacts on biodiversity.

An offset can be integrated with the EIA process to deliver 'no net loss', provided that the above requirements are met. Details about implementation of the proposed offset should then be incorporated in an environmental management plan ('offset management plan') or Biodiversity Action Plan.

Biodiversity offsets and SEA

The purpose of Strategic Environmental Assessment (SEA) is to ensure that the environmental consequences of a proposed policy, plan or programme are appropriately addressed at earlier stages or higher tiers of planning and decision-making than would take place for a project through EIA. Governments can use SEA to establish an analytical framework for assessment of individual project proposals through EIA or other planning processes in a hierarchical model that sets objectives through policy making and planning, and assesses alternative development options, cascading down to the level of project planning and EIA. SEA may draw on results of other landscape level planning initiatives that might clarify biodiversity, conservation and development objectives and provide a platform for comparing alternative development scenarios and their compatibility with these objectives. Individual projects can then be designed to meet policy goals and plan objectives. When planning for biodiversity offsets, a tiered system like this, especially if backed up by comprehensive spatial data on the distribution and significance of biodiversity and priority areas for biodiversity conservation in the landscape, can make it much easier to determine how biodiversity offsets might complement policies and contribute to national or regional conservation objectives.¹⁵

Biodiversity offsets and planning law

In many countries, the planning process, with its formal system of applications and enquiries, offers another potential trigger for dialogue on biodiversity offsets between developers and regulators. Indeed, environmental and social works are often required as a condition for planning approval, or as a form of

¹⁵ Further information about SEA and biodiversity offsets may be found in <http://bbop.forest-trends.org/guidelines/eia.pdf>

'planning gain'. For instance, in the UK, section 106 of the Town and Country Planning Act can be used by authorities to require developers to undertake compensatory conservation activities. Just as with EIAs, certain underlying conditions may be needed for this trigger to work successfully, such as clear guidelines, tax breaks and density bonuses.

Biodiversity offsets and sectoral policies (mining, oil and gas, fisheries, etc)

Policy on biodiversity offsets can be incorporated into national policy relating to particular industry sectors. This could be done with a view to establishing the offset policy within a sector that was anticipated to generate significant biodiversity impacts, or where the nature of the industry sector required particular policy approaches that would not be appropriate for a policy applying to developments generally. Biodiversity offset provisions can thus be integrated into sectoral law and policy concerning, for instance, oil and gas; mining; electricity supply; forestry; fisheries; palm oil and other agricultural sectors; and tourism.

Biodiversity offsets and other environmental offsets (e.g. carbon, water, social issues) and Payments for Ecosystem Services

Governments may have policies that provide for offsetting a range of environmental impacts. Some governments (such as Western Australia and Queensland) have a broad, encompassing policy on 'environmental offsets'. Such policies may have subsidiary programmes on particular types of offsets. Other governments may introduce one or more thematic offset policies (e.g. biodiversity offsets, carbon offsets, wetland offsets and even social offsets) without an overarching environmental offsets policy. Other governments have Payments for Ecosystem (PES) Schemes¹⁶. These schemes may involve a variety of different credits.

In any of these cases, questions will naturally arise as to whether biodiversity offsets and other types of offset or PES schemes can co-exist, and particularly whether there can be an 'overlay' of more than one scheme on the same piece of land. Generally speaking, two mechanisms for coordinating such different schemes have been considered, known as 'bundling' and 'stacking'.

'Bundling' refers to regulatory arrangements where credits from a single site are defined to include more than one environmental good or service. Thus a credit might be defined that incorporates both biodiversity gain and sequestered carbon from a revegetation site. 'Stacking', on the other hand, refers to arrangements where different and distinct types of credits can be generated from a single site. In the example above, separate biodiversity credits and carbon credits would be available for offsets from the revegetation site.

Bundling and stacking remain controversial concepts, with concerns raised about 'double dipping'¹⁷, site management incompatibilities and contractual conflicts. A very important topic for consideration is how the

¹⁶ The Economics of Ecosystems and Biodiversity (TEEB, 2009) study defines ecosystem services as the 'direct and indirect contributions of ecosystems to human well-being' and categorises them into regulating (e.g. water purification, carbon sequestration, flood attenuation); provisioning (e.g. food, fuel, freshwater, timber); cultural services (e.g. for spiritual and aesthetic benefits); and habitat (e.g. maintenance of genetic diversity). Note that 'supporting services' are incorporated under ecological processes, rather than as a category of 'services. The Millennium Ecosystem Assessment (2005) defines four categories of ecosystem services: *Provisioning services*: The goods or products obtained from ecosystems such as food, freshwater, timber, fiber and other goods. *Regulating services*: The benefits obtained from an ecosystem's control of natural processes such as climate, water flow, disease regulation, pollination and protection from natural hazards. *Cultural services*: The non-material benefits obtained from ecosystems such as recreation, spiritual values and aesthetic enjoyment. *Supporting services*: The natural processes such as erosion control, soil formation, nutrient cycling, and primary productivity that maintain other services.

¹⁷ Double dipping is when the person generating the credit(s) sells the same conservation management intervention to different buyers.

'additionality' needed for a biodiversity offset (and indeed for most other types of offsets) can be ensured. Policy development on 'bundling and stacking' is still in its infancy, and many of the related issues remain to be resolved. BBOP's Guidelines Working Group is exploring this topic.

2.4 Ways of implementing biodiversity offsets

The discussion thus far has considered the basics of biodiversity offsetting and the main policy options for government seeking to implement an offsets arrangement. These considerations have focussed on the processes for specifying biodiversity offsets in relation to defined impacts. However, specifying an offset in terms such as size, type, quality and locality is only half of the task. The next challenge is for the developer to discharge the obligation to implement the offset. There are three main approaches to this task of implementing biodiversity offsets: developer-initiated, in lieu fees and market mechanisms. Whichever approach is used, it will need to address key considerations such as identifying roles and responsibilities in the governance, management, monitoring and enforcement of the offset; how risk is assigned; and how the long term security of the offset is assured through legal and financial arrangements. These issues are discussed a little further in section 3, and are also the subject of BBOP's 'Offset Design Handbook'¹⁸.

Developer initiated offset implementation

In this approach, while government may have introduced policy that encourages or requires biodiversity offsets, it generally takes a non-interventionist stance on how offsets should be implemented, and particularly on the task of finding offsets. The onus rests with the developers to find their own offsets (whether the offsets themselves are voluntary or required by regulation). This method can be ineffective in terms of offsets and unpopular with developers for a number of reasons:

- Identifying and securing appropriate offset areas is often outside the core expertise of developers, particularly smaller companies;
- It can be a time- and resource-consuming task;
- Projects or companies may 'move on' before an appropriate offset has been located.

In lieu fees

Under this system a government agency stipulates a payment from the developer with the intention of deploying the funds at a later date to find a suitable offset. This approach is often favoured by developers because their offset requirements can be resolved quickly and with certainty through a single payment which sheds their liability for the offset. In lieu fees can allow aggregation of individual offsets into larger, more beneficial areas. However from a broader perspective in lieu fees have a number of disadvantages including:

- The risks associated with finding the offset are not reduced but merely transferred from the developer to the government agency;
- The agency is required to estimate the cost of the future offset at the time of the in lieu payment. As this cost is not accurately known, the estimate will be either too low (in which case the agency will be short of funds to implement the offset), or too high (in which case the developer has paid an excessive fee).

¹⁸ BBOP Biodiversity Offset Design Handbook. 2009. <http://bbop.forest-trends.org/guidelines/oih.pdf>

- In lieu fee schemes can accumulate large funds over time. In practice the tendency is for the implementation of offsets to be incomplete and sometimes for the funds to be diverted away from biodiversity offsetting to other 'good environmental causes'.

Market mechanisms

Markets can be used to supply biodiversity offsets for developers. These markets do not usually develop spontaneously, but require government intervention to set up the key components. Properly designed and operated, markets can be very effective in supplying offsets in a timely and cost-effective manner. However, biodiversity offset markets are subject to all the traps and limitations of markets everywhere.

However offset markets have some unusual characteristics which challenge general economic thinking about markets. Thus the primary purpose of an offset market is as a tool for effectively supplying biodiversity offsets as part of a biodiversity conservation policy. Market efficiency is an important but secondary goal.

Furthermore there is no aspiration to expand the offset market for its own sake. After all every offset is associated with a commensurate biodiversity loss and the overarching policy objective is the reduce impacts on biodiversity. Thus for no net loss biodiversity offsetting there is no biodiversity benefit from more offsetting and a larger offset market.

2.5 The design of offset markets

2.5.1 First party and third party offsets

In some circumstances a developer can provide a biodiversity offset on their own land. In this case the developer takes on the responsibility for the establishment, management and ongoing protection of the offset site. This situation is sometimes referred to as a first party offset. However many developers are reluctant or unable to provide their own offset because:

- They do not own the appropriate land or biodiversity components on which a suitable offset can be based;
- They lack the capacity and expertise required to establish and manage land and biodiversity;
- Their project has a fixed term and they do not want to be committed to ongoing obligations associated with the project's offset.

The alternative is to reach agreement with another person or company to provide the biodiversity offset – a third party offset. This is the basis for the offset market, demand for offsets from developers and supply of offsets by other landowners.

The basic elements for an offset market are units of trade (credits), trading rules and credit registers.

2.5.2 Biodiversity credits

Offsetting is a balancing of loss and gain and credits are units of gain that can be traded in an offset market. The key consideration for the utility of credits is that they meet all the requirements for gain as specified in the offset policy of the jurisdiction. So, for example credits are measured using the same units used for

measuring the gain. If the gain is required to be ongoing, then credits must also be permanent. Generally whatever standards and processes apply to the establishment, measurement and protection of gain must also apply to the credits.

However credits have some characteristics over and above their correspondence to gain. Credits are bought and sold in the offset market so they also property. There can be some uncertainty about the status of credits as property in some jurisdictions because biodiversity (and other types of credits) are novel and untested. It can be beneficial to formally establish biodiversity credits through legislation to remove any uncertainty. Such uncertainty can undermine confidence in the market if buyers and sellers are unsure about exactly what rights they are exchanging in a credit trade. Governments can engender confidence in the offset market by establishing biodiversity credits in law. Clear land tenure is critical for the satisfactory operation of operation of offsets in general, and clear property rights for credits similarly important for market based approaches to their implementation.

While it is useful to legally recognise credits as property it is important to restrict their use to the function of providing offsets or for contributing to biodiversity conservation more generally. Credits should not be able to be used for security for debt as this could compromise the 'secure and ongoing' requirement where they are used as biodiversity offsets.

Because biodiversity credits are designed to implement and deliver biodiversity offset requirements, they need to be fit for this purpose. This implies that credits need to comply with the policies and standards that apply to offsets themselves. Compliance with these requirements can be achieved in a number of ways including through industry standards and government-operated registers. These standards serve to minimise the risk to the environment arising from poorly performing offsets and also provide certainty to developers that in purchasing the credits they have responsibly discharged their commitment to the provision of the offset.

2.5.3 Trading rules

In addition to clarifying the property status of credits, governments can also facilitate the offset market by formulating trading rules. These rules generally specify the processes and limitations on trades and can include rules that address:

- Recognition of processes and standards for establishing and cancelling credits;
- Proof of ownership of biodiversity credits;
- Process for the change of ownership of credits;
- Processes for extinguishing credits that have been used in an offset;
- Accounting where biodiversity credits with different metrics or management can coexist on the one site.

The issue of accounting for different credits on the one site can arise where the offset policy requires more than one measure of biodiversity to be included in the loss and gain consideration, for example where there is a general measure for habitat and another measure for a particular species. In this example offsets will comprise various combinations of the two measures. The task of compiling third party offsets is greatly facilitated if the two types of credits can be traded independently. However if there is any crossover in the metrics for the two credits (for example the trees may be part of the habitat measure as well as being a measure in their own right), there needs to be a rule to cover the separation (unbundling) of the two credit types and for taking into account any double counting of gain.

More broadly where there are separate management plans for different types of credits, these also need to be examined (for example biodiversity and carbon). It may be that the measures of the benefits are fully separate, but the actions in one management plan have a (negative) impact on one or more of the metric components of another benefit. In this case the interaction is not through common metric components in the measures, but through management actions that have impacts on more than one measure.

2.5.4 Biodiversity Credit registers

Biodiversity credit registers are another important component of an offset market. Registers serve two main functions:

- To be the authoritative record of the number, location, characteristics and ownership of biodiversity credits in the jurisdiction;
- To provide quality assurance for the registration (creation) of credits.

Registers usually provide the documentation for ‘proof of ownership’ and guard against ‘double-dipping’ (inappropriate bundling and stacking) by recording credits that have been used for offsets.

A marketplace

Governments can assist the establishment of biodiversity offsets markets by facilitating the establishment of marketplaces. A marketplace for biodiversity for biodiversity credits will be virtual rather than physical and will comprise brokers and traders. Brokers arrange trades between buyers and sellers within the like-for-like criteria that apply. Traders may own credits themselves and sell these directly to developers. Governments can build buyer and seller confidence in these institutions by encouraging brokers and traders to work through the official credit register and by requiring them to have probity plans and probity audits.

2.5.5 The design of biodiversity offset markets

The design of a biodiversity offset market needs to be tailored to the nature of the demand and supply of offsets and the offsetting processes that exist in the jurisdiction. The biodiversity offset policy can have a significant influence on the level and nature of demand and supply.

The like-for-like rules (and including provisions for trading up) set the number of unique credit types and the degree of segmentation in the market. Like-for-like rules that establish a small number of unique types result in low market segmentation. However this can also mean that different biodiversity types have been combined. Depending upon the level of variety existing across the jurisdiction, this could be taking the diversity out of the biodiversity. Conversely if the like-for-like rules establish many credit types this will reflect the biodiversity more accurately, but result in higher market segmentation.

The general level of demand is itself influenced by scope of the offset policy and in particular by the settings for exemptions, the types of habitats and species required to be offset, and any thresholds applying to the size or nature of impacts.

The degree of segmentation and the level of demand interact to influence the types of offset supply mechanism that evolve in the market. These mechanisms include conservation banks, aggregated offsets, bespoke trades and ‘over-the-counter’ arrangements.

A conservation bank is a mechanism where biodiversity credits are established in advance of any losses they may be used to offset. A bank is an entrepreneurial venture that requires up-front investment into the credit site. A conservation bank is usually designed to supply offsets over time for a multiple number of losses.

In contrast a bespoke trade is one where a credit site is established to supply the offset for a specific, known loss. The credit site is not generally established in advance, but only in response to the particular demand. Subsequently there is an interval between the agreement to a bespoke trade and the actual establishment of the offset. Sometimes this interval can affect the completion of the project requiring the offset. However a bespoke trade is a less risky proposition for the credit supplier.

An aggregated offset is similar to a conservation bank except that the offset demand or requirement is known in advance and the aggregated offset can be specifically designed to compensate for a particular set of biodiversity impacts. An aggregated offset draws together the offset requirements of a number of projects where the biodiversity losses are known and supplies the required credits from a large single site or series of connected sites.

Over-the-Counter schemes are similar to conservation banks but are designed to supply small offsets where it is particularly important to minimise transaction costs. A government agency with responsibility for approving or permitting small biodiversity impacts can establish an arrangement under which it sells credits for the corresponding offsets 'over-the-counter' at the time of issuing the permit. These credits are established in advance (i.e. a small conservation bank) either by the agency or by through a private supplier.

A question arises here as to what extent the biodiversity offset policy should be formulated to provide a well-oiled offset market, for example by combining many biodiversity types together so the market could be supplied by a small number of large habitat banks. To do this may be to lose sight of the purpose of biodiversity offset policy, which is to contribute to biodiversity conservation in the jurisdiction. Nevertheless it is important when developing biodiversity offset policy to consider its influence on the likely form and effectiveness of the related offset market.

Biodiversity offset markets should also address other forms of risk for buyers and sellers. Developers are buying credits in the market with a view to presenting the credits to the permitting agency to fulfil the developer's offset obligations. Developers need to be certain that they are buying the correct type and quantity of credits. The market design needs to incorporate systems for the developer to obtain confirmation of the acceptability of the proposed credit purchase. This is particularly important in bespoke trades.

Small-scale landowners considering entering the market as suppliers can face considerable upfront costs for site assessment, biodiversity management plans and works, and permanent protection covenanting. The market design should allow such suppliers to come into the market in a staged manner so that they can manage the financial risk associated with these outlays. They should be able to make the sequential commitments as demand for their credit types becomes more certain.

Whether or not conservation banks arise in an offset market will depend on the investors' assessments of the risks involved with the future demand for the credits that could be established in the banks. The offsetting like-for-like rules (including any 'trading up' provisions) that set up the credit categories can have a major influence on this question. Where credits are defined in broad categories, there is potential for one offset site (bank) to provide like-for-like matches for a number of impact or loss sites. Conversely, where credit categories are narrowly defined a bank will potentially match up with a smaller range of impact sites.

Thus in general banks could be expected to be more viable where the like-for-like rules and the credit categories are broad, and vice versa. However broad like-for-like rules can mean that important distinctions between biodiversity values are obscured and subsequently some of these values may be lost in the offsetting process.

The viability of conservation banks is not just reliant on the like-for-like rules. The demand for offsets varies geographically due to the interaction of the location of development and the spatial distribution of biodiversity values. Banks can be feasible in situations even where relatively narrow like-for-like rules prevail when the demand for offsets is concentrated on a relatively small number of credit types.

2.5.6 The benefits and risks of conservation banks

Conservation banks and aggregated offset have a number of benefits, but also some associated risks and disadvantages. In summary the main benefits are:

- A number of offsets can be consolidated into a large contiguous site which can have higher habitat and security values;
- The conservation effort can be concentrated into one project which can facilitate more specialist input to offset design and management;
- A conservation bank can have landscape-scale benefits by providing connectivity and pre-empting future fragmentation;
- There can be cost savings from economies of scale and reduced transaction costs;
- Conservation banks can provide developers with immediate access to credits thus reducing the time required to find the offset for the project.

On the other hand there can be increased risks associated with conservation banks including:

- With a number of offsets at the same location the effect of a natural disaster or other failure of the bank site is magnified;
- Pressure on the offsetting policy manager to relax the 'rules' to increase the commercial viability of the banks.

3. Possible roles of government in establishing and administering policy on biodiversity offsets (for each, describe briefly what it entails)

3.1 Policy-maker/regulator

Making policy and regulating are functions unique to government. The development and implementation of biodiversity offset policy or regulations depend on government action. The broad options for biodiversity offsets policy are discussed in section 2.2.

Different governments use different processes for making policy. In considering the process to be used for the development of policy on biodiversity offsets, the BBOP principles outlined above can be helpful, in particular the following that relate to process:

- stakeholder participation;
- equity – consider how risks and rewards can be distributed in a fair and balanced way;
- transparency; and
- science and traditional knowledge –policy informed by scientific knowledge and taking appropriate account of traditional knowledge.

Biodiversity offsets policy is often developed in the context of a broader biodiversity conservation policy. There can be connections between offsetting and other approaches to biodiversity conservation policy such as a protected area system, land use planning and investments in conservation gain. There are also technical links such as common information systems and metrics.

Policy making usually entails the development of policy options, consultation with stakeholders, assessment of options and finalisation of preferred positions. Governments can make formal commitment to final policy through proclamation or legislation.

Plans and adequate arrangements for the implementation of policy are critical to success. As biodiversity offsetting can be a new area of policy, it is prudent to build in a process for monitoring and review so that refinements can be made over time.

3.2 Provider, curator and source of authoritative biodiversity information

Government agencies commonly collect data about biodiversity and natural resources. These data may relate to general biodiversity information such as vegetation cover and type or to more specific aspects such as species occurrence and habitat characteristics. Over time governments often build up significant collection of biodiversity information.

Protocols for the collection, quality assurance and safe storage of these data can be valuable to ensure that authoritative information is available for application to biodiversity offsetting. These systems should also enable other (non-government) organisations to contribute data to the national databases.

Biodiversity information needs to be analysed and modelled in specific ways to create the tools necessary for the implementation of biodiversity offsets policy. This could be, for example, the delineation of bioregions or ecosystems, the classification of vegetation types by significance, systematic conservation planning to determine the optimum configuration in the landscape of a network of areas to conserve biodiversity, or the spatial variation of habitat quality.

Private consultants and companies often play important functions in biodiversity offsetting processes, through for example the assessment of impacts and the identification and evaluation of potential offset areas. Access to the relevant government biodiversity information and tools is very important for the participation of the private sector.

3.3 Buyer of offsets

Regulations for biodiversity offsets should naturally apply to the government itself. Governments are often responsible for activities such as road building, water supply and other public infrastructure projects and where have biodiversity impacts within the scope of the policy or regulation, it will be necessary for the government, or the government agency, to provide offsets.

In these situations the government could provide offsets by creating credits on public land or government-owned freehold land (see below), or more commonly, acquire a third party offset.

3.4 Seller of offsets

Biodiversity gain can be created by transferring freehold land into publically owned protected areas, or by elevating the level of protection of existing areas of public land. As discussed in section 2.1, two types of gain can be generated by these interventions: gain from the change of the use of the land and gain from the increased security of the biodiversity associated with the land.

Governments make decisions from time to time to create protected areas (and generate gain) within the context of broader biodiversity conservation policy. The principle of additionality - requires the conservation outcomes the biodiversity offset delivers to be demonstrably new and additional and not to have resulted without the offset. This principle is relevant when governments are considering whether or not the gain generated from new protected areas (or improvements to existing protected areas) can be considered as biodiversity credits that can be used for offsets.

The additionality principle indicates that the creation or expansion of protected areas as part of a conservation reserve programme and for general biodiversity conservation purposes should not result in biodiversity credits or be used for biodiversity offsets if government should undertake the work as a matter of public duty. However, credits and offsets can result from the establishment or improvement of protected areas where the following conditions apply:

- The creation of the protected area is over and above existing plans and programs for protected area establishment;
- At the time of its establishment the purpose of the protected area is specifically nominated by the government to be for offsetting.
- The decision to create the protected area is linked to nominated current or future developments requiring offsets.
- The improvement of a protected area is specifically for the purpose of offsetting a loss within the protected area.

Subject to these conditions, a government could create credits from new protected areas and sell them to parties requiring offsets.

Where an offset market exists, governments need to consider fair competition principles when they enter the market as a seller. Governments can have inherent cost advantages (such as those relating to taxation) that should be mitigated so that government-owned credits do not unfairly compete with privately owned credits in the offsets market.

3.5 Broker

In offset markets, brokers perform the role of intermediaries between buyers and sellers. Brokers can be particularly useful for arranging bespoke trades where potential suppliers of specific credit types have to be individually identified and brought into the market. In contrast, owners of conservation banks often sell credits directly to buyers, without the intervention of brokers. Brokers can also be a source of advice and expertise to inexperienced and infrequent buyers and sellers who may lack the confidence to deal directly in the offset market.

The brokering role is usually one for the private sector, but there can be circumstances where a government may chose to provide a broker service. This could be, for example, in the start up period of an offset market when there is uncertainty about the functioning and likely strength of the market; or in areas where the market may be too thin to support private commercial brokers.

Where there are commercial brokers operating in the market, a government broker should operate on a full cost pricing basis in order to maintain fair competition.

3.6 Operator of register of credits, standard setting

Credit registers record and track ownership information of biodiversity credits and provide quality assurance through the credit registration process.

The establishment and operation of credit registers is a natural function for government. Credit registers can be set up formally through legislation or administratively through a government agency.

As biodiversity credits are traded they have the characteristics of property, whether this is formalised through legislation or not. Thus it is very important that the credit register is established with a high level of accountability and attention to detail. Credit registers need to be kept up to date, accurate and authoritative. There should be formal rules for the operations of the register including registration, changes of ownership and cancellation.

The initial recording of a biodiversity credit on the register provides the opportunity for implementing the standards set for offsets. These are the standards such as for site assessment, management plans and gain calculations that are set for offsets through documents complementary to the offsets policy. Biodiversity credits need to be fit for the purpose of being biodiversity offsets and acceptance of credits onto the register provides the process for checking this requirement.

3.7 Provider of process to ensure permanence of offsets

Biodiversity offsets need to be permanent where the associated losses are permanent. Permanence is not about making an eternal guarantee about an offset, but rather arranging for a permanent institution to make a binding commitment to the ongoing responsibility to maintain the offset. In many jurisdictions, the relevant permanent institutions are landowners (for freehold land) and government. That is, it is assumed that there will always be an owner of freehold land and that there will always be a government.

Government has a role in arranging permanence for offsets on both freehold and public land. The establishment of third party offsets on freehold land involves some form of statutory agreement with the current landowner. Permanence requires that future landowners are also bound by this agreement. This is usually achieved by attaching the agreement to the land title along with a legal requirement that future owners are bound by the agreement. Government action is required to establish these mechanisms in law and in being a party to the individual agreements.

On public land, offsets usually require some elevation of the level of protection (security) of the subject land, for example through the proclamation of a conservation reserve or a national park. These decisions are taken by government and are usually implemented through legislation.

In countries where different forms of tenure prevail (such as leasehold or community ownership), other approaches to ensuring long-term security need to be considered. The form of these approaches will be strongly dependent on the country's legal framework.

3.8 Monitor and enforcer

Governments' role in monitoring the integrity of biodiversity offsets and managing compliance issues depends on the nature of the offset. For offsets provided directly by the developer (first party offsets) there will usually be provisions in the development approval instrument (i.e. the permit or consent often arising from an EIA) for a government agency to monitor the offset site and initiate a series of compliance procedures if certain specified actions are not implemented, or certain specified targets are not met.

Where the offset has been provided through an offset market (a third party offset) the developer is relieved of responsibility for establishing and managing the offset when the permitting authority accepts the biodiversity credits (purchased by the developer) as a complying offset. The credit supplier takes on responsibility for the offset, and monitoring and compliance is focused on the credit supplier rather than the developer. As described above, the government will have monitoring and compliance responsibilities through the provisions of the statutory agreement with the credit supplying landowner.

Within government, the agency responsible for granting the development approval that requires the offset is ultimately responsible for monitoring the ongoing integrity of the offset. However, another government agency may be responsible for the agreement with the landowner for delivering the biodiversity credits, including the monitoring and compliance provisions in the agreement between government and the landowner (or other entity generating the credit through agreed conservation activities). In this situation there should be some form of understanding between these agencies regarding reporting and action on monitoring information and compliance actions.

3.9 Identifying and managing conflicts of interest between these roles (probity)

Given the various roles for government in biodiversity offsetting that have been explored above, it is clear that there is potential for conflicts of interest. Examples of potential conflicts of interest include:

- The government as a developer of infrastructure projects and as the regulator specifying and enforcing requirements for biodiversity offsets;
- The government as operator of the biodiversity credit register and as a supplier of offsets seeking registration of its credits on the register;
- The government as monitoring and enforcement agency and as a supplier of offsets managing and maintaining credit sites.

These potential conflicts of interest do not necessarily mean that governments cannot undertake a variety of roles relating to biodiversity offsets. However they do mean that potential conflicts need to be identified and arrangements put in place to manage and resolve conflicts as they arise. This process is referred to as probity. Probity is a feature of the design and implementation of an offset system by government that is concerned with integrity in process and ensuring that all parties are treated with fairness and equity, in a system with good governance.

Probity involves an examination of the processes involved in the various roles, describing and separating responsibilities and identifying issues including conflicts of interest, confidentiality, information handling and decision-making. Usually a probity plan is prepared by an independent probity adviser that sets out in advance how these issues will be handled. Measures included in probity plans include the clear separation of decision making, secure arrangements for handling information and formal declarations of personal conflicts of interest. The independent probity adviser will generally review operations from time to time and provide a report to the various parties on compliance with the probity principles and the other provisions of the probity plan.

3.10 Creating the market

Market-based instruments offer policy makers a number of benefits, in terms of effectiveness and efficiency, and markets in biodiversity credits are no exception. However, markets of any kinds are dogged by market failures, and markets related to biodiversity are particularly controversial, given the public and open access nature of biodiversity and ecosystem services. With biodiversity, market failures are typically caused by the existence of externalities, imperfect information, and the non-excludability or non-rivalry of biodiversity's

goods and services¹⁹. Any market-based approach to biodiversity offsets will thus need to be developed with great care.

The key actions for government to set up a credit market are to:

- **Establish the units of trade:** Define the units of trade (credits), the metrics for their measurement and the processes by which they will be measured in the field. Establishing credits as property through legislation can also be beneficial.
- **Set up a credit register:** The register provides certainty to the market about the quality of the credits and about the ownership of credits.
- **Facilitate the establishment of marketplaces:** Assist buyers and sellers of credits to find each other by encouraging and accrediting brokers, over the counter facilities and conservation banks. In some circumstances, the government may establish a state-operated broker.
- **Identify and deal with risk for buyers, sellers and the environment:** The parties in the market need a reasonable level of confidence in order to participate. Buyers need confidence that the credits they buy will be accepted as offsets. Sellers need confidence that if they make commitments to establish supply, there will be some demand for their products. The flexibility built into the market should not always be at the expense of the environmental outcome.
- **Consider customer service, competition and efficiency in the market design:** The market design needs to be responsive to the needs of customers (e.g. developers can procure their offsets in reasonable time). Facilitating competition and avoiding monopoly supply helps achieve fair prices. Efficiency should also be built into the market design, for example by making credits divisible so that buyers can buy just the number they require.

4 What kind of capacity does government need to take on biodiversity offset policy?

4.1 Costs and cost recovery

Government and private sector roles

An initial consideration of the requirement for government capacity is the relative role of government and the private sector, particularly in the implementation of biodiversity offset policy. In jurisdictions where much of the implementation is undertaken by the private sector through markets, the need for government capacity and resources will be significantly reduced.

However, the task of policy development (and regulation where this is adopted) does fall to government. Costs can be considered in two main parts –the development of policy and the operation of the offset scheme. The main sources of cost in the policy development process are:

- Policy development and preparation of guidelines
- Regulation making (may require new legislation and amendments to existing legislation)
- Preparation of standard forms and procedures (and their documentation with accompanying guidance in manuals)
- Biodiversity information systems (collection, storage, analysis). This usually builds on existing information and systems.

The main sources of cost in the operation of the offset policy are:

¹⁹ OECD, 2004.

- The assessment of individual development proposals, usually using existing processes
- The specification of offsets based on like for like criteria and loss gain metrics
- A case management system that documents the flow of applications through the process
- Monitoring and compliance of offset sites
- Communications (websites, information sheets, brochures)

In a regulated context where offsets are supplied through a credit market, governments may be involved in establishing and operating the credit register. The main sources of cost in this situation are:

- Establishment of a credit register through legislation
- Establishment of credit property rights (legislation for credits as property)
- Operation of the register and implementation of trading rules
- Development of guidelines for various trading mechanisms including 'over the counter' and electronic trading

In some circumstances, a government may offer a broker service for suppliers of credits and buyers. This option could be adopted as a transitional measure at the start up of an offset scheme where there is much market uncertainty and the private sector is reluctant to establish broker services. The main sources of cost for brokers are:

- Recruitment of suppliers including site assessment, preparation of management plans and calculation of biodiversity gains
- Receiving enquiries for offsets from developers and matching these to supply
- Managing databases of buyers and suppliers
- Facilitating transactions between buyers and sellers through negotiation or bidding
- Arranging and executing contracts of sale
- Managing contracts for site management and reporting to compliance authorities

Governments will usually be the only institutions that can make legal arrangements for the permanent security of offset sites, where this is required. These arrangements include on-title agreements, private land surrender and inclusion into a public conservation reserve and the creation of protected areas on private land or by the reclassification of the status of public land. These processes will usually already exist in the jurisdiction and the costs will be known from previous experience.

The costs associated with these various processes and services will vary from country to country and need to be estimated on a case-by-case basis. However, experience in jurisdictions that have already established policies and offset schemes of varying design and complexity has demonstrated that these are not trivial tasks. It can be anticipated that it would take several years and the input of a variety of expertise (see below) to develop a policy and establish an operating scheme.

Cost recovery

While there are many costs to be considered as identified above, a government could recover these costs in part or in full. This is done by charging fees for the services provided to the users of the offset scheme. Cost recovery may be particularly appropriate where credit markets are established for the supply of biodiversity offsets. Not only does this ease the burden on the public purse, it also leads to the incorporation of more of the transaction costs into the price of offsets which results in more economically optimal outcomes.

It may be less appropriate to implement full cost recovery for services associated with tasks such as policy development, legislation and policy implementation where these are considered normal functions of government.

Cost recovery usually involves the following steps:

- Define the services to be provided and allocate inputs (labour and other costs) to each service
- Estimate the service levels: that is the numbers of various services provided over each time period
- Set the cost of services (the fees) to achieve partial or full cost recovery
- Consider which parties will pay the fees and when the fees will be collected. It may be advantageous to delay the collection of some fees (for example, associated with credit creation) until the time of credit sales.

Where a government and the private sector are both offering the same services to the market, any requirements of government competition policy will need to be taken into account.

4.2 Skills and capacity

The development and implementation of biodiversity offset policy spans a wide range of professional and technical skills. Box 6 identifies the main skills and inputs required for the four main segments of the framework.

Box 6: Skills and capacities for biodiversity offsets				
Framework segment	Policy/regulation	Credit register	Credit market	Offset security
Skills and capacity	Biodiversity policy	legal	legal	legal
	Biodiversity science (including spatial information and modelling)	Information technology	economic	Protected area planning
	Information technology		brokers	
	Field assessors		Offset analysts	
	Land use planning, EIA			

4.3 Staffing levels

Dependent on case load, complexity of system

Staffing levels depend on the number and complexity of the offset scheme. The most labour intensive area of work can be associated with the assessment of biodiversity losses and gains, where this involves field work. Increased use of mapped and modelled biodiversity information can reduce the need for intensive field work.

Staffing levels need to be considered in the context of the size of the offset transaction. Staff costs are part of transaction costs that are usually intended to be a relatively modest proportion of the overall cost of the offset. A scheme with a high price transaction (e.g. \$1 million) may require and be able to support higher staffing levels than one with smaller transactions (e.g. \$10,000). The design of the scheme would take this into account.

5 Lessons learned to date and some suggested ways forward for governments interested in exploring biodiversity offset policy options

5.1 Lessons learned

This section sets out some of the lessons that have been learnt from the experience in various countries from designing and operating biodiversity offsets policy and programmes. This is not intended to be a complete 'how to do it' catalogue, but rather as a guide to some starting points when considering an offsets policy. The main lessons are:

- If the objective is to achieve a comprehensive biodiversity offsets, then regulation to require offsetting will be required. In the absence of regulation, only a minority of companies are likely to see a business case for voluntary offsets.
- Any policy and legislation on biodiversity offsets need to be clear and definitive about the circumstances in which offsets are required, the explicit outcomes desired, and the rules by which the offsets will be specified and measured (i.e. what criteria and indicators).
- Biodiversity offsets policy should be based on sound principles. In considering the development of policy on biodiversity offsets, the BBOP principles outlined should be considered.
- Keep the rules as simple as possible. Specify the basics necessary to achieve the biodiversity conservation objectives but allow sufficient flexibility for the scheme to provide offsets for developers in an economical and timely manner. Where there are overlapping jurisdictions (e.g. in federal systems) or overlapping policies, seek to have only one offsets scheme or, if this is not possible, arrange accreditation between levels of jurisdiction so the offsets can be arranged through a single process.
- Offer guidance and examples through clear and authoritative publications so people know what to do, and what to expect from the system in terms of cost, time and support.
- If the system uses biodiversity credits, create legal certainty around the property rights of credits and the security of offset sites to enable people to make investments.
- A biodiversity offsets policy requires biodiversity data and mapping as basis for implementation. A scheme can be put into operation with a relatively limited biodiversity information base and a simple loss and gain assessment method. However, the design of the processes should attempt to take into account the uncertainties created by the limitations of information and methods to avoid unintended losses of biodiversity.
- Adequate monitoring and compliance with offset requirements is critical to success. Past failures have often been associated with lack of monitoring and enforcement of EIA or offset requirements.
- Adaptive learning, based on the monitoring above, is recommended to help policy design and implementation evolve based on experience.

5.2 Suggested ways forward for governments interested in exploring biodiversity offset policy options

The decision to introduce a policy on biodiversity offsets is a significant step on the road to sustainable development and biodiversity conservation. It is natural that, prior to any commitment, governments will undertake a substantial body of background work that could include information gathering, cost benefit analysis, pilot projects and the development of policy options. The nature of these tasks is outlined below.

- **Fact-finding and gap analysis - policy:** Generally speaking, governments already have in place a range of law and policy that is relevant to biodiversity offsets (see section 2.1). A first step is thus to undertake an analysis of existing relevant policy at the national or regional levels (e.g. EIA, conservation law including protected area legislation, planning regulations, sectoral policies, fiscal policies, liability regimes, land tenure, indigenous peoples' rights, strategic environmental assessments, land use plans and so on) to explore the extent to which these serve to require, facilitate or even present a barrier to undertaking high quality biodiversity offsets.
- **Fact-finding and gap analysis – biodiversity data:** A certain depth, quality and consistency of biodiversity data is needed in order to assess projects' impacts on biodiversity, to plan appropriate biodiversity offsets and certainly to establish a regional or national system of biodiversity offsets. Most countries have at their disposal quite a volume of habitat and species data, in a range of data sets of varying quality and scope, held by government, NGOs, academic organisations and even companies, some up to date and some old. A gap analysis of existing biodiversity data and maps is thus a wise first step. Data is needed for offset planning to support the classification of habitat types (and condition of such habitat), application of 'like-for-like-or-better' approach, site selection and potential designation of credit types, if aggregated offsets or conservation banking is considered an appropriate approach.
- **Fact-finding– cost-benefit analysis:** In some circumstances it may be useful to undertake a socioeconomic cost/benefit analysis of introducing no net loss policies. In particular such an analysis could consider the benefits and costs to the economy, where the benefits could include environmental benefits as well as the economic benefits of sectors that might expand, such as tourism and conservation restoration. A regional impact analysis could also consider local employment effects.
- **Pilot projects:** Practical experience with designing offsets for individual projects can help governments decide what nature and content of biodiversity offset policy would be appropriate for the country concerned. Practical experience of biodiversity offset design that can inform the development of national policy on the topic. Governments could work with potential pilot project partners to agree a description of what is entailed in a pilot project, as the basis for discussion with potential pilot project partners, then establish a Memorandum of Understanding for collaboration on a pilot project with the companies concerned. The government can form a Working Group (comprising local experts and perhaps one or two international experts with experience of offset design and implementation) to support the companies concerned in the design of biodiversity offsets for their pilot projects.
- **Integrating biodiversity offsets with land-use planning at the national or regional levels:** Governments could examine whether any regional land use-plans or strategic environmental assessments are planned, and integrated biodiversity offset planning into these. Regional land-use and biodiversity offset planning relies on the integration of biodiversity data and data layers concerning the location and nature of development plans (e.g. mines, linear infrastructure, town expansion etc). These will be brought together to serve as the basis for regional land-use and aggregated offset planning.

- **Identify, analyse and evaluate policy options:** The results of the fact-finding and of the empirical work on individual pilot projects and integrating biodiversity offsets with land-use planning at the national or regional levels described above can allow government to identify the full set of policy options. These could range from 'business as usual' (no additional policy needed: offsets will be planned according to companies' and lenders' business case for undertaking them voluntarily) to 'conservation banking' (requirements for offsets that developers can choose to meet by purchasing the correct number and type of 'biodiversity credits'). The options could include a number of other voluntary and regulatory models. In each case, the respective advantages and disadvantages of the option can be articulated, as the basis for discussion, together with a description of the legal, financial and human resources needed for the government to implement each option. Consultation with stakeholders will be important throughout.
- **Policy formulation and system design:** Once the government's preferred approach(es) are ascertained during the policy evaluation stage above, government will need to draft any policy measures needed to give effect to the preferred option, and undertake further work to design the system (e.g. exchange rules, mapping, and any system of conservation credits) needed to implement the particular policy option. Again, consultation with stakeholders will be important throughout.
- **Implementation of policy, monitor and review.**

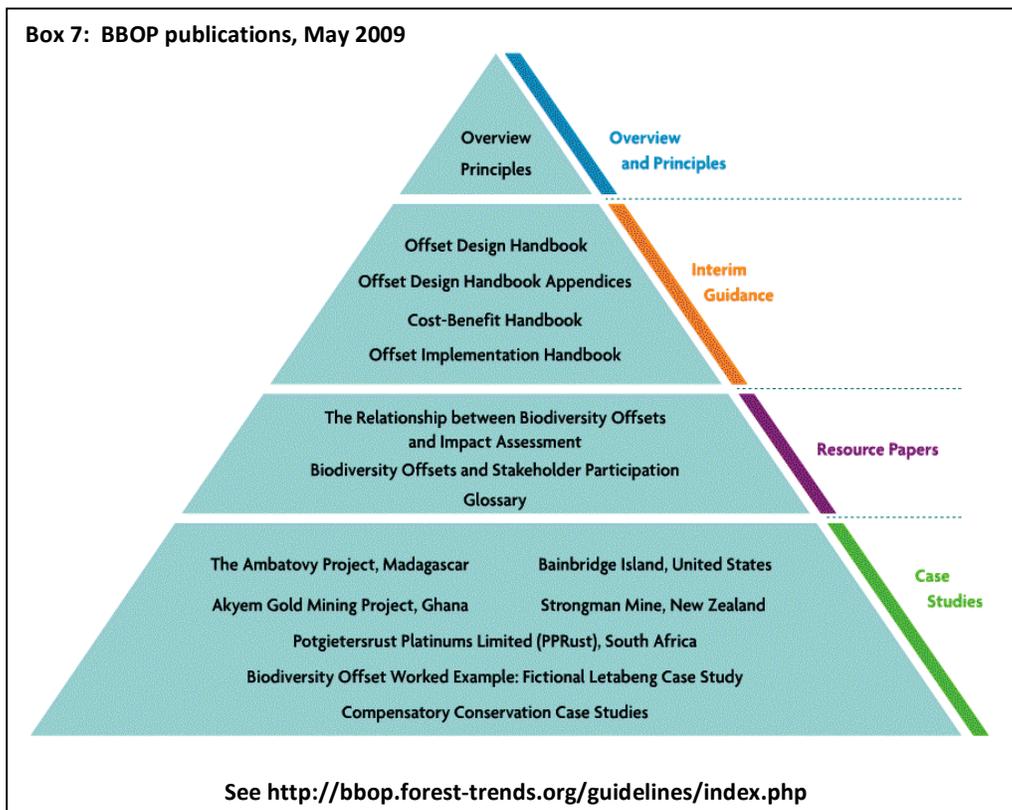
6 Interested in learning more?

This paper was prepared by the authors as a contribution to the Business and Biodiversity Offsets Programme (BBOP).

Over the last six years, the Business and Biodiversity Offsets Programme (BBOP), now a partnership of over 50 leading organisations and individuals including companies, governments, conservation experts and financial institutions from around the world²⁰, has been exploring biodiversity offsets. The member organisations comprise the BBOP Advisory Group, and are served by a Secretariat comprising two NGOs: Forest Trends, which started BBOP, and the Wildlife Conservation Society.

Responding to the decisions by the Parties to the Convention on Biological Diversity at their ninth meeting (CBD COP9) and other requests for work of this kind, the BBOP partners worked hard to reach agreement on fundamental issues relating to biodiversity offsets, and to develop practical guidelines for offset design and implementation. Chief among BBOP's products to date is a set of ten fundamental principles (see Box 3 on page 14) agreed and supported by BBOP members and increasingly adopted and used by other companies, governments and civil society as a sound basis for ensuring high quality biodiversity offsets. In addition, BBOP completed a methodology toolkit in May 2009 which includes three core handbooks on offset design and implementation; resource papers on how biodiversity offsets relate to impact assessment and stakeholder participation. It also contains case studies of the BBOP oil and gas and mining pilot projects and other offset and compensatory conservation experiences; and supporting material such as a glossary of technical terms. All of this material is available on the website: <http://bbop.forest-trends.org/guidelines> and a CD-Rom. See Box 7.

¹⁷ For the full list of BBOP Advisory Group members, please see: <http://bbop.forest-trends.org/documents/BBOP%20Advisory%20Group%20Members.pdf>



Following the first phase of BBOP’s work (November 2004 – June 2009), the programme is now scaling up during its second phase (July 2009 – July 2012), and looking ahead to a third phase.

The BBOP Executive Committee (which sets the group’s strategy and is elected from its Advisory Group members) has established six priorities in the period to July 2012:

- **Standards on biodiversity offsets** – developing internationally agreed and certifiable standards for biodiversity offsets. Starting with agreed protocols for verification and auditing of biodiversity offsets, tested at pilot sites, a draft standard on biodiversity offsets will be made available by July 2012. Subsequent versions with improved indicators and guidance notes based on experience from using the draft will be issued during BBOP’s next phase, which will run to July 2015.
- **A broader portfolio of biodiversity offset experiences** – demonstrating through BBOP pilot projects and others’ experiences how biodiversity offsets could work in a broad range of countries and industry sectors.
- **National level interventions** – providing technical support and policy advice on biodiversity offsets, landscape-level and regional planning to governments, through general reports and specific advice.
- **Better guidelines** – improving the BBOP guidelines on how to design and implement biodiversity offsets, based on broader geographic and sectoral experience of BBOP members and others.
- **Training and capacity building** – training a cadre of professionals worldwide to support companies and governments in the design and implementation of biodiversity offsets and associated regulation and policy.
- **Improved Communications / Global Forum** – providing a range of communications products emanating from the work streams above and serving as a global learning forum on biodiversity offsets

BBOP’s broad membership offers a tremendous wealth of expertise, experience and technical assistance on biodiversity offsets from all around the world.

BBOP would be glad to hear from and ready to welcome new members interested in joining the Advisory Group or the Learning Network. For further information, please contact: bbop@forest-trends.org.

REFERENCES

- Business and Biodiversity Offsets Programme (BBOP). 2009. Business, Biodiversity Offsets and BBOP: An Overview. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/overview.pdf ISBN 978-1-932928-29-7 (paperback) ISBN 978-1-932928-30-3 (PDF)
- Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offset Design Handbook. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh.pdf ISBN 978-1-932928-31-0
- Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offset Design Handbook: Appendices. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh-appendices.pdf. ISBN 978-1-932928-32-7
- Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offset Cost-Benefit Handbook. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf. ISBN 978-1-932928-33-4
- Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offset Implementation Handbook. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/oih.pdf. ISBN 978-1-932928-34-1
- Business and Biodiversity Offsets Programme (BBOP). 2009. The Relationship between Biodiversity Offsets and Impact Assessment: A BBOP Resource Paper. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/eia.pdf ISBN 978-1-932928-36-5
- Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offsets and Stakeholder Participation: A BBOP Resource Paper. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/participation.pdf. ISBN 978-1-932928-35-8
- Business and Biodiversity Offsets Programme (BBOP). 2009. Glossary. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/glossary.pdf
- Hilderbrand R. H., Watts A.C. and Randle A. M. (2005) The myths of restoration ecology. *Ecology and Society* 10. 19.
- Madsen, R.; Carroll, N.; and Moore Brands, K. 2010. State of Biodiversity Markets Report: Offset and Compensation Programs Worldwide. Available at: <http://www.ecosystemmarketplace.com/documents/acrobat/sbdrm.pdf>
- McCarthy M. A., Parris K. M., van der Ree R. et al. 2004. The habitat hectares approach to vegetation assessment: An evaluation and suggestions for improvement. *Ecological Management & Restoration* 5, 24-27.
- Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Biodiversity Synthesis. World Resources Institute, Washington, DC. Copyright © 2005 World Resources Institute www.millenniumassessment.org/documents/Morris
- R. K. A., Alonso I., Jefferson R. G. and Kirby K. J. 2006. The creation of compensatory habitat – Can it secure sustainable development? *Journal for Nature Conservation* 14,106-116.
- OECD, 2004. Handbook of Market Creation for Biodiversity: Issues in Implementation. ISBN 92-64-01861-1. http://www.pebls.org/files/Publications/OECD/OECD_Handbook%20of%20Market%20Creation_implementation.pdf
- Race M. S. and Fonseca M. S. 1996. Fixing compensatory mitigation: What will it take? *Ecological Applications* 6,94-101.
- Salzman J. and Ruhl J. B. 2005. No net loss – Instrument Choice in Wetland protection. Duke Law school Research Paper No. 1.
- The Economics of Ecosystems and Biodiversity (TEEB). 2009. TEEB for policy-makers. <http://www.teebweb.org/ForPolicymakers/tabid/1019/language/en-US/Default.aspx>
- Walker S., Brower A. L., Stephens R. T., and Lee W. G. *Conservation Letters* 2 (2009) 149-157.
- Wilkins S., Keith D. A. and Adam P. 2003. Measuring success: Evaluating the restoration of a grassy eucalypt woodland on the Cumberland Plain, Sydney, Australia. *Restoration Ecology* 11, 489-503.