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Biocredits: incentives for inclusive biodiversity conservation

Ina Porras and Paul Steele

Discussion Paper
August 2019

Environmental Economics

Keywords:
Biodiversity, biocredits, conservation

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About the authors

Ina Porras, Senior Researcher, Shapring Sustainable Markets, International Institute for Environment and Development (https://www.iied.org/users/ina-porras). Email: ina.porras@iied.org

Paul Steele, Chief Economist, Shaping Sustainable Markets, International Institute for Environment and Development (https://www.iied.org/users/paul-steele). Email: paul.steele@iied.org

Acknowledgements

We thank, without implicating: Stephen Porter of IIED, Dorothea Pio of Flora & Fauna International, Richard W Diggle of World Wide Fund for Nature (WWF) Namibia, Oliver Withers of the Zoological Society of London and Glen Jeffries of Conservation Capital. All errors and omissions are the responsibility of the authors.

Produced by IIED's Shaping Sustainable Markets group

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Published by IIED, July 2019

Ina Porras and Paul Steele. 2019. *Biocredits: incentives for inclusive biodiversity conservation.* IIED Discussion Paper. IIED, London.

http://pubs.iied.org/16658IIED

ISBN 978-1-78431-709-6

Printed on recycled paper with vegetable-based inks.

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

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Tackling biodiversity loss is a growing priority for human survival. Introducing incentives for positive actions could play a key role in helping to reverse this loss. This paper explores the potential of using a novel approach to promote biodiversity conservation. Biodiversity credits or 'biocredits' are coherent units of measurement that track conservation actions and outcomes and can help improve tracking and transparency. Well-designed, they can make investments in biodiversity management more financially attractive, for example, by attracting private-sector finance. They can be used by governments to monitor their actions and report on biodiversity commitments. And as much of the world's biodiversity and its richest biodiversity spots are often found in remote and poor tropical regions, we also argue that biocredits need to be inclusive, and founded on fair benefit-sharing principles.

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Summary

Tackling biodiversity loss is emerging as a growing priority for human survival (Díaz et al. 2019). New data has revealed unequivocal links to ecological and economic tipping points. As a result, there is a renewed sense of urgency for institutions and systems to protect, restore and enhance biodiversity.

As with carbon credits to control greenhouse gas (GHG) emissions, biodiversity credits – 'biocredits' – are a way to finance biodiversity improvements. Biocredits can be measured, tracked and sold to raise funding which can be used as incentives for biodiversity conservation. Special attention in its design can also result in (inclusive) solutions to deliver local benefits to poor households.

Biocredits are similar in the design to biodiversity offsets (used in the USA, Australia and the UK, for example). But they differ in use. Biocredits are not designed to offset or compensate for actions with negative impacts on biodiversity elsewhere. In this sense, they are less contentious and do not depend on strict (and often unfeasible) legislation. In addition, few countries have national systems in place to promote and monitor biodiversity offsets. Even fewer of these systems are applicable to developing countries, where local inclusion and fairly sharing benefits are particularly important.

This discussion paper examines the potential for developing countries to put in place a national scheme of biocredits which can be domestically and internationally sold, and which promotes fair benefit sharing with rural populations. The paper draws lessons from related incentives schemes which exist in carbon markets, especially REDD+ and voluntary community carbon offsets, as well as from wider examples of payments for ecosystem services (PES) schemes. Much can be learnt from experiences with these related incentive schemes, which include species conservation banking (USA), eco-credits (Germany), a national PES scheme (Costa Rica) and wildlife credits (Namibia).

Based on the literature reviewed, we identified ways to develop a national biocredit scheme in a developing country. To date, no such biocredit scheme exists, but this paper sets out four key building blocks or characteristics needed to implement such a scheme:

- Simple, transparent and cost-effective design
- Enabling policy from government for implementation
- Market engagement to attract buyers and generate sales, and
- Inclusive and fair benefits for local people.

With the growing emphasis on biodiversity in the run up to the 2020 United Nations Biodiversity Conference,[1] it is likely that interest in incentive-type mechanisms such as biocredits will only grow. Done properly, biocredits may develop into a viable option to improve biodiversity conservation and reduce poverty.

1 The 2020 UN Biodiversity Conference will be the 15th meeting of the Conference of the Parties (COP 15) to the Convention on Biological Diversity (CBD).

Biocredits: why now?

1

Biodiversity – the diversity within species, between species and of ecosystems – is declining faster than at any time in human history (Díaz et al. 2019) and stopping and reversing this trend is emerging as a growing priority for human survival (ibid). Biodiversity loss is driven by perverse incentives such as subsidies for monocrop agriculture, for logging or for industrial overfishing. Correcting or eliminating these perverse incentives are important steps to reverse biodiversity loss. Incentives for positive actions towards biodiversity management can also be introduced, in the same way that renewable energy is rising compared to fossil fuels through incentives for renewable investments – such as subsidies for research and development and technical deployment.

This discussion paper examines the potential of using the novel approach of biodiversity credits, 'biocredits', to promote biodiversity conservation. Biocredits are presented as coherent units of measurement to track conservation actions and outcomes. They can be 'packaged' (for example as a certificate) and 'traceable' for transparency (for example, using a serial code or registration number (Section 2).

We argue that if well-designed, biocredits can make investments in biodiversity management more financially attractive, for example, by facilitating aggregation and monitoring and attracting private-sector finance. They can be used by governments to monitor their actions and report on biodiversity commitments. We also argue that biocredits need to be inclusive, and founded on fair benefit-sharing principles, to ensure that the benefits of biodiversity are shared with poor tropical countries where much of the world's biodiversity is located, and in the richest biodiversity spots which are often found in the poorest and most remote regions.

This document provides a short review of lessons learnt (Section 3) from projects that can inform a possible design of biocredits as an economic instrument (Section 4).

We suggest a distancing of biocredits from biodiversity offsets. Biodiversity offsets have been strongly criticised because they could have been used as a cheap way to 'offset' the destruction of biodiversity and habitats elsewhere. In this discussion paper, we argue that biocredits should not be used to offset such negative actions, especially if countries lack the necessary legislation to assess adherence to a mitigation hierarchy to ensure 'no net losses' of biodiversity.

What are biocredits?

2

This section presents the theoretical make-up of biocredits. Biocredits are an economic instrument that can be used to finance biodiversity-enhancing actions (such as protecting or restoring species, ecosystems or natural habitats) through the creation and sale of biodiversity units (Figure 1). Potentially, biocredits would be generated by those who conserve biodiversity and bought by those who want to invest in biodiversity conservation. Once purchased, biocredits could be 'retired' from the market or potentially sold in secondary markets, similar to voluntary REDD+ transactions, although with REDD+ this only happens in small amounts (see Hamrick and Gallant 2017).

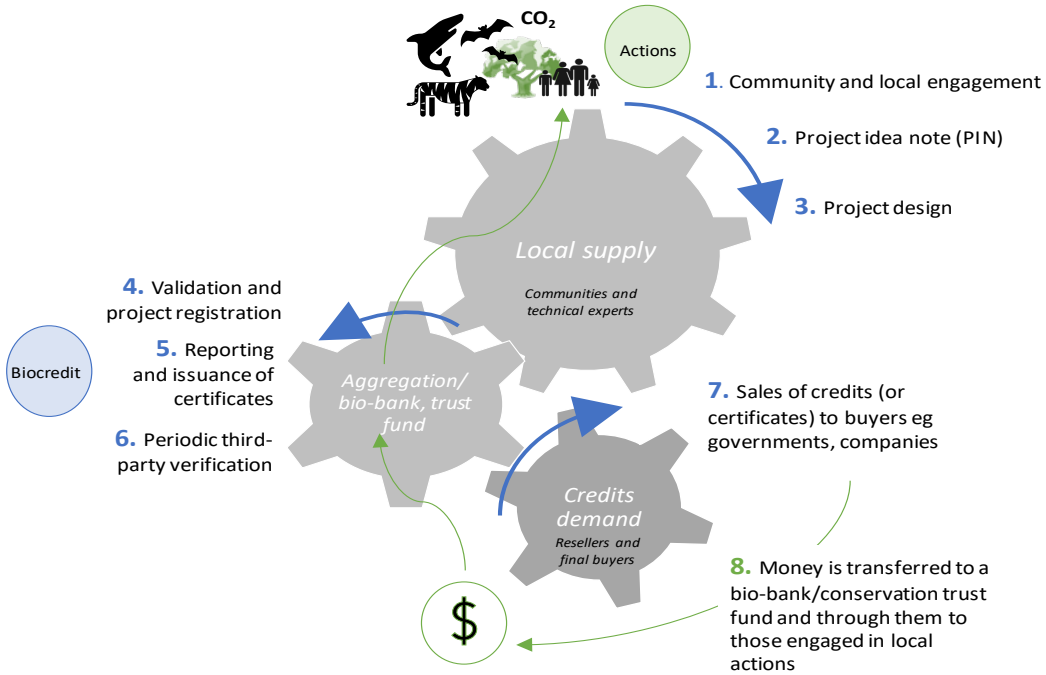
In this way, biocredits would provide the incentives and finance to protect biodiversity by those living in the remote rural areas where biodiversity is often located. The revenues from biocredits sales will promote conservation by financing equitable, pro-poor benefit-sharing mechanisms in low and middle-income tropical countries where a disproportionate amount of the world's biodiversity is located.

2.1 How would biocredits be designed?

As with tradeable credits for carbon, biocredits are units of biodiversity emerging from pre-agreed management actions that improve biodiversity against a baseline (for example its quantity, value or composition). Similar to carbon credits, an independent standard body issues credits to authorised project developers upon (independent) verification of management actions. Credits may then be bought and sold in a market transaction or through direct deals. Ideally, biocredits would be entered into an official register (where actions need to be approved in line with an independent standard), monitored and their ownership tracked for compliance to provide transparency and credibility.

Similar to carbon offsets, biocredits could also be aggregated, facilitating the scaling-up of actions needed to provide significant thresholds, both in terms of biodiversity conservation and for financial investments. The actions supported by the biocredits could have different time horizons depending on the agreements with the providers, for example five, 10 or 20 years or in perpetuity.

Figure 1. Institutional set-up for biocredits



Notes: We created the diagram based on Plan Vivo's process for community carbon offsets (Porras et al. 2018)

Biocredits are similar to biodiversity offsets in their construction, but they differ in their use. In theory, biocredits would be used to fund investments in biodiversity conservation with a net biodiversity gain from the pre-existing baseline. Biodiversity offsets, on the other hand, are used to compensate for the loss of habitats elsewhere, for example through mining operations, building roads or city expansions, and are often part of environmental impact assessment measures (de Witt et al. 2019). Although there are clear rules about when and where to allow biodiversity offsetting, the instrument has come under scrutiny for lack of transparency, mismatch between theory and practice, and lack of enforcement on mitigation hierarchies – all of which has led to concerns about biodiversity loss due to offsets (Bezombes et al. 2019; Koh et al. 2019; de Witt et al. 2019). In contrast, biocredits would only initially be allowed for net benefit gain, not to offset losses.

Biocredits also share some similarities to and differences from traded carbon credits. Carbon markets have a unit of measurement (for example, tonnes of GHG-equivalent) that can be traded. They also have the institutions required to make a market function, effectively bringing in buyers and sellers through both the voluntary and regulated market. However, biocredits are inherently harder to trade than carbon because of the site-specific contexts where biodiversity occurs, and currently there is no unique measure of biodiversity which allows units of biodiversity to be valued, compared or traded. This ability to monitor and measure biodiversity is changing, and there are important developments in metrics in terms of species monitoring and ecosystem accounts that can help drive the biocredit market. These will be assessed in Section 3.

2.2 Who would supply biocredits and how?

The credits would be supplied by groups engaged in biodiversity conservation. They could be individual households and farmers, local groups and nongovernmental organisations (NGOs), private biodiversity project developers (as with carbon project developers) or government and public agencies. Credits emerge from actions that support biodiversity conservation efforts. These include for example:

- Protection of endangered species and habitats
- Restoration actions in rural and urban contexts, and
- Actions that support delivery of biodiversity conservation and reduction of carbon emissions (eg conservation of mangroves).

2.3 Who would buy biodiversity credits?

Biocredits can be bought by anyone. For example, government bodies trying to achieve their conservation outcomes, philanthropic organisations interested in conservation, companies who want to invest in biodiversity (eg the tourism industry or companies with a corporate social responsibility programme), private biodiversity resellers and intermediaries (as with carbon offset resellers) or individual consumers seeking more verifiable ways to ensure donations to wildlife conservation organisations are channelled appropriately.

In some countries, biodiversity credits are sold as 'offsets', which can be purchased by people or industries to offset or compensate for their impact on biodiversity (BBOP 2012; Primmer et al. 2019). In this sense, biodiversity offsets function in a similar way to carbon offsets.[2] A key difference between biodiversity and carbon offsets is that the former are extremely context specific. Local losses in biodiversity may be irreversible and cause significant local distress unless strict regulation is in place, and sometimes even this cannot be a solution. Biodiversity offsets are used in places like Australia, the USA and Europe where, in theory, there are stronger regulations that seek to ensure a like-for-like exchange of biodiversity to avoid or minimise negative impacts and promote 'no net loss' of biodiversity and ecosystem services.[3] We argue that at least initially biocredits should not be used as biodiversity offsets.

2.4 How would biocredits be measured?

An important component of biodiversity credits will be linked to the ability to generate a SMART unit of measurement or metric: simple, measurable, attributable, relevant and timely. Metrics tend to be divided between species focus (for example, metrics used to measure rhino growth in the Rhino Bonds), or area based, looking at the type and condition of specific habitat or landscape areas (for example, number of hectares in cloud forests located in a national park or buffer zone). Some of the strategies to obtain these metrics are presented in the case studies discussed in Section 3.

2 Carbon offsets use carbon dioxide equivalent measurements to compare emissions from various greenhouse gases based on their potential for global warming.

3 'No net loss' refers to the concept that damages to biodiversity and ecosystem service resulting from human activities must be balanced by at least equivalent gains.

While still emerging, the System of Environmental Economic Accounting (SEEA) of experimental biodiversity accounts is providing important advances to measure, assess and account for some components of biodiversity in ways that would be useful for biocredits (UNEP-WCMC 2015; King 2016). The spatial nature of these satellite accounts provides an entry point to assess contextual relationships. For example:

- Ecosystem extent, which provides spatial location and initial degree of ecosystem diversity on the basis of common characteristics, such as land cover, land use, fragmentation, risk of ecosystem collapse,[4] habitat and other ecosystem data using satellite remote sensing. The SEEA Experimental Ecosystem Accounting (SEEA-EEA) provides guidance on how this can be assessed (UN et al. 2014), and
- Species diversity, which includes metrics such as species richness (number of species) and species abundance (population size of each species). Because total inventories are almost always impossible to establish, the focus could be on selected species from different taxonomic groups (birds, plants, mammals), especially keystone species (species that have a disproportionally larger impact on habitats, such as wolves or starfish). This approach could provide better indicators of ecological condition than others.

These biodiversity accounts are still nascent but provide a reference framework to inform the next generation of biodiversity metrics. It will be important to assess how the resolution capability of satellite monitoring could be used to appropriately reflect quality and condition of ecosystems, and how this technology could be complemented with ground measurements.

4 In the International Union for Conservation of Nature (IUCN) Red List of Ecosystems: see www.iucn.org/theme/ecosystem-management/our-work/red-list-ecosystems.

Experiences on which biocredits can build

3

In this section, we present a summary of some of the main examples/mechanisms that use biodiversity metrics (species or habitats) as means to exchange, report or fundraise. There is a range of related experiences from biodiversity bonds, carbon markets, biodiversity offsets and payments for ecosystem services which are relevant to the design of biocredits. Rather than being single instruments, these initiatives are usually a combination of mandatory regulations, voluntary engagement and direct public agency actions (Koh et al. 2019).

We examine these different incentive mechanisms with some general analysis and then analyse a specific example to demonstrate how it works in practice and how it could inform the design of biocredits:

- Biodiversity bonds and wildlife credits: Malua BioBank in Malaysia, Rhino Bonds in South and Eastern Africa, and wildlife credits in Namibia
- Biodiversity offsets and mitigation banks: biodiversity offsets in South Africa, species conservation banking in USA and eco-accounts in Germany
- Biodiversity in payments for ecosystem services in Costa Rica, and
- Carbon offsets: REDD+ highlights and experiences in Vietnam and experiences of voluntary carbon markets in Tanzania.

The next section presents a summary of these initiatives and explores how these experiences can be built on to develop a biocredit scheme.

3.1 Biodiversity bonds and wildlife credits

3.1.1 Biodiversity trades: Malua BioBank, Malaysia

Created in 2008, the Malua BioBank was a partnership between the New Forests (an Australian-registered private company), the USA-based asset management firm Equator LLC, Eco Products Fund LP as daily operations manager, and the Sabah government. This project proposed a commercially sustainable model to help restore and protect 34,000 hectares of formerly logged forests to provide a buffer between lowland virgin tropical forests and palm oil plantations. Daily operations are implemented by New Forest Asia as project manager (Halley 2015; Brock 2015).

The site is home to the largest unfragmented population of wild orangutans in Malaysia, as well as many other threatened species such as pygmy elephants, sun bears, banteng, clouded leopards, tarsiers and possibly the Sumatran rhino. The project sought to generate commercial incentives for biodiversity conservation to compete against alternative land uses.

Eco Products Fund LP, a private equity vehicle, committed US$10 million for rehabilitation actions over six years (2008–2014). The biobank's idea was to generate and trade 'credits' from restoration actions with beneficial biodiversity results. Each Biodiversity Conservation Certificate sold at US$10 (determined by the Forestry Department), representing 100 square metres of rainforest restoration and protection. The certificates were entered in the TZ1 Limited global registry (later on acquired by Markit Environmental Registry), in the same way as voluntary carbon certificates. The online facility enables efficient storage, ownership transfer and retirement of official certificates.

By providing traceability, buyers could make credible, long-term contributions to forest conservation. Although not marketed as instruments to offset biodiversity losses elsewhere, the certificates initially targeted (and had support from) four Malaysian palm oil companies (IOI Corporation Berhad, TH Group, Kwantas Corporation Berhad, and Perbadanan Kemajuan Pertanian Selangor) which publicly announced their support in 2012 by purchasing certificates for US$215,000 (Brock 2015).

The revenues were used to recover costs incurred, and to endow a perpetual conservation trust and generate a return on investment to both the Sabah government and Eco Products Fund LP, with profits to be shared between the forest-management licence holder (Yayasan Sabah, a local community concession holding the logging rights) and the Malua BioBank investor.

Although pioneering in its approach, the project struggled with the stigma associated with for-profit investment. It also faced the challenge of creating and trading certificates in an immature market with little regulation. The voluntary nature of purchases failed to pass the test of shocks to economic markets, failing to obtain enough predictable demand to make the project financially viable (Halley 2015).

3.1.2 Impact investment: Rhino Bonds in South and Eastern Africa

If biodiversity is to be counted as an asset, it needs to be managed as an asset (ZSL 2019).

Conservation is often funded on 'results' (for example, the number of hectares or species protected). This

tends to work for protection of existing ecosystems, but it is more difficult when there is a time lag between actions and outcomes. And there is always a risk of non-delivery: declaring a national park does not guarantee that the wildlife will be protected.

An important funding gap are resources to finance today's efforts in order to ensure tomorrow's conservation outcomes. The Rhino Bonds have emerged as a form of 'pay-for-results' impact investment, which transfers the risk of funding conservation from donors to impact investors by linking conservation performance to financial performance.

The intermediary agency agrees a contract with the government or donor, based on specific outcomes (metrics), which allows the credits or bonds to be sold to impact investors and raise funds to implement conservation actions on the ground. If the outcomes are achieved, the government or donor releases the funds to pay back the investors, totally or partially depending on the level of outcomes achieved. The advantage for governments is the transfer of risk to investors.

The downside is that the project has to essentially fundraise twice – first to identify investors to take the initial risk for conservation performance, and second to fundraise from more conventional development donors to pay back the investors if the project is successful.

The return-to-investment will therefore strongly depend on performance metrics, and the rate of return offered by project donors. The project has developed a theory of change that estimates net rhino growth in terms of a combination of biological growth rate and unnatural death rates (ie death by poaching).

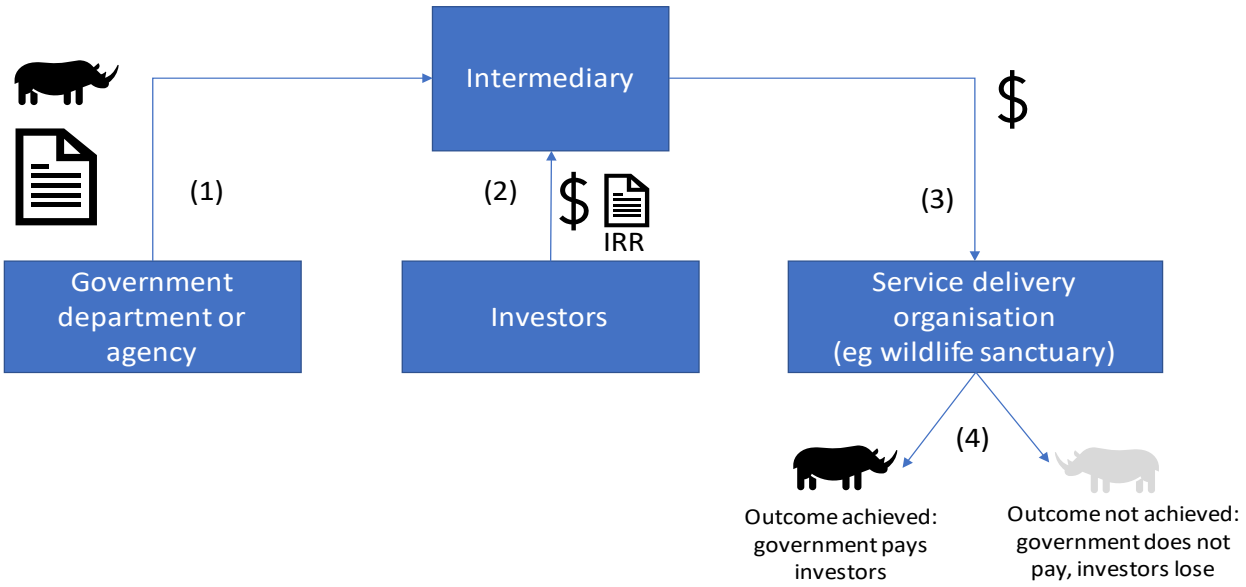
During the four-year US$4.5 million investment readiness phase, the Rhino Bond project faced some significant design-phase challenges:

- Project delays meant that the design phase was set at three years and then extended by another year. There was an underappreciation of data challenges, delays in building financial products and time needed to overcome institutional behaviour of NGOs
- Biodiversity data challenges: there were problems with finding and agreeing data (quality, quantity) to articulate with some degree of confidence what the baselines and impacts of the conservation interventions would be. Reaching a consensus among academics takes time
- Cost variations leading to a portfolio approach: there were hard-to-agree cost estimates with limited benchmarks between state and private sites (state sites can in some circumstances be more efficient due to tight budgets) and the need for a portfolio approach to blend state and private sites. There were also cost implications of generating a unit of biodiversity and a lack of transparency about management of biodiversity, and
- Misunderstanding about impact bonds: issues related to whose outcomes would count as 'successes' and who would receive payments, as well as a need to manage expectations. There was also a stigma attached to 'deriving revenue from animals'.

Having overcome these design-phase challenges, the initiative is about to launch its major fundraising stage, aiming at generating US$40 million to fund conservation action in five sites in Kenya (two sites) and South Africa (three sites). It now faces two main challenges:

- Risk: there is uncertainty about what the implications of non-delivery are and how much of this will be transferred to investors, and
- Financing: there are also challenges related to having to fundraise twice – once for the investors and once the international donors at US$40 million each, which seems a huge amount.

Figure 2. Impact investments and Rhino Bonds



Notes: this figure was created using information from conversations with stakeholders.

3.1.3 Wildlife credits: experiences in Namibia

Wildlife credits are about generating direct income from positive wildlife performance that could feed back into mitigating the cost of living with wildlife, for example as compensation for human–wildlife conflict (HWC).

Wildlife credits differ from the traditional method of financing conservation projects, which relies on donations and grants. Instead, wildlife credits payments are made based upon measurable performance (in other words, funding does not go into a conservation plan, but is applied to a conservation result).

The types of demonstrable conservation performance being considered are population numbers, trends or breeding performance of iconic species, or as a reward for a community setting aside and protecting land for species conservation, such as securing essential wildlife corridors to enable free movement of elephants. In Namibia, the Worldwide Fund for Nature (WWF) is experimenting with an approach to credits that is specifically about performance in reducing HWC, and not about increasing wildlife numbers (because in some areas they already have enough wildlife, and predators in particular: communities are unlikely to want more lions whether or not they get paid for the lions being there).

Payments received in the form of wildlife credits are distributed to the performing landholders who decide how the payments will be used at the local level, for example investment into wildlife management and protection, wildlife monitoring and research, household compensation for damages caused by wildlife or other activities that increase the tolerance of local communities living with problematic yet iconic wildlife that have an international existence value.

WWF is still experimenting with who would pay for this and whom payments would go (and how). They are exploring the use of financial technology, where payments would be made through mobile banking and paying individuals directly, although sometimes it might be better to pay collectively.

Each wildlife credits product should be associated with verifiable measures which are practical and affordable. In some cases, the parameter measured may be a proxy for the desired outcome that could be

more difficult and/or expensive to measure. It is likely that the value that funders/payers would be willing to pay for certain measures will be dependent on the rigour of the measuring/monitoring system used.

Considering potential wildlife credits products will require an adaptive process of development. In order to identify a marketable product, three questions should be considered: does it have conservation value? Will there be a willingness to pay? And will it have the appropriate impact on the ground (ie does it provide the right incentive to conserve)?

Wildlife credits have so far been piloted in six communal conservancies in the Namibian context to test the approach and mechanism of arrangements and payments. Each wildlife credits arrangement has been based on a performance contract signed by the participating communal conservancies who are offering a specific conservation product. Currently, the two wildlife credits products being piloted are payments for maintenance of wildlife corridors and payments dependent on the number of wildlife sightings (such as rhinos, elephants and lions). The more sightings there are of targeted species, the more payments are made. For wildlife corridors, payments are made based on independent verification of use of corridors by targeted species, which in this case is elephants.

This approach is similar to the one used by Save the Rhino Trust (SRT), discussed in this paper. Again, the challenge is who will pay and how to make this approach financially sustainable, as SRT cannot continue to make payments without additional funding.

In every case, some form of funding is required. This could be in the form of a general wildlife credits fund but there could be more potential to fundraise for a species-specific fund (such as a lion fund or rhino fund). The Lion Recovery Fund (which invests in innovative and effective projects across Africa to recover lions and restore their landscapes) will help seed this scheme. But other funding mechanisms are also needed (such as approaching hotels, travel insurance companies or company trust funds like the Amarula Trust to provide sponsorship).

3.2 Biodiversity offsets and mitigation banks

3.2.1 Biodiversity offsets and experiences in South Africa

According to the Business and Biodiversity Offsets Programme (BBOP 2012):

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual 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 and ecosystem function and people's use and cultural values associated with biodiversity.

The 10 principles of the BBOP are:

- No net loss
- Additional conservation outcomes
- Adherence to the mitigation hierarchy
- Limits to what can be offset
- Landscape context
- Stakeholder participation
- Equity
- Long-term outcomes
- Transparency, and
- Science and traditional knowledge.

The BBOP 2012 manual provides very useful information to develop activities, baselines, identifying adverse effects and additionality for 'fit-for-purpose' design. In practice, explicit attention must also be paid to issues like rights to conservation, property and economic activity and the design of 'meaningful institutional arrangements' (Primmer et al. 2019). A number of developed countries have begun using biodiversity offsets including the USA, Australia and the UK. Among developing countries, South Africa has perhaps the longest experience (over a decade) (Brownlie et al. 2017). There have been some site-specific successes in South Africa. But general system weakness, capacity constraints and a lack of a clear regulatory and policy framework has limited the success of a national biodiversity offset programme. There are now attempts to improve this with a national offset regulatory framework being put in place (Brownlie et al. 2017; de Witt et al. 2019; Koh et al. 2019; Bezombes et al. 2019).

3.2.2 Species conservation banking: experiences in California, USA

Species conservation banking started in 1995 in the

USA as an innovative form of species conservation and by 2017 there were 154 listed across the USA with the largest number in California (32%), followed by Wyoming (USFWS 2012; Gamarra and Toombs 2017):

- Species banks are areas of land conserved and managed under the Endangered Species Act according to guidance issued by the federal and state-level Fish and Wildlife Services (FWS)
- 'Species credits' are approved by the USA federal and state-level FWS according to the provision of management plans and endowment-funding agreements
- Species credits can be purchased by developers to offset the loss of species elsewhere. Rather than requiring developers to sustain species in small areas, species banks allow more cost-effective conservation over a larger area
- The creation of species banks is dependent on the number of species listed as endangered in a particular state. California with the most endangered species has over 50% of the species banks in the USA (covering 32% of the acreage). The high demand is influenced by existing federal and state biodiversity protection laws, a large pool of potential credit buyers and relatively high credit prices (Gamarra and Toombs 2017)
- Conservation banks vary significantly in size, ranging from approximately five acres to 504,999 acres, with an average size of 741 acres. In total, the banks covered nearly 196,000 acres by 2016 (Gamarra and Toombs 2017)
- Species protected in a large number of banks include the California tiger salamander, San Joaquin kit fox, coastal burrowing owl, California gnatcatcher, valley elderberry longhorn beetle, bluetail mole skink, giant garter snake, golden-cheeked warbler and sand skink (DoI 2013). However, the majority of banks do not include measurements of habitat quality to calculate the credits, which are primarily based on habitat area (acreage)
- Credit prices vary depending on challenges to establish and conserve the species and other demand and supply factors and are negotiated on a per-case basis. Data on sales volumes and prices are not in the public domain and so are hard to identify. One of the best datasets comes from a 2010 study from Ecosystem Marketplace which shows a range in price from US$1,836 to US$400,000 per credit, with a median value of US$33,027 (Madsen et al. 2010). Koh et al. (2019) present a recent review of how prices are agreed on various forms of biodiversity offsets, and
- The same study estimated that the USA conservation bank credits generated US$200 million in yearly sales (Madsen et al. 2010).

One example of species conservation banking is the bank created by WRA (formerly Wetlands Research Associates), a leading mitigation and conservation bank developer on an abandoned landfill site in Ridge Top Ranch. Nearly 750 acres of the ranch were identified as potential habitat for the Callippe silverspot butterfly and the California red-legged frog. The butterflies were already present, but the red-legged frog had to be introduced using spawn brought from other sites. Once the frogs hatched, microchips were inserted to allow them to be tracked and monitored. A management plan was developed to encourage the development of the habitat for the frogs and butterflies. WRA received 739 frog and butterfly credits worth more than US$20,000 each, based on current market values (Guillon et al. 2015) .

A more recent assessment of conservation banking in the USA suggests that although compensatory mitigation is a viable and in-use recovery tool, banks 'fall significantly short when compared to the analysed Business and Biodiversity Offsets Programme (BBOP) principles', for example in terms of accounting for landscape context, following mitigation hierarchies, introducing quality indicators and addressing additionality (Gamarra and Toombs 2017). The lack of information and transparency (eg lack of a central registry) also reduces potential for policy and practice improvements.

3.2.3 Eco-accounts in Germany: experiences in Baden-Württemberg

Germany has a system of investing in ecosystem and biodiversity improvements to generate 'eco-points' which can then be purchased by developers to compensate for a loss in ecosystem and biodiversity services (Mazza and Schiller 2014).

To give an example of how eco-points are calculated, in March 2012, the Stiftung Naturschutz Foundation carried out the Haberslöh compensation measure within the municipality 'Willstätt/Sand' in Baden-Württemberg. Haberslöh was to compensate for the transformation of agricultural land into wetlands meadow. This has positive biodiversity and ecosystem benefits of enhancing habitat type, soil and water quality and protected species. Each of these goods has a calcualted eco-points value, which are then added up.

- For the habitat enhancement, the value of the compensation measure was evaluated by

comparing the ecological value of the land before and after the measure. Before, the habitat value was given a score of four per square metre. Given an area of 9,230 m2, the habitat value was multiplied by the area (4 x 9,230m² = 36,920 eco-points) to come up with the original value of the land. The wetlands meadow has a habitat value of 32 per square metre (32 x 9,230m² = 295,360 eco-points). The difference between both values (295,360 eco-points minus 36,920 eco-points = 258,440 eco-points) represents the habitat's enhancement value in eco-points

- The compensation measure improved the soil quality by increasing its water-absorbency capacity. Therefore, three eco-points/m² were attributed to the entire surface (27,690 eco-points)
- For the improvement of groundwater quality, two eco-points/m² were attributed to the entire area (18,460 eco-points)
- Specific species' category points were attributed to the creation of new populations of six protected species: natterjack toad (Epidalea calamita), common snipe (Gallinago gallinago), dusky large blue (Maculinea nausithous), scarce large blue (Maculinea teleius), yellow-winged darter (Sympetrum flaveolum) and northern lapwing (Vanellus vanellus). Altogether, the value attributed to these six species was 228,200 eco-points, and
- In total, the wetlands meadow is worth 532,790 eco-points.

To give an example of how eco-points are used, in 2002 the municipality of Dettingen unter Teck developed a land development plan (bebauungsplan) to offset residual impacts associated with building houses on a greenfield site. The planning office responsible for the municipal eco-account developed a proposal for a compensation measure to restore the River Lauter. In 2008, the compensation measure was carried out and the river's weirs were replaced with a more natural river profile with rapids, pools and vegetation. The cost of the restoration measure was about €15,000 and four eco-points were attributed to each Euro spent in the project. Therefore, the measure was considered to have compensated all residual impacts from the development for 60,000 eco-points.

These costs for compensatory measures are to be paid by the developer and/or the owner of the buildings. In this case, approximately 50 home-owners were required to pay for the compensation measures. The overall cost of the compensation of residual impacts was €50,000, suggesting that the individual homeowner had to pay an average of about €900. (Mazza and Schiller 2014).

3.3 Biodiversity in payments for ecosystem services

Payments for ecosystem services (PES) is an economic instrument that rewards good stewardship of natural resources and ecosystems. There is a very large body of literature following the design, implementation and evaluation of these conditional incentives, their potential for poverty alleviation[5] and guidelines for practitioners (Porras and Asquith 2018). Biodiversity protection, and/or the conservation and restoration of natural habitats such as forests, wetlands, grasslands and mangroves, are some of the ecosystem services targeted by this instrument. In this section, we focus particularly on the Costa Rican Payments for Ecosystem Services Programme.

3.3.1 Biodiversity and payments for ecosystem services: Costa Rica

The Costa Rican Payments for Ecosystem Services Programme is one of the oldest and most studied of its kind (Porras and Chacón-Cascante 2018; Barton et al. 2017). The introduction of a landmark Forestry Law recognised that forests provide environmental services to society (carbon sequestration, protection of water sources, landscape beauty and protection of biodiversity) and that forest owners should be compensated for these services.

At its heart, the programme is very pragmatic. It states that forests provide these benefits as a bundle, thereby recognising the importance of the forest 'togetherness' rather than separating benefits using a single-service approach. Scientific models then introduce a level of landscape planning for prioritising different elements linked to service delivery – which in turns helps to identify beneficiaries for payments:

- Forests located in water-recharge areas near cities or hydroelectric projects or located by the edge of rivers and water bodies will receive priority for water protection
- Forests located in buffer zones of national parks, within biological corridors or otherwise identified in the National Biodiversity Strategy will receive priority for biodiversity conservation, and
- Forest plantations and reforestation projects are targeted for their carbon offsetting benefits, with native species receiving a bonus in compensation level.

5 Recently summarised by Menton and Bennet (2018) and Porras and Asquith (2018) in Mace et al. (2018).

The prioritisation criteria (which can also include social and political objectives) is announced annually for application. Successful applicants sign contracts and receive payments per hectare for five or ten years, and are monitored annually against compliance before payments are transferred. The programme features strongly in the country's decarbonisation and carbon neutrality plan.

The recent Biodiversity Finance Initiative (BIOFIN) report (Matarrita-Venegas 2018) for the country identifies several means to fund biodiversity objectives, including issuance of green bonds to compensate for land expropriated for national parks, a green lending facility for transitioning to greener technologies, the implementation of the Sustainable Tourism Impact Fund (where revenues from sustainable tourism in protected areas are used to strengthen those areas), and the expansion of the PES programme beyond the forest-based approach.

3.4 Carbon offsets

3.4.1 REDD+: key points and experiences in Vietnam

REDD+ refers to reducing emissions from deforestation and forest degradation (REDD) and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (+). REDD+ is a performance-based payment mechanism under the United Nations Framework Convention on Climate Change (UNFCCC) where finance is provided ex-post to purchase the carbon stored by avoided deforestation and sustainably managed forests.

Originally focused only on reducing emissions from avoided deforestation (REDD), in 2010 REDD became REDD+ when sustainably managed and conserved forests were also included. This was to ensure that countries which had larger forest coverage and more sustainable forest management were also rewarded by REDD+.

While initially conceptualised as focused on private-sector purchasers of carbon, REDD+ carbon markets have turned out to be led by public and government-sector financiers of carbon, such as the Norwegian government. Overall, the finance for REDD+ payments has not been as sucessful as originally anticipated.

In addition, REDD+ has also proved far more complex to implement in practice than initially expected. In particular, there are a number of requirements for REDD+:

- Additionality: to ensure that the emission reduction or carbon storage would only have occurred with the REDD+ payment (eg against business as usual)
- Permanence: to ensure the temporal stability of an emission reduction or carbon storage due to a REDD+ payment permanently, or for the duration of the emission reduction agreement, and
- Leakage: to avoid direct emissions elsewhere caused by the emission reduction in the project (for example, displacing logging from a new REDD+ conserved forest to non-REDD+ areas).

To maintain the carbon integrity of REDD+ by ensuring additionality and permanence and avoiding leakage, REDD+ schemes have had to develop complex monitoring and reporting schemes with baseline reference levels. These have required complex time-consuming technical calculations, often provided by expensive experts, which have eaten into the budget available for actual REDD+ payments.

The social aspects of REDD+ have also been more complex than originally anticipated, in particular regarding tenure, consent and poverty:

- Tenure: for many rural areas where land rights and forest tenure are contested and unclear, REDD+ requires legal ownership of land or forests to allow the effective transfer of payments
- Consent: the second social issue for REDD+ has been engagement with affected households living in and around forests. Initial attention to local participation and engagement have now given way to an overall commitment to free prior and informed consent (FPIC) for affected households. This suggests that local people have an effective veto power over whether a REDD+ project should go ahead or not, and
- Poverty: the third social issue is related to poverty, with (often poor) affected households struggling with the timelines involved with ex-post REDD+ payments. For example, poor farmers in Vietnam were promised REDD+ payments would be forthcoming if they stopped deforestation for agriculture. However, these REDD+ payments have not been made fast enough or even at all to make up for the lost income.

Finally, the biodiversity ramifications of REDD+ and other forms of voluntary carbon markets have proved more complex in practice, with carbon–biodiversity synergies or trade-offs arising depending on the activities involved (for example, projects that seek to generate carbon credits with reforestation using fast-growing, non-native species planted in plantations). While this may maximise carbon capture, it has much lower biodiversity benefits than native natural forests, and often negative impacts on downstream water

flows (Creed and van Noordwijk 2018).

One REDD+ example has benefitted from substantial external support. Vietnam has had a national REDD+ readiness programme since 2010. This has had mixed results with different stakeholders having different views. For a more cynical view, one village headman had apparently nicknamed the REDD+ officials as the 'here you come and go again brigade' as they come and visit, promise action and money, and then leave (Tatarski 2019). A more upbeat assessment is provided by the Food and Agriculture Organization of the United Nations (FAO), which was involved in supporting the REDD+ process. According to Inoguchi (2019), the FAO officer involved in the process made two main points:

- Firstly, that REDD+ has been a lever to change overall political and economic perceptions of the forestry sector and how it operates. 'In retrospect, however, the key achievements of REDD+ readiness are represented by slogans of the government, such as "from more forests to better forests", advancing the forestry agenda to higher political levels through policies such as the Communist Party's Directive 13 (2017), and the opening of space for more participation and stakeholder engagement', and
- Secondly, that the failure of REDD+ to mobilise international payments has led to an interpretation of REDD+ as being focused on a broader set of incentive mechanisms – from tenure to market access – and a shift from international payments to domestic payments linked to Vietnam's own domestic PES payment scheme. 'Vietnam has learnt that the core of a successful REDD+ strategy is effective planning and investment. By development of national and sub-national investment plans, focused on clearly defined objectives, stakeholders can be incentivised towards better forest management (or dis-incentivised from forest destruction). Such incentives may come in various forms, including through access to more secure tenure over land and resources, assistance for market access or through benefits from a separately managed domestic PES scheme'.

In Vietnam as elsewhere, the actual performance payments of REDD+ have not materialised even after almost ten years of design work. While much has now been learnt and the challenges for carbon integrity, social effectiveness and biodiversity trade-offs are now much better understood and well documented, the initial delays and expense of the design phase and the lack of payments has led to widespread cynicism and doubts about the whole REDD+ approach.

3.4.2 Project-level carbon credits: experiences in Yaeda Valley, Tanzania

Voluntary carbon markets allow private individuals, companies and governments to purchase emission reductions on the open market. Unlike more formal government-led national initiatives operating under REDD+ programmes, they can be nimbler and more flexible. They also include reforestation and restoration activities, rather than focusing only on forest protection or reducing degradation (Porras et al. 2016).

Some of these projects are also able to sell ex-ante credits, as a way to generate finance flows at the beginning of the project. This helps support sellers (local farmers, in most cases) to defray the initial costs of planting and caring for tree saplings until they mature. In these cases, the risks associated with non-delivery are shared by the farmers, the project developers and the buyers. To reduce the risks of non-delivery, projects must adhere to pre-agreed activities, setting aside credit buffers and undergoing continuous technical support and monitoring throughout the life of the project. The carbon accounting methodologies used are approved by an independent certifier and often include other requirements for local benefits, for people and/or biodiversity, and are entered into a public carbon registry such as Markit. Recognised standards include Plan Vivo and Gold Standard.

Transactions of voluntary carbon markets have been regularly reported by Forest Trends following annual surveys to project developers, governments, buyers and sellers. Transactions in 2016 generated over US$191 million, offsetting 63.4 million metric tCO2e, with community-focused projects achieving better prices than other types of projects (Hamrick and Gallant 2017).

Some of these projects also target REDD+ activities, producing carbon offsets for (ex-post) conservation and protection of existing ecosystems. Project developers work with local communities to implement activities, register them under international standards and sell directly to private buyers (national and international).

These projects are at the forefront of experimenting with how to implement actions on the ground and develop the engaging and accounting methodologies at national and sub-national level. As international REDD+ and Nationally Determined Contributions frameworks develop, these projects need to be brought under their respective host country accounting to avoid double-counting and prevent leakage. This process is called 'nesting'. The nesting process can be politically difficult, in some cases

even stalling project activities.

A very good example of a nested REDD+ voluntary carbon project is the Yaeda Valley project in Tanzania. The project has been promoting conservation strategies since 2012, working with hunter–gatherer and pastoralist communities in Northern Tanzania. It was recently awarded the Equator Prize 2019 in recognition of the work of communities, private sector and government partnerships for innovative, nature-based climate solutions.

The project operates as a REDD+ initiative, using a results-based community process that combines elements of an integrated conservation and development project (ICDP) with payments for ecosystem services (PES). Approved activities seek to avoid deforestation and prevent poaching, to promote wildlife management, community recording and reporting of avifauna and mammals, and to tackle illegal land conversion and cattle incursion that results in land conversion. At the core, the project seeks to simultaneously deliver reduced GHG emissions, improve local livelihoods and support traditional cultural values.

Activities are carefully monitored according to operation plans, and their impact in terms of carbon offsets are certified by third-party standards[6] and entered in the global registry Markit to be sold as over-the-counter transactions.

The project is managed by the Carbon Tanzania social enterprise, which also manages the Makame Savannah and Ntakata Mountains projects. Certificate buyers include Tanzanian clients (ecotourism operators, airlines, local businesses) and four international resellers in Europe and the USA. Between 2012 and 2018 the project issued 125,877 community-generated offsets certificates (about 8,653 tCO2e were sold to international buyers in 2017–2018), generating around US$215,000 which was channelled to communities in the first five years, with a projected annual income to communities from this project set to exceed US$70,000 (Baker 2019).

Like all other carbon projects, key challenges are selling all annually issued credits, and the unpredictability of the revenue flow to communities.

6 Plan Vivo, the Verified Carbon (VC) Standard and the Climate, Community and Biodiversity (CCB) Standard.

Using a stepwise approach

4

Following our literature review, we suggest that a biocredit scheme, especially at national level, would benefit from four main components (Figure 3), which we discuss in this section.

Figure 3. Designing and implementing biocredits

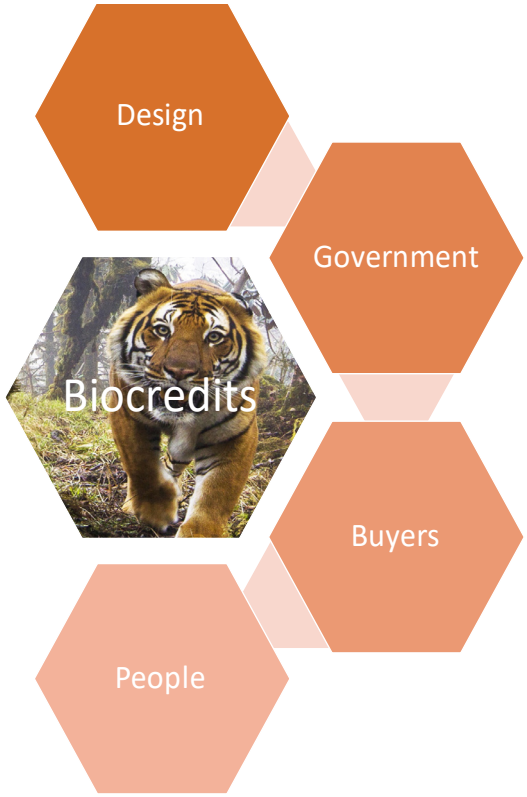


Photo credit: https://video.nationalgeographic.com/video/news/170729-rare-bhutan-tiger-discovered-camera-vin-spd Footage and photos: Emmanuel Rondeau / WWF-UK.

4.1 Simple, transparent cost-effective design

4.1.1 Clear and transparent units for biocredits

It is vital to have a clear and accepted unit for biocredits so market participants know what is being bought and sold. Without that, the market will not function.

These units or metrics for biocredits must be clear, transparent, simple, replicable and coherent with evolving frameworks, such as environmental accounting or the list of endangered species. There have been several attempts by the Convention on Biological Diversity and the Red List of Ecosystems to come up with simple indicators, and there has been some experience from habitat and wetland offsets.

Biodiversity data accounting can learn from carbon accounting and should meet the following criteria (UNEP-WCMC 2015). This typically refers to units of ecosystems biocredits, but although superficially easier, similar issues arise with units of species biocredits.

The biocredit unit needs to:

- Exist at a spatial resolution suitable for monitoring
- Be temporally relevant – which can be used to assess net changes in stocks and flows
- Be comparable to a common reference condition to enable assessment against baselines and improvements (or losses). For example, the Norwegian Nature Index (NNI) measure deviations from a reference state to provide indicators on ecosystem condition
- Be suitable for collective aggregation to provide an overall indicator of the condition of biodiversity. The change in value (not necessarily measured as monetary value) can be used to estimate the changes in biocredit, and
- Be comparable over space and time, to facilitate direct comparisons of biodiversity stocks in different ecosystem units. This will facilitate design and monitoring of portfolios of biodiversity investments.

Allocations of units of biocredit will require some engagement from government to allocate species units as in the US Species Conservation Banks or the German eco-points examples.

4.1.2 Effective use of technologies for biocredits

Cost-effective technologies are developing fast and can have a number of useful applications:

- Technologies to measure biocredit units which can combine expert judgements, monitoring-based estimates, satellite imagery, and/or model-based estimates, and
- Technologies to reduce the administrative costs of making market trades (what economists call the 'transaction' costs) associated with the different steps in the value chains of managing biodiversity actions that generate these biocredits. This is

particularly important when working with scattered, remote communities in high-conservation areas.

4.1.3 Legal and regulatory clarity on biocredit property rights

As with carbon credits, to ensure the smooth functioning of biocredit trades, it is key to define the legal nature of a biocredit unit. This will depend on the existing tenure rights (see section 4.4), who has the right to issue biodiversity credits (usually the government) and if these rights are issued for free or not.

The legal nature of a biocredit can, like carbon credits, range from an administrative grant, licence, financial instrument, a good or a service, and issuance may depend on whether the holder of the unit has a property title or some form of legal or recognised rights (World Bank 2016). The nature of the legal entity will determine if the credit can be used for collateral and the tax implications of sale and transfer, and this will need to be further explored. Tax liability will also require valuation of biocredit units, which may be problematic especially if the biocredits were originally issued for free.

4.1.4 Transparent biocredit standards and registration

There is a need for standards for biocredit generation. For the carbon markets, well-recognised voluntary standards include the Verified Carbon Standard (VCS, managed by Verra.org), the Gold Standard and the American Carbon Registry (ACR). Other standards such as Plan Vivo focus on poverty reduction and community benefits ('ethical' carbon). Voluntary standard bodies provide methodologies for quantifying project emission reductions. Some of these touch on biodiversity, but more biodiversity-specific standards with simple-to-measure units to assess baselines and subsequent changes will be required.

There is significant experience available from carbon markets on third-party registers to draw on for biodiversity credits. These carbon registers are accessible online to track information and eligibility and to record methods and baselines. Drawing from the carbon markets, we can identify four types of registry-accounting system that could work or inform biocredits (World Bank 2016):

- Biocredit inventory: an inventory that records physical units of biodiversity (eg species and/or ecosystems)
- Register: a database that records serialised biocredit units and any other information specific to the biocredit unit as required by policy
- Transaction registry: a database that has all of the features of a register, plus the capability to transfer biocredit units between multiple account holders, and
- Data management system (DMS): a database that records information about biocredits (eg the type of biocredit unit, relevant methodologies, policies and programmes) and, more generally, any information that is not stored in the transaction registry or register, but that for transparency purposes should be recorded and archived.

4.2 Enabling policy from government for implementation

Despite the name, biocredits are far from being a purely market-driven intervention. Enabling policy by government will be required to regulate and facilitate the market according to the ways outlined here: with clear and simple rules in an efficient, transparent way that promotes biological integrity and poverty reduction. The lack of this was shown in the example given in Section 3 of the challenges faced by South Africa's biodiversity offsets. Governments play a key role following up recommendations by national biodiversity-related legislation (eg the US Endangered Species Act) and the international Convention on Biological Diversity.

The examples in Section 3 show the importance of:

- Setting up rules for monitoring and reporting biodiversity as in the US Species Conservation Banks or Germany's eco-credits
- Registration and trading rules
- Granting legitimacy to the biodiversity actions on the ground through recognised management plans similar to in the USA or Germany, and
- Actively seeking strategies to allow for voluntary (often private-led) initiatives at national and sub-national levels in ways that avoid double-counting or leakage, for example the 'nesting' of carbon offsets under REDD+ and Nationally Determined Contributions.

Governments also play a role in making the scheme consistent with legislation:

- Ensuring mitigation hierarchy (biodiversity offsets only for unavoidable biodiversity losses)
- Considering local legislation, and
- Linking to environmental impact assessments (EIAs).

As Section 3 has shown, much can be learnt from the development of carbon markets and biodiversity offsets which have been facilitated by national and international legislation and rules. Countries with national PES schemes such as Costa Rica and Vietnam also provide useful lessons and good guidance for practitioners. For example, biodiversity offsets provide useful lessons for government-facilitated systems to establish metrics and units of analysis (species, habitats) to establish baselines and assess changes and, importantly, to understand the processes to allocate rights and negotiate activities. The experience on the ground also shows that a strong legislative system and meaningful institutions are needed to ensure 'no net loss' and to prevent offsets from destroying biodiversity and habitats.

4.3 Market engagement to attract buyers and generate sales

This is perhaps the most important aspect of biocredits. There is no point having a seller or a provider of biocredits, unless you can find a buyer.

Learning from the mixed experiences illustrated in Section 3 with similar schemes such as REDD+, voluntary carbon offsets, and closely targeted investments such as the Rhino Bond and the Malua BioBank, this seems to be the area with the least experience to build on. Many projects have been overly academic and researcher-led or have spent too much time identifying sellers, with not enough attention paid to market engagement and identifying buyers. This suggests that an effective biocredit scheme needs to be accompanied by a thorough market survey of potential buyers before a scheme is launched to ensure sufficient demand.

Like carbon, the approach may start in the voluntary carbon markets, based on voluntary/self-regulation. But there needs to be a 'push' from governments to drive 'regulatory' purchases and promote continuous and long-term commitment from industry and buyers. But the mixed track record of REDD+ reviewed in Section 3 suggests that doubt and suspicion can affect project development if few buyers are forthcoming.

Regulatory measures are important to boost demand for more sustainable investments. But there are other ways to help make the business case for biocredits, and why investments in biodiversity and habitat conservation can help businesses. For example, biocredits could be linked to existing tools that help 'navigate' the corporate language such as the Natural Capital Protocol (Havemann et al. 2016; Natural Capital Coalition 2016) as a means to provide units of measurement for:

- Financing instruments for companies: privately raised debt, debt, corporate green bonds, targeted financial institution portfolios, public–private partnerships etc., and
- Government-supported demand from consumers and investors to develop environmentally sound practices and leveraged government incentives (such as tax credits, guarantees or market-based regulation).

4.3.1 Specific biocredit buyers

Specific buyers include:

- Tourism industry and tourists: these are key players in the Namibia wildlife credits scheme. Tourism is one of main beneficiaries of biodiversity, and should be able to generate demand for biocredits
- Public and private economic developers causing biodiversity loss: developers of infrastructure, housing or manufacturing are the main buyers of conservation species credits in the USA and of eco-points in Germany to offset biodiversity loss
- Private biocredit resellers and intermediaries: these are some of the main buyers within voluntary carbon markets. Over 200 carbon offset resellers are listed on the Environmental Data Services (ENDS) Directory.[7] While it would clearly need to mature, a private reseller and intermediary market could grow over time, provided they are confident of final buyers
- Companies involved in corporate social responsibility (CSR) seem likely in some middle-income countries where private-sector actors such as HSBC or domestic private companies have expressed a commitment to protecting biodiversity
- Philanthropists and impact investors: this is an emerging branch of conservation finance which may create a potential market for biocredits, and
- The public: public interest in TV documentaries on biodiversity and concern for biodiversity conservation are growing. As such, the general public may be willing to pay for biocredits.

7 See www.endscarbonoffsets.com/directory.

4.3.2 Setting biocredit prices

Buyers for biocredits are attracted by appropriate prices:

- But as there may be limited biocredit trades or not fully functioning "markets" as such, experiences from most payments for ecosystem services and voluntary carbon offsets suggest that unit prices are the result of direct negotiations between buyers and sellers
- Often the information on prices is purposely hidden from other buyers and the general public. For example, there is little data on specific prices for conservation agreements in the USA
- In other cases, opportunity cost is used to set prices (ie the cost of the next best alternative) as in Costa Rica, where the initial price of PES per hectare was based on the average opportunity cost of pasture land, later adapted to reflect variations in the type and quality of ecosystems protected (eg natural forest located in critical water recharge areas, cloud forests high in biodiversity, or reforestation with native species)
- In some cases, costs for biocredits may vary and full financial transparency may not be in everyone's interests. In the Rhino Bond example it was found that costs varied significantly between state parks and private parks and there was a need to bundle the costs together. International biodiversity NGOs who may have high costs for biodiversity management may prefer to keep their cost structures hidden
- Evidence from the international carbon market shows that prices are not static but can be altered by effective marketing and branding. For example, in voluntary carbon markets, prices for carbon are strongly driven by specialised resellers in niche markets, where prices reflect buyers' appreciation for local social and biodiversity benefits derived from land-based interventions, and
- Finally evidence from the international carbon markets suggest prices may in some cases be so low that losses are made on REDD+ projects. This has been a very real challenge and needs to be avoided in the case of biocredits. It can be avoided by effective marketing to identify niche markets or by storing credits until prices recover.

4.4 Inclusive and fair benefits for local people

For biocredits to work, it is vital to share the benefits of them with poor but biodiversity-rich countries and with the communities who often live in those biodiversity-rich areas. When making the transition from status quo towards sustainability, it is important to ensure it is also inclusive and fair to local people. Much can be learnt from the experiences of REDD+ and from voluntary carbon offset programmes, in particular the standard setting developed to initiate and maintain pro-poor benefits, such as Plan Vivo, and the design of equitable and practical benefit (and risk) sharing strategies.

For example, from REDD+ we learnt that important social issues include tenure, poverty and participation and free prior and informed consent (FPIC):

- Tenure refers to the clarity of land and resource rights which in this case would apply to biodiversity. For species conservation in protected areas, biocredits would need to be considered for households living in or near the protected area and to what share of the benefits they should be entitled
- Poverty refers to the challenge of expecting poor local people who need cash and incomes in the short term to take actions that reduce these short-term revenues and only receive future payments once biodiversity performance has been verified. There has been much experience of ex-ante payments in voluntary carbon markets which we can learn from (such as the use of bridging finance to fill the gaps or making payments ex-ante on the commitment to future environmental improvements), and
- Participation by local households has proved very controversial for REDD+ payments but it is clear that some consent will be required for biocredits to be acceptable to the international community.

5 Conclusions

In this discussion paper, we show that while no exact system of biocredits exists at present, much can be learnt from similar schemes that are active in both developed and developing countries.

The clear potential of biocredits is to provide an avenue to raise resources to finance conservation efforts, while compensating those directly involved in action. The use of credits as an aggregation method is attractive to scale up and achieve thresholds that have the potential to create and sustain positive and inclusive biodiversity conservation impacts in the long term.

However, the challenges are also important to consider. To really understand biocredits or other instruments that help manage biodiversity as an asset, it is necessary to move beyond the idea that using markets is counter-productive. Instead, markets should be recognised as important pragmatic mechanisms that can help improve effective management of biodiversity assets – and where the state is not just a regulator but a driving force behind emerging partnerships.

With the growing emphasis on biodiversity in the run up to the Biodiversity Conference in 2020, it is likely that interest in incentive-type mechanisms such as biocredits will only grow. Done properly, biocredits may be able to build on the shortcomings and successes of the global carbon trading markets and develop into a viable option to improve biodiversity and reduce poverty.

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Abbreviations and acronyms

BBOP	Business and Biodiversity Offsets Programme
Biocredits	Biodiversity credits
BIOFIN	Biodiversity Finance Initiative
FAO	The Food and Agriculture Organization of the United Nations
FPIC	Free prior and informed consent
GHG	Greenhouse gases
HWC	Human-wildlife conflict
NGO	Non-governmental organisation
PES	Payments for ecosystem services
REDD+	Reducing emissions from deforestation and forest degradation (REDD) and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (+)
SEEA	System of Environmental Economic Accounting
SEEA-EEA	SEEA Experimental Ecosystem Accounting
SRT	Save the Rhino Trust
tCO2e	Tonnes of carbon dioxide equivalent
WRA	Formerly known as Wetlands Research Associates

Tackling biodiversity loss is a growing priority for human survival. Introducing incentives for positive actions could play a key role in helping to reverse this loss. This paper explores the potential of using a novel approach to promote biodiversity conservation. Biodiversity credits or 'biocredits' are coherent units of measurement that track conservation actions and outcomes and can help improve tracking and transparency. Well-designed, they can make investments in biodiversity management more financially attractive, for example, by attracting private-sector finance. They can be used by governments to monitor their actions and report on biodiversity commitments. And as much of the world's biodiversity and its richest biodiversity spots are often found in remote and poor tropical regions, we also argue that biocredits need to be inclusive, and founded on fair benefit-sharing principles.

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International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055

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