

# **Biodiversity Offsetting:**

## **A Qualitative Exploration of Applicability and Thresholds**

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science and  
the Diploma of Imperial College London

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## **List of acronyms**

<b>AZE</b>	<b>Alliance for Zero Extinction</b>
<b>BBOP</b>	<b>The Business and Biodiversity Offsets Programme</b>
<b>CWA</b>	<b>Clean Water Act</b>
<b>Defra</b>	<b>The Department of Environment, Food and Rural Affairs</b>
<b>EPA</b>	<b>Environmental Protection Agency</b>
<b>ESA</b>	<b>Endangered Species Act</b>
<b>EU</b>	<b>European Union</b>
<b>IFC</b>	<b>International Finance Corporation</b>
<b>UK</b>	<b>United Kingdom</b>
<b>NNL</b>	<b>No net loss</b>
<b>NPI</b>	<b>Net positive impact</b>
<b>NSW</b>	<b>New South Wales</b>
<b>NZ</b>	<b>New Zealand</b>
<b>NGO</b>	<b>Non-governmental organisation</b>
<b>SAC</b>	<b>Special Areas of Conservation</b>
<b>SPA</b>	<b>Special Protection Areas</b>
<b>US</b>	<b>United States</b>

## **Abstract**

Biodiversity offsets are conservation activities attempting to compensate for residual biodiversity loss caused by development impacts in measurable ways. Although governmental offsetting schemes vary significantly in goals, design and characteristics, the basic premise is that biodiversity damage creates a debit, which a company must account for by purchasing credits that fund conservation activities of equivalent value elsewhere. Many large multinational companies are undertaking offsets voluntarily in conjunction with conservation non-governmental organisations (NGOs) as part of company policy. These new alliances are characteristic of 'mainstream' approaches to conservation, whereby NGOs are increasingly cooperating with companies such as extractive industries to generate revenues (Adams 2012).

It is widely held that 'there are situations where residual impacts cannot be fully compensated for by a biodiversity offset', and biodiversity offsetting may not be appropriate in all circumstances (BBOP 2012). The aim of this study is to investigate the limits people have to offsetting, the factors that influence these decisions, and the implications of such thresholds towards the potential of biodiversity offsetting as a conservation tool. Twenty-four in-depth interviews with individuals from various professional backgrounds and diverse engagements with biodiversity offsetting were conducted in June and July 2012. Participants included environmental consultants, national and international businesses, national and international conservation NGOs, governmental representatives and academics.

As anticipated, opinions regarding offsetting were diverse, and much insight was gained in to the challenges of designing and implementing offsetting programs and projects. The key factors limiting individual judgements of the appropriateness of offsetting, discussed here, were found to be ecological thresholds, knowledge thresholds, understanding of the system state, regulatory thresholds, contextual differences, opinions regarding appropriate measurements and valuations, positionality of the participant and the type of compensation offered. A divide was apparent between conceptual appropriateness and practical experiences. Many of the key concerns and challenges outlined revolved around perceptions of the appropriate spatial and temporal frames of reference, the appropriate locations of the offsets, and who holds the power to make these decisions. Findings were analysed in relation to the normative assumptions behind biodiversity offsetting and mainstream conservation, geographical discourses on neoliberal capitalism, and sociology of science literature. It is hoped this study provides insights in to the limits to offsetting and stimulates further academic debate.

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## **Chapter 1.**

### **Introduction**

# 1. Introduction

## 1.1. Compensation for biodiversity loss

Many developments drive biodiversity loss, and can result in residual negative impacts on communities' use and enjoyment of natural resources (ten Kate & Inbar 2008). 'Biodiversity' refers to the variety and variability among living organisms and the ecological complexes in which they occur (OTA 1987:3). Habitat loss is generally regarded the biggest threat to biodiversity worldwide (Corvalan *et al.* 2005). With global population exceeding 7 billion, double that of 1960, human activities are increasingly altering the world's land and waters. Over 10 billion people are anticipated by 2050 (UNFPA 2011), which combined with increasing consumption patterns associated with economic development, means resource pressures are likely to exacerbate to the detriment of biodiversity, unless preventative measures are taken. Around 43 per cent of earth's land has already been converted to agricultural or urban landscapes, with much of the remaining natural landscape networked with roads (Barnosky *et al.* 2012).

Biodiversity offsets are conservation activities attempting to fully compensate for biodiversity loss caused by development. Whereas the United Kingdom's (UK) planning system currently requires 'on-site mitigation' of residual impacts on biodiversity, under the new offsetting approach being trialled by the Department of Environment Food, and Rural Affairs (Defra), offsetting activities elsewhere become transformed in to 'conservation credits' to be spent on compensating for these impacts, 'off-site' (The Environment Bank 2011). Countries such as the USA, Australia and Brazil already have regulation in place for compulsory offsets if particular habitats or species are damaged. However, there is a business case for voluntary offsets. Companies may benefit from faster permit approvals (ten Kate *et al.* 2004), improved reputations, biodiversity-related risk management, cost reductions compared to on-site rehabilitation, and secured social licenses to operate (ten Kate & Inbar 2008). Many programs and companies aim to reduce rates of biodiversity loss, achieve 'no net loss' (NNL) of biodiversity, or even a 'net positive impact' (NPI) following destructive activities (Rio Tinto 2004).

## 1.2. Key challenges for offsets

Permission to offset is usually considered conditional to the developer's conformance with the 'mitigation hierarchy' (**Figure 1.1**). For example, if developers are seeking financial assistance from the International Finance Corporation (IFC):

'As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented'- IFC (2012)

But what constitutes unavailability and how far each step should be pursued before turning to the next is ultimately subjective. There is concern that offsets 'could be one step on the slippery slope to allowing inappropriate developments to go ahead' (ten Kate & Inbar 2008).

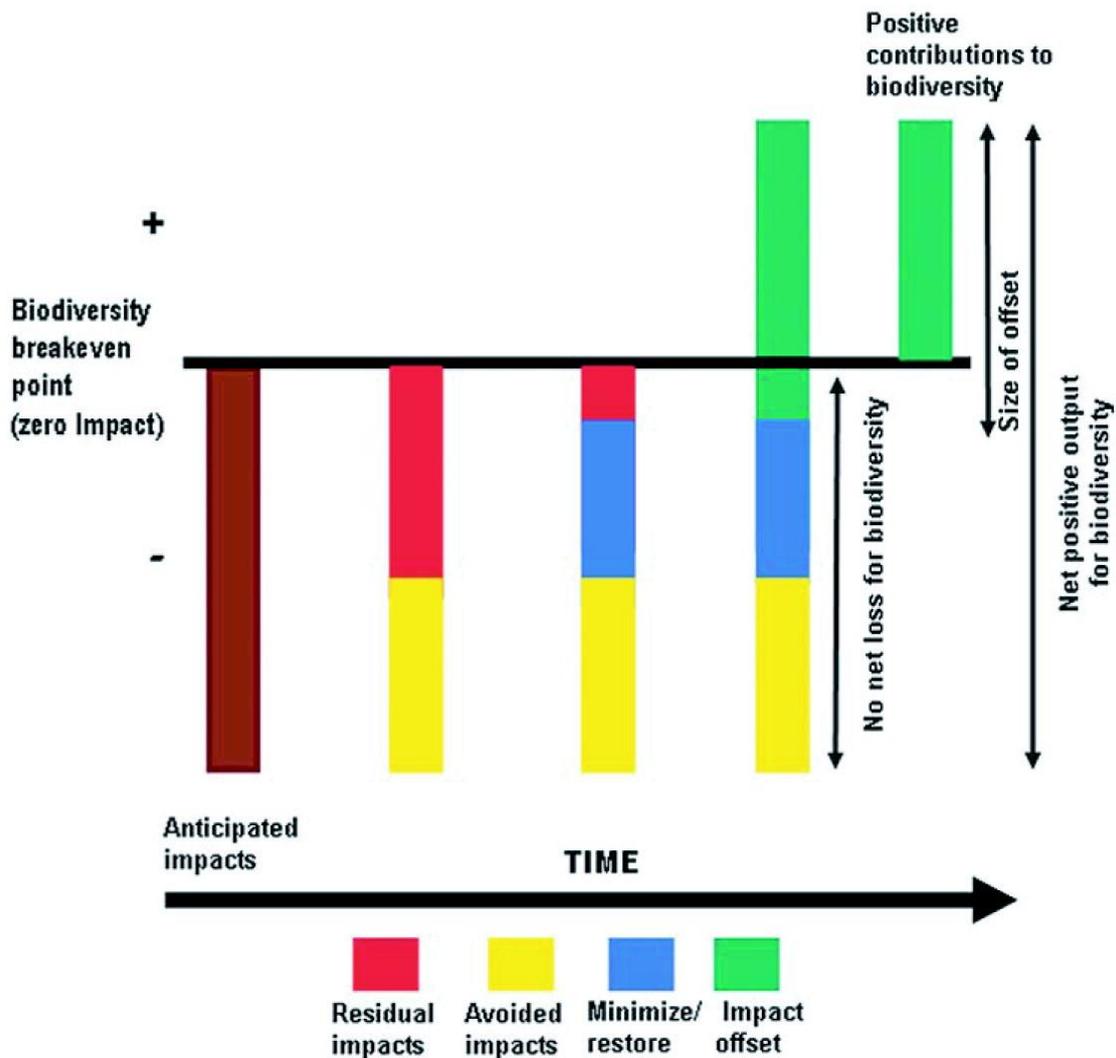


Figure 1.1. The mitigation hierarchy. The role of offsets in achieving 'no net loss' of biodiversity. From Kiesecker *et al.* (2009).

Once offsets are agreed, the amount of compensation required is also debatable. The complexity of biodiversity makes it impossible to define boundaries and estimate an element's contribution to the whole (Kosoy & Corbera 2010). Most offset schemes therefore use proxies such as 'habitat hectares', or favour particular species, but this involves trading-off biodiversity elements (*ibid*). The form of compensation and its location is also debated. Whilst some may consider 'like-for-like' element restoration imperative, others see offsets as valuable fundraising resources for more

pressing conservation activities, such as invasive species control in New Zealand (Norton 2012 – own correspondence).

In addition, there are ecological and political uncertainties; offsets ultimately involve accepting certain immediate loss for uncertain future gain (Bekessy *et al.* 2010).

### **1.3. Thresholds**

The focus of this thesis is on peoples' thresholds regarding biodiversity offsets. The value of such a study was stressed by Ten Kate *et al.* (2004):

*'Biodiversity offsets are not appropriate in circumstances where development should not proceed in the first place. More detailed consideration of the controversial issues of 'no go' criteria is beyond the scope of this report. However, it is an issue on which further dialogue between conservation groups, government and companies is urgently needed.'*

In policy terms, ecological applicability could be decided empirically using a calculation of habitat or species irreplaceability and vulnerability (e.g. BBOP 2012), but applicability extends further than ecological value. The thresholds people apply to biodiversity offsetting are essentially value judgements. Whilst legislation and guidance (such as BBOP 2012) has been developed to somewhat address these subjectivities, legislation itself contains value judgements, and until now a formal study has not been completed which looks explicitly at what those value judgements are and how they vary.

This study aims to gain a richer understanding of thresholds and their implications towards the potential of offsetting as a conservation tool. Policy measures to determine thresholds ultimately rest upon underlying normative values, with boundary definitions being arbitrary. As Bull *et al.* (under review) outline, society may accept a scheme that regards habitat types interchangeable (Defra 2011), but an offset may be unacceptable if it involves mortality to charismatic fauna (Wilcox & Donlan 2007). This study is therefore an investigation of the factors influencing personal and political environmental decision-making in the context of biodiversity offsetting, in relation to wider themes regarding conservation discourses.

### **1.4. Research Questions**

1. How different are the limits people have to offsetting, and why?
2. How do differences in thresholds relate to wider themes regarding conservation discourses?

3. How can these differences inform debate about the potential of biodiversity offsets as a conservation tool?

## **Chapter 2.**

### **Background**

## **2. Background**

### **2.1. Offsets in theory: conceptual background**

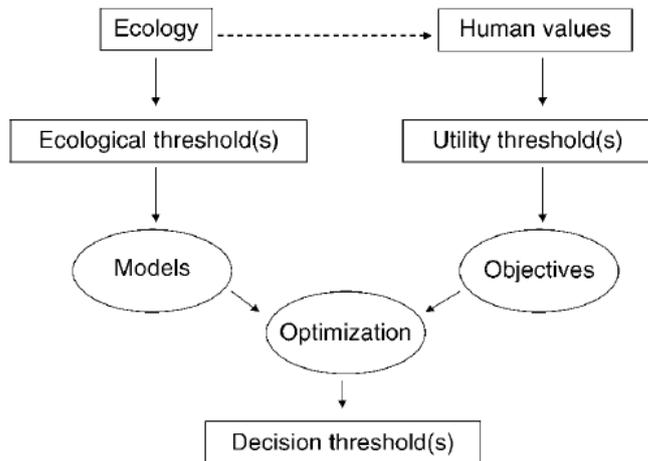
#### **2.1.1. Normative values**

Normative values determine opinions on what things are good or bad, and what actions are right or wrong. Normative statements denote how things should be valued and how things ought to be. Contemporary philosophy largely holds that the way societies define their normative standards varies significantly between people and cultures, and is largely determined by ontological categories and the language used (Law 2004). An individual's normative stance depends on their 'mindset', which is a product of their knowledge, life experiences, and these contextual networks of 'epistemic communities' (Haas & Adler 1992) of which they are a part. Normative values form the foundation of ethical and political discourse, and power relationships determine those which dominate in any particular time and place (Foucault 1982). The varying degrees of agreement between the normative standards of individuals or groups means that knowledge about another's 'reality' can only be partial (Law 2004). There are not only 'partial connections' between people, but within the same person; we do not have single identities, and act differently in different circumstances (Haraway 1991; Strathern 2004).

#### **2.1.2. Environmental decision-making**

Martin *et al.* (2009) outline that environmental decisions are founded upon ontological understandings of the ecology of the system, which informs construction of ecological thresholds using models, and the dominant human values, which determine utility (**Figure 1.2**; Martin *et al.* 2009).

The causes of environmental degradation and biodiversity loss are rooted in institutionalised values (Orr 1992). Any environmental decision is likely to result from a particular configuration of power relationships operating at multiple scales (Adger *et al.* 2003). Any policy approach prioritises certain values over others and frequently certain people over others (Robinson 2011).



**Figure 2.1** Flow chart showing the relationship among different types of thresholds. ‘Ecological thresholds are determined by our understanding of the ecology of the system and are incorporated into models of system behaviour. Utility thresholds are determined subjectively and reflect stakeholder values (although in some circumstances these values can be based on knowledge of the ecology of the system, as indicated by the dashed arrow). Decision thresholds are conditional on and derived from ecological and utility thresholds’. (Martin *et al.* 2009)

Where somebody sets their ‘decision threshold’ in an offsetting context is likely to depend on a culmination of factors (**Table 2.1**).

**Table 2.1.** Factors likely to influence individual decision-making thresholds regarding the appropriateness of offsets.

Factor	Explanation
System state	Their ontological understanding of the system state (e.g. ecological thresholds, species vulnerability, political restrictions) (Law 2004).
Individual ‘mindset’	The individual’s knowledge, experiences, and the ‘epistemic communities’ of which they are a part (Haas & Aadler 1992).
Individual values	The environmental values that the individual holds – both their ‘environmental value orientation’ (e.g. predominantly anthropocentric, eco-centric or apathetic) (Kaltenborn & Bjerke 2002), and more specific values that may dominate (e.g. aesthetics, spirituality, scientific knowledge, recreation, social equality, economic prosperity).
Spatial and temporal dimensions of values	The temporal (past/present/future) and spatial (personal/local/national/global) scales at which they hold these values.

Utility	Estimated utility of an offsetting project in contributing to the values held. This is likely to depend on:  <ul style="list-style-type: none"> <li>- the current utility of the development site;</li> <li>- future utility following development;</li> <li>- the utility of the offset provided;</li> <li>- spatial and temporal dimensions of the proposed project;</li> <li>- practical uncertainties;</li> <li>- their understanding of each element;</li> <li>- their perception of the utility of offsetting in general.</li> </ul>
Positionality	The context of their decision-making, given that we act differently under different circumstances (e.g. personal or professional); knowledge is always 'situated' (Haraway 1991).
Power dynamics	The perception of power dynamics within the system state and their ability to change it.

In 'Western' countries (much of Europe, the United States (US) and other English-speaking countries), national scale governmental power rests upon neoliberal capitalist intentions; economic liberalisation and an institutional framework that preserves strong private property rights, free markets and free trade (Harvey 2005). Such countries are also dominated by the Euro-American metaphysics outlined by Law (2004). By attempting to report on a singular, independent, anterior, definable reality 'out-there' (Law 2004), scientific advice is conventionally regarded politically-independent; a perceived impartiality that can paradoxically enforce political agendas (Demeritt 2001).

The aim of this project is to investigate how influences on environmental decision-making interplay in relation to biodiversity offsetting.

**2.1.3. Conservation discourses**

As in all mission-oriented disciplines, ethical norms are a genuine part of conservation science (Soulé 1985). Some generalised normative postulates of conservation science are that diversity of organisms is good, ecological complexity is good, evolution is good, and biodiversity has intrinsic value (*ibid*). Conservationists however are not a homogenous group and referring to them as such 'implies a unity of thought, values and practice that is simply not found' (Igoe *et al.* 2010; Fletcher 2010). Conservation is riddled with conflict over ethics, practices and compromises which are evident in meetings, journals, books and campaigns. A few ideologies apparent in some typical conservation approaches are shown in **Table 2.2**.

**Table 2.2. Responsiveness of three different conservation approaches to four different ideologies.** X indicates that the conservation approach weakly contributes to the values of that ideology, while XXX indicates that the approach contributes strongly. From Robinson (2011).

Mainstream Conservation	X	X	XX	XXX
Respectful Partnerships	X	XXX	XXX	X
Fortress Conservation	XXX	XX	X	X
	Intrinsic Value	Traditional Cultural Value	Pro-Poor Value	Economism

#### 2.1.4. Mainstream conservation

Biodiversity banking and trading represents a ‘mainstream’ approach to environmental problems. ‘Mainstream conservation’ refers to the increasing cooperation of conservation organisations with large multinational organisations, such as extractive industries, to generate revenues; a form of neoliberal capitalist ‘institutional blending’ (Adams 2012). These new alliances are characterised by faith in market solutions to environmental problems (Brockington & Duffy 2010), with economic growth becoming the assumed prerequisite for positive social and environmental outcomes (Fletcher 2010). Corson (2010) outlines how by providing an avenue by which corporations and politicians can become “green”, as well as through new enclosures and conservation-based enterprises, ‘international biodiversity conservation is creating new symbolic and material spaces for global capital expansion’. Biodiversity offset ‘banks’ and regulated markets in ‘conservation credits’ typify such new material spaces.

The maintenance of neoliberal capitalist economies is predicated upon continual expansion of the value of commodities produced, which relies on a broadening and deepening of sources as labour and resources are drained (Harvey 1985). Capitalism has a ‘destructive-extractive relationship’ with the environment (Moore 2011); there is a ‘fundamental contradiction between capitalism’s need to expand exponentially vis-a-vis the capacity of ecosystems to withstand and absorb the disturbances and stresses that this exponential growth entails’ (Igoe *et al.* 2010).

Mainstream conservation overlooks this contradiction, with messages such as: ‘capitalism is the key to our ecological future and ecological sustainability will help end our current financial crisis’ (message of The World Conservation Congress 2008; Igoe *et al.* 2010). Corbera *et al.* (2007)

outline that although seemingly objective and logical, market environmentalism fails to recognise that ‘global environmental problems, such as climate change or biodiversity loss, are rooted in the invisible structures of global energy resource flows, government export policies and corporate economic interests’.

#### **2.1.5. The normative assumptions of biodiversity offsetting**

Offsetting conceptually assumes that degraded nature and environmental harm ought to be and can be balanced by pristine nature and environmental protection. This allows the possibility of imagining the Earth as a ‘virtual ledger’, on which it is possible to carry out a quantitative balancing of environmental goods and bads (Brockington & Duffy 2010). Compensatory methods are therefore founded upon the material and legal delineation and itemisation of ecosystem functions, elements, or values, so they can be balanced, bought, sold, traded or used by individuals, groups or organisations (Castree 2003). The recent focus on ‘ecosystem service’ science epitomises these abstractions. Categorising ecosystem services, however, can mask complexity and establish boundaries which are difficult, if impossible, to draw (Castree 2003).

Linked to delineation difficulties, is the assumption of interchangeability. Carbon offsetting for example conceptually enables carbon production as one thing (e.g. industrial emissions) in one location, to be ‘offset’ against its storage in another qualitatively different thing (e.g. tropical forests) in another location (Sullivan 2011). Castree (2003) suggests this is a fallacy with two inter-dependent dimensions: The functional fallacy ‘involves looking for real and classifiable similarities between otherwise distinct entities as if the [functional] can be separated out from the [spatial] unproblematically’, while the spatial fallacy ‘involves any individualised thing in one place being treated as really the same as an apparently similar thing located elsewhere’ (Castree 2003).

Many analytical tools for evaluating the ‘trade-offs’ made in such exchanges quantify and compare values according to a single metric (Hirsch *et al.* 2011). This strengthens the assumption that because problems can be defined in terms of trade-offs, everything can indeed be traded off (*ibid*). Many actors in complex conservation scenarios however may feel that certain values, such as individual rights, cultural attachments, or species protection, are incommensurable. No currency may adequately capture ‘what we care about’ (Salzman & Ruhl 2000). From this perspective, for one actor to frame a problem in a positivist light in terms of trade-offs is to undermine another’s ability to protect what they value (O’Neil *et al.* 2007). A trade-off approach can obscure the divergent abilities of groups affected by environmental policies to negotiate solutions that are favourable to them (Hirsch *et al.* 2011).

In summary, behind the concept of biodiversity offsetting are the following descriptive and normative assumptions of mainstream conservation (**Table 2.3**). Conservationists may recognise these prescriptions cannot be achieved ecologically, but still believe that by attempting to do so in an abstract sense they develop useful conservation actions.

**Table 2.3. The descriptive and normative assumptions behind biodiversity offsetting and mainstream conservation.**

<b>Assumption</b>	<b>Description</b>
Economic importance	Ongoing environmental destruction occurs because the environment currently lacks economic value.
Compensation	Ongoing environmental destruction occurs because environmental harm is not compensated for.
‘Virtual ledger’	We can (and should) carry out a quantitative balancing of environmental goods and bads.
Equivalence	Degraded nature can (and should) be balanced by pristine, protected nature.
Measurability	We can (and should) delineate boundaries between ecosystem functions, elements, or values.
Value quantification	We can (and should) use a metric to quantify ecosystem functions, elements, or values.
Interchangeability	We can (and should) trade ecosystem functions, elements or values.

Many authors criticise some (or all) of these assumptions. Walker *et al.* (2009) demonstrate how ‘Incomplete measurement, imprecise valuation, and non-interchangeability mean biodiversity exchange is strictly not commodity trading, but barter’. Unlike barter in private goods, environmental exchanges affect interests beyond direct participants.

Biodiversity can be considered non-interchangeable in three dimensions (from Walker *et al.* 2009):

- **Space** (e.g. isolated and contiguous habitat patches are not equivalent);
- **Time** (e.g. genetic bottlenecks alter population characteristics irreversibly; early and late seral stages of an ecosystem type support different species suites);
- **Type** (e.g. endangered frog habitat is neither equivalent to nor exchangeable for endangered tree habitat; captive bred sub populations do not replicate a diverse population gene pool).

Hannis & Sullivan (2012) also notes that offsetting ‘cannot recognise or preserve the value of specific relationships’. By encouraging people ‘to think that one bit of nature is much like another’, offsetting risks undermining the work of many conservation organisations who focus on preserving meaningful connections between people and their local environments.

Simple currencies for trading biodiversity serve to omit, obscure or conceal biodiversity features and non-interchangeabilities, and in any exchange, ‘a characteristic not counted is protected only by chance, which facilitates its loss’ (*ibid*).

In addition, there are spatio-temporal assumptions that limit offsetting’s potential as a long-term solution; 30,000 km<sup>2</sup> of new land would have to be afforested every year to offset carbon emissions from leisure aviation travel alone (Brockington *et al.* 2008). This would fill all the space available for afforestation by 2050 (Boon *et al.* 2006). On a finite planet, many authors feel global sustainability requires altering ‘business-as-usual’ scenarios; “The earth does not take MasterCard®. If there is no oil or water in the ground it does not matter how much someone is willing to pay for it, they simply will not be able to have it” (Brockington *et al.* 2008). As Elkington (1999) asserts, it is not enough for sustainability to be declared by a single individual, nation, or corporation, it must encompass a complete socio-ecological system, and not its component parts.

It is predicted that people’s opinions regarding limits to offsets will rest upon the extent to which they agree with some or all of these assumptions.

## **2.2. Offsets in practice: institutional background**

### **2.2.1. The Business and Biodiversity Offsets Programme (BBOP)**

The Business and Biodiversity Offsets Programme (BBOP) is an international partnership of companies, government agencies, financial institutions, scientists and non-governmental organisations (NGOs) encouraging best practice in biodiversity offsetting. They have constructed ten principles which they believe provide a framework for designing and implementing successful offsetting projects and attempt to address some of the conceptual and practical challenges (**Table 2.4**).

**Table 2.4. BBOP principles on biodiversity offsets (2012).** Available online at: [http://bbop.forest-trends.org/documents/files/bbop\\_principles.pdf](http://bbop.forest-trends.org/documents/files/bbop_principles.pdf) (Accessed 08/08/12).

Principle	Explanation
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1. Adherence to the mitigation hierarchy	A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimisation, and on-site rehabilitation measures have been taken according to the mitigation hierarchy.
2. 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.
3. 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.
4. 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.
5. 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.
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.

### 2.2.2. Policy background

A number of countries have regulations in place that mandate environmental compensation for development impacts, many of which include offsets (**Table 2.5**). The policy goal signifies the values each programme seeks to maximise.

**Table 2.5. Examples of legal requirements for environmental compensation.** From ten Kate & Inbar (2008).

Country	Programme	Legislation	Policy goal
US	Species mitigation (of which conservation banking is one tool for mitigation)	ESA 1973, as amended, and 'Guidance on establishment, use and operations of conservation banks'	To offset adverse impacts to threatened and endangered species

	Wetland mitigation	CWA 1972 Chapter 404 (b) (1) and the US Army Corps of Engineers regulations (33 CFR 320.4 ®)	'no overall loss of values and functions' (1990); 'net gain' (2004)
<b>Australia</b>	New South Wales	'Green offsets for sustainable development' Concept Paper (2002); Native Vegetation Act (2003) & subsequent regulations (2005); The Threatened Species Conservation Amendment (Biodiversity Banking) Bill (2006)	'net environmental gain'
	Victoria	Native Vegetation Management Framework (2002) & subsequent amendments to related Acts; Bush Broker – native vegetation credit registration & trading, Information Paper (2006)	'a reversal, across the entire landscape, of the long-term decline in extent and quality of native vegetation, leading to a net gain'
	Western Australia	Native Vegetation Act (2003); Environmental offsets, Position statement No 9 (2006)	'net environmental benefit'
<b>Brazil</b>	Forest regulation and national system of conservation units	Lei No. 4771 of 1965; Lei No. 14.247 of 22/7/2002, Lei No 9.985 of 18/7/2000, Decreto No 4.340 of 22/8/2002	No net loss of habitat under a defined minimum forest cover for private landholdings
<b>Canada</b>	Fisheries Act	R.S. 1985, c. F-14, Policy for the management of fish habitat (1986), and 'Habitat conservation and protection guidelines, 2 <sup>nd</sup> edn (1998) (see especially subChapter 35 (1) and subChapter 35 (2) of the Fisheries Act)	No net loss in capacity of habitat to produce fish
<b>European Union (EU)</b>	Habitats and birds directive	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora and Council Directive 79/409/EEC	Maintain overall (ecological) coherence of the sites

Different policies have slightly different stances towards implementation. Some of these are outlined in **Table 2.6**.

**Table 2.6. How offset policies in the United States, Australia, European Union (EU) and Brazil address key implementation issues.** From McKenney & Kiesecker (2009).

Key issues by programme	Equivalence	Location	Additionality and types of offsets	Timing	Duration	Currency and offset ratios
<b>US (Conservation banking)</b>	In-kind for species; must support conservation needs of the species	Same service area (US FWS); provides best long-term benefit to species	Must be additional; no specific constraint on type of offset	Offset must be operable at time first credit is sold	Perpetuity only	Based on species and habitat values, at least 1 to 1 ratio for area supporting nest site or family group
<b>US (Wetland mitigation)</b>	Most environmental	Same	Must be additional; prefer	Before first credit is	Self-sustaining;	Based on lost aquatic resources;

	ly preferable option, in-kind for difficult-to-replace resources	watershed	restoration; allow establishment, enhancement, and preservation	sold/debited, need to have secured site, approved mitigation plan, and assurances	preservation must be permanent	at least 1 to 1 ratio by acreage or linear foot
<b>Australia (Native vegetation)</b>	“Commensurate” or in-kind (especially for losses of high significance)	Adequate geographic link between losses and offsets; closer to on-site when losses are high significance	Must be additional; full range of offset types allowed	Flexible; timing is factored in to scoring	Perpetuity preferred; in place as long as on-site impacts	Based on assessment methodology in NSW; “Habitat hectares” framework in Victoria
<b>European Union (Natura 2000)</b>	Comparable proportions and functions	Same biogeographic region in the same Member State; same bird migratory path	Must be additional; re-creating habitat, or in exceptional cases proposing a new site	Offset must be operable at time when project damage is effective	Perpetuity preferred	Based on impacts to species, habitat and functions
<b>Brazil (Industrial offsets)</b>	No preference	No preference, but if impacts are to a protected area, offset must benefit that protected area	No requirement; supports funding of Brazil’s protected areas system	Offset payment required prior to environmental permitting	Perpetuity preferred	Commensurate with impacts (minimum payment of 0.5% of total capital costs of project)
<b>Brazil (Forest offsets)</b>	Same ecosystem type	Same watershed	Must be additional to required conservation area on any private landholding	Offset is retroactive, addresses land clearing that has already occurred	Perpetuity preferred	Defined ratio of 1 to 1

### 2.2.3. Defra’s biodiversity offsetting scheme

In the UK, Defra is undertaking biodiversity offsetting pilots in England, in light of recommendations made in Lawton *et al.*’s (2009) review of England’s wildlife sites and ecological network. The new coalition government’s mainstream approach to conservation is exemplified in the Natural Environment White Paper (2011:10) which states:

*'We reject the outdated idea that environmental action is a barrier to growth, or that achieving economic development and a healthy natural environment are incompatible objectives'.*

The scheme coincides with their reform to simplify the UK planning system. Their National Planning Policy Framework (NPPF) has a 'presumption in favour of sustainable development', with implications for biodiversity:

*"118. When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:*

- *if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused"* – (Department for Communities and Local Government 2012)

May see offsets as simply making the outcomes of existing compensation requirements within planning permission more efficient, transparent and standardised (The Environment Bank 2012). Others consider biodiversity offsetting a planning tool intended to assist developers in gaining permits (Hannis & Sullivan 2012). This may contribute to a net increase in land developed, and a decrease in local biodiversity on the land hosting this increased development. Offsetting may, however, benefit local biodiversity at habitat-banks, the owners of whom (including certain agriculturalists, wildlife trusts and NGOs) would receive new income streams to manage habitats (*ibid*).

The political dynamics of such exchanges will determine whether or not the potential positive impact of increased conservation funding adequately compensates for the negative impacts of increased development (*ibid*).

### **2.3. How level is the playing field?**

The public choice theory of politics outlines the motivated few will be more powerful than the disorganised many (Olson 1965). This theory predicts private interests, based on profit maximisation (the economic bottom-line), tend to defeat public interests, such as biodiversity protection. Walker *et al.* (2009) describe an uneven playing field between traders, biodiversity protection interests and regulatory officials; the 'default setting' predicted by Olson (1965) is that development will defeat biodiversity.

To address biodiversity decline, policy instruments must level this playing field, but Walker *et al.* (2009) predict biodiversity ‘barter’ will reinforce rather than correct this default setting. This is because ‘mandates to barter biodiversity weaken existing statutory constraints on biodiversity harm by allowing officials discretion to circumvent them’. Also, case-by-case decision-making reduces the ease of opposition to projects, and renders biodiversity trading vulnerable to information asymmetry, whereby outsiders (biodiversity protection interests and the public) cannot judge the quality of deals.

## **Chapter 3.**

### **Methodological Framework**

### **3. Methods**

#### **3.1. Conceptual framework**

My research questions are designed to grasp how biodiversity offsetting is understood by different people. A post-structuralist qualitative approach is therefore appropriate; seeking to analyse people and organisations in their temporal and local context. Instead of imposing a pre-established grid of analysis upon relationships discovered, since ‘what there is and how it is divided up should not be assumed beforehand’ (Law 2004:102), the research attempts to identify the manner in which various actors define and associate the elements that build their worlds, relating patterns found within limitations. The main features of qualitative research are that it is naturalistic, descriptive rather than numerical, concerned with process rather than simple outcomes, inductive rather than deductive, and subjective due to the researcher/informant relationship (Bogdan & Bilken 2007). Post-structuralist qualitative research does not attempt to seek ‘truths’ but embraces the ambiguity of diverse meanings, seeking to study each one and how they can simultaneously exist (*ibid*).

#### **3.2. Methodological framework**

##### **3.2.1. Method used: Semi-structured interviews**

Interviews are the most effective way of communicating in-depth personal information. Their flexibility enables more complex responses than questionnaires, allowing less ambiguous interpretations to be made (Johnston *et al.* 2000). Structure ensured topics were covered, but considerable freedom was granted for describing experiences in their own terms. Open-ended questions allowed informants to express thoughts freely by answering from their own frame of reference (Bogdan & Bilken 2007).

##### **3.2.2. Collection technique**

Purposive sampling was appropriate. To establish the role of contexts in shaping ideas, participants from various countries, and with diverse engagements with biodiversity offsetting, were desirable. Participants from the UK, US, Australia and New Zealand (NZ) were desired to discuss contextual factors. In the UK, it was desired to speak to those involved in the Defra pilot, whereby design challenges and speculations were anticipated to feature strongly. A range of NGO representatives with experience of advising upon or implementing compulsory or voluntary offsets for large corporations were desired, to discuss practical experiences from a conservation perspective. Business-persons with various interests were desired; it was anticipated their limits would differ from conservationists. Environmental academics with diverse perspectives were also desired, to provide insights based on expertise.

Participants were initially contacted based on location or professional experience, and were discovered online, from conference attendee lists, or suggested through academic networks. 42 emails were initially sent, with a fairly low response rate. However, during interview, participants often mentioned potential contacts; this ‘snowball’ effect enabled access to previously inaccessible individuals (Atkinson & Flint 2001). One participant kindly advertised the research on a consultancy website, instigating numerous responses.

A variety of interview styles were available (**Table 3.1**).

**Table 3.1. Suitability of interview styles.** Adapted from Opendakker (2006).

<b>Face-to-face preferred when:</b>	<b>Telephone preferred when:</b>	<b>E-mail preferred when:</b>
Social cues (e.g. body language) are important sources of information	Social cues are less or not important information sources	Social cues are not important information sources
The interviewer has enough budget and time for travelling	The interviewer has a small budget and less time for travelling	The interviewer has a small budget and less time for travelling
Standardisation of the interview situation is important	Looking for access to people on sites which have closed or limited access	Looking for access to people on sites which have closed or limited access
	Standardisation of the interview situation is not important	Standardisation of the interview situation is not important
	Some anonymity is requested	Anonymity is requested
		Both interviewer and interviewee are competent in type writing and have computer access
		There is a huge time difference
	It is necessary that the interviewee takes time to respond to the developing dialogue	

Given distant locations and/or preferences of participants, face-to-face interviews were rarely feasible, but were conducted where possible in participants’ working environments. Telephone interviews using Skype were however adequate – the comfort of personal surroundings enabled relaxation, and a feeling of anonymity was generated. One-on-one interviews were chosen over group interviews to prevent confident characters dominating, or increased social pressures affecting sincerity.

In total 24 interviews were conducted between 12<sup>th</sup> June and 19<sup>th</sup> July 2012 (**Table 3.2**). They were designed to last around 30 minutes but the final range was between 28m and 1h 29m. Total interview hours was 17h 22m. To reduce uncertainty, interviews were recorded with permission using a Dictaphone and fully transcribed by hand. Transcription made opinions more easily comparable. Total word count of transcriptions was 129,461 words.

**Table 3.2. List of participants and interview types grouped according to country of residence and professional experience.**

Ref.	Current job	Engagement with offsetting	Country of residence	Interview type
1	Chairman of a biodiversity offset broker.	Designing and implementing UK offsets for clients.	UK	Face to face
2	Principal Consultant, a biodiversity consultancy.	Designing and implementing UK offsets for clients.	UK	Skype
3	Business Development Director, a leading environmental economics consultancy	Designing and implementing UK offsets for clients. Managed a study on habitat banking for the European Commission.	UK	Telephone
4	Principal Ecologist, a local planning authority	Designing and advising upon offsets for local implementation of UK government biodiversity offsetting scheme.	UK	Skype
5	Former scientific advisor to UK government	Designing policy and metric for UK government biodiversity offsetting scheme.	UK	Skype
6	Interim Business Development Manager, a county Biodiversity Partnership	Contracted to research and advise upon offsets in the UK to a county Biodiversity Partnership.	UK	Skype
7	Principal Landscape Manager, a quarry products company	No direct experience but interested in implications for the company.	UK	Skype
8	Managing Director, a water company	No direct experience but interested in implications for the company.	UK	Skype
9	Environment Adviser, a cooperative retailer	No direct experience but interested in implications for the company.	UK	Skype
10	Sustainable Development Manager, a leading UK retailer	No direct experience but interested in implications for the company.	UK	Face to face
11	Business Director, a charity established by a multinational oil and gas company	Interested in offsetting from a business perspective. Provided substantial funding to UK biodiversity offset broker in 2011.	UK	Telephone
12	Programme Manager of an NGO-Corporate Partnership, an international bird conservation NGO	Designing and implementing offsets for an international mining company.	UK	Skype
13	Head of Site Conservation Policy, a UK bird conservation NGO	Advising upon compensation or offset proposals triggered by UK legislation.	UK	Skype
14	Programme Director, Corporate Partnerships, an international conservation NGO	Designing and implementing offsets for international corporate partners.	UK	Face to face
15	Head of a Regional Team, a leading plant science and conservation organisation	Conducting scientific surveys for international corporate partners.	UK	Face to face
16	Head of a Regional Team, and Advisory to BBOP, a leading plant science and conservation organisation	Organisation's Advisory to BBOP, and been involved in designing one project.	UK	Skype
17	Conventions and Policy Officer, a leading plant science and conservation organisation	Advising upon offsetting policy for an international corporate partner.	UK	Face to face
18	Senior Conservation Officer for a county Wildlife Trust	No direct experience but interested in county implications from a conservation	UK	Skype

		planning perspective.		
19	Professor in Geography, a UK university	No direct experience or research but interested academically.	UK	Face to face
20	Research Fellow in Conservation Science, an Australian university	Researching offsets from an academic perspective.	Australia	Skype
21	Chief advisor, Biodiversity and Ecosystem Services, a large multinational mining company.	Designing and implementing offsets for an international mining company.	Australia	Skype
22	Part of the United States Environmental Protection Agency (EPA), Wetlands Regulatory Program	Writing and enforcing regulations regarding damage to wetlands in the US	US	Skype
23	Lead Scientist, Conservation Lands Team, an international conservation NGO	Scientific research, designing and implementing international offset projects.	US	Skype
24	Professor in Forestry Conservation, a New Zealand University	Writing academic papers and reviewing offsetting proposals in NZ	NZ	Skype

### 3.2.3. Interview technique

Interviews initially asked background information and details of involvement with offsetting. Participants were then encouraged to outline projects wherein they felt offsetting was appropriate and why, projects where offsetting would have been inappropriate and why, followed by any that went ahead that they in hindsight consider inappropriate. These questions encouraged participants to make value judgements about applicability. A recurring controversial theme was offsetting for developments within legally protected areas, so as interviews progressed all participants were asked about this. The final part discussed some normative statements followed by a thought experiment (**Table 3.3**).

**Table 3.3. Normative statements discussed with participants and a thought experiment conducted during interview, with explanations.**

Question	Explanation
<b>Opinions were desired on the statements below:</b>	
<i>"We best serve environmental goals by resisting the spread of market norms"</i> (O'Neill 2007)	Ambiguity forces participants to discuss opinions on environmental goals, the role of market norms, and co-operation with or opposition to environmentally damaging organisations; could reveal 'mainstream conservation' mindsets.
<i>"Offsetting could halt or reverse global declines in biodiversity"</i>	Forces participants to discuss opinions on the role of and limits to offsetting, and the importance of other conservation activities; could help delineate strong pro- or anti- offsetting mindsets.

“Species have intrinsic rights to exist”	Forces participants to discuss how they value species. They were then asked whether such values applied to some species more than others, and whether offsetting accounted for these; could help reveal conflicting normative stances and inform the challenges of assigning explicit values.
<p><b>The final part was a thought experiment:</b></p> <p>Participants were asked to think of a ‘natural’ place they had a strong personal attachment to; somewhere that had not been designated legally protected.</p>	
What do you like about this place?	Explicitly asks about personal environmental values.
How would you feel about a development project occurring here?	Negative response expected; it entails the destruction of somewhere they have an attachment to.
Would it make you feel better if the impacts were offset? If so, how would you judge whether the offset provided was suitable?	Encourages participants to re-consider thresholds from a different positionality. Responses to these questions could reveal conflicting normative stances and inform the challenges of assigning explicit values.

### 3.2.4. Analysis technique

Once transcribed, each interview was analysed as a text in a post-structuralist fashion making educated guesses about likely interpretations (McKee 2003). This involved considering wider contexts, professional experiences and researcher positionality (*ibid*). McKee (2003:80) asserts it is ‘fine just to pick out the most interesting and relevant parts of a text for analysis: in fact this is the correct approach for post-structural textual analyses’.

Normative statements, interesting facts, interesting opinions and areas of disagreement were highlighted using the qualitative analysis software program NVivo, which facilitated the organisation of complex data in to emerging themes.

Analysis of websites and policy documents was also used; investigating things from several angles facilitates richer interpretations (Bechhofer and Paterson 2000). For **Question 3**, findings were analysed in relation to wider themes and theories by referring to multi-disciplinary literature.

### 3.3. Limitations

Although inevitable with purposive sampling, self-selection biases are strong. The variety and number of individuals contacted aimed to address this to some extent.

No control was held over responses; many sought-after individuals were not interviewed. Also, only 3 informants were female, and most had ecological backgrounds. This accentuates the importance of not generalising results.

Interview times ranged from 7am to 10pm, which may have affected conversational dynamics. The length of interviews was also participant-controlled; hence some participant's views may be better understood than others. It was considered in research interests to prolong interviews as long as possible where insights were forthcoming.

As understanding of issues and case studies increased through the research process, conversations flowed more easily. There therefore may be a bias towards higher quality information over time.

Dynamics between researcher and interviewee are limitations of interview techniques – age, gender and ethnicity for example can all influence outcomes (Pile 1991).

#### **3.4. Ethics**

Due to the sensitivity of opinion-based information, participant and organisation names are anonymous. A briefing granting anonymity, asking consent for quote use, and outlining project and interview details was given prior to participation.

## **Chapter 4.**

### **Results**

## 4. Results

### 4.1. Overview

Given the nature of my research questions, this chapter discusses **Question 1**:

*‘How different are the limits people have to offsetting, and why?’*

**Question 2**, which situates findings in relation to the literature, and **Question 3**, which discusses the wider implications of the research are addressed in the discussion, **Chapter 5**.

For an overview of each interviewee’s opinions regarding factors determining applicability and key challenges for offsets, see Appendix (**Table 7.1**). Some interesting findings based on this table are:

- Participants who were keen to discuss multiple conceptual and practical challenges of offsets tended to be those who had experience of implementing offset projects internationally for conservation NGOs;
- Three UK businesses interviewed (7,8,9) stated they believed many companies already have positive impacts on biodiversity so offsets are unnecessary;
- Of three private UK consultants interviewed (1,2,3), only he who stated professional perspective as ‘conservation’ (2) firmly outlined that offsets had room for abuse and should be a last resort;
- Seven participants (all UK) did not explicitly mention the importance of governmental/company commitments or power relations. Six stated their professional perspective as ‘business’, except one ecologist employed by a UK local authority (4). This may be due to awareness of the research situation and company reputations, or simply a lack of engagement with offsetting in practice. Five of these had no direct experience in offsets but were interested in their implications for the company (7,8,9,10,11), whereas two (1, 4) are currently employed by UK government so understandably avoided the subject;
- Two participants in particular (one marketing manager, 12; one academic geographer, 19) were sceptical about offsetting under any circumstances and regarded it fundamentally flawed.

**Table 4.1** outlines findings based on some emerging themes, grouped using NVivo.

**Table 4.1. Key themes arising from interviews and their potential importance.**

Theme	Potential importance
<b>Ecological threshold: vulnerability</b>	Participants’ understanding of system state ecological vulnerability, and values regarding its importance, may determine ecological thresholds and ‘no-go’ areas. Ecological thresholds may determine institutionalised, regulatory thresholds (e.g. protected areas).

<b>Ecological threshold: replaceability</b>	Participants' understanding of system state ecological replaceability and values regarding its importance may determine ecological thresholds, and practical thresholds – the possibility of adequately compensating for losses. Ecological thresholds may determine institutionalised, regulatory thresholds (e.g. protected areas).
<b>System state knowledge</b>	Knowledge thresholds limit understanding of the system state and ability to change it.
<b>Regulatory thresholds: protected areas</b>	Participants' understanding of system state regulatory thresholds and their perceived effectiveness in different contexts may inform discussion on political thresholds and power dynamics.
<b>Contextual differences</b>	Various unique implications for offset design and implementation.
<b>Measurement and valuation thresholds</b>	Underlying values, contextual differences and understanding of system state will determine participants opinions on what should be measured. These thresholds determine compensation type, what exactly is compensated for, and inform challenges arising.
<b>Thought experiment</b>	Encourages shift in participant's positionality and reflection on valuation thresholds; may reveal value fluctuations and 'multiple identities' (Haraway 1991).
<b>Compensation type: 'like-for-like'</b>	Differing opinions regarding compensation type reveal a wide range of values which determine participant's perception of what the goals of offsetting should be.
<b>Compensation type: 'like-for-non-like'</b>	Differing opinions regarding compensation type reveal a wide range of values which determine participant's perception of what the goals of offsetting should be.

The following section discusses these themes in detail.

## 4.2. Ecological Thresholds

### 4.2.1. Vulnerability

There was general agreement that vulnerable species or habitats should not be offset. Some gave specific figures; an Australian conservationist (20) stated:

*'Once you get beyond a certain threshold [of vegetation degradation] whether it is 80%, 90%, 95% y'know to some extent that's a value judgement, but once you get beyond that threshold I would say offsetting, that shouldn't be allowed at all'.*

In some legislation this is enshrined, for example Defra have categories of high, medium, and low distinctiveness, which determine compensation required. A participant who designed Defra's metric (5) said:

*'[They initially] had this concept of a very high category as well [which] was those habitats for which under BAP targets there'd been a target of 'no loss', not 'no net loss', but 'no loss'.*

Some business-oriented participants took an economic angle, stating that where biodiversity damage was great, the cost of offsetting would be too high to allow developments to continue, whilst many NGO representatives thought high costs were not a great enough incentive for avoidance.

Deciding spatial scales of vulnerability was often considered challenging. One consultant (3) stated:

*'Within the Thames estuary there's a lot of salt marsh, and I think having more in one place and less in another is an acceptable sort of cost'.*

A BBOP NGO advisor (16) highlighted that what seems ecologically offsettable from a global distribution perspective may not be locally in terms of function or community value.

Ecologically vulnerable species/habitat may also need utility or charisma. (20) highlighted this:

*'Most of the year [offsets] just look like a field of dead grass' so there's been some community resistance to them because of snakes, essential burning causing smoke, and lack of public access; 'probably a lot of the residents would prefer if the grassland was just turned in to a sports zone or something they could utilise'.*

#### **4.2.2. Replaceability**

Ecological replaceability was also important. Eight participants explicitly mentioned you could not offset species extinctions, although there was much debate over measurement thresholds;

*'The house that I've built here in Melbourne and the house that you're living in in the UK have probably caused extinction of some organism because of some situation'.* (21)

Particular 'irreplaceable' habitats mentioned were Alliance for Zero Extinction (AZE) sites, habitat types protected under legislation such as ancient woodland (mentioned by seven participants) or particular sites such as Special Areas of Conservation (SAC) and Special Protection Areas (SPA) sites like the Severn estuary (3,5,18). Many participants stressed that protected habitats are nonetheless often impacted (discussed under 'regulatory thresholds'). For example in NZ:

*'[the] economic power of the coal industry [means the government] 'isn't prepared to step in'.* (24)

An NGO with experience of advising upon UK legislative offsetting (13) stressed they had never seen the principle of irreplaceability *'bite in reality'*. A quarry manager (7) felt protecting irreplaceable habitats may be inefficient; if surrounded by development the money could be *'better spent elsewhere'*.

Many conservationists recognised that physical replaceability is rarely known, whereas some such as an offsetting broker (1) felt many habitats such as secondary semi-natural woodland or many wetlands were replaceable, but recreating conditions was challenging. He mentioned the time taken to reach replaceability was factored in to the UK metric, so a long time-scale of replaceability would require large multipliers, making offsetting *'prohibitively expensive'*.

Some felt regardless of replaceability or vulnerability some large ecosystems *'just need to be left alone'* like the Arctic (21) or Antarctic (14).

An academic geographer (19) stressed replaceability could never be achieved by offsetting:

*'Because you can't equate the two. A loss is still there, there are still things that were lost'.*

Replaceability does not just encompass replacing physical features, but also values and relationships (discussed later under 'positionality').

### **4.3. Knowledge Thresholds**

Many recognised that baseline ecological knowledge was often limited. (8) attributed this to lack of experts to conduct surveys, whilst some conservationists attributed it to inadequate surveys themselves; a lack of appreciation of interconnections and complexity means *'we don't know the damage we're doing'*. A retailer (10) highlighted high costs of environmental assessments as disincentives. (8) suggested lack of knowledge should warrant avoiding habitats that are likely to have high vulnerability and endemism, such as virgin tropical rainforest.

However, paradoxically, lack of knowledge about damage limits the ability to be precautionary. This was outlined by the supply chain manager of a large retail company. Offsets would only be possible for them if they could establish exactly where their impact was greatest, which means mapping their footprint. But:

*'The challenge is very often those areas where you know your impact is great are also those where the transparency of the supply chains are most constricted'.* (10)

Time constrictions of companies may also limit knowledge about damage, hindering the ability to be precautionary; one NGO (17) outlined they were under pressure to conduct a baseline plant survey for a mining offset but it was the dry season so plants were unidentifiable. The project went ahead and they do not know what exactly was lost.

### **4.4. Regulatory thresholds: protected areas**

Whilst a governmental ecologist felt legal status was adequate protection because *'it's against [EU] policy'*, many noted that in reality this would not prevent development:

*'If High Speed 2 comes along and your woodland's in the way, well, y'know, the reality is that your woodland's going to get trashed'* (a former designer of the UK metric; 5).

A Bristol Port Company development on the Severn Estuary for example has been granted permission provided it compensates. In the EU, overriding legislation is justified on grounds of *'overriding public interest'*.

An NGO with substantial experience in international offsetting (14) claimed:

*'Resource extraction takes priority over any other activity, and then no land is sacred in most parts of the world... I'm all for 'no go' zones but it's not a concept that's even vaguely part of either a company or a government's vocabulary, it's all compromise'.*

One case study frequently mentioned was uranium mining in Namibia, a country with a policy about the coexistence of mining in protected areas (14). Many African countries were outlined as under significant pressure from large multinational companies:

*'Some have explicit policies on coexistence; others just turn a blind eye or remove boundaries'*. (14)

Many felt protected area status warranted avoidance:

*'Once areas have been protected then that's precisely what they should be, protected areas'*. (8)

Others allowed more flexibility. One consultant stated that if a small degraded portion of a protected area was sold to a coal mine and as a consequence the remainder could be funded, that could arguably be justified; *'I don't think you can necessarily make black and white rules on these things'* (2). A similar case was made by (16) but he stressed *'it's an area one has to be particularly cautious of'*. (8) said *'decisions clearly have to be made on what a sufficient amount of protected area is'*, and this should be done at the global scale.

A UK conservationist outlined that funding protected area improvement using offsets would not be justified here because *'we've battered everything else so much that [protected areas] are the best bits'* (13); hence there is little scope for enhancing value.

The cost of maintaining protected areas was often outlined as inadequately accounted for. This however was not always considered a justified rationale; one NGO (13) saw it as a separate legal obligation to manage and restore them. An academic geographer (19) made the following analogy:

*'I don't think I would see it as a good argument if you decide to cut the Dartmoor national park in half because Devon county council doesn't have enough money to pay for it... it's not justified. Let's close half the libraries and sell them off for casinos so the other half are better managed... well you think actually that isn't right we want the libraries, and I see the same about biodiversity - it's not justified; it may be a necessary cynical decision but only because in this instance the state has established a reserve network that it doesn't have the revenue and the capacity to manage'*.

Often however, protected areas have valid mineral planning permission sitting on them. The director of a UK quarrying company (7) said in the UK, mineral operators are under no legal obligations to revoke historic permits but may if offered financial incentives or new land. He felt *'planning permission does come first'*, but that:

*'Ultimately... the world needs some of these old permissions to be revoked... it will cost the public money but at the end of the day the public will have to pay for safeguarding its protected landscapes'*.

A US wetland regulator (22) outlined that agencies operating protected areas often sell extractive permits to mining companies.

Many companies such as Rio Tinto and Shell have signed a commitment to avoid World Heritage Areas, which have the most robust system for identifying, designating and protecting them (21).

An apparently popular argument encountered by an NGO's partnership manager (14) is to refer to company reputation and say:

*"'Wouldn't you rather it was us than some" well, the classic one is "some nasty Chinese company"... it's a strange game'*.

Offsets themselves can be cordoned off as protected areas. One mining company (21) stated they had an operation in Australia whereby ‘*the way the operation was created it basically just re-drew the boundaries*’. Some were sceptical about such activities being branded additional; ‘*you’ve still got a net loss in that situation*’ (13) and some said it would be additional conditional to reducing other systemic threats in the area (12, 19).

A complication of this may be existing planning permits on the offset area, which raises doubts about the long term viability of this solution (12) and can cause political tension between competing government ministries (14). An Australian academic outlined such solutions can lead to having to ‘*offset the offset*’, which is a ‘*pretty dangerous slope*’.

#### 4.5. Contextual differences

Contextual differences were often the stated reasons for limits. Many participants mentioned contextual characteristics of countries that had implications for the design and/or implementation of current or future offset schemes (**Table 4.2**). Given the number of UK participants, UK contextual characteristics feature disproportionately.

**Table 4.2. Contextual characteristics of different countries and the implications of these towards offset program design and/or implementation that were stated during interview.**

Country	Context type	Implications mentioned
UK	Physical geography	<ul style="list-style-type: none"> <li>• Lots of coastline; many major estuaries protected. (5). Many developments for ‘reasons of overriding public interest’ requiring compensation are port developments/flood risk management (3/4). Compensation done by Environment Agency but not called offsets (3). Cost of not maintaining flood defences would be enormous to society (3).</li> </ul>
	Economic context	<ul style="list-style-type: none"> <li>• Development pressures and land prices high in South East and low in North. Could lead to ‘exporting’ of biodiversity. (18) stated this would break the link between habitats and local communities. Natural England’s view is ‘it should be happening in a local authority area’ (5).</li> <li>• Many section 106 agreements never happen because there’s no funds for adequate management/monitoring (18).</li> <li>• Historic mining and quarrying rights exist on protected areas that local councils may not be able to afford to revoke (7).</li> <li>• Intention is to design offset system without barriers to it becoming a habitat banking market, and when offset volume becomes big enough, habitat banking becomes efficient (3).</li> </ul>
	Ecological context	<ul style="list-style-type: none"> <li>• Much development is on lower biodiversity value land; may be easier to find suitable offset habitats (16, 5).</li> <li>• Cumulative effect of impacts to low/ medium-distinctiveness habitat will impact lack of green space. (5).</li> <li>• Most habitat is agricultural to some extent hence a complicated system for measuring detailed pristine ecology was unnecessary (5);</li> <li>• Compensation currently located poorly, ‘unloved and unconnected’. Should sign up to principles of Lawton review that habitats should be better, bigger and more joined up (5), so species can move ‘from John O’ Goats to Lands End and vice versa if they need to’ (4).</li> </ul>
	Political context	<ul style="list-style-type: none"> <li>• Present government trying to alleviate environmental constraints on development (12).</li> <li>• Drive to localism. Local authorities currently decide offsets. This may confuse developers who cross large geographic boundaries. Conflict between local, flexible standards, and national consistency (13).</li> </ul>

		<ul style="list-style-type: none"> <li>• Stable government makes ‘in perpetuity’ protection more realistic (8).</li> <li>• Not clear on what it is we want offsets to do (13).</li> <li>• Already in EU legislation to restore species and habitats to favourable levels; are offsets meant to reach beyond this requirement? (13).</li> <li>• Existing legislation in place may be best way of dealing with pristine habitats (5).</li> <li>• Compensation is currently responsibility of planning departments who often are not ecologically skilled (18).</li> </ul>
US	Physical Geography	<ul style="list-style-type: none"> <li>• Large country, so ‘mitigation banks’ (offsets) not evenly distributed; concentrated in areas with most wetlands and streams (22).</li> <li>• Rule that wetland mitigation should be within watershed – the obvious geographic boundary. This can conflict with political boundaries (22)</li> </ul>
	Ecological context	<ul style="list-style-type: none"> <li>• Long history of stream channelization, conversion and filling, wetland drainage, wetland filling and vegetation removal; needed addressing,. Many ecological functions can be restored, but it’s ‘not a panacea or a quick fix’ and requires real commitment (22).</li> </ul>
	Program design	<ul style="list-style-type: none"> <li>• Species banking offsets often actually averted risk; protecting areas with species already there (13).</li> <li>• CWA 404 drives wetland banking. The only reason credits are bought is government regulations (22).</li> <li>• Wetland banking may have seen a ‘29% increase over the last 20 years in the area of wetlands compared to what was lost’ but it is a net loss because it’s poor quality (13).</li> <li>• Independent experts in 2001 declared wetland banking failing to meet its goals (22); a ‘model set up with the best intentions that never quite got to a flourishing stage’ (14).</li> </ul>
	Political context	<ul style="list-style-type: none"> <li>• Many municipalities passing laws for offsets to occur within county or township boundaries; limits options for permit applicants (22).</li> <li>• Conservation Easements are development rights purchased from private landowners to prevent development. But mineral rights on the same property are senior (23).</li> <li>• Agriculture, silviculture and ranching activities not regulated like other activities (‘perhaps because they have a very large lobby’) (22).</li> </ul>
Australia	Ecological context	<ul style="list-style-type: none"> <li>• A lot of degraded native vegetation (5)</li> <li>• Native grassland has a ‘charisma problem’ – people don’t care for it to be offset nearby (20).</li> <li>• Queensland government is the only place marine offsetting is enshrined (2).</li> </ul>
	Program design	<ul style="list-style-type: none"> <li>• Ecosystems over 90% / 99% destroyed can be developed and have offsets implemented on that last 1% (20).</li> <li>• Trading up allowed as long as the ecological community protected is more threatened (20).</li> <li>• Does not take account of time lags (5).</li> <li>• In perpetuity management means developer pays for ten years then local councils take over. Councils often have limited resources for existing conservation areas (20).</li> <li>• Program’s reduced total impact in terms of slowing development and making it more expensive. Offsets provide gains that would not have otherwise occurred (20).</li> </ul>
	Political context	<ul style="list-style-type: none"> <li>• Under federal threatened species legislation, decisions now made on a larger scale. Lines drawn on maps to decide where species and development will go. Sometimes lines are impacted, but it’s a more strategic method (20).</li> <li>• Programs involve large amount of government input. Now handing some work over to private sector and consultants. (5)</li> </ul>
NZ	Ecological context	<ul style="list-style-type: none"> <li>• Pervasive problem of invasive plants and animals (24).</li> </ul>
	Political context	<ul style="list-style-type: none"> <li>• Resource Management Act requires regulatory authorities to balance impacts against economic and social gains from the project. Impacts focus particularly on landscape, and indigenous biodiversity (24).</li> <li>• Emphasis on visual landscape influences legislation e.g. in South Island you cannot</li> </ul>

		<p>put plantation forests above 900m or develop close to coastlines for landscape reasons (24).</p> <ul style="list-style-type: none"> <li>• Not enough government money to fund invasive control. Offset funding can control this. If it just sets aside areas that then get affected by invasives, there are no gains (24).</li> </ul>
	Social context	<ul style="list-style-type: none"> <li>• Low population density so a most big development projects don't have direct social impacts (24).</li> <li>• Impacts usually landscape or recreational and benefits usually put up in terms of jobs etc. (24)</li> </ul>
	Economic context	<ul style="list-style-type: none"> <li>• Coal has high value in NZ economy so coal industry is powerful and may impact vulnerable/irreplaceable habitat (24).</li> </ul>

This table highlights the influence of national differences in determining design features and contextual challenges encountered. For example in the UK, a simple scheme was considered adequate because enforced legislation to protect more pristine areas means development usually occurs on 'lower biodiversity value', largely agricultural land (5, 16). The US required a wetland scheme to address their long history of wetland damage (22), Australia required a complex native vegetation scheme (20), and NZ needs to urgently address invasive species problems (24). Such contextual differences may determine suitability of offsetting goals.

Political context was also regarded important; the current UK government's simplification of the planning system was highlighted. One participant (18) was concerned that land prices in the South-East would make it more economically efficient to locate offsets elsewhere, which may conflict with community interests and governmental 'drive to localism'. Conflicts of interest in choosing locations were experienced by (22).

Prevailing political values may underlie institutionalised goals of offsetting schemes; in NZ for example there is large aesthetic emphasis on visual landscape (24).

#### **4.6. Measurement and valuation thresholds: measuring biodiversity and its value**

What counts as 'biodiversity' and '*how far down the compensation pecking order you go*' was extensively discussed. An offset manager for a bird NGO (13) outlined that non-charismatic species such as invertebrates '*don't get as good a deal*'. A quarry manager (7) considered this inappropriate:

*'When someone builds their thousand home housing estate on a wheat field they say 'oh jolly good we got rid of a wheat field but there was no biodiversity value there'. Well yes there was, there were all those soil microorganisms and ten thousand years of soil formation processes...Offsetting does need to account for that'.*

A mining company executive (21) however claimed '*we need to see things through our own lens and our own lens is probably at the vertebrate level*'. An NGO (14) claimed charismatic species were '*easier to offset because they get support*'. Other NGOs mentioned this was not necessarily detrimental, for example tiger conservation in India is important because additional species, habitats and ecosystem services benefit (12).

One NGO manager involved in offset design (13) claimed we should focus on habitats or species of highest conservation concern otherwise it could apply to everything and become impractical. A

consultant (2) stressed the need for a *'suite of species or features... which whoever is doing it has all agreed are the most important'* and then *'you hope that you've got those things covered. You probably won't at some point, but one would hope that you've got most'*. For example, the use of 'habitat hectares' was explained as an *'approximation'* by a developer of the UK metric (5) who said they were like indicator species:

*'We measure them because it's easy to measure one species and we hope that everything else that's associated with them is there'*.

He stressed there was not money or resources to manage individual components, so we should be managing habitats with space for species within them.

One international NGO employee (23) stressed contextual differences; the tropics have high endemism compared to temperate environments so accurate measurement is more important. However these places often have fewer resources to account for that accuracy. Another international NGO employee (14) stressed that often governments in developing countries care primarily about functions to humans. In line with Castree (2003)'s *'functional fallacy'*, focusing on offsetting species and habitats meant process and functions were lost and there were trade-offs between high biodiversity or charismatic species, and high ecological function;

*'You may lose something for the benefit of something else, and who's to say what's more important?'*

She believes an additional BBOP principle incorporating ecological function could be useful for strengthening the business/policy case to protect functionally important habitat.

Many people mentioned cultural values and the difficulty of measuring these:

*'Why's this particular tree, that tree on the hill important to a local community? Well it might be just because they believed for generations that it's important. How do you then put that in the metrics around science? Well you can't.'* (21)

A member of a Wildlife Trust (18) feared that attempting to quantify nature's value may *'build in its own destruction'* because at some point it would become more economically valuable to develop than protect. A sceptical marketing manager (6) outlined that values change over time, according to positionality such as how far away you live, or with the seasons. The detrimental influence of seasonal value fluctuations was demonstrated in (17)'s baseline plant survey: *'it was the dry season and everything was dead'*, so they *'weren't really able to identify the plants that might have been important'*.

Not everybody recognised such trade-offs. A business-director of a charity established by an oil and gas company (11) thought complexity was insignificant and there was no reason biodiversity could not be traded like carbon. (6), who has researched public perceptions of offsets, however, felt no methodology could adequately measure biodiversity damage and prepare an equivalent without a degree of contraction in accuracy. He felt biodiversity value was beyond measurement:

*'I could put a value on anybody's partner whether it's male or female, I could say OK they provide you with, they help out with, say, a man's wife helps out with ferrying the kids, helps out with bringing them up, does some cleaning, decorating, dusting, cooking. I could hire in all those services and I could put a value on your partner. Now would you sell him or her? Clearly you*

wouldn't, because people are worth more than that. They're not a monetary value. And I believe that people evaluate green space and countryside and the environment in a similar way. It's not something that a price can be put on'.

He felt the evaluative tools needed could never be there, without significant financing and research in to human values, and even if such figures could be derived it would not be clear how to use them in societal decisions.

#### **4.7. Positionality**

Although not explicitly stated by participants, the thought experiment revealed values were not as measurable, nor replaceability as scientifically determinable, as many initially expressed. When asked about the hypothetical development of an area they had an attachment to, fairly consistent results were found (Appendix **Table 7.2**). Unfortunately 3 participants did not complete the thought experiment due to interview time constrictions (10, 21, 22).

Results show that when offsetting was suggested for somewhere they cared about, most people strongly felt they would fight the development, and that offsets in the first instance would not make them feel better. Most said offsets would be better than nothing, and had certain conditions to be adhered to, such as '*close by and of similar quality*' (13, 18) or '*if globally the gains were bigger than the losses*' (8, 2, 4). Only one, business-oriented participant (11), immediately stated offsets would make them feel better.

Some mentioned they '*wore different hats*' and could analyse the situation differently, which demonstrates Haraway's notion of 'multiple identities' (1991). Many said they would '*put their emotion aside*' or accept it as '*tough luck*', highlighting there are winners and losers in environmental decision-making (Brockington *et al.* 2008), and that individual-personal values may lose out to national-economic.

Whilst one policy officer (17) highlighted '*there should be measures to compensate for that loss to people*', others stressed that a new place created would feel '*meaningless*' and they would not utilise it. As Hannis & Sullivan (2012) notes, by placing fungibility at the core of biodiversity policy, offsets '*cannot, by definition, recognise or preserve the value of specific relationships between human individuals and communities, their local landscapes, and their real non-human neighbours*'.

One consultant (2) referred to the thought experiment as a '*reality check*'. His comments imply that the perceived fungibility of nature overshadows individual attachments to places, and this has been institutionalised in his professional environment:

*'That was very useful for me to do actually, it's funny how with work sometimes I kind of have to shoulder off guilt working with major international corporations, but fifteen years ago I'd have been outside them with placards. I think taking a step back every so often I think it's important for me to get a reality check.'*

#### **4.8. Compensation type**

##### **4.8.1. 'Like-for-like'**

There was general consensus that restoring habitats to favourable enough conditions to equate the habitat lost was fraught with uncertainties. Environmental consultants tended to be more confident but still noted that offsetting's '*never 100% complete*' (3). (23) mentioned restoration was easier in temperate environments due to lower endemicity. Others mentioned the scale of impact determined the limits of like-for-like compensation. For example, in reference to a hydroelectric dam:

*'You can't just build another valley that doesn't have anything else living there... and what are the credits going to be? ... and how are you possibly going to spend them if you haven't got the space to do it?'* (9)

(13) mentioned it's too early to know whether restoration works, and that we will continue to '*refine our view of what like-for-like actually is in reality*'. A marketing manager (6) however had little faith:

*'I don't see any evidence that we're as skilled [at evaluating and managing natural environments] as we'd like to pretend'*.

A wetland banking regulator (22) highlighted that restoration success was very region-specific; a lot of it was trial and error, with a '*long flat learning curve*' and after 35 years they are still struggling:

*'We should encourage the science and practice of ecosystem restoration... but I cannot sell it as easy, or a quick fix, or a panacea, or something that does not involve a real commitment to oversight'*.

(19) felt before agreeing to restoration as compensation we need to ask '*have we done it before? And what was the evidence that it worked before?*' He said whilst the uneducated probably would not notice relative biological differences of new-growth woodland, ecologists would recognize differences in a thousand years time, and was therefore surprised by ecological enthusiasm for offsetting.

Like-for-like offsetting encounters trade-offs. By attempting to replace elements, site-specificities can result in fragmented offsets. Replacing lost functions or processes, however, requires connectivity, '*so you may lose out on something even though you've managed to do a like-for-like offset*' (14; Castree 2003's 'functional fallacy'). A wetlands regulator (22) outlined replacing wetland functions and community value within the same watershed, alongside securing the future viability of the offset was challenging, because '*you don't want to put your offset right in the middle of a lot of development – it will threaten it*'. These are '*tough competing goals to harmonise*'.

#### **4.8.2. 'Like-for-non-like'**

Many participants were in favour of 'trading up'; whereby instead of attempting to counter the elements lost, the funding focuses on something of higher conservation priority; offsetting '*apples with pears rather than more apples*' (7).

For example, (24) highlighted the crucial role that offsets could play in funding invasive species control in NZ. Many emphasised that compensation must have obvious conservation value and could not be a '*visitor centre*', for example (13).

The spatial scale of the trade was often mentioned:

*'I think many people here would be persuaded to allow an acre of heathland to be developed if 10,000 square miles of rainforest was going to be protected'.(8)*

Others were sceptical about this. For example with regards to carbon offset programmes:

*'Where the impacts are happening in one country and the offsets are a world away - are they real? Who's looking at them? Do we even know that wherever the money is going to is a legitimate project?'* (22)

Others mentioned trading like-for-non-like may be beneficial because like-for-like is difficult to achieve. One offset broker (1) said:

*'You might find in fact it's very difficult to achieve like-for-like... so what you might want to do is have some multipliers in there, and go for a like-for-unlike but get much more of it, which is something that offsetting allows you to do'.*

Another consultant (3) outlined more flexible exchanges have economic benefits; strict like-for-like creates small markets for specific habitat types, making costs higher:

*'Whereas if you have trading up you actually connect those markets together and bigger markets work better from an economic point of view, and also ecologically in some respects'.*

This could however encourage a substitution of quality for quantity. Many others mentioned that in ecological terms large-scale landscape-level planning would be beneficial; that conservation should not occur on a site-by-site basis; we need a coordinated approach that links fragments together (23, 3, 10, 9, 14). It was only consultants who mentioned the economic benefits of this.

One sceptical participant (19) sees such trades as essentially exchanging habitat and species loss for money given to conservation, the funds of which could help recover a hunted primate population in a national park, for example:

*'How successful are anti-poaching patrols in stopping the loss of primates from forests? Can you actually deal with the root cause? Why is it that you're losing primates from this forest? People say 'oh well it's illegal hunting'. Well yes but it's illegal hunting, it's the size of the bush meat market which is urban driven, it's the nature of roads, it's corruption, it's inefficiency, it's lack of training, and even millions of pounds doesn't - these projects don't easily work. So you put a load of money in to an ant-poaching patrol and these projects struggle to work'.*

He said even if attempts to create new habitats with similar values to those lost are made, they would not benefit biodiversity:

*'It's like saying 'we're gunna take down Westminster Abbey but we're gunna build a really cool football stadium'... you might say 'well OK on balance... I never really liked Abbey as much and I quite like football stadiums, and on balance human capital will go to both, they're both kind of quasi-religious'. But at the end of the day it's not sensible to think that one replaces the other in any useful sense; one is a medieval something and the other is a modern something and they're not comparable unless you accept a kind of measure of utility, but that means you fly in the face of biodiversity'.*

## **Chapter 5.**

### **Discussion and concluding comments**

## 5. Discussion

This chapter analyses thematic findings chronologically in relation to background literature (**Questions 1 and 2**). The importance of spatial and temporal frames of reference and power relationships in determining values and institutionalised thresholds is then discussed. This is expanded upon with thoughts that developed regarding the potential of biodiversity offsetting as a conservation tool (**Question 3**) and key areas for clarification and further study.

### 5.1. System state

The results outline participants' ontological understandings of the system state and the perceived importance of actions regarding it. High ecological vulnerability was regarded an important determinant of avoidance and is often institutionalised in legislation; something which business-oriented participants stated would be reflected by high market prices. Others highlighted taken alone this cannot reflect social desirability and other important values must be considered such as recreational utility and charisma (20). Likewise, low ecological vulnerability did not negate offsetability; local functions and community values were important considerations. Thresholds of ecological replaceability were often mentioned a challenge for 'like-for-like' offsetting, and most participants stressed knowledge limits regarding this.

Many participants illustrated ways in which institutionalised ecological thresholds are overridden by political interests, where the economic bottom-line encourages resource developments within protected areas (uranium mining in Namibia, historic quarrying permits in the UK). Even in the EU this occurs on grounds of 'overriding public interest', revealing an assumption that public interest in economic growth supersedes that of conservation.

### 5.2. Measurement and valuation thresholds

The divergence of opinions regarding what should or should not be compensated for raises doubts about the suitability of the term 'biodiversity' offsets. Biodiversity is so complex that to accurately offset all biodiversity in a system would be 'impractical', requiring prohibitive amounts of expertise, resources, skills and finance, and still the outcomes would be uncertain (Bekessey *et al.* 2010). The use of proxies as representative of biodiversity was often regarded acceptable, but is fundamentally reductionist. What is measured in each context is what is considered important to measure. Opinions on suitable proxies varied depending on values, from charismatic species, to vertebrates, to indicator species, to habitat types, to habitat functions to community values.

In a fractal-like conundrum, when undertaking biodiversity surveys, the more that is measured, the more will be found, but the longer it will take, the more expensive it will cost, and the harder it will be to measure success. There is therefore a trade-off between measurement 'resolution' and the ease of 'success' in achieving the stated goals; the desire for success may therefore influence simplifications of the impact.

Measuring everything may be 'impractical' for an offset scheme, but it would be beneficial for biodiversity for three reasons. Firstly, as Walker *et al.* (2009) outline; 'in any exchange a characteristic not counted is protected only by chance which facilitates its loss'. Secondly, it would do justice to the name 'biodiversity' offsets. Thirdly, it would incentivise keeping offsetting 'a last resort'. If it is made more practical it will simultaneously become less ecologically robust and more widely utilised. This would not safeguard biodiversity.

Biodiversity's value measurability and interchangeability was more readily assumed by those who prioritise economic values:

*'[Offsetting] puts a value to something right, that people haven't appreciated in the past. And once you start putting a value then people start appreciating it a bit more'. (11)*

This implies that if you cannot delineate or quantify something it cannot be accounted for in an offset, but this does not denote unimportance. As Hirsch *et al.* (2011) outline, defining problems in terms of trade-offs strengthens the assumption that everything can be traded off;

*'If it's gonna have an impact socially you can offset that in some way by getting investment in to social capital, and corporates who we work with are quite interested in that'. (1)*

Many participants implicitly revealed via the thought experiment that metrics could never capture certain aspects of biodiversity. Ecological replaceability does not determine value replaceability; 'specific connections' between people and places are always lost (Hannis & Sullivan 2012); a 'sense of place' is always lost. Any offsetting program must decide whether the inevitable decline of such attachment matters in the long run.

### **5.3. Compensation Type**

'Like-for-like' offsetting rests upon the agreed 'establishment of [conceptual and physical] boundaries which are difficult if impossible to draw' (Castree 2003), and the attempted replacement of elements within such boundaries elsewhere to the same quantity and quality, without a degree of contract in value. Most participants recognised the inherent difficulties, and many were in favour of 'like-for-non-like' exchanges. Some were sceptical and felt only 'like-for-like' could be called an offset, and that 'like-for-non-like' is essentially financial compensation. An economist stressed the economic benefits of 'like-for-non-like' exchanges.

The use of multipliers in such exchanges, for example the 'trading up' of habitat types, assumes the interchangeability of quantitative and qualitative values, which may have a homogenising effect on biodiversity. Further research needs to be undertaken to address whether that would be beneficial ecologically, or just economically because it creates bigger markets. There is also a risk that if 'like-for-non-like' exchanges are allowed, replaceability of the impacted habitat would no longer matter as much.

Some NGO members highlighted the problematic high value of charismatics; that *'some things were easier to offset because they get support'* (14). In a circular logic however, public desire for charismatics is reinforced by the niche nature of NGOs. One bird NGO representative (12) stated *'the lion is a very powerful tool'*. But using flagships to breed aesthetic, romantic, appreciations of nature may detract from wider appreciation of the functional importance of protecting (and offsetting) other 'ecosystem services', and undermine the scientific bases of conservation. It may take soils to become permanently degraded, for conservationists to realise their oversight in considering it 'appropriate' to only offset what was symbolic and practical. Further research could elaborate on this symbolic/functional interplay, and its implications for offsetting.

As Salzman & Ruhl (2000) point out, offsetting may not capture 'what we care about'. But do we even know what we care about? As this research demonstrates, values fluctuate and may

simultaneously coexist and conflict; which ones we choose to project may depend on which ‘hat’ we are wearing. In the thought experiment, for many conservationists, the analytical/realistic/scientific ‘hat’ overruled the personal/emotional (2, 12, 15, 16, 23). To address these trade-offs, the goals of offsetting programmes must be explicit about which types of value may be captured and which may be lost, and there ought to be public consent regarding this.

#### 5.4. Spatial and temporal frames of reference

Most limits revolved around the spatial/temporal scales of the decision-making, which ultimately determines the values captured. Offsetting materialises a fallacy that if you cannot measure something it’s not important, so the spatial/temporal scale at which biodiversity is measured determines its fate. For example (17)’s plant survey illustrates that environmental values fluctuate, and the temporal baseline taken at a low-value period resulted in the ‘freezing’ of that fluctuation at low-value, and the prevention of potentially higher values being captured. Another NGO (14) mentioned the recently recognised interconnectivity of large-scale ecosystems, previously regarded discrete. This means *‘we don’t know the damage we’re doing, and no-one’s being precautionary’*.

The spatial/temporal scale at which damage is measured is also fundamental. By focusing on visible, immediate, stand-alone impacts; one ‘snapshot’ of a supply and demand network, scattered or subsequent effects are ignored. Many NGO members with practical experience implementing international projects mentioned knock-on effects, for example the building of roads through offset habitats. Such effects are intangible, unpredictable and not regarded the responsibility of original developers. So at what spatial/temporal scale should the damage be measured? This depends on what is considered to be driving the damage. Whilst some participants felt offsetting did address the root cause, many did not, and others felt it depends on your temporal frame:

*‘If you consider the cause to be our demand for products... the demand that is ultimately having the impact on biodiversity, then yes it’s addressing the symptoms. But if you look at the cause being the actual people who are responsible for it, then I would say it’s not quite so clear cut because it’s actually trying to work with those people to bring them to understand the impacts of their actions and how to minimise them. And in that respect you could say that it’s actually working to address the cause... It depends on how far back you look at it.’ (16)*

It suits the capitalist model to view offsets as addressing the root cause, because doing so naturalises economic growth and environmental destruction as unavoidable. However, sustainability must be defined for a complete system and not for its component parts (Elkington 1999).

The spatial scale or place at which the environment most benefits depends on ecological context, and many participants were keen to outline contextual differences (**Table 4.2**). (8) said he would happily sacrifice a loss of somewhere personally important if a significant amount of rainforest was protected. Trades on this scale may seem ecologically beneficial globally but are not locally. They are also not socially equitable; it is essentially the privatisation of distant public resources (Brockington *et al.* 2008). Small-scale ecological thresholds were often outlined as important but rarely known:

*'It comes back to systems... do we need to spend enough time to understand what the invertebrates or fungi do within a system, to actually say 'getting rid of this you're going to cause a collapse in the system'? I think we do but who has the patience? And certainly business won't have the patience to wait for that'. (14)*

The spatial scale or place at which the offset might be most viable was discussed as dependent on:

- Economic uncertainties: estimating future development patterns (e.g. UK land price differences may lead to the 'exporting' of biodiversity from SE-NW);
- Ecological uncertainties: estimating future environmental conditions;
- Political uncertainties: estimating future governmental legislation (especially challenging in unstable political contexts).

The spatial scale or place at which people feel the benefits is also paramount. Akin with Castree (2003)'s 'spatial fallacy', there is a fundamental conflict between finding suitable offset locations economically, ecologically or politically, and finding offset locations that enable communities to feel compensated. These were outlined as 'tough competing goals to harmonise' by a wetland banking regulator (22). If the community loss is specific and intangible, no amount of compensation could replace this value.

Given these insights, it can be concluded that offsetting is all about resolution – the 'snapshot' in space, time and type that is regarded the appropriate one to take. This is what determines the values captured. So in practice, who gets to decide the appropriate spatial/temporal scale for measuring the damage? Who gets to decide the appropriate spatial/temporal scale and location of the compensation? And who gets to decide which type of processes, elements or values are present in the frame and which are absent? It is therefore not about what is or is not appropriate *per se*, but about who has the power to make and enforce those decisions.

### **5.5. How level is the playing field?**

The majority of participants highlighted, explicitly or implicitly, that the playing field is not level. So who are the winners and losers?

*'You can put in as many management structures, or processes, or actions, or activities, or intentions as you like, but the government could come and say 'actually we've just approved another mine' or 'we want to put a railway line all the way through there, tough'.'. (14)*

*'Even though we were very clear with what we wanted, it struck me that it really wasn't an option for us to say 'please don't take down this mountain'.'. (17)*

It was widely recognised that governmental decisions overruled others and these tended to be based on the economic bottom-line. Predictably the more business-oriented participants were more pro-economic growth:

*'How can you use those market mechanisms to actually try to deliver what you want, which is basically economic prosperity, but do so in a way that doesn't throw the conservation baby out with the bath water?'. (21)*

Many conservationists saw little room for changing the economic bottom-line:

*'It isn't going to be possible certainly within the foreseeable future to reverse the, the way that global economics works'. (16)*

Naturalising the economic bottom-line strengthens the case for the apparent unavoidability of impacts, which legitimises compensation. Hannis & Sullivan (2012) assert this re-frames conservation as now taking place because of- and funded by- environmental destruction, which one participant described as ironic; *'like CocaCola funding an obesity campaign'* (19). Development dependency could come to obscure *'who decides what development, and what environmental damage is unavoidable where, and why'* (*ibid*).

Acceptance of the economic bottom-line can also enhance the acceptability of spatial and temporal uncertainties, for example that:

*'At some point a model will be found which will show that building that set of houses is more valuable in economic terms than holding on to that woodland or that bit of habitat'* (18).

Offset maintenance depends on the future financial security of the organisation, and the future importance of the offset for individuals within that organisation. But organisations change hands over time, and it might become devalued (17). Acceptance of the economic bottom-line makes devaluation scenarios acceptable.

Where does this leave conservationists? Do they accept the economic bottom-line and the corresponding rationality behind offsets, or not? This threshold between opposition and cooperation is significant. One conservation theorist outlined that:

*'By and large conservation organisations don't block waste pipes and protest anymore... local communities do... and the conservation organisations say 'don't worry we've got an offset, we've got it sorted'. That's the problem. We have become complicit with the destruction'. (19)*

One NGO said their role was to provide *'independent scientific advice'* to corporations, because destruction was unavoidable (17). Science is often regarded a-political (Law 2004; Demeritt 2001), but by this NGO making that political decision to accept the economic bottom-line, the decision to collaborate and give scientific advice is naturalised. The public tend to trust scientific decisions because they are regarded a-political, so this decision may lead to positive feedback in promoting the mainstream argument that economic destruction is unavoidable. This may jeopardise the reputation and undermine valuable work done by conservation organisations who share many of the same fundamental values as those who cooperate, but work to resist the economic bottom-line. This further polarises an already disjointed conservation landscape, leading to confusing conservation messages. Given that the organised few will be more powerful than the disorganised many (Olson 1965), polarisation reduces the overall power of the conservation agenda.

Further research could explore this hypothesis further, comparing NGOs who partner with large corporations to those who are more resistant, discussing their opinions regarding limits to offsetting, reasons behind their choice and their perception of its implications. Public perceptions could also be investigated. One limitation of this current study is that unfortunately no participants from more politically-active NGOs participated.

### **5.6. How do these findings inform discussions regarding the widespread applicability of biodiversity offsetting?**

These findings reveal that offsetting can never truly be biodiversity ‘replacement’; it is compensation of certain values using a particular ‘snapshot’ of biodiversity, in return for a particular spatial/temporal ‘snapshot’ of destruction, and therefore cannot be seen to quantitatively ‘balance’ destruction on a ‘virtual ledger’ (Brockington & Duffy 2010).

Justification for the terminology used is therefore urgently needed. The term ‘biodiversity’ offsets is misleading, so why are they framed as ‘biodiversity’ offsets? Furthermore, can ‘like-for-non-like’ trades really be considered ‘offsets?’ Further research ought to examine the reasons behind using this specific terminology and its implications.

Many participants outlined the goals of offsetting must be explicitly stated. What do ‘trading up’, ‘no net loss’, and ‘net gain’ actually mean? And according to whom? :

*‘A net gain in what? And when are we going to get a net gain?’... Offsets are about trading certain immediate loss with future gains that may be uncertain... so the net gain, if all goes to plan, will occur in ten years time or thirty years’ time, but y’know there’s so many uncertainties. That ‘net gain’ may not ever occur’. (20)*

Without clarification of such terms they may become ‘symbolic policies’ (Walker *et al.* 2009), masking the inherent difficulties in achieving them, and the values they dismiss.

Many conservationists saw biodiversity offsets as ‘*one tool in the tool box*’, but this could be a tool that undermines the power of and public support for the rest of the tool box. Similarly many regarded offsets as ‘better than nothing’. One critical academic outlined this was like shooting someone in the leg, offering them a wheel chair, and saying ‘oh well - it’s better than nothing’. He regards offsetting a clever strategy for blunting and re-directing the destructive effects of capitalism but that is all; they are not a preventative measure or long-term solution (19).

Offsets require huge amounts of resources to ensure their success, and even then there are countless practical challenges and uncertainties. A US wetland banking regulator outlined that it’s taken them 35 years ‘*to figure out what kinds of project really represent a meaningful offset and there’s still scientific debate; we’re still getting questioned on whether or not our wetland restoration projects are offsetting functions and services and impacts to wetlands*’ [vocal emphasis]. (22)

One participant saw offsets as epitomising a gap between the conceptual and the practical; a case where ‘*theory says if you could do 3 or 4 fundamental things then yes it would work. My contention is that the 3 or 4 fundamental things are impossible to do on any meaningful level*’. (6)

A few participants mentioned these conceptual-practical, and intention-action gaps:

*'This whole line of work is silly. I think it just err sort of, it's great fun, very abstract, very intellectual, keeps a whole army of researchers thinking and doing research, but it's more or less irrelevant in terms of the future of biodiversity I think'.* (19)

*'[conservationists] love having meetings and talking about concepts, they love developing papers, and they produce these papers, they produce these documents that seem to be an end in themselves, but for me that's just the first step'.* (12)

Could intellectual and financial resources be better spent tackling prevention rather than cure? There are limits to the current 'business-as-usual' scenario delivering environmental benefits in the long run (Igoe *et al.* 2010). Even the supply chain manager of a large retail organisation said we must eventually turn *'the American dream'* on its head, because:

*'There's a whole wide world out there of countries and regions and huge populations who are just beginning to go well actually I quite like the telly and y'know I want to buy ready meals too'.* (10)

One NGO member (14) felt the main issue is we don't see the effects of our consumption:

*'People don't make the connection between throwing a plastic bag away and the oil that it came from',* because *'the way we derive our livelihoods is no longer connected to the earth'.*

Offsetting does not address this major hindrance to environmental sustainability, rather it strengthens it by promoting 'the message that humans and nature are better off separate' (Hannis & Sullivan 2012).

As discussed, in-depth clarification on the initial policy objectives of offsetting and its implications is absolutely fundamental, as is clarification on the goals of conservation. (19) explained:

*'I think most people seem to have accepted that you'll end up with ten, somewhere between fifteen and twenty per cent of the world in reserves, and the rest is going to be trashed... and if that's what conservation's about, then offsets is quite a clever idea because if you can secure the funding for the best bits then let the rest go, that's OK. But you've got to have accepted that that's the model, that you expect a world...where the biodiverse pieces are quite small.'*(19)

As discussed, the conservation landscape is polarised even though many values and goals overlap. This is likely due to the influence of competitive neoliberal capitalism; every organisation must occupy a certain 'niche' in the donor market to receive funding. This neoliberal competitiveness works in a vicious circle by detracting vision from uniting goals and recognition of the system's fundamental contradictions (Igoe *et al.* 2010).

Many participants noted that large scale, cross-disciplinary visions were essential:

*'You need some kind of vision that everybody has a part to play in realising, both government, both development, civil society, both in terms of social value based civil society as well as biodiversity based... you need collaboration to realise these visions'.* (12)

*'We need post governmental collaboration in a way that's never really been seen. And we need to move on from boundary-based management and land ownership in the way that it's been perceived and we actually need to kind of go like well what do we need? We need food, we need fibre, we need fuel. How do we best use the land available within our planet to deliver these outputs in a way that actually meets the needs of the population?'* (10)

These visions however are unlikely to materialise under a neoliberal-capitalist economic model that prioritises competition and the ongoing commodification of new forms of value (Brockington *et al.* 2008).

## **5.7. Concluding comments**

This research has explored various conceptual thresholds held by people with regards to biodiversity offsetting, the factors influencing these limits, and the ways in which people with various engagements have experienced these limits conflict in reality.

Insights have been gained in to the personal, ecological, social, economic and political limits to offsetting as a conservation tool, and the importance of the chosen spatial/temporal frames of reference, which ultimately determines which values are captured.

Aside from specific insights regarding offsets, this project is an encouragement for conservation scientists and practitioners to reflect more thoroughly upon the context of their decision-making, the assumptions underlying their options, the values that each option captures or discards, and the wider implications of their choices.

Science does not operate within a vacuum, and mainstream ecologists, scientists and conservation organisations who engage with corporations are making a political decision to do so. It is a decision which has ecological, socio-economic and political implications and uncertainties operating over a wide range of spatial and temporal scales:

*"In the same way that y'know a bunch of colonial administrators thought they were being utterly impartial, when we look back on them and say 'no you weren't! You were complicit with an exploitative regime that was racist', and see well at the time they were decent people trying to do a really good job, as they saw it, and y'know, similarly with scientists they say 'we've thought about this very carefully, we've got various models, and this is the solution. This isn't political at all'. But it doesn't stop it being political, the fact that you don't wish to talk about the politics".* (19)

It is hoped this study provides interesting material to stimulate academic debate regarding the applicability of biodiversity offsets, and the implications of mainstream compensatory approaches to conservation.

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## **7. Appendix**

**Table 7.1. An overview of each participant's opinions regarding key factors that determine offsettability/applicability and the key challenges that need addressing.**

Ref	Current job description	Engagement with offsetting	Examples of applicability/offsettability	Examples of non-applicability/non-offsettability	Important factors mentioned	Key talking points and challenges	Notes	Country of residence	Stated 'Professional Perspective' – Business (B), Policy (P) or Conservation (C)	Educational Background
1	Chariman of a UK biodiversity offset broker.	Designing and implementing UK offsets for clients.	Residual impacts on SSSIs; Regional ports; Depends on Defra 'distinctiveness' and 'condition'; Many wetlands and secondary woodlands; Intensive farming.	Anything totally irreplaceable e.g. ancient woodland; Below that things you can replace but Defra multipliers would make prohibitively expensive.	EU Legislation; Scale of development; Land use types e.g. Greenfield /brownfield sites; Landscape level planning.	Fragmented conservation body creates a bad market for the model; Offsets should be compulsory; Should be offsetting intensive farming.	Trusts metrics and legislation; Strong preference for like-for-nonlike.	UK	B	Ecology
2	Principal Consultant, a UK biodiversity consultancy.	Designing and implementing UK offsets for clients.	Where it's a last resort; If not like for like, where globally the gains are better than the loss; Depends on the client and their policy.	Irreplaceable features e.g. AZE sites; Large scale impacts e.g. oil palm plantations or oil and gas mining.; Cannot offset everything – need to use biodiversity indicators.	Necessity e.g. mining companies may produce a net gain anyway; Political context – legal frameworks.	Government commitments; Economic bottom line; Room for abusing mitigation hierarchy – 'license to trash'; BBOP emphasises offset aspect too much; Goals of offsetting need to be clarified; Offsets need to become compulsory to ensure monitoring is affordable.	Offsetting must be a last resort; Recognises uneven playing field; Preference for like-for-nonlike so long as larger spatial scale benefits.	UK	C	Ecology
3	Business Development Director, a leading environmental economics consultancy	Managed a study on habitat banking and biodiversity finance for the European Commission. Designing and implementing UK offsets for clients.	Important habitat for public utility that's expensive to maintain e.g. intertidal areas; Where similar biodiversity functions and species can be replaced; Common habitats e.g. salt marsh in Thames estuary; Type of project – more scope where	Large scale damage to irreplaceable habitats e.g. Severn estuary; Where compensation isn't efficient in the long-term; Where timescales for replacement are long.	Cost; Long-term viability; Spatial planning to create bigger markets; Listening to stakeholders; Transparency; Policy objectives.	Like for like creates small markets with high costs. Trading up creates bigger, cheaper markets; Are areas really ever no-go to economic interests? Information must be transparently available – internet allows that; Policy objectives determine outcomes not economic instruments; Need agreed upon policy	Sees like for non-like essential for keeping costs down; Recognises uneven playing field.	UK	P	Envtl. Economics

			impacts are sustainable.			objectives.				
4	Principal Ecologist, a UK local planning authority	Designing and advising upon offsets for local implementation of UK government biodiversity offsetting scheme.	Where it's a last resort; Metrics will dictate; There will be 'martyrs' in certain places; Habitat-dependent. E.g. semi-improved grassland, developing scrub; Where offset contributes to larger landscape connectivity; Where impact contributes to global utility.	Protected landscapes e.g. SSSIs, SACs, Ramsar sites.	Legislation; Landscape level planning – connectivity; Engaging stakeholders.	Should be compulsory for all developments regardless of size; Process of financing projects needs to be decided.	Couldn't comment much on personal opinions given sensitivity; In UK believes metrics and legislation will dictate applicability.	UK	C/P	Ecology
5	Former scientific advisor to UK government	Designing policy and metric for UK government biodiversity offsetting scheme.	Only where it's a last resort; Habitats of 'lower distinctiveness' (Defra metric) e.g. arable fields/pony paddocks; Within local authority areas.	European protected sites; Major estuaries; Small, stand-alone offsets - Should be linked to large, planned systems; Cannot offset everything – need to use biodiversity indicators.	Policy differences - Simplicity of the metric; Political landscape; National ecological landscape e.g. UK has lots of agricultural habitats of 'low distinctiveness'; Landscape level planning.	Designing metrics proportional to habitats being dealt with; Need genuine contributions to conservation, not just recreation areas; Efficient spatial planning; Government commitment; It's a planning tool – only tackles one form of environmental damage.	Scheme design very important; Political and ecological context very important; Strong preference for effective spatial planning.	UK	C	Ecology
6	Interim Business Development Manager, a county Biodiversity Partnership	Contracted to research and advise upon offsets in the UK to a county Biodiversity Partnership.	N/A. You can't meaningfully equate the compensation with the loss. Not a good tool.	Anything where the compensation cannot be meaningfully equated with the loss. Where people are affected it won't be for them. Even where it's just biodiversity it	Practical methods of evaluating aren't there; Sense of place; Stakeholder satisfaction; Public opposition.	Completely alien concept to public; Biodiversity is priceless - valuing it economically is flawed; Deciding scale at which people feel the benefits; Impossibility of achieving fundamental principles; Playing field is not level;	Very sceptical; Does not regard places as interchangeable; Many conceptual flaws;	UK	B	Business

				cannot be done accurately.		Conservationists have become complicit with the destruction.	Community-focused; Recognises public disapproval; Recognises uneven playing field.			
7	Principal Landscape Manager, a UK quarry products company	No direct experience but interested in implications for the company.	Only where it's a last resort; Where there is valid mineral planning permission; Where it's easily recreatable e.g. calcareous grassland and butterfly habitat. Where all aspects are accounted for e.g. soil microorganisms.	Protected landscapes; Irreplaceable habitats. Although ancient woodland surrounded by development might be money better spent elsewhere. Where gains are produced anyway post-operation.	Cost; Replaceability; Necessity; Direction planning system is pushing.	Need some old planning permissions to be revoked; Making it cheap for companies; Doesn't tackle other human pressures e.g. population/need for food.	Believes many companies have positive impacts anyway; Ecological replaceability important; Concerned about cost to business; Government controls what companies do.	UK	B	Forestry
8	Managing Director, a UK water company	No direct experience but interested in implications for the company.	Where it's a last resort; Where habitat features can be recreated; Where somewhere important elsewhere benefits e.g. a large area of rainforest protected; Where ecological condition can be improved e.g. of degraded heathland.	Where gains are produced anyway; Where compensation is unimportant/artificial e.g. secondary woodland.	Recreating habitat features; Ecological value of compensation; Popularity of impacted species; Governance structures.	Baseline assessments require high expertise; Complexity of biodiversity; Global agreement on what a sufficient amount of protected area is.	Sceptical about expertise required; Believes many companies have positive impacts anyway; Sceptical about replaceability, sees like-for-nonlike important if large gains are made.	UK	B	Envtl. Science

9	Environment Adviser, a leading UK cooperative retailer	No direct experience but interested in implications for the company.	N/A. Very difficult to equate compensation with loss; Can be used to fund bigger and better coordinated conservation.	Anything where the compensation cannot be meaningfully equated with the loss; Irreplaceable habitats e.g. national parks in Africa; Where it's unnecessary – e.g. they're aiming to improve biodiversity on farmland.	Long term resilience of offset; Large scale benefits.	Recreating lost conditions, communities and resilience; Lack of space – can't just move pre-existing ecosystems/human developments; Ensuring additionality; NGOs reputations being diminished – changes what they once stood for.	Very sceptical about replaceability ; Practical challenges; Offsets often unnecessary; Like for non-like preference.	UK	All 3	Envtl. Technology
10	Sustainable Development Manager, a leading UK retailer	No direct experience but interested in implications for the company.	Where there's a business risk; Where standards are followed.	Where it's being used to validate an impact, e.g. to vulnerable species/protected areas.	Additionality; Cost; Good standards; Landscape level planning.	Mapping business footprint would be expensive and difficult; Certification limits traceability; High cost of baseline assessments; Uniting stakeholder values; Need post-governmental collaboration; Need NGO support; Challenging 'the American dream'	Regards it as essential for global sustainability ; Concerned about cost to business; Recognises financial and practical limitations from a retail perspective.	UK	B	Business
11	Business Director, a charity established by a multinational oil and gas company	No direct experience but interested in offsetting from a business perspective. Provided substantial funding to UK biodiversity offset broker in 2011.	Widely applicable where methodologies for monetising biodiversity are robust.	Where damage is so large that economic cost of offsetting is too high.	Robust legal system; Additionality; Cost; Long term management; Role of intermediaries e.g. Environment Bank Land rights Standards.	Need robust methodologies for monetising biodiversity; Need long-term management; Need clear land rights; Need favourable governance structures e.g. in India land rights disputes can take years.	Sees market as determining no-go; Sees consultancy role as paramount; Recognises contextual challenges. Mainstream	UK	B	Business

							approach.			
12	Programme Manager of an NGO-Corporate Partnership, an international bird conservation NGO	Designing and implementing offsets for an international mining company.	Where it's a last resort; Wherever there's a net residual negative impact on biodiversity; Where a degraded system can be addressed.	Sites with high intrinsic values, but also the site's value in a wider context e.g. highway through Serengeti will change it and cause irreversible secondary damage; Unique sites e.g. AZE sites	Ecological and evolutionary constraints; Compliance environment; Adherence to BBOP principles; Landscape level planning; Must be managed to 'favourable condition'; Capacity to determine irreplaceability and vulnerability, and political will to support.	Definition of 'offset' Need good systems of environmental governance; Competing government ministries; Need a level playing field; Ensuring additionality; Addressing secondary impacts; Importance of flagships; Conservation sector narrow-minded, not visionary enough – need collaboration; Policies can become ideologies – need more flexibility; Little follow through between conservation research and action.	Recognises multiple conceptual, practical and contextual challenges; Recognises uneven playing field.	UK	C	Ecology
13	Head of Site Conservation Policy, a UK bird conservation NGO	Advising upon compensation or offset proposals triggered by UK legislation.	Where projects are in national economic interest; Where proxy for biodiversity used is practical and manageable.	Where gains are intangible e.g. funding a visitor centre; Irreplaceable habitats with unique geology e.g. limestone pavements; Where replaceability is unknown; Where the scale/magnitude of the damage is very high.	Replaceability; Additionality; Policy goals; Quality of compensation; Local classifications of biodiversity value.	Policy goals and clarifying success; Lack of underlying science regarding replaceability; Ensuring quality of compensatory habitat; Trade-off between accounting for biodiversity at higher resolutions and ease of determining success; Finding suitable land – on a map vs. what works in reality; Ensuring additionality; Irreplaceability rarely enough to warrant avoidance; Government commitments; Playing field is not level. Uniting local and national desires.	Recognises multiple conceptual and practical challenges; Recognises uneven playing field.	UK	C	Geography, Spatial Planning
14	Programme Director,	Designing and implementing	Only where it's a last resort;	Species extinctions; Where land tenure	Background degradation levels;	Inadequate baseline assessments; Prioritising land use values;	Recognises multiple	UK	All 3	Biology, Ecology,

	Corporate Partnerships, an international conservation NGO	offsets for international corporate partners.	Only where socio-political support frameworks exist	is insecure; Indigenous livelihoods affected; Sustainable livelihoods affected e.g. a sustainable salmon fishery.	Socio-political context; Governmental commitments.	Recognising complexity; Secondary impacts; Takes a 'snapshot' in time; Should add an additional BBOP metric of 'ecological function'/sustainability to strengthen business/policy case; Economic model must change.	practical and contextual challenges. Community-focused.			Envtl. Science, Development
15	Head of a Regional Team, a leading plant science and conservation organisation	Conducting scientific surveys for international corporate partners.	Where other suitable habitat is available so species can be translocated; Where previously unprotected areas can be protected.	Species extinctions; Dramatically altering ecology e.g. hydrology of a river system.	Availability of suitable habitat; Diligence of the organisation.	Finding suitable offset sites, politically and ecologically; Differing company policies.	Sees it as a useful conservation tool for protecting new areas; Sees company diligence as key to success.	UK	C	Biology
16	Head of a Regional Team, and Advisory to BBOP, a leading plant science and conservation organisation	Organisation's Advisory to BBOP. Involved in designing one international project.	Low value biodiversity value land; Partial loss of critical habitat could be offsettable depending on feasibility.	Species extinction; Loss of critical habitat; Protected areas if opening up to development that wouldn't otherwise occur.	Government regulation; Standards; Stakeholder engagement.	Baseline scientific data may be lacking; Spatial scale of vulnerability – habitat/species may be offsettable globally but not locally; Unpredictability; Calling things offsets which don't comply with principles; Demand is only going to grow; Need to collaborate with companies to help minimise impacts; Cannot address impacts with huge geographical footprints; Accepting there will be 'winners and losers'	Recognises importance of standards, but many conceptual and practical challenges; Recognises uneven playing field.	UK	C	Biology
17	Conventions and Policy Officer, a leading plant science and conservation	Advising upon offsetting policy for an international corporate partner.	Where previously unprotected areas can be protected.	Somewhere heavily used by people, very rich in plant diversity or with plants of economic potential/social	Value to communities; Pragmatism; Company policy; Governmental context.	Businesses work on a different time frame; Time restrictions of surveying limits baseline assessment; Unavoidability of destruction; Roles of different NGOs –	Sees destruction as unavoidable; Keen to stress diverse roles of	UK	C/P	Conservation Science

	organisation			utility/intrinsically valuable – but wouldn't personally oppose.		collaboration/ resistance; Internal staff changes in organisation can lead to devaluing of project; Political uncertainty; How much value is given to community/plants vs. chimpanzees for example.	NGOs; Company diligence important; Recognises practical uncertainties.			
18	Senior Conservation Officer for a UK county Wildlife Trust	No direct experience but interested in county implications from a conservation planning perspective.	Only where it's a last resort; Where it's done close-by; Where management funds are in place.	Irreplaceable habitats e.g. estuaries, semi-natural woodland; Where management funds aren't in place.	Direction planning system is pushing; Local contexts e.g. land prices/soil fertility/ development pressures.	Valuing biodiversity is subjective; Economic uncertainties; Adherence to the mitigation hierarchy – 'license to trash'; Locational conflict between satisfying locals and cost-effective locations.	Sceptical about design and practicalities; Interested in UK spatial planning implications.	UK	C	Ecology
19	Professor in Geography, a UK university	No direct experience or research but interested academically.	N/A. You can't meaningfully equate the compensation with the loss. May be 'better than nothing', but not a methodology for saving nature.	Anything where the compensation cannot be meaningfully equated with the loss.	Politics of the bargaining; Positionality; Context; Long-term management and monitoring; Enforcement.	Defining what an offset is; Biodiversity is not interchangeable; Conservation is rarely successful; Agreeing goals of conservation; No funds for monitoring; Niche nature of conservationists; Playing field is not level; Irrelevant to the future of biodiversity; Blunts opposition to and avoidance of environmental damage. We have become complicit with the destruction; Re-tuning capitalist market economy.	Very sceptical.; Does not regard places interchangeable – not an 'offset' – definitions are important; Sees it as political bargaining; Recognises uneven playing field; Sees it as a tool for capitalist expansion; Strong anti-mainstream.	UK	Academia	Geography
20	Research Fellow in Conservation	Researching offsets from an academic	Very degraded land.	Vulnerable ecological communities e.g.	Community utility of offset; Private/public land;	A lot of scope to game the mitigation hierarchy; Development pressure;	Ecological context important;	Australia	Academia/ C	Conservation

	Science, an Australian university	perspective.		beyond 80%-95% destroyed/highly degraded.	Level of degradation; Government commitment; Policy goals.	A lot of grassland is on private land – offsets protect it better; Governmental commitment – ‘offsetting the offsets’; Highly uncertain future gains for certain immediate loss; Biodiversity gains should be proved first, but that has temporal and financial restrictions; Need clear policy goals; Responsibility for addressing failure.	Recognises multiple practical challenges; Recognises an uneven playing field.			Science
21	Chief advisor, Biodiversity and Ecosystem Services, a large multinational mining company	Designing and implementing offsets for an international mining company.	Anything where a positive social impact is created; Protected areas are offsettable as long as boundaries are re-drawn.	Species extinctions; Fragile ecosystems e.g. drilling for oil in Arctic.	Company commitments; Governmental commitment.	Where to draw line with species vulnerability; How to promote conservation as a business issue; Spatial limitations make offsetting a transitory mechanism not silver bullet; Governmental commitment – is anything really no go?	Recognises no-go areas but sees these as reliant on government commitments .	Australia	B/P	Ecology
22	Part of the United States Environmental Protection Agency (EPA), Wetlands Regulatory Program	Writing and enforcing regulations regarding damage to wetlands in the United States	In terms of US wetlands - Any wetland/stream impact, as long as it’s located proximally, and it replaces lost functions and services.	Regulations often determine offsettability; Where there is much local opposition.	Government regulation; Expertise and vigilance; Offset location; Stakeholder opposition.	Economic uncertainties – market determines supply and demand; Estimating future development patterns; Government commitment; ‘Offsetting the offsets’; Locational conflict between satisfying locals and planning for long-term viability; Scientific uncertainties; Management difficulties; Government regulation must be strong.	Sees management and regulation as key; Many lessons to learn from wetland banking program.	United States	P	Envtl. Science
23	Lead Scientist, Conservation Lands Team, an international conservation	Scientific research, designing and implementing international offset projects.	Where species richness is low and species distribution is relatively uniform e.g. temperate environments.	Threatened and endangered species; Charismatic species e.g. lemurs; Protected areas; High species richness e.g.	Landscape scale goals; Stakeholder engagement; Regulatory driver; Policy goals; Land tenure;	Need broad landscape scale vision; Avoidance often not used effectively; Business/regulatory/even biological assumption sometimes that anything can be	Recognises multiple conceptual and practical challenges; Recognises uneven	United States	All 3	Conservation Science

	NGO			tropical environments.	Local context.	offset; Defining and using policy goals; Gap between analysis of objectives and effective implementation; Implementation challenges - local context, governance, land tenure; Future development patterns; To have large impact would need to offset every land use change; Private land rights.	playing field; Context-dependencies			
24	Professor in Forestry Conservation, a New Zealand University	Writing academic papers and reviewing offsetting proposals in NZ.	Widely applicable tool; Controversial hydro-dam proposal; Anything that raises funds for control of invasives.	Poor quality rehabilitation offered e.g. Coal mining.	Resource Management Act Legislation; Public opposition; Ecological context; 'Losing habitat and improving condition is like for like'.	Power of energy industries; NZ's focus on visual 'landscape'; Lack of funding for invasives/habitat degradation.	Strong preference for like-for-nonlike; Sees offsets as important fundraising tool for other aspects of conservation.	New Zealand	C	Ecology

**Table 7.2. Results of the thought experiment.** (NB: unfortunately 3 participants did not complete the thought experiment due to interview time constrictions: 10, 21, 22)

<b>Ref.</b>	<b>Job description and engagement with offsetting.</b>	<b>What do they like about this place?</b>	<b>How would they feel about development occurring?</b>	<b>Would offsets make them feel better?</b>
1	Chairman of UK biodiversity offset broker; Designing and implementing offsets for clients.	Landscape quality; High biodiversity value; Lots of rare species (waders, hares, wildflower meadows); Unspoilt by development.	If it was a new house not a problem, anything bigger I'd fight it.	No, it has such high landscape quality. It's a national park, SSSI, SPA, SAC, so it would be screened out anyway.  <i>(NB. was first interviewee – following this participants were asked for areas that were not legally protected).</i>
2	Principal Consultant, a UK biodiversity consultancy; Designing and implementing UK offsets for clients.	Spectacular landscape; Extraordinary wildlife.	Very unhappy.	Probably not, no. I don't want this place just to be offset, I want as much as possible done to minimise that disturbance. I would fight for avoidance. Then I'd have to put the emotion aside and look at it professionally. Are the values being compensated for? Or if it's a like for non-like, are globally the gains better than the losses? I might steal that thought experiment; I have to shoulder off guilt working with major international corporations, but fifteen years ago I'd have been outside them with placards. It was good for me to get a reality check.
3	Business Development Director, a leading environmental economics consultancy; Designing and implementing UK offsets for clients.	Familiarity with the landscape.	Only if it was sustainable.	Only if it was for a useful, sustainable project and local degraded land could be improved.
4	Principle Ecologist, a UK local planning authority; Designing and advising upon offsets for local implementation of UK government scheme.	Tranquility; Beauty; Stress relief.	It would be a shame but would have to be politically correct; Would depend on the development size and type. If it was a wind farm that might outweigh my needs for stress release.	Potentially but I'd need more data on the social economic importance of the development, whether the alternative was satisfactory, and what the legislation and policies to examine the proposal were. I would get everything out of it as humanly possible for the nature conservation impact.
5	Former scientific advisor to UK government; Designing policy and metric for UK government biodiversity offsetting scheme.	Wild feel; Can see for miles.	Very annoyed.	No, we just shouldn't be impacting it. It would probably fall in to the 'no loss' category anyway.
6	Interim Business Development Manager, a county Biodiversity Partnership; Contracted to research and	Unusual; Old Saxon high street and hilltop village; View across about 50 miles;	It'd be tragic.	No you couldn't offset it. No matter how much was done, it would still be the loss of that piece of landscape and space and enjoyment for me.

	advise upon offsets in the UK to a county Biodiversity Partnership.	Space; Trees and landscape; Immediate connection with nature. Even though I'd seen it hundreds of times before, every time it was as though it was the first.		
7	Principal Landscape Manager, a UK quarry products company. No direct experience with offsets.(7)	Tranquility; Uncrowded; Rare, pretty orchids.	Sad, I would miss it.	I'd fight it as much as I could. They should do their best to avoid having anything left to offset. I'd make sure they were aware of its special qualities that the average person would miss. It should be mitigated. Rare flowers should be transplanted. But that's not offsetting, it's mitigation.
8	Managing Director, a UK water company; No direct experience with offsets.	Openness; Quiet; Slow speed of life; Wild flowers and insects.	Pretty upset.	Not if the offset was 20 miles away no. I'd fight it as much as I could. But, if I knew the offset was 10,000 km sq of rainforest I would sacrifice anything in terms of enjoyment factor to know a huge area somewhere else would benefit.
9	Environment Adviser, a leading UK cooperative retailer; No direct experience.	Nice sunny beach; Interesting beach features; Views; High biodiversity value.	Disappointed.	No. It'd feel meaningless if you created another place, because the place you were used to was gone, along with what you used it for. It would be more palatable if it had a big beneficial aspect to it, something larger or better that was improving habitats and ecosystems in general.
11	Business Director, a charity established by a multinational oil and gas company; No direct experience.	Beaches in the canary islands; Unique sand dunes.	A lot of development occurs here and now it's too commercial. It's extracted the beauty of it. But there needs to be jobs, there needs to be stuff that is done. I'd assume the development had gone through the right hurdles to get to execution.	Yes. Offsetting allows us to bring good in to every development. But I don't think the Spanish regulations currently allow for that.
12	Programme Manager of an NGO-Corporate Partnership, an international bird conservation NGO; Designing and implementing offsets for an international mining company.	Wild natural habitat; Large predators; Intact biodiversity.	I'd be totally nimby-istic about it.	Only if there was no other option. You fight it until you realise you're not gonna win and at the moment you come to that realistic realisation you engage positively to secure a better outcome. If an offset was decided I'd push for a really generous one.
13	Head of Site Conservation Policy, a UK bird conservation NGO; Advising upon compensation or offset proposals triggered by UK legislation.	Semi-naturalness; A reasonable community of wildlife; Peaceful; Somewhere to get away.	Pretty upset.	On a personal level, no. I'd fight it as much as I could. On a professional level, 'if it could be close by and could be of a similar quality'.

14	Programme Director, Corporate Partnerships, an international conservation NGO; Designing and implementing offsets for international corporate partners.	No people; Wilderness; Vast and unpopulated; An ecological time-warp; Extraordinary sense of peace; No evidence of man's impact.	Devastated because there are fewer and fewer of these places now.	That's interesting because I'm working on one now. One I think is a no-go because it's completely uncompensatable. It has huge importance to indigenous people. But with developments going ahead, they absolutely need to be offset, on a metric of about 100 to 1 would be good. But how do you offset an entire sustainable salmon fishery? Some things are non-offsettable.
15	Head of a Regional Team, a leading plant science and conservation organisation; Conducting scientific surveys for international corporate partners.	Wild; Interesting plants.	Annoyed.	It's not ideal, but if you can get a new area protected that's equivalent or larger then that goes a long way to addressing negative feelings. Ideally you'd like to get both areas protected but sadly if the project concerned is mineral extraction then even if the company doesn't go ahead, the government will, because they want the area for their people. It would be better if a responsible company like Rio Tinto did it than the Chinese who as I understand it have no consideration for environmental issues beyond the mechanical.
16	Head of a Regional Team, and Advisory to BBOP, a leading plant science and conservation organisation; Organisation's Advisory to BBOP. Involved in designing one project.	Wild; No development.	'Cheesed off'. But if it was a wind farm it'd be more justifiable than a bunch of bungalows or a caravan park.	No not particularly. It would with my biodiversity hat on, but actually as a human being it wouldn't really, no. We're ultimately sort of selfish and it's a place I love and it's going to be spoilt and I'm not going to go somewhere else. If I was looking at it analytically I might well conclude that it is offsettable and that for people like me it's just tough luck. I think it's important we don't sit around and do maths about species and an area, and that we take the human side seriously, but also recognise sometimes people will end up unhappy.
17	Conventions and Policy Officer, a leading plant science and conservation organisation; Advising upon offsetting policy for an international corporate partner.	Peaceful; Beautiful; Natural, but with a beautiful wooden bridge; English; Green; Close to home.	I'd stand on the bridge and say 'over my dead body!' Yeah, I'd be very annoyed.	No, I want it to be there. I can't imagine you could make it the same again somewhere else, and I might not be able to get to this place. It's special to me. That's why I think there are measures around offsetting to consider the value a place has to people; there should be that.
18	Senior Conservation Officer for a UK county Wildlife Trust; No direct experience.	Golden eagles; Wilderness; Isolation; Quietness; Fecundity of plants; Full of life.	Would oppose it massively, but it's quite steep-sided so it'd be hard to build there. But yeah, I'd fight it tooth 'n nail. Depends how sensitively they do it.	Depends on where the offsetting is done. I'd need it to be close by and I'd need to see the resources put in to do it well.
19	Professor in Geography, UK; No direct experience with offsets.	Large open landscapes; Very few people.	Unimpressed.	No. Offsetting is not helpful. But I'd be much angrier if nothing else happened. Prior to development would write to planning authority and outline that they were privatising a public resource, that the ecological value would never be replaced and they should turn it down. If they choose not to turn it down, I would make recommendations about what should be done. It's about the politics of the bargain and your positionality
20	Research fellow in Conservation Science,	Relaxation; Replenishment;	Unhappy.	Better than if it was being developed and nothing was being done. But it would not alleviate the sadness. Would need to know that the offset was a real gain

	Australia; Researching offsets from an academic perspective.	Looking at natural vegetation; Smelling natural smells.		and was secure in the long term, with legislation in place to ensure the gains were met.
23	Lead Scientist, Conservation Lands Team, an international conservation NGO; Scientific research, designing and implementing international offset projects.	No people; Incredible natural beauty and natural value.	I have many hats – scientist, conservationist and personal. It would depend on which one I'm wearing.	Personally no, it's a place I love. But the practical reality is that people are choosing to develop what is theirs. And where it does go ahead, there are opportunities for compensation. The compensation could buy land rights to prevent private landowners developing.
24	Professor in Forestry Conservation, NZ; Writing academic papers and reviewing offsetting proposals in NZ	No people; Pristine environment; Can drink from streams; High mountain passes; Forests; It is still buggered though – I can still hear the birds that aren't there.	Depends what the project is and what the particular place is.	Offsets are fundamentally important to any development project in New Zealand.