THE USE OF MARKET-BASED INSTRUMENTS FOR BIODIVERSITY PROTECTION - THE CASE OF HABITAT BANKING

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1. Introduction

This is the Technical Report of the consortium led by Economics For The Environment Consultancy Ltd (eftec) and the Institute for European Environmental Policy (IEEP) for the contract for European Commission Directorate-General Environment on "*The Use of Market-based Instrument for Biodiversity Protection – the case of habitat banking*" (ENV.G.1/ETU/2008/0043).

This research project examined the potential use of habitat banking in the EU as an economic instrument for biodiversity protection. This report identifies a range of information and experience with habitat banking from around the world, from economic theory and provides an institutional analysis for practical implementation. It aims to guide future European policy options.

A summary report of this work, including an executive summary and recommendations is also available at: http://ec.europa.eu/environment/enveco/index.htm.

The report is organised in eleven sections:

- Section 1 outlines the objectives of the project and lists key terms and abbreviations;
- Section 2 reviews the institutional and policy context of use of market based instruments in biodiversity policy in Europe;
- Section 3 reviews types of market based instruments and their current policy applications;
- Section 4 describes the theory behind market based instruments of biodiversity offsets and habitat banking;
- Section 5 reviews Europe's legal framework in which habitat banking would need to operate ;
- Section 6 examines the institutional framework in which habitat banking could operate;
- Section 7 summarises worldwide experience on habitat banking (which is covered in detailed case studies in the case studies Appendix);
- Section 8 analyses evidence on potential supply and demand for habitat credits in Europe;
- Section 9 summarises the key design features of habitat banking identified from Sections 2 – 7;
- Section 10 outlines potential options for implementing a system in the EU, and
- Section 11 draws conclusions from this work and outlines suggested next steps in the research.

1.1 Objectives

Investing in habitat banking as a way to create, restore, enhance or preserve critical habitats and biodiversity designed to offset biodiversity damage requires thoughtful planning and design in order to realise sustainable benefits. This research project examined the potential use of habitat banking in the EU in the context of alternative economic instruments for biodiversity protection. Its specific objectives were to:

- Investigate whether habitat banking can be managed so that it benefits biodiversity protection and could be expanded into an EU-wide system;
- Compare habitat banking to other market instruments as a means of delivering biodiversity protection;
- Identify the tools and components of such a system, to deal practically with challenging issues such as equivalency, efficiency and location;
- Analyse the conditions and limitations for the development of habitat banking at the Community level, and
- Develop guidance on how habitat banking could be implemented in keeping with the requirements of relevant laws, policies, institutions and stakeholders.

The research identified a range of opinions and experience with habitat banking from around the world, and from economic theory, and presents a preliminary institutional analysis for practical implementation. It aims to guide future European policy options to address biodiversity loss and conservation objectives.

A range of pressures on biodiversity (described in Section 2) are leading to ongoing biodiversity loss. This is of concern for both the species themselves, and the ecosystem services and other benefits that may also be lost. Therefore, there is a need to compensate for biodiversity loss. The term used for providing a full like-for-like or better compensation for unavoidable residual biodiversity damage is biodiversity offset. The specification for this project described habitat banking explicitly as an extension of biodiversity offsets; turning offsets into assets that can be traded, creating a market system for developers' compensation liabilities. Offsets are further described in detail in Section 4.1.6.

Habitat banking concepts have developed from approaches that offset damage to biodiversity in particular or the environment in general. Offsetting has specific legal implications in relation to the Habitats Directive (HD) and Environmental Liability Directive (ELD) (see Section 5). However, offsetting measures are also applicable in other circumstances where compensation actions are required (e.g. developments that damage species or habitat of community interest outside of designated sites).

These multiple drivers raise the possibility of creating a single system that integrates the offset requirements under these different circumstances. This could achieve

efficiencies in the delivery of offsets through economies of scale, for example by allowing their exchange over time – a habitat banking system. Habitat banking is also mentioned in the Phase 1 report of TEEB[1] as a policy instrument of the future. Potential benefits are reduced costs of biodiversity conservation and/or increased delivery of conservation.

The market failure habitat banking attempts to address is one of missing markets (for biodiversity conservation). Therefore, rather than altering an existing market (as a tax or subsidy does), it creates a new market through regulation. While the only way to really know if a market can work is to establish it and see, there must be sufficient chance of policy success for its establishment to be a good use of public money.

There are a number of factors that will affect the chance of a habitat banking system being successful. Such factors include ensuring 'additionality' of ecological benefits, equivalency between damage and banking credits, financial endowments, monitoring, delivery and coverage of geographical scope of credit application.

Not identifying and addressing these factors could lead to perverse incentives and habitat banking causing unintended biodiversity damage. Only through careful consideration of these potential risks can a habitat banking system that fits within, and does not undermine, the current legal requirements and policy objectives be designed. Such careful consideration will lead to design criteria that mitigate the risks and ensure potential benefits are delivered. On the other hand, such design criteria are likely to constrain the habitat banking markets - with the extreme case of too many design criteria making any market transaction too costly.

The optimal design, in economic terms, is one that strikes the right balance between a functioning market that gives the buyers and sellers sufficient freedom and a regulated market that ensures that the potential risk factors are mitigated against. The trade-off between free market and regulated design is not necessarily linear – sometimes flexible market design can also lead to better ecological outcomes. This offers opportunities for optimal design of a system, but first we must consider whether a balance can be struck between these factors, such that a system that would produce net benefits for society is feasible.

1.2 What is habitat banking?

Habitat banking is a biodiversity compensation mechanism that is based on the concept of biodiversity offsets which are, according to BBOP (2009): "*measurable conservation outcomes resulting from actions designed to compensate for significant*

[1] The Economics of Ecosystems and Biodiversity, http://ec.europa.eu/environment/nature/biodiversity/economics/

residual adverse biodiversity impacts arising from project development and persisting after appropriate prevention and mitigation measures have been implemented. The goal of biodiversity offsets is to achieve no net loss, or preferably a net gain, of biodiversity on the ground with respect to species composition, habitat structure and ecosystem services, including livelihood aspects".

This project defines habitat banking as: "*a market where the credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time*". Biodiversity credits in the context of this project include both habitats and species.

Offset approaches have developed to address (ex-ante) the foreseeable impacts of projects. Credits from habitat banking can be purchased ex ante for planned projects and can also be used to compensate (ex-post) for accidental damage to biodiversity, for example due to pollution incidents under the Environmental Liability Directive (ELD).

Actions that create credits include the restoration or creation of habitats or measures that enhance the viability of species populations (e.g. removal of alien predators). They can also include the protection of valuable habitats that are at risk of loss or degradation (the so-called risk aversion offsets), even though the additionality that these actions may provide is a complex issue (see Section 4.2). Additionality of an action refers to the requirement that the outcomes it delivers would not have occurred without the action.

In the case of offsets, the debit and credit are quantified separately for each and every case (even though offset delivery may be undertaken in a single location to satisfy demand for more than one offset requirement). This is not the case in habitat banking: credits can be assessed once, created in different quantities and locations and stored. They need not be designed to match a specific debit at the time of creation, although they still need to fulfil equivalence requirements (i.e. be like for like or better) for the debit they are subsequently used to compensate for. The independence in the timing of credits from debits at the creation stage is the key feature distinguishing habitat banking from offsets.

1.3 Definition of key terms

Literature on habitat banking uses a wide range of terminology. This has several different sources: in addition to banking and offsetting language, there are liability regimes, ecological analyses and economic instruments that give rise to different terms. In addition, the terms have developed differently in some locations around the world and have different meanings. Where such differences exist, this report adopts

European, i.e. rather than US, meanings for the relevant terms. In particular the concept of 'mitigation' follows the European definition, rather the broader US meaning.

As mentioned above habitat banking can refer to both species and/or habitats. In the context of this study, habitat banking is analogous to commonly used terms 'conservation banking' and 'biodiversity banking'. Various other terms used in the literature on habitat banking are also ambiguous. To avoid confusion in reading this report, the list below gives definitions for the terms involved in habitat banking as used through the remainder of this report. The definitions are adapted from those developed by the Business and Biodiversity Offset Programme[2], the Biobanking system in New South Wales, Australia[3] and various other sources. As part of our description of habitat banking, definitions of key terms are discussed further in Section 4.1.

Readers should be particularly aware of our use of three key terms:

- '**Mitigation**': Actions taken as an integral part of a damaging project or activity to minimise the damage. The remaining residual impacts are what require compensation.
- '**Compensation**': Compensation as defined in this study relates to measurable biodiversity outcomes, and not indirect actions such as awareness activities or financial payments to affected parties (although this does not exclude payments within the process, as long as the end result is a biodiversity outcome). Habitat banks and biodiversity offsets are both mechanisms for delivering compensation.
- '**Offsetting**': Measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity.

Other terms include the following:

Additionality

A property of a biodiversity offset (or any action), where the conservation outcomes it delivers are demonstrably new and additional and would not have resulted without the offset (or the action).

Arrested degradation offset

An intervention to prevent other (than development) risks from continuing to operate. This results in biodiversity within the offset area being degraded at a lower rate than biodiversity elsewhere in the surrounding area. The difference in degradation rates before and after intervention, or between offset and non-offset sites, is the biodiversity gain. In this case, it is achieved by reducing destructive influences rather than through restorative management.

[2] http://www.forest-trends.org/biodiversityoffsetprogram/index.php
[3] http://www.environment.nsw.gov.au/resources/biobanking/09116bbglossary.pdf

Averted risk

The removal of a threat to biodiversity for which there is reasonable and credible evidence.

Averted-risk offset

Biodiversity offset interventions which prevent future risks of harm to biodiversity from occurring (the benefit is biodiversity protected by the removal of such threats).

Baseline

A description of the conditions without damage to biodiversity, against which the biodiversity loss is assessed. It reflects the condition of the resource and its associated services (including the physical, biological, or ecological functions of a resource, as well as any use or non-use human services provided by those functions) if undamaged. The baseline may be static and refer to a reference year, or be dynamic and refer to predicted future conditions based on extrapolation of existing trends. In both cases, it is the state *without* the change assessed.

Biodiversity (or biological diversity)

As defined by the Convention on Biological Diversity (CBD), biodiversity is the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species (genetic diversity), between species and of ecosystems.

Biodiversity conservation

The deliberate management of biological resources to sustain key biodiversity components or maintain the integrity of sites so that they support characteristic types and levels of biodiversity. One of the motivations for biodiversity conservation is to maintain the potential of biodiversity to meet the needs of future generations. Conservation includes preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment.

Biotic factors

Environmental factors resulting from the activities of living organisms.

Bespoke offsets / bespoke equivalency

Assessment of debits, credits and their equivalency specifically for the given damage case using the most appropriate method selected to fit the circumstances of that case.

Checklist-based system

Assessment of debits, and sometimes credits and equivalency, based on pre-determined information about the 'type' of biodiversity and damage (incorporating any necessary variations).

Clean up activities

On-site remediation activities. See mitigation.

Compensation

Generally, compensation is a recompense for some loss or service, and is something which constitutes an equivalent to make good the lack or variation of something else. Specifically, in this study and in terms of biodiversity, compensation refers to measures that restore, create, or enhance, (or sometimes to avoid loss or degradation of) an area of habitat or a species population in order to compensate for damage to it.

Credit

An expression of the quantity of environmental enhancement or avoided damage delivered as a result of compensation actions.

Credit site

The area of land that is subject to specific actions to generate the credits sold within a habitat banking system.

Credit provider

The person or organisation that is responsible for a credit site. This may be the landowner, or an agency working with a landowner (though some legal agreement with respect to the relevant management of the land).

Cumulative effects

An umbrella term for effects that accumulate over space or time. In ecological terms cumulative effects may derive from the combined effects of a project, plan, programme or policy in association with other past, present or reasonably foreseeable future plans and actions. They may also result from time- or space-crowding of development combined with the effects of stochastic events/changes, including climate change. Consideration of cumulative effects emphasises the need for broad and comprehensive information regarding effects.

Debit

An expression of the quantity of loss suffered as a result of environmental damage.

Easement

A right to use a part of land, or component of land, which is owned by another person or organisation (e.g. for access to another property or development of property). An example is a conservation easement that is a legally binding agreement not to develop part of a property, but to leave it "natural" permanently or for some designated (very long) period of time. The property still belongs to the landowner, but restrictions are placed both on the current landowner and on subsequent landowners as to the type of use.

Economic instruments

See market-based instruments

Ecoregion

A relatively homogeneous, ecologically distinctive area which has resulted from a combination of geological, landform, soil, vegetative, climatic, wildlife, water and human factors.

Ecosystem

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Ecosystem approach

A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. The ecosystem approach was designed to help reach a balance of the three objectives of the Convention on Biological Diversity (conservation of biodiversity, sustainable use of biodiversity, and the fair and equitable sharing of the benefits arising from the use of genetic resources). It recognises that humans, with their cultural diversity, are an integral component of ecosystems.

Ecosystem services

The benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fibre; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling.

Endemic

Confined to, or indigenous in, a certain area or region.

Endowment

An endowment is a type of fund that spends only the interest earned from its investments and not its capital to finance agreed-upon activities (GEF, 1999). The capital is managed to exist in perpetuity.

Enhancement

Actions that increase the ecological condition of a habitat (e.g. by removing invasive alien species) or a species population (e.g. by reducing predation by invasive alien species, thereby increasing survival and breeding productivity rates).

Equivalence

A state whereby the expected benefit (credit) generated approximately equals the damage (debit), both quantified in terms of the same metric. Equivalence is calculated so that the number, type and size of compensation projects are sufficient to ensure no net loss of environmental resources.

Fragmentation

A process whereby habitat patches are reduced in size as a result of habitat loss, change or degradation (e.g. disturbance). Fragmentation may also lead to a reduction in ecological connectivity between remaining habitat patches.

Habitat

'Habitat' is strictly a species-concept, referring to the particular abiotic and biotic conditions with which individuals or populations of the same species are typically associated. The term 'habitat' is also often extended to refer to the circumstances in which populations of many species tend to co-occur, in which case it is strictly a biotope.

Habitat banking

A market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time. The term 'habitat banking' can refer to both species and habitats – therefore in context of this study is analogous to 'conservation banking' and 'biodiversity banking'.

Habitat structure

The arrangement of biodiversity components in space, with three major variables: complexity (the amount of structure or variation attributable to absolute abundance of individual structural components), heterogeneity (the kinds of structure or variation attributable to the relative abundance of different structural components) and scale (which emphasises that the first two components must be commensurate with the dimensions of the organisms being studied).

Impact site

The area affected by the direct, indirect and cumulative impacts attributable to factor (e.g. pollution incident or development project) causing damage. (See also footprint)

Interim losses

The loss of resources and services, defined in the Environmental Liability Directive, between when environmental damage occurs, and when the environmental resource returns to its baseline condition. If the baseline is restored, the interim losses would be temporary, if not, they will be permanent.

Landscape

Visible features of an area of land, including physical elements such as landforms, living elements of flora and fauna, abstract elements such as lighting and weather conditions, and human elements, for instance human activity or the built environment. Landscape means different things to different people. Within the scientific community, a landscape can be a watershed, a region defined by soil or vegetation type, or an ecologically cohesive space. When the human dimension is overlain, the same biophysical landscape can have its boundaries re-defined. At the grassroots level, landscape may be the local forest, watershed or even agriculture community. For the ecologist, landscape may be the habitat and connecting corridors

necessary for a species to survive. At the national-level, landscape may mean an entire bioregion that crosses political boundaries and encompasses multiple watersheds, towns, villages, highways, flora, fauna, core protected areas, buffers and corridors.

Landscape scale conservation

Designing, planning, financing and managing projects with significant natural conservation value while incorporating the cultural and economic activities of people situated in the landscapes involved.

Like-for-like

Conservation of the same type of biodiversity (e.g. specific type of habitat, species, subspecies or population of a species) as the one that was damaged. More frequently referred to as in-kind. Several biodiversity offset policies are based on a principle either of 'like-for-like' or of 'like-for-like or better'.

Market-based instruments (MBIs)

Incentive systems that operate through establishing prices for environmental services, via a market. The markets in question are either established ones, for example existing markets in goods and services or in labour and capital equipment. Or the market may be 'created', usually with some form of encouragement from government - as in the case of habitat banking.

Mitigation[4]

Following the definition of the European Commission[5], mitigation measures are "measures aimed at minimising or even cancelling the negative impact of a plan or project, during or after its completion. Mitigation measures are an integral part of the specifications of a plan or project. They may be proposed by the plan or project proponent and/or required by the competent national authorities." Such mitigation measures may include relocation of elements of the project to avoid impacts, revised designs (e.g. to reduce pollution or disturbance), or new elements (e.g. 'green' habitat bridges to connect fragmented habitat patches). This study does not adopt that broader definition (commonly followed in the US) where mitigation measures include compensation measures and offsets that are not part of the project activities itself.

Mitigation[6] **hierarchy**

The mitigation hierarchy is a principle that is normally followed in the consideration of appropriate mitigation and compensation measures. According to the principle, actions should be taken in the following priority order – where appropriate: (i)

[4] Note that in the US the term mitigation is used to refer to off-site compensation measures, i.e. offsets undertaken after preceding steps in the mitigation hierarchy. This project uses the EU terminology, whereby mitigation refers to on-site activities, i.e. steps ii) and iii) in the mitigation hierarchy.

[5] Managing NATURA 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.
http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

[6] In this case the term mitigation has its wider meaning than defined above, but is adopted here because of the common use of the term "mitigation hierarchy".

avoidance of impacts; (ii) minimisation of impacts; (iii) rehabilitation/ restoration measures taken on the ecosystems impacted; and (iv) offset measures to compensate for significant adverse residual impacts.

Monitoring

Activities undertaken after the decision is made to adopt a plan, programme or project to examine its implementation. For example, monitoring to examine whether the significant environmental effects occur as predicted or to establish whether mitigation measures are implemented. Strictly speaking monitoring should be carried out in relation to an explicit target or standard.

Multiplier

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

Natura 2000

The Network of Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) designated under the Birds and Habitat Directives respectively throughout the EU.

Natural habitat

Land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions.

Net gain

Where the gain from compensation measures exceeds the loss, the term 'net gain' may be used instead of no net loss.

No net loss

A target in which the impacts on biodiversity caused are balanced or outweighed by mitigation measures and, if necessary, offsets or compensation measures for residual impacts, so that no loss remains.

Offset

Following the definition of the Business and Biodiversity Offset Programme (BBOP, 2009), offsets are "measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss of biodiversity.

Offset activities

Offset activities are the set of activities identified to achieve no net loss or a net gain of biodiversity in the specific context of the development project concerned. They

can involve a mixture of activities that typically involve the conservation of biodiversity, the sustainable use of its components and ensuring that stakeholders are benefited by the presence of the development project and motivated to support the proposed biodiversity offset. A very broad range of activities may be suitable. These generally tend to involve one or all of the following:

- *Undertaking positive management interventions* to restore an area or stop degradation.
- *Averting risk* by protecting areas of biodiversity where there is imminent or projected loss of that biodiversity.
- *Providing compensation packages* for local stakeholders affected, so they benefit from the offset.

Supporting actions such as awareness raising, environmental education, research and capacity building are a welcome contribution to conservation and can be important to the overall success of a biodiversity offset, but they are not considered part of the core offset, unless there is evidence of measurable on-the-ground conservation outcomes.

Polluter-pays principle

In economic terms, the principle means the cost of pollution control and remediation should be reflected in the cost of goods and services which cause pollution in production and/or consumption. The implication of the principle in practice and in legal terms is that the parties responsible for environmental damage are also responsible for its remediation.

Pooled Offsets

The collective organisation of resources to deliver compensation requirements for debits from more than one source, usually delivered ex-post of damage. They have some features of habitat banking (like economies of scale), but not others (they do not produce a market for supply of credits).

Protected area

An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Remediation

Actions aimed at recovery of the damage environmental resource either on the site where damage occurs or on another site (off-site) adhering to the rules of like-for-like or other as relevant. While the terms 'remediation', 'mitigation' and 'clean-up activities' are sometimes used interchangeably, they can have specific legal meanings.

Restoration

Altering an area in such a way as to re-establish an ecosystem's or habitat's composition, structure and function, usually bringing it back to its original (pre-disturbance) state or to a healthy state close to the original. Restoration differs from rehabilitation in that restoration is a holistic process not achieved through the isolated manipulation of individual elements. While restoration aims to return an ecosystem to

a former natural or semi-natural condition, rehabilitation implies putting the landscape to a new or altered use to serve a particular human purpose.

Service Area

The area within which habitat or species loss can be offset by a credit from a specific location. It is determined by the type of resource being protected, any physical limitations for creating offsets, and administrative/political boundaries.

Species banking

A banking approach where the measurement of credits is in terms of the population or numbers of a particular species.

Stakeholders

In this context, stakeholders include persons or groups who are directly or indirectly affected by a damage causing incident or project and/or offset, as well as those who are interested in a project and/or offset and have the ability to influence its outcome, either positively or negatively. They include persons or groups who hold rights over land and resources in the area of the incident or the project and offset. Stakeholders can include, but are not limited to, individuals, land owners, indigenous peoples, local communities, non-governmental organizations and members of scientific bodies such as university departments and research institutes, local and central government, customers, shareholders, management, employees and suppliers.

Total Economic Value

Total Economic Value is measured by individuals' willingness to pay (WTP) for an improvement or to avoid degradation in the quality and/or quantity of a resource or their willingness to accept compensation (WTA) to forgo an improvement or to tolerate degradation. There are several motivations for why individuals may have WTP and WTA for the environment: direct use value (consumption of resources or non-consumptive uses like recreation), indirect use value (ecosystem services that regulate the functioning of the environment), option value (for future uses of the environment) and non-use values (protecting the environment for others who make use of it now – altruistic value; for future generations – bequest value; and for the sake of the environment itself – existence value).

Trading Up

Process through which compensation delivers biodiversity credits of a greater and/or more valuable (e.g. more threatened conservation status) type than that damaged. This implies pre-determined categorisation of the conservation status of biodiversity resources, and allowance for this in equivalence calculations. The opposite flow of trade is known as 'trading down'.

1.4 Abbreviations

A/R	Averted Risk
BBOP	Business and Biodiversity Offsets Programme
BD	Biodiversity
CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
CERs	Certified Emissions Reductions
CO_2	Carbon Dioxide
DECC	Department of Environment & Climate Change, New South Wales, Australia
DSE	Department of Sustainability and Environment, Victoria, Australia
EEA	European Environment Agency
EIA	Environmental Impact Assessment
ELD	Environmental Liability Directive
ELI	Environmental Law Institute
ES	Ecosystem Services
EU	European Union
Ha	Hectare
HB	Habitat Banking
HD	European Habitats Directive
HWBD	European Habitats and Wild Birds Directives
IMR	Impact Mitigation Regulation (Germany) formed under the Federal Nature Conservation Act (the Eingriffsregelung).
MBI	Market Based Instrument
NGO	Non-Governmental Organisation
NNL	No Net Loss
OECD	Organisation for Economic Cooperation and Development
REDD	Reduced emissions from deforestation and forest degradation
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
TDR	Tradable Development Rights
USD	United States Dollars

2. Review of policy framework

This section first reviews the current status of biodiversity in the EU and the key policies and measures that are in place to address current pressures (Section 2.1). This provides a baseline for assessment of the likely effectiveness of implementing a habitat banking system in Europe. Key institutions and other stakeholders that are involved in biodiversity conservation are then identified (Section 2.2) to provide the institutional and policy context within Europe that will influence the potential use of habitat banking in the EU.

2.1 The current status of biodiversity in the EU and measures to conserve it

2.1.1 The EU 2010 biodiversity target and Biodiversity Action Plan

Much of the EU is densely populated and has been affected by human activities for many hundreds and often thousands of years. As a result very few areas of natural habitat remain away from the remotest mountain and northern regions, and much of the remaining biodiversity interest is associated with semi-natural habitats (such as grasslands, heathlands, managed forests and many wetlands) and even artificial habitats (such as arable farmland). The EU has therefore developed over many years a suite of policy instruments that aim to conserve the remaining areas of high biodiversity interest (primarily through designation as protected areas) and regulate potentially damaging impacts in the wider environment (IEEP, 2008). This provides a good framework for biodiversity conservation with relatively comprehensive and effective legislation, wide-ranging environmental policies and potentially high levels of funding.

As a result of this strong environmental policy framework, the EU Heads of State and Government felt able to adopt in 2001 the ambitious target of halting the decline of biodiversity in the EU by 2010 and to restore habitats and natural systems (which is significantly more ambitious than the CBD (Convention on Biodiversity) target of reducing the rate of loss of biodiversity). To achieve this aim the European Commission adopted in May 2006 a Communication on "Halting Biodiversity Loss by 2010 – and Beyond: Sustaining ecosystem services for human well-being". The Communication underlined the importance of biodiversity conservation and included a Technical Annex detailing an EU Biodiversity Action Plan (BAP) to achieve its objectives. The EU BAP attempts to reinforce the implementation of nature conservation legislation whilst also encouraging the integration of biodiversity conservation requirements into the policies of other sectors such as agriculture, fisheries, transport and energy.

Although the EU biodiversity target of halting biodiversity loss implies that a no net loss policy is required, this is not explicitly stated in the Commission's 2006 Communication. The BAP does include an action (A1.1.2) to "transpose fully [by 2006] Articles 6(2), 6(3) and 6(4) of the Habitats Directive into national legislation and planning policies" and where appropriate "ensure special effort for adequate design and implementation of compensatory measures" (see Section 5.2 of this report for details of these articles). The BAP also includes actions to strengthen Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs) with respect to regional and territorial development and refer to the need to "prevent, minimise and mitigate impacts on biodiversity and provide where possible benefits to biodiversity" (see BAP Actions A4.1.4 and 4.1.5). In this context it is assumed that the term mitigation refers to compensation measures (see discussion of terms in Section 1.3 above). However, the BAP does not include actions that explicitly call for the development of offsetting or habitat banking as a means of compensation for residual impacts for Natura 2000 sites or any other biodiversity impacts. Therefore, there appears to be a gap in the BAP and EU policy framework with respect to measures for residual impacts on biodiversity outside Natura 2000 sites.

2.1.2 The status of biodiversity and key pressures

In December 2008, the Commission published its mid-term assessment of progress with the implementation of the BAP at both European Community and Member State levels (European Commission, 2008). The assessment concluded that although many biodiversity conservation actions had been undertaken (notably the further extension of the Natura 2000 network of protected areas), further actions are urgently required, especially integration of biodiversity and ecosystem conservation measures into other sectoral policies: consequently the EU will fail to meet its target of halting the loss of biodiversity by 2010 unless there is significant additional effort over the next two years. Subsequent reviews of biodiversity indicators under the Streamlining Biodiversity Indicators Initiative (EEA, 2007) and Article 17 assessments of the status of habitats and species of Community Interest under the Habitats Directive (European Commission, 2009) have further confirmed that biodiversity continues to decline and it is clear that the 2010 target will not be met. The Article 17 assessments revealed that only 17% of the 701 Annex I habitats are currently in 'favourable' condition[7]. The results display regional differences with regard to status; none of the habitat assessments from the Atlantic region (covering UK, Ireland and the Atlantic coasts

[7] The Article 17 reports classify the habitats and species into 'favourable', 'unfavourable inadequate', 'unfavourable bad' and 'unknown' status according to a common framework agreed by the Habitats Committee. The national assessments are apportioned to (and subdivided where necessary) into seven land and four marine bio-geographical regions.

from Spain to Denmark) were marked 'favourable' (despite occasionally achieving 'favourable' status at a national level).

Of nine habitat groups broadly encompassing the habitat types in the Habitats Directive those in poorest condition were:

- Dunes: less than 5% in 'favourable' condition;
- Bogs, fens and mires: approximately 7% in 'favourable' condition;
- Grasslands: approximately 7% in 'favourable' condition, and
- Coastal habitats: circa 9% in 'favourable' condition.

Dunes and coastal habitats were reported by Member States to be under severe pressure from tourism, coastal development and climate change. Bogs, fens and mires suffered from land conversion (e.g. drainage and afforestation) and climate change, and were particularly affected in the Atlantic and Continental regions.

However, Article 17 assessments and EEA review indicate that the most widespread pressures continue to result from the intensification of land use, especially in agricultural habitats. This has been prevalent since the 1970s in western Europe (Newton, 2004; O'Connor & Shrubb, 1986; Pain & Pienkowski, 1997; Tucker & Evans, 1997).

Despite many reforms to the EU's Common Agricultural Policy (Tucker et al. in prep), intensification is continuing and spreading, especially to Southern and Eastern Europe. This results in farm and field amalgamation which involves loss of hedgerows, woodlands and other important ecological features, and farm specialisation with a consequent decline in mixed farming. There are also marked switches in crop types and substantial declines in the area of unimproved habitats. Many remaining semi-natural grasslands are still subject to high stocking rates causing widespread damage to vegetation communities and their associated fauna. In contrast, agricultural abandonment is a significant problem in parts of Europe. Semi-natural grasslands of High Nature Value (Baldock et al., 1993) are particularly at risk, such as in some hill farming areas and in the Mediterranean region and especially in Eastern Europe. In fact a current study for DG Environment[8] suggests that very high rates of land abandonment can be expected (according to results from the CLUE land use model) over the next 25 years if current policies and trends continue (IEEP/Alterra, unpublished results).

The biodiversity impacts of these agricultural changes have been well documented and have included major population declines in many farmland birds, e.g. in the UK

[8] Reflecting environmental land use needs into EU policy: preserving and enhancing the environmental benefits of "land services": soil sealing, biodiversity corridors, intensification / marginalisation of land use and the permanent grassland. ENV.B.1/ETU/2008/0030

(Gregory et al., 2004), and in fact across most of Europe (Donald et al., 2001). Further results from Europe wide farmland bird monitoring schemes (included in the SEBI indicator set) show that farmland bird populations are continuing to decline (EBCC et al., 2008)).

In contrast many forest habitats in the EU are less threatened and a relatively high proportion of forest and Mediterranean shrublands have a Favourable Status. Over the past few decades, both the forest area and standing volumes of timber have increased (EEA, 2008). Around 25% of forests are also protected from harvesting as a result of their importance for biodiversity and a higher proportion are allowed to grow into older development stages, thereby improving the biodiversity value. However, intensification of forestry is still an important issue in some areas (e.g. in parts of Eastern Europe, where formerly strictly protected state forests have now been privatised). Intensive commercial forest management results in the loss of old-growth semi-natural forests and their replacement with more uniform and denser forests with reduced species and structural diversity. Commercial forestry also results in high levels of disturbance, which is a major problem for many sensitive species. In contrast, in some parts of Europe, abandonment of forest management is evident, which is also having serious impacts on their ecological quality.

Large-scale wetland drainage has declined in many parts of Europe over recent decades (Stanners & Bourdeau, 1995), mainly because there is much less to drain. But drainage and wetland degradation remain a threat in some areas, especially in the Mediterranean regions of Europe. 2001-2006 Article 17 assessments indicate that 60% of habitats of Community Interest are potentially threatened by human induced changes in wetlands and marine environments in at least one Member State in at least one biogeographical region. Some species groups, such as amphibians are particularly at risk from threats to wetlands as they entirely depend on these habitats. As a result IUCN has recently noted that 23% of amphibians are threatened with extinction in Europe (of which many are endemic or concentrated in Europe and therefore globally threatened) (Temple and Cox, 2009). The main threats are a result of the ongoing loss and fragmentation of small wetlands (e.g. temporary ponds) primarily as a result of agricultural intensification and infrastructure developments.

Land take as a result of the expansion of artificial areas and related infrastructure is the main cause of habitat loss, which has particularly impacted agricultural areas and, to a lesser extent, forests and semi-natural habitats and their associated species (EEA, 2005d). With increasing populations and economic prosperity over the region over the last few decades there has been a considerable increase in infrastructure developments. According to EEA data for the EU most land has been taken over the 1990-2000 period for housing, related services and recreation (nearly 50,000 ha/year) and industrial/commercial purposes (approximately 30,000 ha/year). Land uptake by mines, quarries and waste sites varies considerably between countries, but totalled some 14,000 ha/year, whilst land take for transport and related infrastructure was

relatively low, amounting to only 3,000 ha/year. Although the combined areas of these remain relatively small compared to Europe as a whole, they have significant biodiversity impacts, especially in some of the more developed regions of Europe and in favoured locations (e.g. coasts and valleys), and also lead to wider impacts (e.g. air and water pollution). Consequently, Article 17 assessments indicate that leisure and tourism, transportation and communication, and urbanisation, industrialisation and similar activities each threaten between 70% and 80% of habitats of Community Interest in at least one Member State. Nearly 60% of habitats of Community Interest are threatened by mining and extraction of materials. Furthermore, it is expected that these pressures will grow with further economic development.

As a result of the combination of these changes in land use and other pressures, many habitats are now becoming increasingly fragmented into small patches that are often ecologically isolated from other areas of habitat and/or are too small to hold viable populations of species of conservation importance. Small habitat patches also suffer from high levels of disturbance and pollution from, for example, nearby roads and industry, and visitors.

It is also certain that all these impacts will be increasingly exacerbated by the growing impacts of climate change (Berry, 2008; Brooker & Young, 2006; EEA, 2004a and 2005b; Huntley et al., 2007; IPCC, 2007a; Parry, 2000; Reid, 2006; Thuiller et al., 2005; Usher, 2005). Indirect impacts such as the growth of biofuels or large scale tidal energy projects may also have additional substantial impacts (RFA, 2008; Rowe et al., 2007; Sustainable Development Commission, 2007; T & E, 2009).

2.1.3 The potential for habitat banking to compensate for impacts on biodiversity

From the above analysis it is evident that there is an important need to develop measures that can address the residual impacts of pressures on biodiversity, especially those from infrastructure related developments. Although the impacts of most appropriately located and mitigated infrastructure projects in the EU are relatively low compared to other pressures, many cause significant biodiversity losses. Table 2.1 therefore provides a more detailed analysis of a range of infrastructure impacts on biodiversity, and indicates the potential for mitigation and compensation measures for them. This clearly indicates that there are a wide variety of potential impacts from infrastructure developments that need to be mitigated and potentially compensated for. Compensation measures for such impacts are therefore the focus of this study.

In principle habitat banking could be used to address other impacts (e.g. from agriculture and forestry), but in practice it would probably be too difficult for policy makers and too onerous (in terms of transaction costs) for land managers to apply such measures to widespread and common land use practices (e.g. ploughing of grassland

habitats) that are often regulated under other policy instruments (e.g. cross-compliance measures under the Common Agricultural Policy).

Two exceptions to this are possible. Firstly, if transactions costs can be reduced by using a checklist based system (see Section 10.1). Secondly, where environmental damage is sufficient to trigger compensation measures under the ELD (see Section 5.1), for example as a result of spillage of agricultural chemicals. An additional option would be to designate some specific actions as being subject to compensation measures, such as the removal of hedgerows, ditches and ponds (that are not of sufficient importance to be protected). Such an action would be valuable as cumulative impacts from these actions can be significant (see Section 4.3.5). The impacts of such individual actions can also be relatively easily quantified in terms of the amount of habitat loss, which may enable compensation measures to be delivered through relatively simple low-cost systems, such as an fee in-lieu of credit system (as described in Section 9.2.11).

Table 2.1. Summary of key impacts of infrastructure developments on biodiversity in Europe

Impact source / impact type	Direct mortality	Direct habitat loss (footprints)	Disturbance	Indirect habitat degradation	Cumulative impacts	Potential for mitigation	Role for compensation	Example references
Buildings (inc housing, light-industrial, commercial, schools, and associated lighting	Bird collisions: normally insignificant but tall glass and illuminated buildings can be significant hazards	Relatively low on habitats of high conservation value	Some avoidance of buildings and interruption of birds' flight-lines	Normally minimal	Significant especially along coasts, rivers and lakesides etc	Low, other than avoidance of key sites	Important	(Klem 1990; Longcore & Rich 2006; Newton 2007)
Heavy industry, chemical plants, incinerators and power stations	Toxic pollutants can cause significant impacts	As buildings	As buildings	Ecosystem disruption from pollutants	Industry often concentrates close to rivers and coasts	Avoidance of key sites and pollution reduction	Important	(Bull et al. 1983; Bustnes et al. 2006; Crivelli et al. 1989; Smits et al. 2007)
Quarries, mines (including spoil heaps) and landfill	Loss of burrowing animals during excavations and ongoing losses of ground-nesting birds from machinery etc	Extensive habitat areas can be lost, e.g. for opencast coal, peat or gravel extraction.	Substantial disturbance impacts on operational sites	Often hydrological disruption of surrounding habitats, possible impacts on water-bodies from acid mine drainage, silt-laden run-off and other pollutants	High demands for aggregates and cause widespread impacts	Low, other than avoidance of key sites and reduction of pollution and hydrological disruption	Very important. Habitat restoration normally impossible, creation is normal practice (e.g. wetlands) – but often of low ecological quality	
Transport: roads, railways, ports, airports	Collisions are common, while population impacts normally low, they can be a major threat to some species of high conservation importance	Relatively low, but often along coastal strips (causing coastal squeeze) and lakesides etc	Often substantial disturbance impacts, but some species become habituated especially if people are not visible	Hydrological disruption, polluted run-off and air-pollutants (esp. NOx) can disrupt ecosystems and food resources	Significant growth in transport infrastructure in many countries	Avoidance of key sites and pollution reduction	Important	(Forman & Alexander 1998; Nilsson 1999; Spellerberg 2002; Trombulak & Frissell 2000)
Flood defences &	Flood storage areas may become	Can lead to significant loss		Can have large-scale impacts on	Climate change may	Low, normally little choice over location	High	(Davidson et al. 1991; Evans et al.

Table 2.1. Summary of key impacts of infrastructure developments on biodiversity in Europe

Impact source / impact type	Direct mortality	Direct habitat loss (footprints)	Disturbance	Indirect habitat degradation	Cumulative impacts	Potential for mitigation	Role for compensation	Example references
land reclamation	ecological traps (i.e. providing suitable habitat but frequently flooded with loss of ground nesting species birds etc)	of upper tidal habitat (coastal squeeze)		coastal geomorphology and adjacent habitat (e.g. sediment structure) and profound hydrological impacts on adjacent floodplains	increase need for flood defences (or abandonment / realignment in some areas)	and operation		1979; McLusky et al. 1992)
Dams for hydro-power or water storage	Loss of terrestrial species during construction and ongoing losses from species that are caught by sudden increases in river flow.	Increases open water but maybe at the expense of other habitats (e.g. mires).		Disruption of down-stream flow regime (e.g. causing low summer flows and reduced flooding of adjacent wetlands)		Low, other than avoidance of key sites	Important, and many uplands habitats need enhancement	(BirdLife International 2004b; McAllister et al. 2001)
Sewage works, water treatment plants and drains		Normally small	Normally small	Often causes eutrophication which can increase food resources at low levels, but high levels cause severe ecosystem impacts		Key sites can normally be avoided and pollution reduced to acceptable levels	Low	(Clark 2001; Mason 2002; Robledano Aymerich et al. 2008)
Oil and gas rigs and pipelines	Low level mortality from attraction to gas flares and collisions with rigs. Fish and cetaceans may be killed by underwater explosions for demolition and seismic surveys.	Some marine habitat loss from distribution pipes and port developments, relatively small terrestrial impacts from refineries and storage	Some disturbance related habitat loss during pipeline construction. Disturbance at sea from work on rigs, demolition and	Pollution impacts from rigs (drilling muds and water, and wastes) on marine ecosystems	Off shore activities now declining in much of Europe	High. Most habitats can be restored following pipeline construction, most sensitive habitats can be avoided.	Impractical for marine habitats. High for pipeline impacts on most terrestrial habitats (if fragile habitats and that require long-time scales for restoration are avoided).	(Sage 1979; Wiese et al. 2001)

Table 2.1. Summary of key impacts of infrastructure developments on biodiversity in Europe

Impact source / impact type	Direct mortality	Direct habitat loss (footprints)	Disturbance	Indirect habitat degradation	Cumulative impacts	Potential for mitigation	Role for compensation	Example references
	Pollutants from drilling muds and water may be toxic to some species.	facilities.	seismic surveys. Low level disturbance at refineries, storage and ports.					
Wind turbines	Collisions can be significant where turbines are inappropriately placed	Normally insignificant from turbine, but service roads can be significant	Some species avoid breeding close to turbines	Can cause some hydrological disruption, e.g. as a result of service roads	Potentially significant with increase in wind power schemes	High, most significant impacts can be avoided by appropriate location	Low, except for measures to increase survival or productivity rates of particularly vulnerable species.	(Drewitt & Langston 2006; Hötker et al. 2004; Huppop et al. 2006; Langston & Pullan 2003; Larsen & Guillemette 2007; Maxwell 2005)
Tidal barrages & impoundments		Normally substantial loss of inter-tidal habitats (but depends on scheme and coastal topography)	Disturbance impacts near barrage structures, especially if a road is present	Changes in tidal flow will cause significant and wide-ranging changes (e.g. to sediments, salinity, nutrient loads, turbidity and oxygen levels) and ecosystem changes which affect food availability.	Displaced birds may not find alternative habitat if other tidal habitats are affected by infrastructure impacts	Low opportunities for avoidance (most suitable sites or high biodiversity importance).	Constrained – very difficult to compensate for sub-tidal habitats. Inter-tidal habitats can be created, but may be insufficient suitable areas.	(Burton et al. 2003; Burton et al. 2006; Clark 2006)
Power lines, telephone lines, aerials and masts	Collisions and electrocutions can be significant, especially if placed on flight-lines near wetlands etc	Insignificant	Normally insignificant		Potentially significant	High, most significant impacts can be avoided by appropriate location and design of structures, or of necessary burying cables	Low	(Bevanger 1998; Newton 2007)

2.2 Current drivers of habitat banking in the EU

The current drivers of demand to offset residual biodiversity damage predominantly relate to legislation for biodiversity conservation and planning laws which require mandatory biodiversity compensation for residual impacts. At present EU legislation is limited to protected areas (such as Natura 2000 sites under the EU Habitats Directive (HD)) and the incidents covered by the EU ELD. An analysis of the legal framework suggests such compensation measures are normally strictly regulated and must be project-specific offsets that are like-for-like and normally within or close to the project development site (more so for the HD).

At a national level, planning procedures (in particular through SEA and EIA requirements) encourage and enable the development of compensation measures for residual impacts (e.g. that are part of the project proponents' development proposals after appropriate application of the mitigation hierarchy). However, current legal requirements for such measures, and their enforcement in EU Member States, are variable (see further discussion in Sections 4.1 and 8.1.4).

In addition to these, commercial considerations, such as the management of business risks and liabilities, access to investments, accreditation requirements, public relations and Corporate Social Responsibility (CSR) objectives also create incentives for 'voluntary' demand for offsets.

The current level of policy driven and voluntary demand for offsetting or credits within a habitat banking system may be insufficient to support a market because of the:

- Strict like-for-like compensation requirements under the Habitats Directive (described in Section 3.1 below);
- Limited enforcement of most national compensation laws and regulations (including the ELD);
- Varying levels of protection and enforcement (e.g. through impact assessments and planning processes) in different parts of the EU for biodiversity that is not strictly protected by EU legislation; and
- Unpredictable and fluctuating levels of voluntary activity.

However, if developed, the market could benefit from dynamic effects: by creating a more efficient compensation mechanism, habitat banking could lead to better enforcement of compensation requirements where previously impracticalities or cost concerns were a barrier. Interest in using market based instruments like habitat banking is increasing in Member States. For example, there is political and policy development interest in the UK, a pilot scheme in France (see Case Study appendix)

and a Dutch/German led project 'EcoTrade'[9] is looking at the applicability of tradable development rights to biodiversity.

2.3 The need for a no net biodiversity loss policy in the EU and supporting policy instruments

From the above analysis it is clear that there is currently no explicit no net biodiversity loss policy in the EU and without such a policy and supporting instruments, it will be impossible to achieve the EU's target of halting biodiversity loss. At the moment the key types of policy instruments that aim to directly prevent or reverse biodiversity losses are:

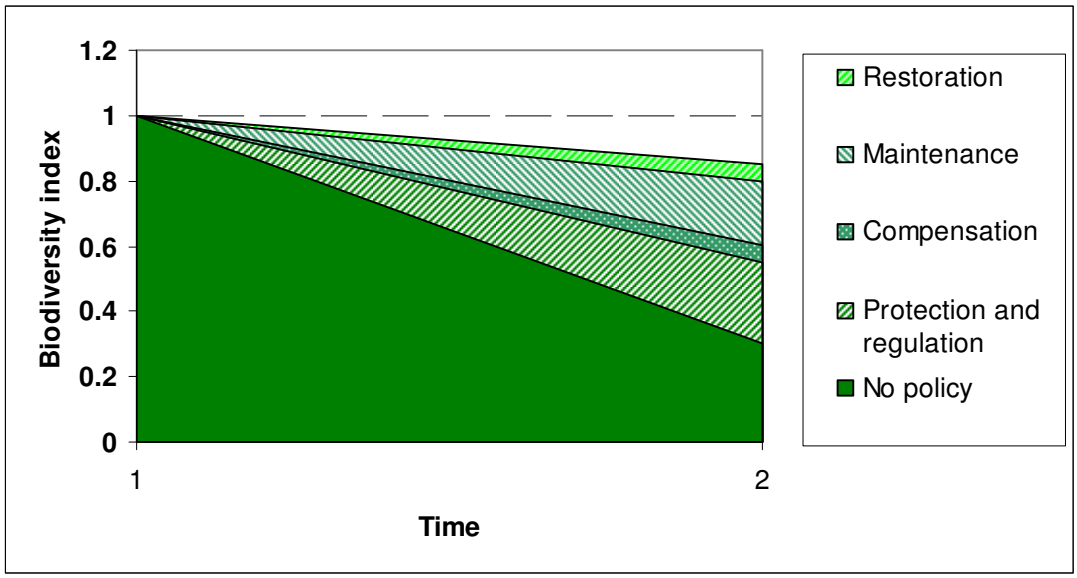
- Protection and regulation, which aim to prevent damage and losses: including legal protection of Natura 2000 features (i.e. habitats and species of Community interest within Natura 2000 sites) under the HWBD, national site protection, species protection measures (e.g. in accordance with HD Article 12), cross-compliance regulations under the Common Agricultural Policy, and pollution control regulations etc.;
- Compensation measures (primarily for residual impacts of developments): currently legal requirements for Natura 2000 features in accordance with HD Article 6(4), ELD requirements and some planning related measures in some Member States;
- Maintenance measures, which aim to keep existing habitats that are of particular biodiversity value (and their associated species) in good condition: including payments for environmental services (e.g. agri-environment measures) and market based instruments (e.g. certification schemes) that provide economic incentives for environmentally beneficial land uses etc., and
- Restoration measures: including payments from agri-environment schemes and direct grants (e.g. from EU LIFE-nature funds).

The contributions that each of the policy instruments is making to reducing the rate of biodiversity loss in the EU is unknown, but it is evident from the status of habitats and species and the mid-term assessment of the EU BAP that these current instruments in combination are not sufficient to maintain biodiversity. Figure 2.1a uses a hypothetical biodiversity index to illustrate the plausible additive impacts of each type of policy instrument over time. This shows that with current policies that do not require compensation for all significant residual impacts, biodiversity will inevitably decline to some extent.

[9] http://www.ecotrade.ufz.de/index.html it includes an online trading 'game' to illustrate the potential functioning of a biodiversity market.

Figure 2.1: An illustration the possible current and future roles of policy instruments in halting the loss of biodiversity in the EU. (Note: The biodiversity index is hypothetical and the illustrated values only aim to show likely broad trends.)

a. Current policy and instruments



b. No net loss policy and additional instruments

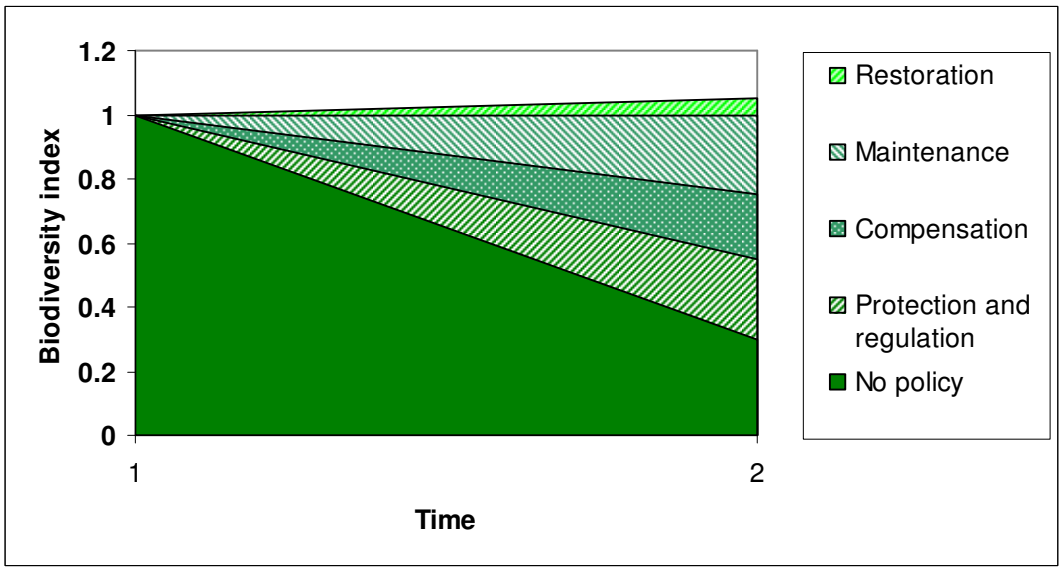


Figure 2.1b illustrates the possible combined impacts of the adoption of a no net biodiversity loss policy and the development of supporting instruments, including full compensation (or a net biodiversity gain) for all residual impacts (including individually small, but cumulatively significant impacts) through habitat banking and other forms of offset. Biodiversity benefits arise from the compensation actions themselves, but also as a result of the internalisation of the environmental costs of

development, which may reduce the level of unavoidable residual impacts (that then need compensation).

It is, however, necessary to point out that the achievement of a comprehensive no net loss policy would also require further actions to address the impacts of land use change (e.g. agricultural intensification). The loss of important and distinct habitat elements in the wider environment (e.g. the destruction of hedgerows, ponds, trees and ditches) could feasibly be compensated for by habitat banking instruments, but changes in crops or farming operations (e.g. increases in fertilizer use) could not. Cross-compliance measures, agri-environment measures and certification schemes etc currently address these issues to some extent. But these would need to be significantly strengthened or expanded to achieve not net biodiversity loss in the wider environment.

3. Market-based instruments: review of the concepts and examples

This section reviews the theoretical background on market-based instruments (MBIs) for the environment (Section 3.1), and describes the main types of market based instruments (Section 3.2). Section 3.3 is a brief section on MBIs specifically for biodiversity conservation which links to further analysis of habitat banking in Section 4.

3.1 Market-based instruments for the environment

The rationale for public policy intervention on the environment is to address market failures that arise in the supply and use of public goods. Public goods are those that provide benefits that are non-excludable (other cannot be prevented from benefiting from them) and non-rival (one person benefiting from them does not preclude another person doing so). For example, some ecosystem services like supporting services underpin other services that benefit humans (like provision of clean water) as part of a wider ecosystem – making them non-excludable. Environmental goods (such as biodiversity conservation) are also known to have significant non-use values – making them non-rival. These non-excludable and non-rival properties mean many environmental goods are public goods. The types of market failure impacting the environment include environmental externalities, information failures, and/or an absence of property rights.

Relevant policy intervention options to correct these failures can be summarised as (i) spending programmes (e.g. to deliver public services, such as state management of a protected area); (ii) laws and regulations (or command and control); and (iii) market based instruments, for example by paying a subsidy to influence an existing market transaction to encourage a certain land management practice. These categories are not entirely exclusive, but (i) involves direct spending by Government, whereas (ii) influences existing market transactions. Options (i) and (ii) have traditionally been used in biodiversity policies.

Policy interventions can be implemented at different scales: at EU level (e.g. the Habitats and Environmental Liability Directives, or CAP agri-environment scheme payments), Member State level (e.g. the 'Biodiversity Duty' in S.40 of the UK Natural Environment and Rural Communities Act), or Regional Government level (e.g. the different habitat banking systems in Australian States).

This Section focuses on market based instruments (MBIs), allowing their comparison with offsets and habitat banking in Section 4.5.

3.1.1 Conceptual Background

Environmental pollution and natural resource depletion impacts are often external to markets. Not considering these externalities can have negative consequences for the environment, human health and the economic performance of other sectors. So by not considering these externalities, market prices fail to reflect the true cost of production and consumption for society and resources are not allocated efficiently.

In economic terms, environmental policy in general acts to internalise externalities. A key principle in this respect is the polluter pays principle (PPP), which means the cost of pollution control and remediation should be included in the cost of goods and services which cause pollution in production and/or consumption.

There are two ways in which PPP can be implemented: regulations and market based instruments. Regulations (otherwise known as command and control) impose standards that polluters must meet. Thus, polluters incur the cost of environmental abatement and comply with standards thereby internalising the cost of environmental damage.

The problem with such regulation is that not all pollutants face the same abatement costs and so strict regulation can be inefficient (imposing too high a cost on some, and too low on others). MBIs have been promoted for their ability to correct market failure in a cost-effective manner. MBIs establish prices for environmental goods and services, via an existing market or a market that is created through regulations from government.

The advantage of MBIs over regulatory instruments is that they allow polluters to act according to their abatement costs. For example a tax allows polluters to choose between two options - paying the tax or abating their impact. Similarly, a permit trading system allows polluters to choose between abating their own impact and paying other firms that can abate at lower cost to do so. Thus, through the flexibility and cost-effectiveness they offer (OECD, 2001 and EEA, 2000), MBIs are generally believed to promote innovation of abatement technologies.

The European Commission has previously recognised MBIs as advantageous (EC, 2007c) because if appropriately designed they:

- Improve prices signals;
- Allow industry flexibility in abatement;
- Incentivise technological innovation; and
- Can be designed to support employment.

Given these advantages, the potential use of MBIs to protect biodiversity is being given increasing consideration around the world. By changing the price of traded goods and services, MBIs potentially offer a means of integrating nature conservation into the decision-making of economic actors, and cost-effectively reaching policy objectives for conservation and sustainable exploitation of natural resources. Types of MBIs currently in use for biodiversity protection include: taxes/charges/fees, tradable permit, subsidies, liability schemes and eco-labelling. Examples of their use are described in Section 3.2.

Some MBIs, in the EU biodiversity policy context, are also seen as a way to link several legislative drivers that require compensation of environmental damage (e.g. HD & ELD) with other policy targets (such as land use planning guidelines). The European Commission notes biodiversity offsets as possible options to "encourage landowners to maintain forests or wetlands, or to compensate for the unavoidable harm that development projects do to biodiversity by creating similar habitats elsewhere to ensure no net loss of biodiversity" (EC COM (2007) 140).

3.1.2 Political Uptake

Policy interest in MBIs for environmental policy has been growing since the 1980s with emphasis given to them in the final report by the World Commission for Environment and Development (Brundtland, 1987). Further, the Rio Declaration on Environment and Development (UNEP, 1992) stated:

> *"National authorities should endeavour to promote the internalisation of environmental costs and the use of economics instruments, taking into account the approach that the polluter should, in principle, bear the costs of pollution, with due regard to the public interest and without distorting international trade and investment."* (Principle 16)

Such broad-based support for MBIs came after early successes. For example, as a consequence of substantial water pollution problems in many rivers, water effluent charges were implemented in several European countries such as France, Germany and the Netherlands in the 1970s and 1980s. While in the US, the Fish and Wildlife Service supported the establishment of mitigation banks for habitat degradation as early as 1983.

Since broader global recognition of MBIs, their use has spread widely, particularly in developed nations. The more intensive use of MBIs in Europe was advocated in the EU's 6th Environment Action Plan (EAP), the renewed EU Sustainable Development Strategy and the renewed Lisbon Strategy for Growth and Jobs. MBIs have been become widely-used across Europe since the mid-1990s, both across Member States and environmental media/issues. Some well-known examples include agri-environmental support through the Common Agricultural Policy, The EU Emissions

Trading Scheme for CO_2 emissions, and waste levies such as the Irish Plastic Bag Levy and UK Landfill Tax.

The levels of environmental taxation in OECD countries[10] show that they make up only a small percentage of total taxation, averaging about 6% of tax revenues in OECD countries, with on average a slight decline in this percentage since 1996.

3.2 Types of market-based instruments

MBIs can be classified in various ways, but the most basic distinction is whether the instrument fixes a quantity or a price for the externality in question (Weitzman, 1974). If a price is fixed, the maximum marginal cost of abatement is fixed generating a range of possible abatement levels (quantities of externality). If a quantity limit is set, the level of environmental impact is precisely limited, but can lead to a range of potential cost outcomes. Taxes and charges are typical examples of price-based instruments, while tradable permits are quantity-based.

A quantity-based instrument is also inherently a rights-based instrument. When a quantity is set, this indicates the level of environmental degradation each firm or individual has the right to cause. It raises the issue of whether they should have to pay for that right or if it should be allocated free of charge. In contrast, a price-based instrument more clearly follows the polluter pays principle. Here a polluter must pay for each unit of environmental degradation they cause.

In reality the range of MBIs is much more complex than price vs. quantity[11], each with its own set of strengths and weaknesses. For example, eco-labelling is also a type of market mechanism - it provides environmental information to allow consumers to differentiate between products in a market. However, information provision can be used to correct failures of policy instruments more broadly than MBIs. Therefore this analysis does not cover eco-labelling. Voluntary agreements between polluters and the state can also be used as policy instruments and may fix prices or quantities depending on the design. In fact, some features of offset and banking systems could be similar to other voluntary agreements such as the incentives for entry into the agreement, the need to monitor implementation and so on. The focus of the rest of this section is on the definition and examples of more typical MBIs including:

- Subsidies;

[10] OECD/EEA database on instruments used for environmental policy and natural resources management. http://www2.oecd.org/ecoinst/queries/

[11] In addition, hybrid price-quantity mechanisms are being developed in the hope to provide some of the price-certainty of a tax at the same time as the efficiency (i.e. flexible abatement cost) associated with tradable permit systems. This (cap-and-trade system) is done by establishing a floor and/or ceiling to the price of a tradable permit.

- Taxes and charges;
- Performance bonds and deposit-refund schemes;
- Tradable permits and rights, and
- While not normally covered in the MBI literature, 'liability and compensation' since these instruments are closely linked to offsets and banking.

3.2.1 Subsidies

Support measures of various forms: transfers, payments, assistance or protections, are generally, referred to as subsidies. Subsidies can be environmentally friendly or environmentally harmful depending on what activity they are designed to support and the environmental impacts of that activity.

Subsidies can benefit the environment by supporting an activity that provides environmental public goods. Their effectiveness is therefore dependent on uptake of the subsidy by that activity. Uptake is not always predictable, as non-economic factors such as cultural traditions may hinder adoption of practices receiving subsidies.

Environmentally-friendly subsidies may be used to overcome policy failures (i.e. unintended negative impacts from other policies), making them sub-optimal. However, an environmentally-friendly subsidy can also be used to overcome market failure, and so falls more directly into the definition of an MBI. Either way, subsidies will give rise to inefficiencies, and require financing from limited public funds.

The linkages between support and damage can be intricate and difficult to identify. Even some subsidies that appear environmentally-friendly in the short to medium term, may, in the long term, introduce a vested interest or perverse effect that distorts markets (e.g. when improved technology is available, but subsequently difficult to bring to market).

Subsidies can also damage the environment when they subsidise an activity (usually for non-environmental reasons) that has significant external costs to the environment. The Organization for Economic Cooperation and Development (OECD) defines (OECD, 1998[12]) environmentally-harmful subsidies as:

"…all kinds of financial support and regulations that are put in place to enhance the competitiveness of certain products, processes or region, and that, together with the prevailing taxation jurisdiction, (unintentionally) discriminate against sound environmental practises."

[12] This definition has been used in subsequent OECD work, e.g. Potier M. (2005)

There are a number of economic sectors that are relevant to a discussion about environmentally damaging subsidies, most importantly, agriculture, fisheries, energy, manufacturing, transport and water (Barde and Honkatukia, 2003). The most prominent sector in which subsidies are provided is energy, particularly in light of climate change and some countries' attempts to move away from a fossil fuel based economy. In Europe, environmentally-friendly agricultural support is also prominent, particularly in the context of the biodiversity goals the EU has set. EU agricultural support continues to be reformed in an effort to shift it from being environmentally-damaging to being environmentally-friendly, and is discussed further in Box 3.1. The presence of environmentally damaging subsidies reduces the efficiency of using MBIs for environmental protection.

3.2.2 Taxes and charges

The type of tax used for environmental policy is a Pigouvian tax. The economist Arthur Pigou was the first to suggest that economic activities can have negative externalities, making the social cost of an activity higher than its private cost. As a solution to rectify this market failure and internalise the social costs, Pigou suggested levying a tax of a magnitude equal to the negative externality. An alternative, more pragmatic approach is to not necessarily attempt to completely internalise environmental externalities, but to at least set a tax or charge at a level estimated to be sufficient to achieve a given environmental objective.

The modern definition of an environmental tax sits on the rationale that it is defined by its tax base. An environmental tax is "a tax whose tax base is a physical unit (or a proxy of it) that has a proven specific negative impact on the environment." (European Commission, 1997). A further distinction is made between taxes and charges based on whether or not they are requited: a payment is requited if it directly secures some benefit, such as access to natural resources. The OECD (1999) defines the distinction:

Taxes are defined as *"…compulsory, unrequited payments to general government. Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments."*

Charges and fees are defined as *"…compulsory requited payments to either general government or to bodies outside general government, such as for instance an environmental fund or a water management board."*

Environmental taxes and charges can be classified into three types:

- A revenue-raising tax, which is intended to influence behaviour, but also raise substantially more revenues than required for related environmental services

or regulation (e.g. water treatment costs required by polluting activities of a tax-paying firm);

- An incentive tax, which is specifically designed to not raise revenues, but only change behaviour. The success of such a scheme may even be judged by the extent to which initial revenues from it fall as behaviour changes, and
- A charge or user fee is a compulsory and requited levy. Often a charge is viewed as contributing to or covering the costs associated with the payer's use of the environment. These levies are frequently paid into a fund or to an organisation that manages the environmental attribute being used.

Taxes and charges are very clearly a price-based MBI and so the actual level of environmental quality achieved is variable. However, they do provide a clear price signal to firms for investment in abatement and innovation. Additionally, they are very closely associated with the polluter pays principle. They place the costs of polluting on those responsible for the pollution. The revenues from environmental taxation in the EU are described in Box 3.2.

Green taxes have been part of Member States' policy portfolios for nearly two decades (EC 2009b). Member States have implemented them for carbon dioxide emissions, air pollution, agricultural inputs, waste, water, fisheries, and various other areas. EU-wide taxes, however, have not yet successfully been implemented and no Member State has yet attempted to introduce a mechanism that directly taxes impacts on biodiversity.

Tax refund and reduction schemes have been part of green tax reforms in Member States such as Denmark, Germany, the Netherlands, Sweden, Finland and the United Kingdom[13]. However, despite this, environmental tax revenues are declining. Since 1999 environmental tax revenues' share of GDP has fallen by 0.3% and as a share of total taxation by 0.8% (EC 2009b). The decline in tax revenue can partly be attributed to the emergence of other policy instruments, such as emissions trading and increasing energy prices, which have spurred improvements in energy efficiency (EC 2009b).

[13] Also recently identified by the UK Green Fiscal Commission: http://www.greenfiscalcommission.org.uk/

Box 3.1: The Common Agricultural Policy and Biodiversity

Agriculture receives by far the largest producer support of any sector, estimated at USD 258 billion in OECD countries in 2007 (OECD, 2008). The Common Agricultural Policy (CAP) has been in place in Europe since the 1960s to support agricultural production. It costs €55 billion per year, accounting for 40 percent of the entire EU budget (EC 2009a).

Since the 1990s, steps have been taken to reduce the environmentally-degrading effects of the CAP and incorporate EU environmental objectives to a greater degree by supporting the capacity of agricultural land to provide environmental public goods. Various reforms have reduced output-coupled payments in favour of single farm payments. The former generally promotes monocropping and intensification (e.g. increased fertiliser and pesticide use), while the latter can be structured to have a less distorting effect on trade *and* the environment. It also changes emphasis from agricultural production towards rural land management more widely, (e.g. through an extension to cover forestry measures).

The agri-environmental measure introduced in 1992 is a flagship for environmentally-friendly agricultural policy. However, despite successive CAP reforms, biodiversity conservation "continues to be undermined as a result of land abandonment, the fragmentation of semi-natural habitats, the loss of farmland features, high chemical input use and the conversion of pasture land to arable." (Farmer et al., 2008)

Agriculture is the most dominant land-use in Europe and it is estimated that up to 50% of all species in Europe depend on agricultural habitats (EEA, 2009). There is an obligation under Article 6 of the EC Treaty (1) to integrate environmental protection measures into all community measures, including the CAP. Additionally, the EU has committed to reversing the decline in biodiversity by 2010 (2). Although the need to reform the CAP to further incorporate the EU biodiversity goal has been recognised (CEC, 2006), the Commission in its communication on the 'Health Check' of the CAP (CEC, 2007) acknowledged that the 2010 biodiversity goal was unlikely to be met.

Farmer et.al. 2008 identify four primary interventions to effectively target agricultural land for biodiversity conservation:

1. Maintenance of existing high nature value farming systems;
2. Adoption of more extensive practices in intensive farming systems;
3. Restoration or re-creation of habitats degraded, damaged, or lost farming systems; and
4. Creation of new habitats "as part of a strategic, landscape scale approach to promote the development of functional connectivity between habitats in the context of climate change."

Clearly support for the European agricultural sector has shifted to some degree from being environmentally-degrading to environmentally-friendly. However, the effect on biodiversity is unclear. Particularly in light of the future context of climate change, there may be a need for subsidies and other support mechanisms to incorporate agricultural landscape management for biodiversity protection to a much larger degree.

Notes:
(1) The Treaty on European Union and the Treaty establishing the European Community; Official Journal C 321E of 29 December 2006. Article 6 "Environmental protection requirements must be integrated into the definition and implementation of the Community policies and activities (…), in particular with a view to promoting sustainable development."
(2) Presidency Conclusions, Göteborg European Council 15 and 16 June 2001

Box 3.2: Revenues from Environmental Taxes and Charges in EU

Environmental taxes and charges are the most widely used MBI for environmental policy in Europe. They have proven particularly useful for addressing diffuse sources of pollution, such as cars and pesticides, or extraction of natural resources (EEA, 2005). Aside from following the polluter pays principle, one reason for the wide use of taxes and charges across the EU is their revenue raising ability.

For Member States, in 2005/2006 revenues from environmental taxes varied between 5 percent (Belgium) to about 9.5 % (Denmark) of total tax revenue. Turkey (candidate EU country) tops the list with 15 % of tax revenues achieved through environmental taxes. In terms of GDP, environmental taxes in the EU can represent from nearly 2 % to over 4 % of GDP (1).

The issue with taxes, more specifically, is that they are unrequited payments. Hypothecation of these payments for an environmentally-friendly purpose is often advocated by environmental interests, such as:

- Support for environmental technology (e.g. renewable energy resources);
- Funding environmental remediation, and
- Funding recycling schemes and proper disposal.

Examples of such spending in the UK include the landfill communities fund, whereby some tax liability can be diverted into a grant scheme supporting environmental enhancements in the vicinity of landfill sites (2). However, national Treasuries are often reluctant to hypothecate environmental tax revenues for environmental purposes, and their use funding biodiversity objectives is limited in the EU. Revenues from environmental taxes can also be used for non-environmental purposes, such as environmental tax reform (e.g. reduction of other taxes) or revenue recycling back to liable payers.

In contrast, environmental charges are requited payments, and so one might expect the revenue raised to be linked directly with an environmental objective. One example related to biodiversity conservation is charges to enter protected areas (PAs), which can be used to fund that PA. This is particularly important in countries where public money for nature conservation purposes is limited (Ecologic, 2006). However, the level of charges may not be high enough or the revenues may be diverted to other uses. For example, in Slovenia, PA charges are completely recycled for use in those PAs but only cover 26 % of the costs, while in Croatia charges for PAs total 230 % of the costs, but are principally funnelled to public environmental institutions, with a relatively small portion of that going to fund PAs (Ornat and Jiménez-Caballero, 2006).

Notes:
(1) Data from OECD/EEA database on instruments used for environmental policy and natural resources management. http://www2.oecd.org/ecoinst/queries/
(2) The fund is regulated by ENTRUST http://www.entrust.org.uk/home/lcf

Environmental taxes in the EU can be divided into broad categories: energy, transport, and pollution and resource taxes. Of these, energy taxes are the most significant representing nearly three quarters of all environmental tax receipts (EC 2009b). Figure 3.1 below shows that pollution and resource taxes account for a very small portion of

environmental tax revenues for member states, and for the EU-27 and EU-16 (weighted averages as a % of GDP) (EC 2009b).

The Council of Europe published an in-depth review of the potential for using tax incentives to conserve biodiversity (Shine 2005). It is limited in scope to the use of the current tax system, highlighting the limited discussion to date. Tax incentives for conservation currently in place are generally aimed at increasing conservation activity on private land and do so by providing tax breaks (in effect an environmentally friendly subsidy). The taxes levied on activities that are detrimental to the environment could also indirectly create incentives to conserve biodiversity. However, they remain, on the whole, in the scope of natural resource extraction (e.g. logging) or use of hazardous products (e.g. pesticides). Across the globe, there is little experience to date with a tax levied on a tax base chosen primarily because it has direct negative impacts on a habitat or biodiversity.

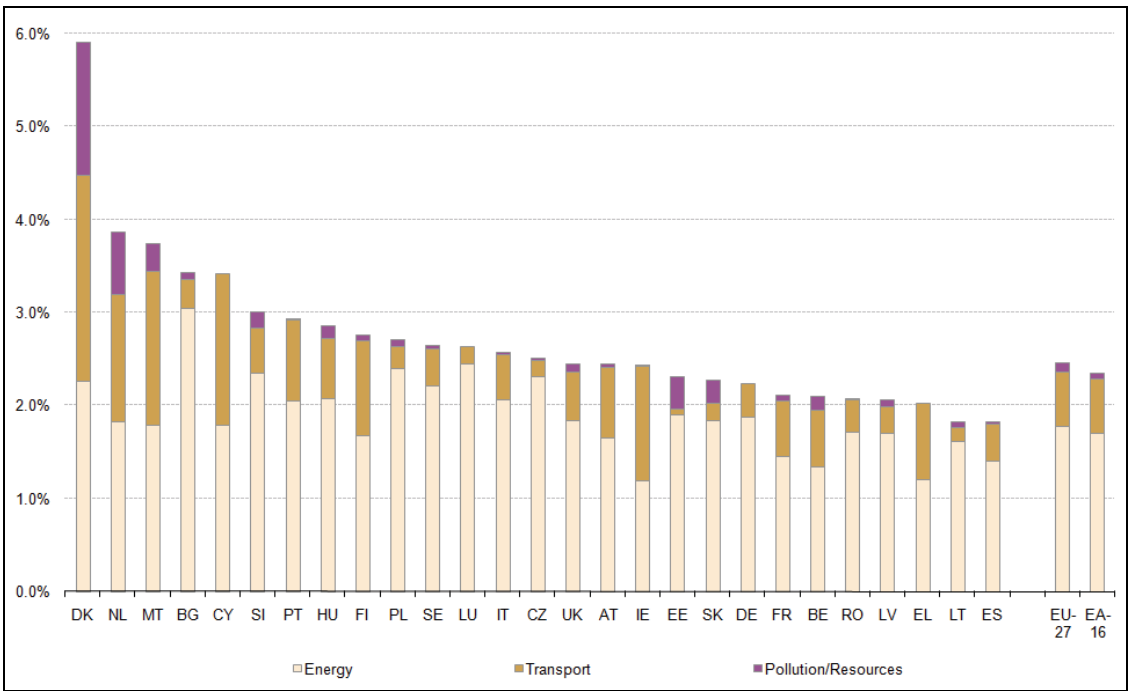


Figure 3.1. Pollution and resource taxes as a % of total tax revenues, in the EU (EC, 2009b).

3.2.3 Performance bonds and deposit-refund schemes

Both performance bonds and deposit-refund schemes are based on the idea that financial collateral should be offered to assure environmental performance but work on very different levels.

Deposit-refund schemes require a deposit to be paid on the purchase of potentially polluting products. That deposit is refunded when the products (or their residues) are returned for recycling or proper disposal. The instrument is designed to encourage environmentally sound practices (e.g. recycling, appropriate waste disposal), thereby rewarding good behaviour and avoiding littering, pollution, and contamination.

The primary issue with deposit-refund schemes is that they are either very expensive or easily ignored and so generally considered voluntary, or have very high transaction costs to enforce. As such, they are not powerful enough tools for major environmental issues like biodiversity conservation and have been most widely used for beverage containers. Success in this area, however, has encouraged the broader use of deposit-refund schemes, which have now been implemented in various EU Member States for, inter alia, batteries, lubricating oils, electronics and automobiles (parts and whole). With the extension of such schemes, companies are encouraged to take more consideration of the entire life cycle of their products and develop new business models, such as leasing services in place of selling products.

Performance bonds can also be used for environmental protection, in which case they are known as “environmental assurance” or “environmental performance” bonds. Essentially, before a firm carries out a major infrastructure, construction, or extraction development it must purchase these bonds from the appropriate government entity with the promise of maintaining a certain minimal level of environmental impact. Upon completion of the project, the government purchases the bonds back, but only if the conditions of minimal environmental impact previously agreed upon are met.

Some early advocates of environmental assurance bonds promote them as a strong method of dealing with uncertainty in environmental performance (Costanza and Cornwell, 1992). One early concern over such bonds was that they may crowd out small enterprises that could not handle the financial responsibility of activities potentially hazardous to the environment. However, that is to some degree the desired effect: businesses that cannot handle the cost of remediating the potential environmental damage should not be allowed to impose those costs on the public purse or unsuspecting commercial partners. Indeed later criticisms of environmental performance bonds claimed that they perhaps did not go far enough; that there was still too much room for non-compliance and evasion of environmental obligations (Boyd 2001).

To date there has been little experience with environmental bonds in the EU. The majority of experience is among extractive industries in the US (see Box 3.3), Australia, and developing countries. But there are still lessons that can be learned from these experiences. The major benefit is that "*…assurance leads potential polluters to a transparent, in-advance appreciation of future environmental obligations*" (Boyd 2001). Although there is some economic incentive, it is backed up by command-and-control requirements cited in the bond. This requirement may have more incentive than the deposit paid for the bond since a firm's ability to access natural resources in the future "*…is dependent in part on satisfying regulatory requirements today*" (US EPA, 2009). Similarly, the strength of environmental bonds may be increased by third party mediation. In this case, the ability of the primary firm to receive underwritten assurance bonds would depend on its past performance of meeting environmental obligations.

If associated with good environmental regulation, bonds provide a strong incentive for operators to meet environmental standards. They place the risks of not meeting those standards on the private operator, therefore safeguarding public welfare. However, bonds that are sufficient to incentivise compliance with environmental standards may be costly, and therefore bonds may tie up large amounts of capital compared to insurance systems for liabilities that share financial risks.

Box 3.3: Environmental Performance Bonds and Reclamation in the USA

Environmental performance bonds were introduced in the US by the Surface Mining Control and Reclamation Act (SMCRA) of 1977. The Act required performance bonds for surface coal mining and reclamation permits, such that once coal resources were exploited, the land could be reclaimed and restored to its natural state. The size of the bond is dependent on the reclamation requirements as specified in the permit and relevant characteristics of the site (US EPA, 2009), such as topography; geology; hydrology and revegetation potential.

Simply, the amount must be large enough that the regulatory authority can carry out reclamation in the case of forfeiture by the bond holder.

The scope of bonding is limited however, and to date, most experience is with land reclamation rather than remediation. Based on mining experience, the conditions where bonds are likely to be effective have been catalogued (Shogren et al., 1993) and include:

1. Well-known damage value;
2. High probability of detecting environmental damage;
3. Well-defined agreement;
4. Few parties;
5. Fixed time horizon;
6. Low bond value; and
7. No irreversible effects.

In reality, these conditions are difficult to meet, clearly indicating the limits to the bonding mechanism. Particularly, the criteria of a fixed time horizon and no irreversible effects are difficult to ensure, especially when considering the case of biodiversity, which is increasingly proven to be dynamically complex in light of climate change and rural communities' interaction.

Finally, although there is moral hazard associated with most MBIs, it is particularly prevalent in relation to bonds (as widely-recognised in labour economics for example). Since the level of environmental damage and reclamation/remediation is agreed upon at the outset, there is potential for moral hazard on the part of both parties. The regulatory agency could easily claim the bond and associated funds despite the level of precaution of the firm. Alternatively, the firm, if it realises its limits are exceeded, now has no direct economic incentive to restrict pollution (although there may be some other incentives as noted above).

3.2.4 Tradable permits and rights

The lack of property rights is a major reason for environmental externalities; since there is no ownership of environmental goods and services, there is no stewardship of them. The issue of lack of property rights is often referred to as the tragedy of the commons (Hardin, 1968), where common land is over-exploited because all users feel they maintain the right to use all of the land. The term "tragedy of the commons" now represents more than just common goods, but also tends to be used when speaking of pure public goods. The qualities of pure public goods are shown in Table 3.1.

Table 3.1: Economic definition of types of goods		
	Excludable	**Non-excludable**
Rivalrous	Private good	Common goods
Non-rivalrous	Club goods	Pure public goods

The seminal paper by Robert Coase (1960) posits that with property rights defined, the most efficient use of the environment will be negotiated by the party that wants to use the environment and the party that has right to the environment. The theorem is based on two major assumptions of perfect information and zero transaction costs. Both are infeasible, but that does not diminish the importance of defining property rights. Defining property rights means that previously open-access environmental goods and services move out of the state sector and into the hands of private owners who have a stake in sustaining them.

The modern advancement of assigning property rights for the environment is to assign tradable permits and rights. The total level of environmental degradation allowed is determined by an overseeing body (e.g., government) and firms are granted the right to affect some portion of the total allowed environmental degradation. The allowed level represents a fixed environmental outcome, and as it will be below the current level, abatement must occur.

Trading is allowed, creating a market for these permits and allowing for the lowest cost abatement option to prevail and making it an efficient instrument. That is, if one firm can abate at a lower cost than another, it is in the interest of both firms to trade permits. The abating firm will receive a payment higher than its costs of abatement, making profit, while the permit purchasing firm will pay a price less than its own cost of abatement, reducing costs.

To date, trading schemes have been primarily focused on reducing emissions to air and water. There are a number of issues associated with such trading schemes, including:

- Property rights must actually be created and well defined, but at the same time trading must not be obstructed by large transaction costs – this is a difficult balance to strike if the commodity traded varies across time and space;
- Credits must be fungible, requiring an easily comparable credit (e.g., 1 tonne of CO_2 emissions from one source is equal to 1 tonne of CO_2 emissions from another);
- Monitoring and enforcement are also crucial to ensure that the system is effective in its environmental goals, and can be difficult; and
- Allocation of credits must be carefully designed, considering the costs and benefits of free or auctioned allocation, and is liable to political capture.

The EU emissions trading scheme for CO_2 emissions (EU ETS) offers lessons on the operation of a tradable permit system in Europe, such as the risks of political capture. Its comparison to habitat banking is limited because CO_2 emissions are perfectly fungible, whereas biodiversity is a highly variable commodity. However, some lessons can be drawn.

The price volatility in the EU ETS has been correlated to the volatility of the global oil price. It may be that habitat credits will be similarly correlated to land prices, or world food prices. However, habitats, land and food markets are likely to be subject to greater market failures (e.g. seasonality, fewer traders) than EU CO_2 and global oil markets. The EU ETS has also been able to adjust allocations over time (through allocations rounds), learning from experience and gradually altering performance targets. There is room to do this with CO_2 emissions because they are fungible over time. Biodiversity does not share this quality, as losses can be irreversible.

If the concept of tradable permits is to be applied to the context of biodiversity conservation, the criteria above beg an explanation of how to define property rights, equivalency of credits between habitat types, enforcing biodiversity protection normally carried out over large parcels of land and so on. These and other issues are discussed in more detail in the rest of this report.

Some early experiences with permit trading related to conservation were carried out using Tradable Development Rights (TDRs). Like emissions markets, TDRs cap the level of undesirable activity. Where a water quality trading scheme caps the total amount of effluent emitted into a watershed, a TDR scheme caps the total amount of development allowed to be undertaken in an area identified for its conservation value.

Although TDRs may have avoided some of the questions related to trading biodiversity rights, they also highlight some of the other relevant issues. There is no experience in Europe with TDRs to date due to the way property rights are defined (Renard, 2007). Property rights in Western Europe have traditionally been viewed as a single right. Some countries like the US, however, define property rights more as a bundle of rights associated with land, such as lease, use, and development rights. It is in places where property rights are defined as this bundle that TDR schemes have been implemented (See Box 3.4).

Box 3.4: Tradable Development Rights

TDR programmes separate out the right to develop land from other rights such as use and lease. As the right to develop land is sold, that parcel of land becomes protected from development, often as a conservation easement. The parcel of land that the rights are transferred to are then allowed to develop, in some cases to a higher degree than normally would be allowed by standing planning permission. There is a lot of experience with this type of TDR schemes in the US for conservation (Messer, 2007) and agricultural land (American Farmland Trust, 2008).

Variations on the explicit trade of development rights also exist. In Brazil, for example, there is a scheme where developers are required to maintain a certain percentage of the land being developed as a conservation area and this requirement can be traded between development projects.

Despite fairly broad experimentation and use, there are a number of outstanding issues with TDR schemes in addition to the general issues associated with a permit trading scheme. Some examples are briefly highlighted below.

Issue	Problem	Potential Solution
Spatial dependence of habitat patch	The biodiversity value of a habitat patch is dependent on its proximity and connectivity to other habitat patches	Oversight intervention defining the areas that can/should sell rights
Geographic scope	TDRs are ineffective if developers can easily move projects outside the geographical boundary of such a scheme	TDRs have been successful in metropolitan areas expanding into green belts, where moving development further from urban areas reduces its value
Weak zoning and planning ordinances	Developers may be able to sidestep TDRs through the planning process, decreasing demand	Strengthen the planning process by fully integrating TDRs

3.2.5 Liability and compensation

There is a strong history of law related to environmental liability and compensation, which have not traditionally been considered as MBIs. However, as environmental policy becomes more heavily integrated into economic markets, environmental liability and compensation regimes are paving the way for MBIs based on environmental liability.

Traditional market-related impacts of environmental liability issues include (EEA, 2005c):

1. Fines and non-compliance penalties;
2. The risk of liability and the need to have insurance or contingencies to cover eventual liabilities;

3. The effects of liabilities on price;
4. The costs of addressing liabilities; and
5. The costs of compensation.

Compensation requirements are often linked to application of the mitigation hierarchy (see Section 4.1.6), in order to avoid a 'right to pollute' (or damage) developing. They can also be covered by insurance policies, allowing risks to be shared and therefore potentially making them cheaper than bonds. However, this requires accurate assessment of risks and reparations costs, and an adequately developed insurance market.

The operation of an insurance market and of efficient liability regimes are both strongly influenced by the design of the regulations of the liability instrument. Strong regulation can specify permanence of reparations and no net loss, but weaker regulations (e.g. substitutability between compensation measures) may be necessary to allow markets to develop (e.g. to make risk insurable).

Environmental liability is within the realm of the "polluter pays principle", and is more closely linked to its principles than for example, taxes on pollution. Whereas a tax is based on the estimated value of damages, under liability regimes those that damage the environment have to pay for it, they are legally liable for that damage. There are two main legal variations of liability:

Strict Liability – Liability does not require proof of culpability (i.e. *fault* or *negligence*) for damages.

Fault-based liability – Liability depends on the polluter being *negligent* or at *fault*.

Strict liability tends to be deemed more appropriate when dealing with damages that are regarded as hazardous. In contrast, fault-based liability is more appropriate when dealing with damage to the environment that is not directly hazardous to humans.

The early history of environmental liability legislation within Europe focused on damages that were potentially hazardous to human health, such as oil spills, contaminated land/soil, contaminated groundwater, and other forms of pollution. In recent years, however, broader incorporation of environmental damages not necessarily caused by pollution has been increasingly included in national-level and EU-level legislation. Notable legislation related to habitats can be found, for example in Germany and Sweden (for both see case study appendix). Further, the EU Habitats Directive includes provisions for compensation measures which have been expanded beyond Natura 2000 sites by the Environmental Liability Directive.

A recent permutation on the compensation concept that has been taken up voluntarily (beyond the EU ETS) is the principle of carbon offsets. Carbon is well-suited to offsets

because a tonne of CO_2 equivalent emissions has the same climate change impact wherever it is emitted. This makes carbon emissions highly fungible. While both formal and voluntary (Kyoto and non-Kyoto) carbon offset regimes have developed, however, both have suffered from issues of credibility related to the additionality of their offsets.

This problem arises because carbon offsets are often based on avoiding some activity (e.g. deforestation or burning of fossil fuels). The baseline for these actions is therefore a predicted future scenario, with the benefit arising by averting the risk of future emissions (e.g. by preserving forest, or supplying renewable energy technology, respectively). The assessment of predicted averted risk makes verification of baselines, and therefore the additionality of emission reductions, difficult to monitor and audit.

The theory of compensation regimes is further developed in Section 4, which describes the theory and concept of biodiversity offsets (see Section 3.3. below) and habitat banking in more detail.

3.3 Economic instruments for biodiversity

Using MBIs as a flexible and cost-effective means to meet policy targets is an increasing trend in the EU, which is expected to persist with the 6th EU Environmental Action Programme, the renewed Sustainable Development Strategy and the renewed Lisbon Strategy for Growth and Jobs (EC 2007c). In addition to the Common Agriculture Policy (i.e. the agri-environmental measures of the Rural Development Policy) and the Cohesion Policy in the environment and energy sectors, instruments such as indirect taxation, targeted subsidies or tradable emission rights are currently used within the EU. There are many such economic instruments that target environmental degradation; however environmental levies have been the most widely used MBI for environmental policy in Europe (EEA, 2005c). EU-wide taxes, however, have not yet been implemented[14].

There are many economic instruments that target environmental degradation. Indirectly, these instruments can have positive impacts for biodiversity conservation. For example, taxes on agro-chemicals to protect water resources may also benefit biodiversity. However, there are limited examples of market based instruments that directly target biodiversity objectives in the EU:

- Subsidies: Payments for biodiversity conservation measures through agri-environment schemes under the Common Agriculture Policy (CAP);

[14] Although minimum EU energy and CO_2 tax rates are again under discussion (EEA, 2005c).

- Taxes and Charges: Fees for natural resource extraction (e.g. hunting) and access to habitats for recreation (e.g. entry fees to national parks);
- Performance bonds: No known examples directly targeting biodiversity in the EU[15];
- Tradable permits and rights: Rights-based management tools in fisheries; and
- Liability and Compensation: Biodiversity offsets, whereby actions are taken to enhance biodiversity as compensation for unavoidable damage, ensuring no net loss, and habitat banking (especially in the US), whereby offsets are delivered through habitat 'credits' that are stored and traded over time.

Over 200 such instruments can be identified (Ecologic, 2006). However, many of these relate to charges, fees or tradable permits for management of individual species (e.g. to control hunting). With notable exceptions like agricultural and forestry subsidy schemes, economic instruments used in the EU to manage biodiversity are often small-scale relative to overall biodiversity resources, and the policy challenges facing biodiversity conservation. Ecologic's research identified that:

- Price instruments are more common than quantity based ones, with taxes/fees/charges being the most common, followed by subsidies/support measures;
- Taxes/fees/charges are useful for limiting damage to biodiversity, whereas subsidies/support and eco-labelling protect or enhance biodiversity;
- The majority of instruments are habitat/ecosystem based, with a minority (around a third) based on particular species;
- The majority of EU countries have economic instruments relevant to biodiversity conservation in use, but practice varies, with subsidies/support more common in Northwest Europe, and taxes and charges being more common in Central and Eastern Europe, and less use of economic instruments in Southern Europe, and
- The appropriate choice and design of economic instruments for biodiversity is context specific, although they can be more efficient that command-and-control approaches alone, but optimal design may involve a combination of both types of instrument.

Applying MBI *specifically* to biodiversity problems is gaining acceptance within the EU. The EU Biodiversity Action Plan and the Common Fisheries Policy have incorporated instruments to promote cost effective means to reaching conservation and sustainable exploitation objectives (EC, 2007c). All three main types of market-based instruments are in place in the EU – taxes/charges/fees, subsidies and tradable permits. They are

[15] Previous experience is predominantly outside the EU and focused on remediation of hazardous materials or other contamination. Although the intent is to return to a healthy baseline status of the environment, the measure of success is, for example, pollution levels rather than biodiversity levels.

used primarily for habitat and ecosystem conservation, but also for the protection of specific species (EC, 2007c).

Worldwide, there are notable examples of biodiversity-targeted instruments in some subsidies and tradable rights instruments (e.g. payments for ecosystem services), but the main examples to date are habitat banking schemes, such as those operated in the US and Australia which are detailed in the next Section.

4. Biodiversity offsets and habitat banking: the concepts

This section reviews the background to biodiversity offsets and habitat banking. Firstly Section 4.1 covers definitions of the key components of offsets and habitat banking systems, including a working definition of the latter. Then Section 4.2 discusses the potential benefits of habitat banking, Section 4.3 reviews its constraints and risks, and Section 4.4 outlines principles for maximising the benefits. Finally Section 4.5 evaluates habitat banking in comparison with the other MBIs reviewed (in Section 3.2) and in the context of the current status of biodiversity in the EU (Section 2.2).

4.1 Compensation within the mitigation hierarchy[16]

It is a widely accepted principle that appropriate measures should be identified and taken to avoid and reduce the potential impacts of a development, and where necessary to compensate for residual impacts. Furthermore, such actions should be considered and prioritised according to the following mitigation hierarchy:

1. **Avoidance**: measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity. This results in a change to a 'business as usual' approach.

2. **Minimisation / reduction**: measures taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided, as far as is practically feasible.

3. **Rehabilitation**: measures taken to rehabilitate degraded ecosystems/habitats or restore cleared ecosystems/habitats following exposure to impacts that cannot be completely avoided and/or minimised.

4. **Offset or compensation measures** (see below).

According to this hierarchy, emphasis should be given to avoidance of significant adverse impacts at source as the first objective (as well as seeking opportunities to enhance biodiversity). This should normally be followed by efforts to identify mitigation measures to reduce or minimise impact, then remedy unavoidable residual damage or loss if possible through on-site restoration of ecosystems/habitats and finally by use of compensation or offsets. The process of identifying and developing

[16] http://www.forest-trends.org/biodiversityoffsetprogram/site/misc/Slide1.ppt

mitigation and compensation measures can normally be carried out in the first instance as part of a Strategic Environmental Assessments (SEA) e.g. by locating developments in areas that avoid significant impacts as much as possible. Detailed proposals for project-specific mitigation and compensation measures are identified and described in Environmental Impact Assessments – EIA (see Box 4.1) or an Appropriate Assessment as required under the HD (see Section 5.3). Detailed development proposals should take into account the findings of previous Strategic Environmental Assessments (SEA), e.g. to consider alternatives, and if necessary to identify sites where habitat compensation measures could provide valuable benefits (South West Ecological Services et al. 2004).

Box 4.1. The principal steps in EIA

EIA Step	Tasks
1: Project screening	Determine whether significant impacts are likely and whether these merit formal impact assessment.
2: Scoping	Set terms of reference for the assessment. Review proposed project activities and likely implications in order to design an impact assessment which captures the main issues. Confirm consultation requirements.
3: Consideration of alternatives	Consider alternative locations, designs, methods, timeframes to avoid or minimise adverse effects.
4: Baseline review and population assessments	Define biodiversity distributions (temporal and spatial) and baseline conditions. Baseline = state and condition of biodiversity in the absence of the proposed project and accommodates trends, i.e. not just a static 'snapshot'.
5: Identification and prediction of main impacts	Identify ways in which the proposed project activities will drive changes in baseline conditions. Focus on key issues and provide evidence if possible.
6: Evaluation and assessment of impact significance	Apply the precautionary principle and consider criteria/ set thresholds (adopted from existing legislation and policy where possible & appropriate) for determining significance.
7: Recommendations for mitigation and compensation	Make suggestions in order to achieve 'no-net-loss' of biodiversity. Seek avoidance ahead of damage limitation or compensation.
8: Production and review of Environmental Impact Statements	Produce a report documenting the results of the assessment. Ensure the EIA framework allows for consultation on the draft/ peer review.
9: Decision making	Use the results of the EIA to support decision making.
10: Post-decision monitoring, auditing and follow-up	Ensure that the results of the EIA are built into environmental management systems for project implementation and operation. Review performance against any objectives and ensure mitigation measures have been implemented as proposed. Ensure there is a mechanism for remedial action if necessary.

Figure 4.1 illustrates some mitigation and compensation measures with respect to the potential impacts of a hypothetical road development on two ponds of importance for the Great Crested Newt *Triturus cristatus* (a species protected under Article 12 of the

HD) and an area of forest. The initial proposal (a) would result in the destruction of one pond containing the newts and the loss of forest habitat, as well as disturbance and fragmentation of the forest block. As a result of an EIA a revised proposal is made (b) that realigns the road to avoid one pond and to reduce the loss and fragmentation of the forest. Further mitigation measures that are proposed include barriers to reduce noise disturbance of the forest (and reduce collision rates with wildlife) and a habitat bridge to provide some ecological connectivity between the forest patches. Finally a new area of forest is to be restored to compensate for the unavoidable loss of the forest habitat.

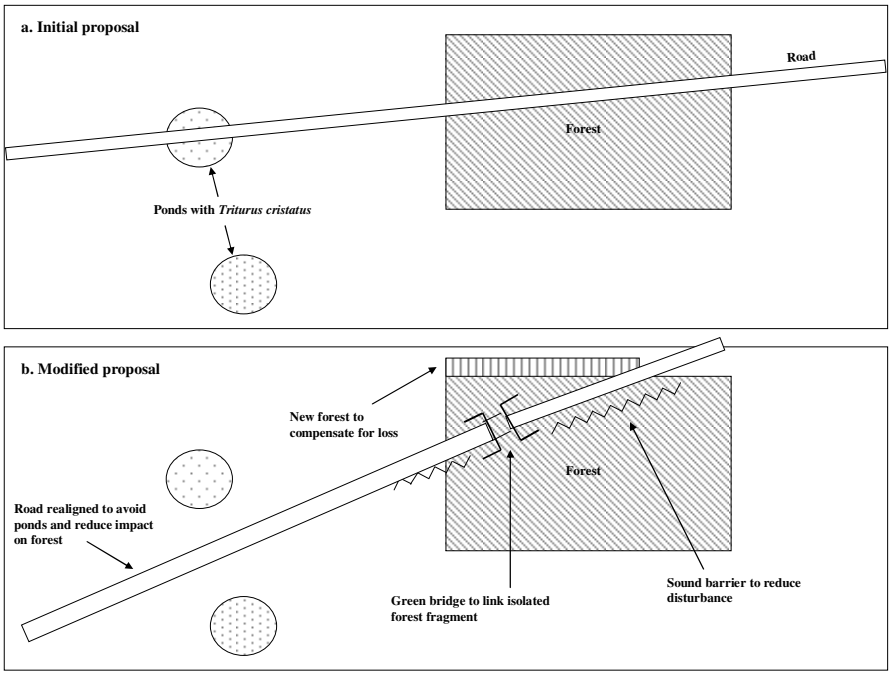


Figure 4.1: A hypothetical illustration of potential mitigation and compensation measures for a road development

The mitigation hierarchy is often misinterpreted with insufficient consideration given to which avoidance and mitigation measures are appropriate. Such considerations should compare the potential conservation outcomes of combinations of mitigation and compensation measures, their cost-effectiveness and their reliability. As discussed further in Section 4.2, it is not always appropriate to undertake all possible avoidance and reduction measures and restrict compensation measures to remaining residual impacts.

There is also often a presumption to carry out compensation measures (e.g. the creation of a wetland) on site if this is possible. But in many cases this can lead to the creation of poor quality, fragmented or disturbed habitats. Instead it may be better to implement the compensation in a more suitable but ecologically appropriate off-site

location (e.g. ensuring it is functionally connected to existing wider viable populations) where, for example, the viability of the habitat may be greater and where it may contribute to restoring habitat connectivity (see Section 4.2 for further discussion of the location of compensation).

4.2 Components of biodiversity offsets and habitat banking

This section expands the definitions in Section 1.3 for certain terms that are key to describing habitat banking. As stated in Section 1.3, in defining these terms, we are working on the basis of current EU terminology, in particular the concept of mitigation which has different US and EU meanings.

Whether dealing with an offsetting or banking system, the decision-making context is one of trying to compensate for damage to the environment. Three fundamental questions need to be answered in this context:

1. What is the damage to the environment?
2. What kind of environmental resources and services are required to offset that damage? and
3. How much offsetting is sufficient?

Terminology and systems are developed to answer these questions at a general level with applicability to different site, resource and damage specific cases. In this case the resource in question is biodiversity as defined in Section 1.2.

In practice the conservation of biodiversity in the EU is carried out primarily through measures for particular species or habitats (although it is assumed that actions for these will often provide wider benefits). In this context, the term habitat banking is used to reflect banking of areas of habitat for their biodiversity value, and therefore the terms 'habitat' and biodiversity are analogous. Thus the concept of habitat banking can be developed by thinking about the nature of damage to biodiversity and its services, compensation needs, enhancement of the biodiversity to deliver those needs, and the exchanges of environmental goods thus may take place.

The rest of this section introduces the components of offsets and habitat banking that help answer the decision-making questions set out above.

4.2.1 Debits

The term debit refers to the loss suffered as a result of environmental damage. Figure 4.2 is a stylised presentation of what happens to the environment when damage occurs. The y-axis shows the quality and/or quantity of the resource/service affected

(in this case biodiversity). In an assessment of damage and compensation, the debit is an expression of the quantity of loss suffered as a result of biodiversity damage.

The x-axis of the graph in Figure 4.2 shows the change in the quality and quantity of the resource/service affected over time. Biodiversity varies over time due to natural and human-made factors and so does its recovery after damage. This variation needs to be taken into account when estimating both the damages and offset benefits occurring over time.

The dotted line at the top of Figure 4.2 shows the baseline. The baseline reflects the condition of the resource and its associated services (including the physical, biological, or ecological functions of a resource, as well as any use or non-use human services provided by the resource) had the damage not occurred. Data and models that predict a dynamic projection of the baseline over time may better reflect baseline conditions in some settings than a static analysis. In Figure 4.2, a more or less flat baseline is shown, implying that the conditions are not expected to vary substantially if the damage does not occur. Under different conditions, the baseline could be declining – demonstrating a decreasing quality and/or quantity of biodiversity (e.g. in an already polluted environment). Baseline could also be increasing – demonstrating an improving quality and/or quantity of biodiversity (e.g. due to better implementation of environmental policy).

Figure 4.2 also shows an 'incident date'. This point represents the onset of biodiversity damage and typically represents the base year for any analysis. The 'incident' could be one that is anticipated such as the development of, say, infrastructure, in which mitigation measures to avoid or reduce impacts have been taken (HD context). Or it could be an imminent or unanticipated event, such as a pollution incident from a malfunctioning production or waste storage system (Environmental Liability Directive (ELD) context). The resulting damage could be direct damage to biodiversity, or a physical, biological or chemical change in the quality and quantity of a habitat and all or some of its ecosystem services.

When biodiversity damage occurs, there is usually some immediate intervention to try to help the resource recover back to its baseline (as required by the relevant laws). According to the mitigation hierarchy (following avoidance of damage as far as possible), this would involve activities that concern the same kind of resource as that which is damaged and on the site of damage. This is also referred to as remediation (primary remediation in the ELD), which is a component of mitigation.

The dot-dash line in Figure 4.2 shows the natural recovery line - the case when nature is left to take its course. Sometimes, human intervention would be necessary to help the resource recover (the dashed line in Figure 4.2). Where action on the site where damage occurs recovers the exact resources and services damaged, the natural recovery or intervention lines (dot-dash or dashed lines, depending on the actions) will

return to the baseline level. However, it takes time for biodiversity to return to baseline and until that time damage continues to occur. In the language of the ELD, the damage during the time between the incident and the return to baseline is referred to as 'interim loss'. Such a term is not used in HD since HD assumes the compensation to be in place when damage occurs. In some cases, biodiversity may never return to baseline (or interim loss is said to continue in perpetuity) as shown in Figure 4.2 with the natural recovery or intervention lines not meeting the baseline.

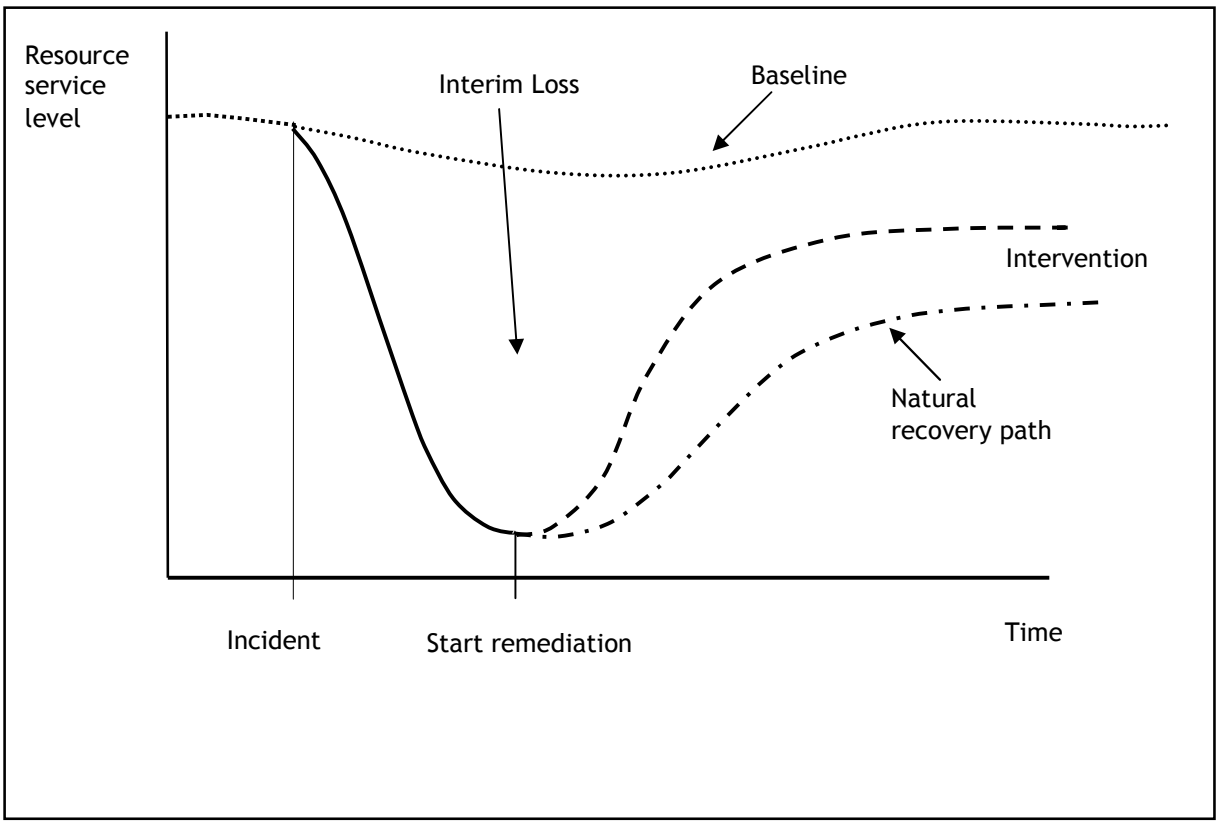


Figure 4.2: Anatomy of Debit

The assessed degree and spatial and temporal extent of the damage can vary depending on how damage is measured. Therefore, while the debit can be measured in any unit, or metric, it needs to be a metric that does justice to the multi-dimensionality of the debit. The metric must also be the same for estimating both the debit and benefits from offsetting (credits - see Section 4.1.3). Selection of the metric is also linked to the type of equivalency method used (see Section 4.3.4).

4.2.2 Compensation

Both temporary and permanent damage (where baseline is not returned to) must be compensated for no net loss of environmental resources to be achieved. While both

temporary and permanent damage can be relevant, the experience of most habitat banking systems is of consideration of permanent damage to biodiversity, and therefore of the need for compensation to last in perpetuity (see credits below).

If the mitigation hierarchy is followed appropriately (see Section 4.1), on-site measures will normally have been exhausted, so compensation is often delivered through an action off-site. Although some sites can be very large (e.g. airports) and can accommodate habitat/species translocations or habitat creation (e.g. to move a population of a protected species) this is in fact a form of compensation (or offset). The fact that it is on-site in terms of the developers' land holdings etc has no ecological relevance. Moreover it can be a problem that on-site compensation is often preferred, e.g. recommended by Commission for N2000 sites, when it is not the best location (see Figure 4.6).

On-site measures that fully repair the damaged resource are not within the scope of habitat banking compensation. Both biodiversity offsets and habitat banking are concerned with the residual damage after all forms of mitigation take place. On-site compensation measures could in theory be delivered by habitat banking, but in practice the circumstances where this could take place are likely to be rare.

4.2.3 Credits

Figure 4.3 uses the same x- and y-axes as Figure 4.2 to show how credits, benefits from offsets and banking that are additional to the baseline, can be generated. Figure 4.3 represents an intervention that alters the habitat type significantly (e.g. creating wetlands on arable land). The resource level achieved (the solid line) is significantly above the baseline (the dotted line) and the difference between them represents the credit.

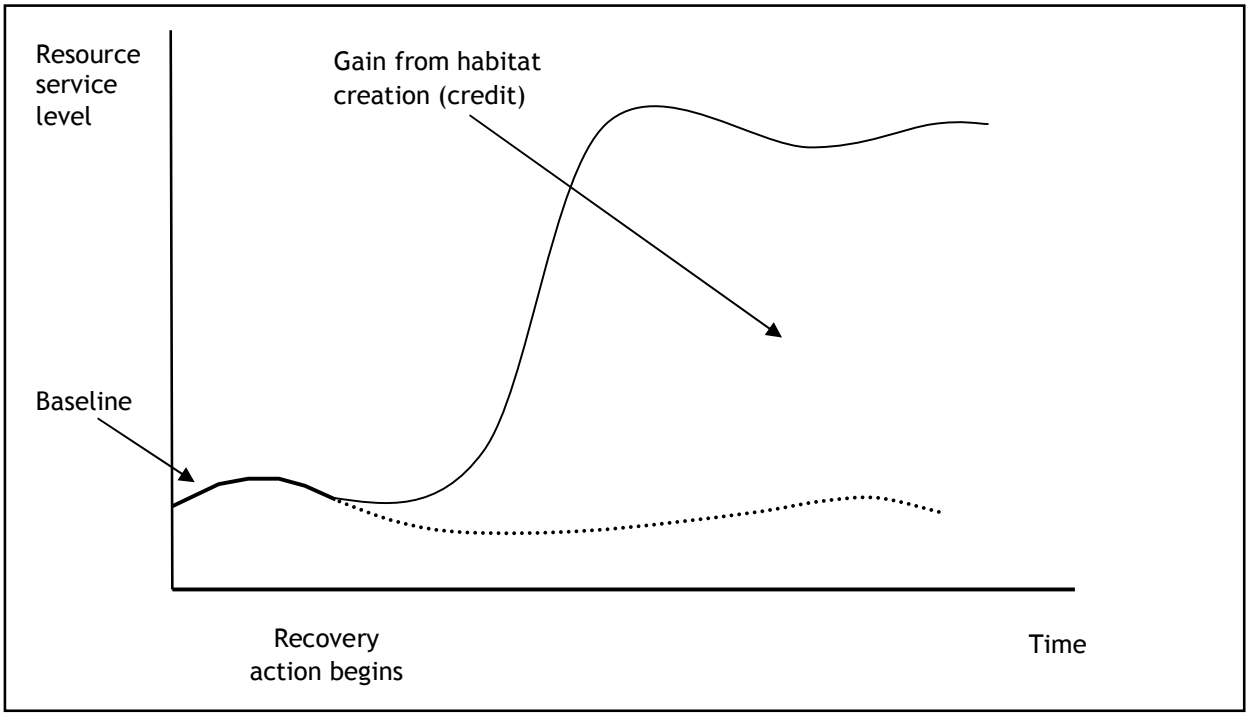


Figure 4.3: Anatomy of a habitat creation credit

Figure 4.4 shows an alternative situation in which credits arise from additional conservation measures to an existing habitat. This can be delivered by reducing the risk of loss of a declining resource (by protection, and by maintenance through habitat management), and in addition, restoration. In the case of an offset specific to a damage case, the credit is the amount of resource or service benefit that will be gained through compensation. In the case of habitat banking and offsets, the qualifying actions that take a biodiversity resource beyond its baseline quality and quantity over time would qualify for 'additionality' and generate credit.

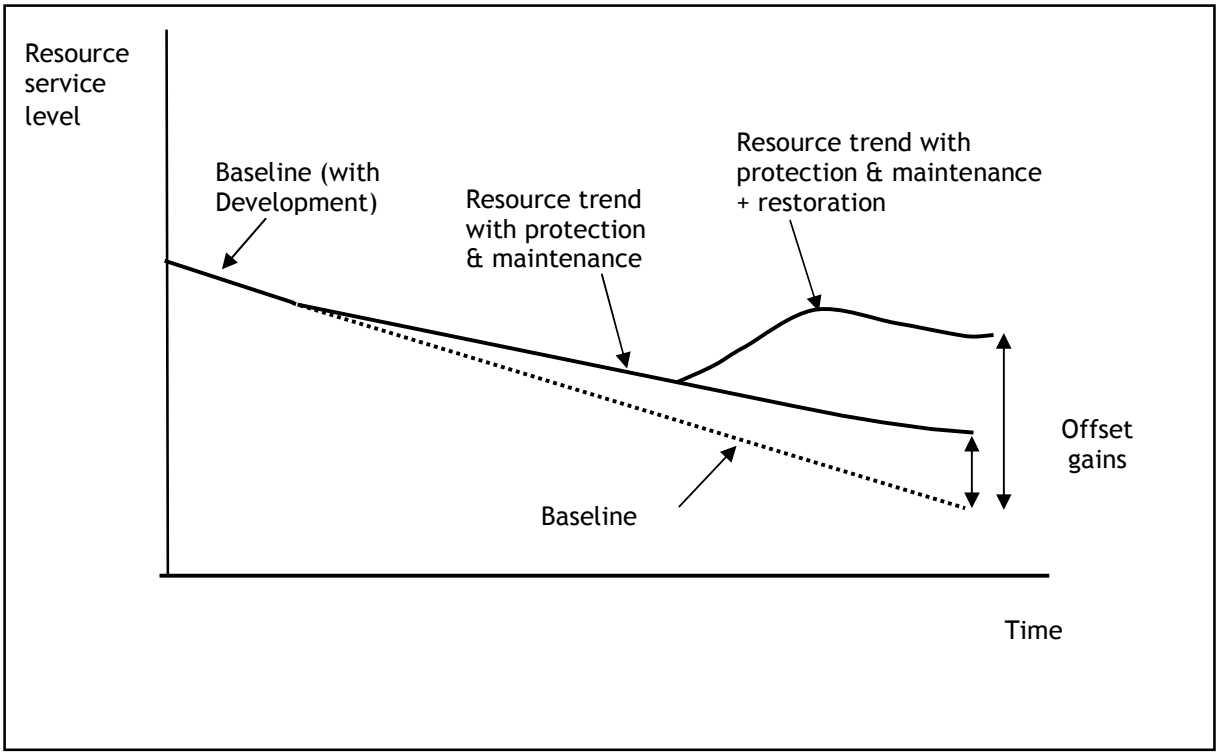


Figure 4.4: Anatomy of protection credit

As with debits, the units used to measure credits are a critical issue as they need to be at least equivalent in terms of their biodiversity value. The definition of a credit requires careful attention for both biodiversity offsets and habitat banking. Offsets also have to establish like-for-like rules as no compensation can ever be identical to the biodiversity that was damaged.

It is normally necessary to define credits very specifically. For example in some Australian habitat banking schemes, many hundreds of different native vegetation types are defined. Residual damage to each therefore requires compensation through a credit specific to that vegetation type. Similarly, most EU habitats of Community Interest[17] are narrowly defined according to an official interpretation manual. Thus credits for these would need to relate to these types and definitions.

It could be possible to define credits more broadly: say, damage to 'type B' biodiversity can be offset by credits from 'type A'. This could be a simpler system to work within, but risks a gradual loss of type B if type A credits were easier and cheaper to deliver than type B. A key consideration in this respect is whether there is some ratio between type A credits and type B credits, for example to reflect their relative biodiversity value, costs of creating them or scarcity. To allow for some

[17] Habitats and species that are listed in Annex 1 of the Birds Directive as well as other migratory birds, or Annexes 1 and 2 of the Habitats Directive.

flexibility but to guard against loss of biodiversity components of high conservation value, most offset systems adopt a 'like-for-like-or-better' policy. This allows 'trading up' to 'type A' credits from 'type B' credits, provided type A are of demonstrably higher conservation value, according to agreed policy on conservation prioritisation.

However credits are defined, analysis is essential to ensure that credits are equivalent to debits, and therefore that biodiversity damage has been adequately compensated. Different methodologies that can be used for this are defined in the next section.

4.2.4 Types of equivalence analysis

Equivalency analysis ensures that the number, type and size of compensation projects generate credits that are equivalent (or larger) than the debit, both quantified using the same metric. Ensuring equivalency (scaling) between the debit and credit is conceptually quite simple:

- Quantify the losses (total debits) caused by the damage;
- Determine the amount of benefit expected per unit of compensation (per unit credits, a unit is typically a hectare of habitat); and
- Divide the total debit by the per-unit credit to yield the total amount of compensation needed.

These steps in determining compensation are similar to the logic applied in identifying compensation under European Laws, such as ELD and HD. In particular, the concept that when a given area is damaged, a greater resource (e.g. number of hectares (ha) of habitat) is required to compensate for that damage, has been reflected in compensation ratios. This ratio depends on the qualities of the damaged environment and the biodiversity restored by compensation actions, and can also take into account the timing of when credits and debits occur. Therefore, compensation for temporary damage can involve restoration of a smaller area than that damaged but for a longer period of time, with adjustments for different time periods carried out using discount rates.

In practice, biodiversity is complex, and understanding and quantifying the impact of a foreseen or unforeseen incident on species, habitats and/or ecosystem services can be difficult. In addition, quantifying the benefit that will be provided over time through compensation projects can be technically challenging. This is the case when credits are designed and quantified specifically for a given case of damage (an offset), or when credits are supplied ex-ante of specific damage assessments.

The choice of metric, in turn, determines what label the equivalency analysis should have. The labels described below are taken from Annex II of the ELD which is the only

legal definitions used in the EU, with other relevant Directives not defining equivalency[18].

- If the metric is expressed in terms of resource units (such as number of fish or birds), the analysis that follows is called Resource Equivalency Analysis (REA). Here, debit is measured in terms of the reduction in the chosen resource units. The credit is measured in terms of the increase in the chosen resource units.

- If the metric is expressed in terms of habitats and the ecosystem services[19] (e.g. provisioning, nutrient and carbon cycling, regulating etc.), the analysis that follows is called Habitat Equivalency Analysis (HEA). Here debit is measured in a combination of the area of habitat(s) damaged and the degree of damage (in terms of the percentage reduction in the ecosystem services typically provided in the baseline)[20]. For example, a pollution incident causing temporary damage to a habitat may be judged to cause a 50% reduction in its value over 10 years. A development that permanently destroys a habitat would cause a 100% loss in perpetuity. Similarly, the credit is measured in terms of area of habitat improved or recreated and/or provision of services improved.

- If the metric is expressed in terms of money, the analysis that follows is called Value Equivalency Analysis (VEA). With VEA, there is a value – to – value equivalency where both damage and benefit of compensation are measured in terms of their economic value, i.e. in money units. 'Value' measured here refers to Total Economic Value of the environment based on individuals' preferences for the use they make of the environment and for other non-use reasons[21]. VEA is likely to be most appropriate when the nature, scale, or location of compensation projects differs from the specific resources and services damaged. In the value – to – cost variation, damage is measured in terms of the economic value lost. The compensation actions are then designed to cost at most as much as the monetary estimate of this value lost. While value - to - cost can be used to design compensation, it is not strictly speaking an equivalency method.

In all of the above analyses, the biodiversity resources that are actually damaged and those that are used for compensation are likely to be of different kinds and in different locations. The "equivalency" between these differences is what lies in the heart of equivalency analysis.

[18] For further discussion of resource equivalency analysis, see eftec et al. (2008)
[19] This typology of ecosystem services is used by the Millennium Ecosystem Services (2005). The changes in each and every service are not necessarily quantified but a proxy percentage loss or gain is preferred for ease of analysis. A summary can be found in *Living Beyond Our Means: Natural Assets and Human Well-being*, Millennium Ecosystem Assessment, available at: http://www.millenniumassessment.org/en/index.aspx
[20] The specific choice of metric will define the degree of "percent reduction in ecosystem services". The choice of alternative metrics may lead to different percent service loss.
[21] see Section 1.2

4.2.5 Offsets

Biodiversity offsets are defined by BBOP[22] as: "*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate prevention and mitigation measures have been implemented. The goal of biodiversity offsets is to achieve no net loss, or preferably a net gain, of biodiversity on the ground with respect to species composition, habitat structure and ecosystem services, including livelihood aspects*".

The concept of offsets is illustrated in Figure 4.5. The zero impact line equates to the baseline in Figures 4.2 - 4.4. The residual impacts are those described in Figure 4.2, the entire size of offset is made up by the credits described in Figures 4.3 – 4.4. The vertical axis is the status of the biodiversity resource, so up to zero impact, compensation offsets the damage for which it was designed, impacts above zero are net gains. Some gain may be included in the offset as a requirement of trading, or to manage risks that ex-post offsets do not realise their intended biodiversity value. Positive impacts in excess of the offset may be made for the purposes of enhancing biodiversity (additional conservation actions).

[22] http://www.forest-trends.org/biodiversityoffsetprogram/index.php

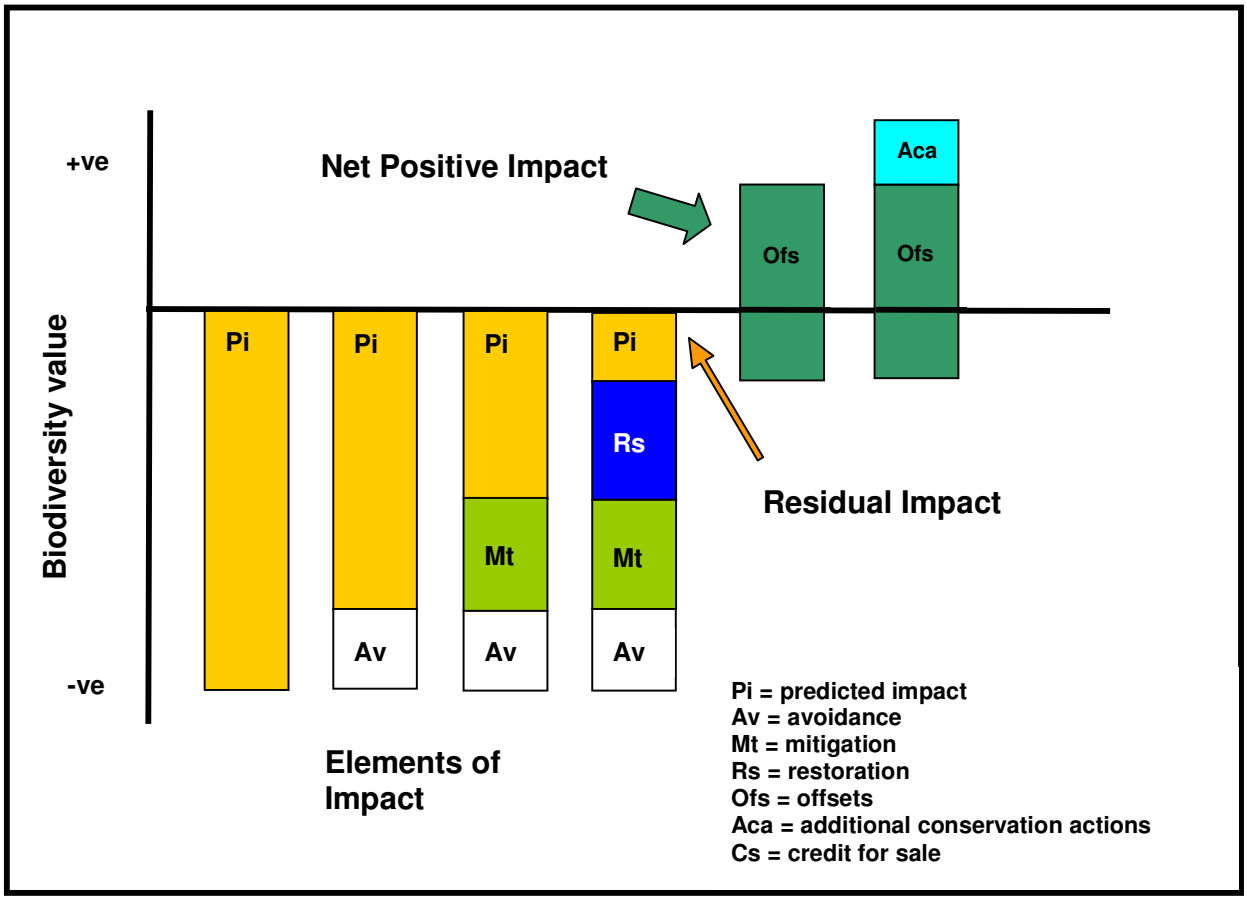


Figure 4.5: A hypothetical illustration of the achievement of a net positive biodiversity gain from a development as a result of the combination of mitigation measures and an offset. (Credit: Adapted from RioTinto and Government of Western Australia, via Kerry ten Kate.)

There can be different options for implementing offsets including:

- Voluntary biodiversity offsets;
- Regulatory biodiversity offsets (e.g. through regulations expanding the scope of offset requirements beyond the Natura 2000 network and Environmental Liability Directive requirements);
- Aggregated voluntary or regulatory offsets (an interim step between case-by-case offsets and banking); and
- Habitat / species banking.

Each of these options involves delivering the biodiversity 'credit' to offset the damage being compensated. Offset credits should address the intrinsic vales of species and habitats (normally reflected in their biodiversity conservation importance) that are impacted and the range of benefits that the ecosystem provides. However, in practice vegetation types or particular species are generally used as proxies. Banks defined

around vegetation types are considered effective because they: cover a wide range of biodiversity, because vegetation type is representative of a wider ecosystem and associated species; and help ensure habitat gains, usually being measured in areas of habitat. However, the delivery of certain vegetation types does not ensure the conservation of certain key species and therefore delivery of biodiversity conservation or ecosystem function goals. In contrast, species banks can explicitly look after particular species of interest, but species conservation alone doesn't ensure conservation of biological communities, species assemblages, or overall ecosystems.

Each of these options can play a different role in delivering biodiversity policy objectives. However, each one must be implemented after careful project planning and at the appropriate stage in the mitigation hierarchy. The process of delivering offsets effectively, for example ensuring additionality and permanence, whilst avoiding leakage, is considered further below in Section 4.4 and in the case studies of existing activities (Section 7 and Appendix).

4.2.6 Habitat banking

The project specification describes habitat banking explicitly as an extension of biodiversity offsets; turning offsets into assets that can be traded, creating a market-based instrument. The term 'habitat banking' can refer to compensation for both species (i.e. habitats as resources for particular species) and habitats as assemblages of species and abiotic elements, which may also be termed biotopes (e.g. HD Annex 1 listed habitats). Therefore in the context of this study habitat banking is analogous to 'conservation banking' and 'biodiversity banking'.

Offset resources or actions can be combined to compensate for biodiversity damage. Through this combination, the sum of biodiversity damage from multiple causes can be compensated for through a single larger project. This combination of offsets does not automatically create a habitat bank – an offset that covers more than one project impact could be described as an aggregated or pooled offset. The distinction between an aggregated offset and habitat banking and offsets is the connections between and timing of the actions they entail.

Offsets entail actions that arise from (although do not always occur in) a sequential logic: planning of a project or activity; identification of likely damage it will cause; application of mitigation hierarchy; biodiversity offset for residual damage. Banking allows these actions to happen without ex ante connection. As a result they can occur in any order - the biodiversity credit may occur before the scale of the debit has been assessed, be stored until a need for it arises from a project causing damage that it can compensate for. While offset credits can be delivered before debits occur (indeed in some offset systems this is required), under an offset system the *assessment* of the debit would usually need to happen before actions to deliver the credit start.

Thus banking gives rise to credits that were not created in response to specific (occurred, happening or planned) debits, and so are influenced by past and future conditions (e.g. demand for compensation). Therefore banking has the features of supply and demand over time, including speculation, and discounting of values. This is reflected in Dodd's (2007) definition of habitat banking as: "*The advanced provision of habitat with the intention of selling 'credits' in the habitat to developers to provide compensatory measures*".

The definition of habitat banking used in this study is: "*a market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time*".

The independence in the timing of assessment of damage and assessment of offsets (determination of debits and credits) is the key feature distinguishing habitat banking from offsets. This results in several features of habitat banking systems in addition to offsets. In the case of offsetting the debit and credit are quantified separately for each and every case (even though offset delivery may be undertaken in a single location to satisfy demand for more than one offset requirement). This is not the case in habitat banking: credits are only assessed once, and can be created in different quantities and locations, and stored over time.

In effect, in the case of habitat banking, the debit is quantified for each incident causing damage. However, the credit is only estimated once for the whole of the bank. A credit need not be designed to match a specific debit at the time of creation, although they still need to fulfil equivalence requirements (i.e. be like for like or better) for the debit they are subsequently used to compensate for. To allow this simplification of debit and credit assessment to a one-off process, there must be a pre-determined metric, through which debits and credits are both measured, and a geographical area across which it can be traded. This common currency and scope of damage enables the key distinction of habitat banking: the determination of credits before debits have been assessed.

This 'currency' may be particular to specific biodiversity resources (e.g. habitat types of Community Interest defined under the HD and vegetation types in the Australian examples). It enables exchange of equivalent types and forward planning of biodiversity offsets. For example, if a loss of saltmarsh habitat is predicted within a certain part of Europe, an entrepreneur may decide to invest in creating saltmarsh habitat elsewhere in anticipation of selling the biodiversity gain as a credit. To undertake such an investment they need to know the rules by which their credit can be sold to compensate debit (e.g. the metric and geographical scope mentioned above, and further factors such as monitoring and management provisions, to be defined – in other words a habitat banking system).

4.3 Potential biodiversity benefits of offsets and habitat banking

4.3.1 Mechanisms for net biodiversity benefits from protection, enhancement and restoration

The overarching potential benefit of offsets and habitat banks is that they provide a mechanism for achieving no-net-loss of biodiversity from developments, or even net biodiversity gain. This can be achieved by compensation of a nature and scale that outweighs development losses, through one or more measures that avoid/reduce the loss of habitats that would otherwise be lost or degraded by ongoing activities (risk aversion offsets), create, restore or enhance ecosystems and habitats, increase species populations or improve their viability. Boxes 4.2 and 4.3 provide examples of the range of such offset measures that are used in the US (with respect to wetland banking policies) and the State of Victoria, respectively.

In much of the EU there is considerable potential for providing offset benefits through enhancement and restoration measures (combined, where necessary, with additional protection e.g. through site purchase or use conditions). This is because, as outlined in Section 2.1 a high proportion of habitats is fragmented or otherwise degraded. Biodiversity offsets provide opportunities for reversing habitat fragmentation by restoring habitats in appropriate locations. In particular significant conservation benefits could result from reversing the loss of the most threatened habitats and increasing the size of remaining small habitat patches.

Different measures may be more or less likely to yield different quantities of different services. For example, habitat creation could be designed to allow public access and therefore ensure recreational services. However, preservation and enhancement of existing areas may deliver a wider range of ecosystem services if they protect existing ecological functions that are harder to establish in habitat creation schemes.

As a result of their size, small habitat patches are particularly vulnerable to external pressures (e.g. disturbance and pollution), dominated by edge habitats and too small to hold viable populations of many species (Crooks & Sanjayan 2006). Many species of high conservation importance in the EU (e.g. large raptors and carnivores) require particularly large areas of functionally connected habitat, i.e. habitat patches that they can access, and are therefore at risk as a result of current and ongoing habitat fragmentation.

Box 4.2. Offset measures used under wetland habitat banking regulations in the USA: their definitions, policy application and relationship to no net loss policy (source: Bean et al. 2008)
Creation (Establishment) (see Figure 4.3 above)
Definition: The manipulation of the physical, chemical, or biological characteristics to develop a wetland on an upland or deepwater site where a wetland did not previously exist.
Policy: Because of the difficulty in establishing wetland hydrology, should be used only with adequate assurances of success.
No net loss role: Results in a gain in wetland acres and functions.
Restoration
Definition: The manipulation of the physical, chemical, or biological characteristics of a site, with the goal of returning natural or historic functions to a former wetland.
Policy: Should be the first option considered when siting a bank.
No net loss role: Results in a gain in wetland functions. May or may not result in a gain in wetland acres.
Enhancement
Definition: The manipulation of the physical, chemical, or biological characteristics of a wetland (undisturbed or degraded) site to heighten, intensify, or improve a specific function(s) or to change the growth stage or composition of the vegetation present. Enhancement is undertaken for specified purposes, such as water quality improvement, flood water retention, or wildlife habitat.
Policy: Because of the tradeoff in wetland functions involved with certain enhancement activities, should be used only with adequate assurances of overall environmental benefit.
No net loss role: Does not result in a gain in wetland acres. Results in a gain in some wetland functions, but may result in a loss of others.
Preservation (Protection/ Maintenance) (see Figure 4.4 above)
Definition: The removal of a threat to, or preventing the decline of, wetland conditions by an action in or near a wetland. This term includes the purchase of land or easements, repairing water-control structures or fences, or structural protection such as repairing a barrier island.
Policy: Should be used as the sole basis for generating credits "only in exceptional circumstances."
No net loss role: Does not result in a gain in wetland acres or functions[23].

[23] However, this is not true if the baseline situation is one of a declining resource in which case a net gain can be achieved with respect to the impact debit by reducing the rate of loss to a higher level than the debit compared to what would have been lost without the protection based offset.

Box 4.3. Four types of conservation 'gains' that are recognised in offsets/credits in Victoria, Australia
1. Prior management gain: acknowledges actions to manage a freehold site since State-wide planning permit controls for native vegetation removal were introduced in 1989. In the offset calculations, the habitat hectare gains from maintenance and improvement (3 and 4, below) are inflated by 10% of the current (pre-offset) condition score (in habitat hectares) as a means of acknowledging this retrospective contribution.
2. Security gain: from actions to enhance security of the on-going management and protection of native vegetation at the offset site, either by entering into an on-title agreement (i.e. a covenant on the land), or by locating the offset on land that has greater security than the clearing site, or by transferring private land to a secure public conservation reserve. In the offset calculations, the gains from placing land under protected status are calculated as 10% of the current condition score in habitat hectares.
3. Maintenance gain: from commitments that contribute to the maintenance of the current vegetation quality over time (i.e. avoiding any decline). Includes *forgoing certain entitled activities* that could otherwise damage or remove native vegetation, such as grazing or firewood collection. Also typically requires a commitment to ensure no further spread of weeds that may otherwise result in the loss of vegetation quality over time. For an offset, a commitment to maintain the vegetation quality will be required in perpetuity.
4. Improvement gain: from management commitments *beyond existing obligations under legislation* to improve the current vegetation quality. Achieving improvement gain is predicated on maintenance commitments (such as controlling grazing/weeds) being already in place.

Small populations in habitat fragments are also vulnerable to chance events (such as fire) that may lead to local extinctions unless the habitat patches are functionally connected to others, in which case they may persist as metapopulations (Hanski 1999). In such situations extinctions in one patch may be overcome by immigration from other functionally connected patches, i.e. the rescue effect. Thus it is particularly important for small patches to be connected ecologically. Ecological connectivity is also necessary to enable foraging movements, migrations, the genetic exchange through pollination and dispersal, and increasingly dispersal and colonisation in relation to climate change.

Consequently, the restoration or creation of habitats that restore functional connectivity can provide considerable conservation benefits provided these are of appropriate types and quality (e.g. sufficiently wide) and in key locations (Kettunen et al. 2007; Opdam & Wiens 2002). Although as noted below the restoration of fully functional habitats is often very difficult and slow, the creation of habitats that can facilitate movements between habitat patches (e.g. by providing sufficient cover) or buffer habitats is often feasible.

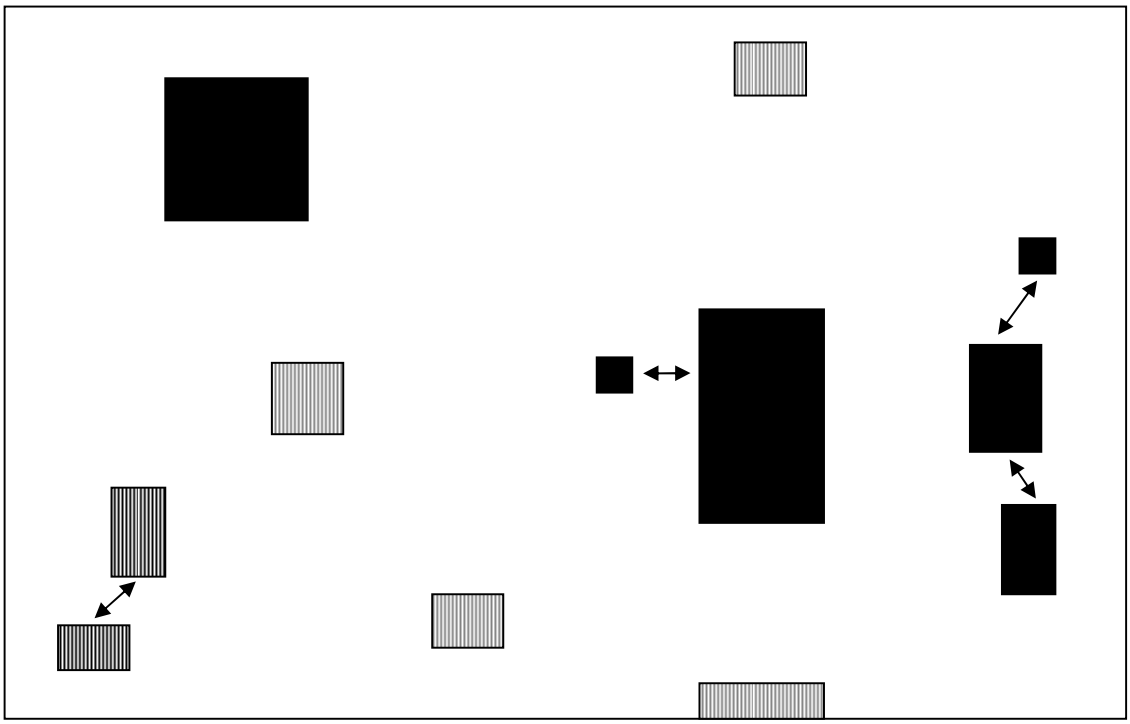
Figure 4.6 provides a schematic illustration of how well-located offsets or habitat banks can be used to reverse the impacts of habitat fragmentation. The illustration shows the possible impacts of developments across a landscape that contains patches of habitat of high conservation importance for a threatened species that has limited dispersal abilities. At time (a) there are a number of habitat patches that are large

enough to hold viable populations of the species, or are close enough to others to be connected to viable metapopulations. There are also a number of smaller and/or isolated habitat patches in the landscape that cannot hold viable populations. Development and compensation measures then occur according to two scenarios. In scenario (b) most of the habitat patches have been affected by developments such that they have become fragmented into smaller and more isolated patches. Although compensation that equals habitat losses has occurred this is all on-site or alongside the development. Habitat is maintained at each patch, but no areas are able to hold viable populations, so overall compensation actions have not been effective. In scenario (c) the same amount of compensation has been strategically placed to functionally link small habitat patches with ('stepping stone' habitat patches) that hold viable populations. Although the stepping stones are too small to hold viable populations they are close enough to others to be able to connect some of the smaller populations to create more stable metapopulations.

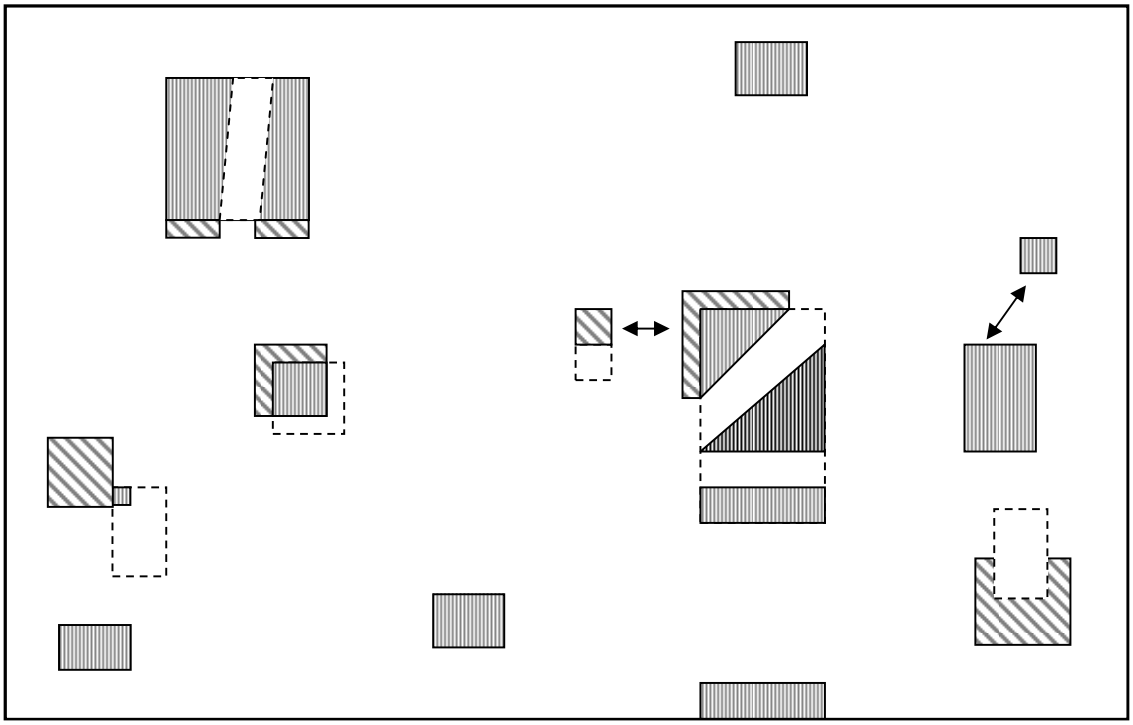
Figure 4.6: A schematic illustration of the potential benefits for populations of a threatened species of strategic placement of restored habitats as part of development compensation measures

Key: Black = habitat holding viable populations of species of conservation importance. Striped grey = functionally isolated habitat holding non-viable populations. Hatched grey = newly created habitat, which can provide connectivity, but which cannot hold viable populations of species of conservation importance. White with dashed outline = former habitat. Arrows indicate habitat patches that are functionally connected for the species.

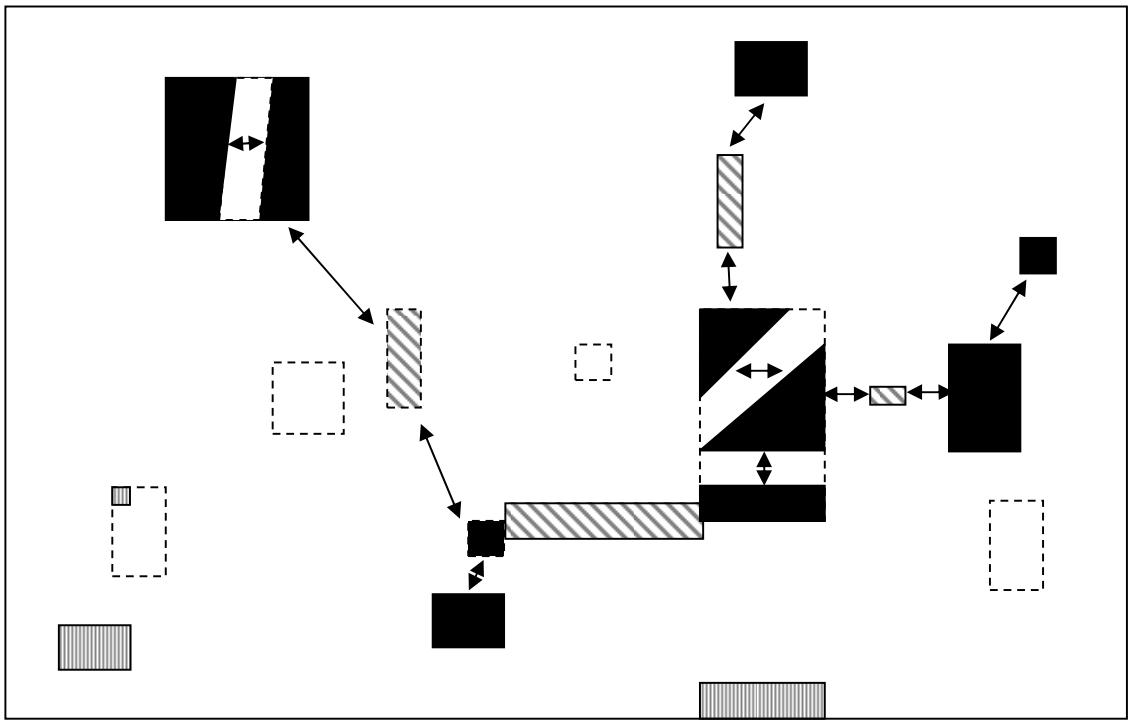
a.



b.



c.



In most EU countries maps of proposed ecological networks have been developed that indicate requirements for increasing the size of core areas of habitat and restoring connectivity, e.g. by the creation of new corridors or stepping stones of habitat (Bennett 2003; Bennett & Mulongoy 2006; Bennett & Wit 2001; Jongman & Kristiansen 2001). More dynamic and ecologically sophisticated GIS tools have also been developed that can map out existing functional connectivity for representative species of various habitat types (e.g. forest networks) and examine the potential ecological impacts of habitat restoration in specific locations (Catchpole 2006; Watts et al. 2005). Site selection tools can also be used to guide the location of offsets (Keisecker et al. 2009). Such ecological network maps and GIS tools can therefore provide strategic guidance that can help maximise the benefits of ecological restoration within offsets and habitat banking schemes.

A good example of the use of field studies and models to increase the ecological benefits of strategic location of compensation measures is provided in proposed conservation measures that are part of the sustainable development of the port of Antwerp (Ottburg et al., 2007). The proposed development will lead to impacts on populations of the Natterjack Toad (*Bufo calamita*), which is protected under Article 12 of the Habitats Directive. However, field surveys of its habitats and populations, combined with ecological modelling (using LARCH) revealed that some of the impacted populations are non-viable due to their small size and/or fragmentation (Figure 4.7). Compensation measures therefore focus on creating new viable populations that will be functionally connected with some of the existing populations, thereby creating a 'backbone' of habitats supporting larger and more viable populations (Figure 4.8)[24].

Habitat restoration measures are not explicitly required under the Habitats Directive or Birds Directive. In theory they should be undertaken where it is necessary to return a habitat or species population to Favourable Conservation Status (see Section 5), and as such may be part of management plans for Natura 2000 sites. Many EU Member States have developed Biodiversity Action Plans that include habitat restoration targets (e.g. the UKBAP[25]). As a result some habitat restoration projects are underway in the EU, many of which are funded by the LIFE Nature programme[26]. There is therefore the possibility that restoration based compensation measures could provide little added value, i.e. merely replacing what a Member State would have carried out anyway (see discussion of additionality constraints in Section 4.4.1 below). However, in practice restoration rates are very low for most habitats in most Member States. Furthermore, with increasing pressures from climate change, habitat restoration measures will become increasingly important for adaptation purposes and the gap between habitat restoration needs and delivery will probably widen (Opdam & Wascher 2004).

[24] We are grateful to Mischa Indeherberg for supply of and permission to use these figures
[25] http://www.ukbap.org.uk/
[26] http://ec.europa.eu/environment/life/

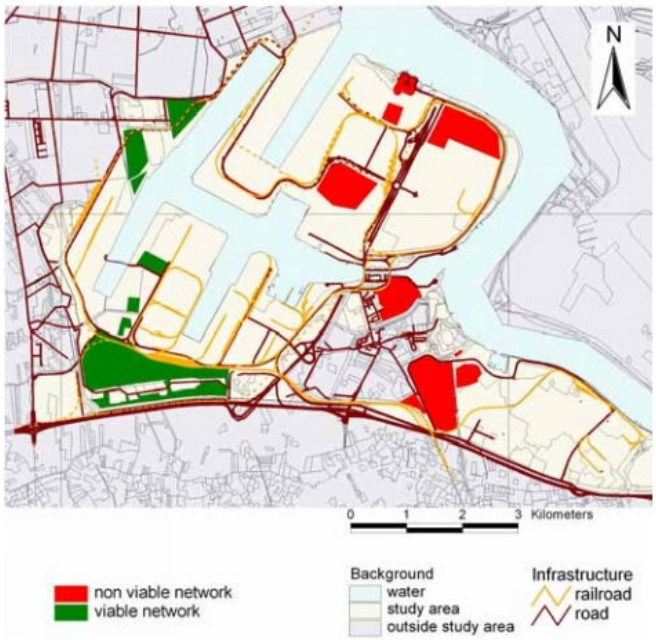


Figure 4.7: Current viability of the ecological networks of the Natterjack Toad on the left bank of the Scheldt at the port of Antwerp. (Source: Ottburg et al, 2007).

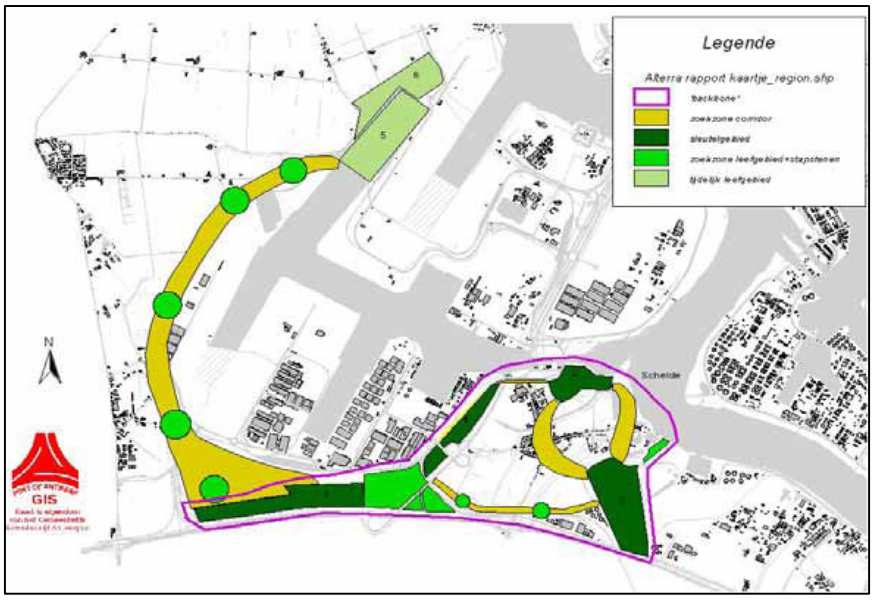


Figure 4.8: Proposed 'backbone' and temporary habitats for sustainable conservation of the Natterjack Toad on the left bank of the port of Antwerp (Source: Ottburg et al, 2007).
Key: Purple bordered area = 'backbone' of interconnected viable populations; yellow = search zone for corridor; dark green = key area; bright green = search zone for habitat and stepping stones; light green = temporary habitat.

There is considerable potential for using offsets and habitat banking measures to enhance habitats and species populations in the EU. As described in Section 2.1 a large proportion EU habitats is in poor condition. This includes habitats and species of Community Interest (major proportions of which occur within Natura 2000 sites) of which 50% of species, and possibly up to 80% of habitat types have an unfavourable conservation status (EU BAP mid-term assessment[27]). As described in Section 4.3.1. above, the use of offsets to improve the conditions of habitats on Natura sites, or other protected areas with management obligations, is unlikely to be appropriate in most situations because such actions would not provide added value. Nevertheless, there are large areas of habitats and species populations in the wider environment in the EU that are degraded or declining and require urgent improvement through large-scale conservation actions. Enhancement of such habitats and species populations can be achieved through the proactive management of the habitats or species themselves or by the control of external influences etc. These enhancements deliver the protection, management and restoration of biodiversity resources that could generate credits within a habitat banking system. Some examples of practical management measures that could be taken are outlined in Box 4.4.

Box 4.4 Examples of measures that may be taken to enhance habitats or species populations

- Controlled vegetation management to increase structural diversity (e.g. gap creation in forests)
- Regulation of grazing rates, seasons and types of livestock (e.g. replacement of modern breeds with hardy / traditional breeds)
- Reductions in the use of fertilizers and pesticides (on and off-site)
- Environmentally sensitive felling and forestry management practices
- Regulation of burning practices
- Hydrological management (e.g. reductions in water abstraction or installation of water control structures)
- Creation of breeding or roosting sites (e.g. nest boxes) where these are lacking
- Removal of alien invasive species
- Predator control
- Reintroductions of key species that are missing from communities (e.g. top-level predators)
- Provision of supplementary food (e.g. carcasses for vultures)
- Removal of harmful pollutants (e.g. nutrients in lake sediments)

[27] http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/bap_2008_en.pdf

4.3.2 The potential for large scale measures

One of the main advantages of aggregated offsets and habitat banks over case-by-case compensation of damage is that they can affect large blocks of contiguous habitat, as a result of pooling of measures. As noted above, small areas of habitat are vulnerable to degradation and will not have complete species communities. Thus there are considerable advantages to creating large areas of habitat, especially for some species of high conservation concern. Such considerations are widely adopted in existing offset schemes, where additional credits are given to measures that restore or enhance large areas of habitat.

The biodiversity conservation related benefits of large areas of habitat are discussed above. Large areas are also increasingly important as a contribution to climate change adaptation. It is expected that large habitat patches will be more resilient to climate change because their key species are likely to be in favourable condition and therefore better able to accommodate new pressures (Berry et al. 2008; Donald 2005; EEA 2005b; Harley 2008; Huntley 2007; RSPB 2007; Smithers et al. 2008). Furthermore, large habitats that are in favourable condition can facilitate redistributions of populations in response to climate change, because they are more likely to hold populations of species that have high levels of breeding productivity (recruitment), which would increase emigration rates, potentially to new areas of suitable habitat (Kettunen et al. 2007).

Another practical advantage of the creation of large blocks of habitat is that some processes (e.g. hydrology) are more easily regulated at large scales.

4.3.3 Increased certainty and cost-effectiveness of environmental outcomes

As described below, while the feasibility of some habitat restoration is a major constraint on the usefulness of offsets, in some cases they may provide more reliable biodiversity outcomes than mitigation measures. The creation of simple compensatory habitats that can link to existing habitats and populations rather than isolated habitats may be more successful than some technical solutions. For example, the construction of wildlife bridges, i.e. wide vegetated bridges, is now a common mitigation measure for roads, but they are highly expensive and there appears to be no proof that they provide population level benefits (Clevenger & Wierzchowski 2006). Small-scale piecemeal mitigation measures are also unlikely to be effective in the long-term as a result of fragmentation and, unless properly managed, natural succession.

Such problems have been evident with mitigation measures in the UK for the Great Crested Newt (*Triturus cristatus*), which is strictly protected under Article 12 of the Habitats Directive (see Section 5). There is mounting evidence in the UK that mitigation measures for these species are leading to excessively high biodiversity

mitigation costs and delays, with low levels of conservation benefit (see Boxes 4.5 and 4.6). Some of the problems are generic problems of poor implementation that could also affect offsets and habitat banks, but many arise as a result of the location and ownership of mitigation measures. A common problem is that mitigation measures are within or close to development footprints (e.g. sometimes entirely encircled and isolated from other habitats by the new development and roads etc). Furthermore, where pooling of offsets or creation of banks occurs, isolation risks and external pressures can often be totally avoided or more easily managed.

Management of land for biodiversity benefits is subject to economies of scale, including in relation to the costs of staffing, sub-contractor and premises. The RSPB, an NGO that manages over 200 nature reserves in the UK, reports that sites below 100 ha in size have significantly higher management costs per ha, with most economies of scale being realised for sites over 250 ha. Costs per ha decrease by around half as sites increase from 100 and 250 ha in size. Most economies of scale have been realised by the time a site reaches around 500 ha in size, with little subsequent decrease in costs per ha[28].

The economies of scale and better cost-effectiveness of offsets and habitat banking also increase the likelihood that adequate management will be provided in the long-term. Habitat banking can introduce the opportunity cost of land into compensation and biodiversity policy considerations. This can be beneficial for policy implementation, internalising the externality of biodiversity damage efficiently. It can also improve conservation policies more widely, as this cost (and therefore market changes to land values), are generally not accounted for in relevant Government budgets. Using the market in this way reduces the exposure of these budgets to land price variations (Lourival et al. 2009).

[28] Malcolm Ausden, RSPB pers comm.

Box 4.5. Mitigation measures in the UK for Great Crested Newts and their limitations

Typical actions associated with licensed mitigation and on-site compensation measures for a Great Crested Newt population that are in accordance with requirements under Article 12 of the Habitats Directive

- Pond, hibernaculum and grassland creation
- Barrier construction
- Exclusion and capture from breeding ponds and translocation
- Site search and trapping during habitat destruction
- Site management
- Monitoring

Typical problems associated with newt mitigation and on-site compensation

- Created ponds and grassland / scrub habitat of poorer quality than that lost
- Competition with existing populations
- Isolated populations
- External impacts (e.g. nutrient deposition, predation, climate change)
- Lack of long-term management
- Lack of monitoring and reporting
- Many post-development schemes not properly implemented

Box 4.6 Ten newts and their £250,000 pond

Great crested newts are protected under the EU Habitats Directive, although they are fairly common in many reconstructed water ecosystems. In the UK, companies could be fined up to £5,000 per newt lost through development. When Northumbrian Water was upgrading its water treatment works in Darlington, it found that 10 great crested newts, which had not been present on the site before the waterworks were built, had moved into the concrete lagoons the company used to settle and drain sludge. In order to meet its legal obligations, Northumbrian Water built the newts an adjoining pond and, two years later, when this new ecosystem was ready, hired someone to collect each newt and transfer them to the new pond. The newts are now breeding happily in the new pond. The exercise cost the company £250,000. As Chris Spray, formerly Environmental Director at the company explains, "If I were to ask conservationists how they would like to spend £250,000 for biodiversity conservation, they would not say "on 10 newts". Conservationists would have had other priorities."

Source: ten Kate et al. (2004)

4.3.4 Trading up

In most situations offsets and habitat banks aim to provide like for like credits, such that compensation relates to the specific habitats, species and ecosystem functions/services that are impacted, i.e. for which debits are required. The key benefits of this approach are that it avoids many of the problems of comparing equivalency of different biodiversity components and obtaining agreement on conservation priorities. It is also a relatively safe approach that reduces the risk of developing systems that encourage offsets that select the lowest cost compensation measures.

However, like for like compensation does not necessarily produce the best biodiversity outcome. Therefore, some compensation schemes allow trading up, such that resources are used on higher conservation priority habitats and species than those impacted. For example, conservation benefits could be obtained by using funds or land to take urgent action in response to threat to habitats or species that have inadequate protection or are irreplaceable rather than those that are well protected or readily restorable. Clearly such decisions need to be taken following appropriate consultations with stakeholders.

Trading up relates to moving to a higher level of conservation value than that of the damaged resources. However, doing this may increase the risk of not compensating fully for all ecosystem services. For example, the loss of a pond may have little impact on species of conservation importance, and therefore trading up to compensate for the loss with a higher priority habitat elsewhere may be beneficial in nature conservation terms. However, the loss of the pond could have aesthetic and educational impacts if the pond is valued by local people and used by schools for biology lessons (in other words provide other ecosystem services). Thus, the replacement of the pond with another habitat of higher nature conservation priority elsewhere could offset the biodiversity impact, but would not offset the social impacts. Such social impacts could require other types of offset. This demonstrates the additional complications introduced if ecosystem services, rather than just biodiversity value, is used to define credits and debits exchanged in habitat banking.

4.3.5 Compensation for minor and cumulative impacts

An ongoing source of biodiversity loss in the EU is the cumulative effects of small-scale or low magnitude impacts. Due to housing and related service and recreational developments amongst others (EEA, 2005d). Many such developments are likely to be individually small. Furthermore, as the EEA data show, such developments tend to occur on agricultural habitats, which are mostly likely to be of relatively low biodiversity value. Consequently, although quantitative data are lacking, a significant proportion of developments is unlikely to trigger formal impact assessments and are often judged to be too insignificant to be compensated for (or even mitigated in some circumstances).

But the cumulative ecological impacts of small developments can undoubtedly be substantial. Fragmentation of habitats commonly occurs as a result of even small infrastructure developments and their biodiversity impacts have been well documented (Canters 1997, Fahrig 2003, Opdam and Wiens 2002, Saunders et al., 1991). Developments also frequently lead to the loss of habitat elements that though small may be of high ecological importance, such as trees, hedgerows, ponds and ditches. The cumulative losses of such habitats have had observed impacts on some

taxa groups. For example, the incremental loss of ponds and small wetlands is having a major impact on many European amphibians; as a result of which a large proportion is now threatened in Europe and globally (Temple and Cox 2009). Similarly, the loss of hedgerows and trees in the farmland landscape, largely as a result of agricultural improvements, has significantly contributed to widespread declines in many farmland birds in the UK (Wilson et al. 2009).

Although SEAs, EIAs and Appropriate Assessments should consider cumulative impacts, this issue is complex and as a result, such impacts are often ignored or poorly dealt with. The failure to deal with cumulative impacts in the development control process is also in part due to the view that conventional compensation measures (e.g. restoration of like for like habitat) would be prohibitively burdensome and unreasonable for small developments especially given their individually low ecological impact. In other words it would be costly to restore, for example, an area of farmland that was damaged by small development and it would provide few ecological benefits.

Minor impacts could be compensated for in a more financially and ecologically efficient manner if tackled collectively through pooled offsets or habitat banking. Financial efficiency arises from a lower unit cost of compensation achieved through economies of scale. Ecological efficiency arises as compensation actions can be directed to more ecologically beneficial activities (e.g. measures that use larger and/or ecologically richer habitat blocks).

There is, therefore, a need for a policy instrument that can provide an effective and proportionate mechanism to compensate cumulative biodiversity losses from individually minor impacts. Without such a mechanism, it is obvious that the goal of halting biodiversity loss will not be achievable. Offsets and especially habitat banks provide a mechanism whereby low-level impacts can be efficiently compensated for with relatively low costs and administrative burdens for the developer. For example, the minimum cost of restoring equivalent benefits from the loss of a habitat type can be calculated and used as a basis for a fee. Fees can then be pooled (e.g. by a relevant authority or trust) and used directly for offset measures or to buy credits from a habitat bank – this is a 'fee in lieu of credit' is discussed in more detail in Section 10.6. Furthermore, as affected habitats will most often be of low ecological value then development fees can be used to support offsets that trade up – as described above.

4.4 Constraints on offsets and habitat banking and potential risks

4.4.1 Ensuring additionality

Perhaps the most fundamental constraint on all compensation measures is that they must provide added value. Firstly, they must provide benefits that would not have occurred in the absence of new actions, i.e. in the baseline. For example, land abandonment is occurring in many parts of Europe and therefore restoration of scrubland and forest in such areas may have no added value as such habitats are increasing anyway.

Secondly, as a minimum, conservation outcomes from compensation measures at a site must be more than those required under existing or foreseen policy and legislative requirements for that site. Thus offsets and habitat banking should not be used as a mechanism for implementing the Habitats or Birds Directives or other EU or national legislation that aims to provide similar biodiversity outcomes (see Section 5). Member States have obligations under the Habitats and Birds Directives to manage habitats within Natura sites (and, where necessary, elsewhere) according to the ecological needs of the habitats and species of Community Interest – in order to maintain or restore them to Favourable Conservation Status. Thus, in theory enhancement offsets cannot provide added value to the management of Natura sites unless they go above and beyond the measures that are required under the Directives.

In practice, and as already noted in Section 2.1, a large proportion of habitats and species of Community Interest are not in Favourable Condition, at least in part due to ongoing under-funding of biodiversity conservation measures required for the Natura network and wider environment. In 2002, a Commission Working Group – the Markland Group – estimated the cost of managing Natura 2000 in the EU 15 to be somewhere between €3.4 and 5.7 billion per year, for the next ten years. These figures were revised by the Commission, first to take account of the new Member States and then to reflect new national estimates. As a result the current broad estimate of the cost of managing the Natura network is €6.1 billion per year[29]. But this figure remains an underestimate in some respects as it applies only to 25 Member States. Although current spending levels on biodiversity in the EU are uncertain a recent study by IEEP suggests that the required €6.1 billion annual investment is four times higher than a possible indicative annual contribution of the present EU budget to biodiversity (Kettunen et al. 2009)[30]. The TEEB study also found estimated that only 20 per cent of

[29] COM (2004) 431 final

[30] Estimated as the annual sum of the EU 2007-2013 allocations for biodiversity: earmarked funding for biodiversity under LIFE+; EAFRD Natura 2000 payments; the earmarked funding for biodiversity and nature under ERDF; and assuming 1/3 of EAFRD AEM expenditure to be allocated for biodiversity.

the total financing needs for managing protected areas in Europe were met (TEEB 2009).

From an ecological perspective, it should be possible in theory to provide offset and habitat banking benefits that have added value if they go beyond the legal requirements of the Directives and other national and local requirements / mechanisms for management. In many situations, there is likely to be scope for improving the ecological quality of habitats beyond those required to meet Favourable Conservation Status standards (as required in Natura sites under the Habitats Directive) and therefore benefits could be significant unless additional national or site specific management measures are required and envisaged. But, in practice the added benefits and hence credits would probably be difficult to monitor and quantify unless the sites in question are already in Favourable Conservation Status and likely to remain so for the foreseeable future. Clearly this would limit the number of suitable sites that could be used for enhancement offsets, but benefits could occur at them, provided they comply with other existing legal requirements of the Directives.

Similar conclusions also apply to any other protected area for which there is a clear, though currently unrealised, requirement and/or mechanism in place to enhance biodiversity through management measures etc.

A related issue is that theoretically offsets and habitat banking schemes could compete for suitable land for restoration. With high levels of restoration activity, offset measures could conceivably crowd out other restoration initiatives. However, in practice restoration rates are very low for most habitats in most Members States, and therefore appropriately located and designed restoration based offset measures could provide high levels of additionality for most habitats, with little risk of crowding out in the foreseeable future. In fact with increasing pressures from climate change adaptation, habitat restoration measures will become increasingly important and the gap between habitat restoration needs and delivery will probably widen (Opdam & Wascher 2004).

4.4.2 Displacement and the measurement of averted risk

As noted above, in some situations significant biodiversity benefits may be obtained by arresting ongoing degradation and averting losses from, for example, agricultural improvement, deforestation, drainage of wetlands or pollution etc. This may be achieved by protecting areas of biodiversity where there is imminent or projected loss of that biodiversity (e.g. by entering into agreements such as contracts or covenants with individuals in which they forego the right to convert habitat in the future in return for payment or other benefits).

The theory is that such protection reduces the overall loss or degradation of habitats. One of the main advantages of the approach is that the biodiversity on which the compensation is based exists (enhancement or restoration based schemes) and its conservation value and therefore credits can be calculated with reasonable certainty. However, such benefits can only be realised where there are significant areas of remaining habitat that are:

- Worth maintaining in their current condition (taking into account their potential for improvement);
- Unprotected;
- Subject to significant and predictable levels of loss or degradation; and
- Likely to retain their biodiversity values in the long-term with feasible protection and management (i.e. taking in to account possible external influences).

Therefore, in practice the inclusion of habitat protection measures as risk aversion offsets is often constrained for a number of reasons (and poses significant risks). Firstly, in Europe, a large proportion of habitats that are worth protecting without enhancement are likely to be already protected (if only at national or local scales) (Briggs et al. 2009) or receiving some form of payments for environmental services (e.g. agri-environment funding). Thus a large proportion of habitats that are not protected (e.g. intensive agricultural habitats and managed forests) are likely to require significant enhancement to be worth protection as part of an offset. Thus in practice, the situations in which protection alone can provide significant benefits in Europe are likely to be limited.

Secondly, it is very difficult to be certain that protection will provide a conservation gain in the long term because baseline losses and likely outcomes under business as usual scenarios are very difficult to reliably predict. For example, recent socio-political changes in eastern Europe have led to agricultural abandonment, which threatens some agricultural habitats of high nature value, but is increasing the area of scrub and young woodland habitats (DLG Service for Land and Water Management, 2005). Changes in commodity prices or new land use opportunities, such as for biomass or biofuel production (stimulated by the recent EU Renewable Energy Directive targets for biofuel use) could well change the prospects for such habitat again. Thus if losses of habitats protected under offsets turn out to be less than expected then the biodiversity gain will be less than expected. A related issue is that, if losses continue then there will be an increasing likelihood that protection measures developed in response will provide new and greater protection, thus reducing or eliminating the additionality (see above) that was envisaged under the offset protection measure.

Thirdly, protection of one area of habitat may simply lead to the displacement of the threat to another area, resulting in no impact on the overall rate of loss (often referred to as leakage). Such problems are likely to arise where there is a high demand for a commodity but a surplus of land on which it could be produced. For

example, measures to protect forest patches from intensive forest management in northern Europe would probably result in the intensification of forestry elsewhere in the region as there are large areas that could be intensified to meet demands. Without an impact on overall demand (e.g. through price increases resulting from a shortage of forest land) it is unlikely that there would be an impact on forest use for timber.

These challenges in assessing additionality reflect a distinction between credits that are actively generated (paying some-one to do something for biodiversity), and those that are passively-generated (paying someone not to do something). The former are much easier to verify. They also have a lower risk of not being additional, although this risk still exists in cases where the actions involved were likely to happen anyway.

As a result of these constraints, the use of protection measures alone to avert risks of loss and degradation, i.e. without enhancement, in offsets and habitat banks is likely to be inappropriate in many situations in the EU. Similarly for such reasons, protection measures are only exceptionally incorporated in wetland banking mitigation in the US. However, a key issue is the rate of ongoing biodiversity loss, so it is possible that the ongoing loss or degradation of some unprotected habitats and species is high enough and certain enough in the long-term, to justify risk aversion offsets in some circumstances.

4.4.3 Difficulties with habitat restoration

Another significant constraint that relates to all compensation measures is the feasibility of creating or restoring habitats that have an equivalent quality (in terms of ecological properties and ecosystems services) of those that are impacted. Proposed offsets must provide a high level of certainty that their intended conservation outcomes will be realised in practice (or at least that they are high compared to alternative mitigation measures). Restoring habitats to favourable conservation status is not just a matter of money and time (Sipkova et.al, undated).

The creation or restoration of many habitats is extremely difficult, particularly natural and ancient habitats that have developed over thousands of years. Thus, as for example noted by Morris and Barham (2007), many habitats of Community Interest are in fact difficult to restore and would require many decades or even hundreds of years to attain their a reasonable level of ecological quality (Table 4.1).

Table 4.1. The feasibility of restoring selected habitat types and their relative time-scales

Habitat	Time-scale	Notes
Temporary pools	1-5 years	May never support some faunas e.g. *Triops* and *Cheirocephalus*, but rapidly colonised by water beetles.
Eutrophic ponds	1-5 years	Creatable provided adequate water supply. Readily colonised by water beetles and dragonflies but faunas restricted to those with limited specialisms. Include ponds created for Great Crested Newts *Triturus vulgatus*.
Mudflats	1-10 years	Dependent upon position in tidal frame and sediment supply.
Eutrophic grasslands	1-20 years	Dependent upon availability of propagules.
Reedbeds	10-100 years	Will readily develop under appropriate water conditions.
Saltmarshes	10-100 years	Dependent upon availability of propagules, position in tidal frame and sediment supply.
Oligotrophic grasslands	20-100 years +	Dependent upon availability of propagules and limitation of nutrient input.
Chalk grasslands	50-100 years +	Dependent upon availability of propagules and limitation of nutrient input.
Yellow Dunes	50-100 years +	Dependent upon sediment supply and availability of propagules. More likely to be restored than re-created.
Heathlands	50-100 years +	Dependent upon nutrient loading, soil structure and availability of propagules. No certainty that vertebrate and invertebrate assemblages will arrive without assistance. More likely to be restored than re-created.
Grey dunes and dune slacks	100-500 years	Probably not recreatable but potentially restorable.
Ancient Woodlands	500 – 2000 years	No certainty of success if ecosystem function is sought – dependent upon soil chemistry and mycology plus availability of propagules. Restoration a possibility for plant assemblages but questionable for rarer invertebrates.
Vegetated shingle structures	500 – 5000 years	Dependent upon sediment supply and coastal processes. Essentially un-recreatable.
Blanket Bogs	1,000 – 5,000 years	Probably un-recreatable but will form in these timescales.
Raised Bogs	1,000 – 5,000 years	Probably un-recreatable but will form in these timescales.
Limestone Pavements	10,000 years	Un-recreatable but will form if a glaciation occurs.
Pingoes	10,000 years	Un-recreatable but will form if a glaciation occurs.
Turloughs	10,000 years	Un-recreatable but will form if a glaciation occurs.

Source: Morris and Barham, 2007

A review of the regeneration ability of habitats in Germany revealed that the majority of habitats that have an unfavourable conservation status have medium (15 years plus) or long term (150 years plus) regeneration timescales (Sipkova et al., undated). It also suggest that the potential for functional compensation or regeneration of habitats is largely overestimated in many impact assessments (and Appropriate Assessments under the HD), resulting in a risk of slow permanent loss of high quality habitat areas within Natura 2000.

However, while the problems described above are serious, they do not necessarily mean that restoration activities cannot be successful. Much will depend on the habitat, its conservation value and options for restoration. Although it may take many years to restore some habitats to a mature state, the creation of early successional stages of some habitats is highly valuable as these are often rare in many parts of Europe. Some habitats can be more readily restored, especially semi-natural and man-made habitats, for particular species, rather than habitat / ecosystem as a whole. For example, numerous LIFE_Nature nature projects have successfully created reedbed habitats for the Bittern (*Botaurus stellaris*)[31]. Ponds may also be readily restored for some species, as shown by a LIFE project that restored and created habitat for two declining species - the Great Crested Newt (*Triturus cristatus*) and the Common Spadefoot Toad (*Pelobates fuscus*), in six protected areas in southern and southeastern Estonia (Rannap et al. 2009). The project showed that habitat restoration and creation can rapidly increase the populations of threatened pond-breeding amphibians if implemented at the landscape scale, taking into account the habitat requirements of target species and the ecological connectivity of populations.

The appropriateness and success of habitat restoration also depends on the quality of the underlying biological resources. Individual sites can have different restoration possibilities, and different management approaches can have different costs and effectiveness. One advantage of habitat banking in this respect is that, in creating a market for restoration, it provides an incentive for those holding land that offers ecologically more feasible, and therefore potentially more effective and lower cost, habitat restoration to supply those opportunities to the market. Without these incentives, such judgements are left to conservation planning activities. Such activities can have different advantages, including a greater strategic approach and ability to take a landscape-scale view. However, the addition of information revealed through market incentives could improve the available conservation options.

An important principle in credits derived from habitat restoration is that the level of certainty in the long-term success of the credit should increase in relation to the importance of the habitat / species affected. So, for example, for very rare or otherwise valuable habitats:

[31] http://www.bitterns.org.uk/news/page.php?pageID=140

- Stringent avoidance and mitigation measures should be taken to avoid any residual impacts;
- Any debits that do occur must be compensated for with credits that are considered to provide a reliable conservation outcome; and
- If unavoidable impacts can only be compensated with credits from measures with less reliable long-term outcomes, they may be permitted with the condition that higher compensation ratios (between the debit and credit) are required. Thus the risk of failing to achieve conservation goals is mitigated by undertaking credit measures over larger areas.

In this respect habitat banks can have a distinct advantage when credits exist in advance of the impacts (e.g. based on habitats that have already been improved or fully established by the bank or are sufficiently established to provide required biodiversity benefits and reasonable certainty that the habitat will continue to develop as required). Linking credits to existing and measurable biodiversity outcomes avoids concerns over the feasibility and quality of compensation.

4.4.4 Measurement of equivalency

The idea that compensation through offsets or banks can achieve a no net loss or net gain of biodiversity rests on the assumption that it is possible to measure what has been lost and what has been gained. Metrics are required that can be applied to both the debit (damage) and the credit (benefit from compensation) in the same way. Furthermore, to ensure equivalency of utility and service to relevant stakeholders, issues such as time preference (when will the benefits of the offset site appear?) and social equity (who suffers from the loss and who benefits from the gain?) require consideration. Hence, the question of 'what has been lost and gained' is made up of the objective and subjective (from an ecological point of view) measures of biodiversity value: objectively, the measures include the type, quantity and quality of the biodiversity in question; subjectively, the measures includes how this biodiversity is perceived or utilised by end-users – economically or culturally.

Consequently the difficulty of measuring and comparing the equivalency of debits in impacted areas with credits in proposed offsets or existing banks is one of the most difficult challenges to establishing habitat banking systems. It is also a complex subject that is rapidly developing and therefore we can only give the briefest of overviews in this report. The main issues and challenges discussed below include:

- Type of biodiversity;
- The amount of biodiversity – how much of it is lost and gained; and
- Secondary issues: managing risk, accounting for time preference, conservation targets and social equity.

The relevance of equivalency methods is also reviewed under these headings.

(i) The type of biodiversity

There needs to be equivalence in terms of the type of biodiversity impacted and offset. This is most commonly measured in terms of biotic variability: including sub-specific / genetic, species, populations, and habitats or ecosystems. Most offset systems have a preference for like for like offsets, meaning, for example, that impacts on lowland heath are compensated for by offsets in lowland heath. Similarly, like for like might be in terms of particular species. Society does not value all components of biodiversity equally, and we have a preference for rarer, more threatened, more beautiful or more useful biodiversity. Myriad prioritisation systems have emerged to classify these preferences. Globally, the IUCN Red List of Threatened Species is a good example. With respect to this study, habitats and species of Community Interest are of particular importance and these include IUCN Red Listed species. However, the national, regional and local importance of habitats and species also need to be taken into account. In general, impacts on threatened ecosystems or species will be compensated for by offsets on the same or more threatened ecosystems or species.

The type of biodiversity may also refer to the ecosystem processes operating within the system and the ecosystem services derived from it. Hence impacts on water purification services need to be compensated for by offsets on water purification services. Difficulties in measuring the nature, quantities and functional significance of some ecosystem processes such as pollination or mycorrizhal infection rates lead to many of these not being sufficiently considered in the compensation equation - hence habitat area and service loss % are often used as a proxy. This demonstrates the importance of measuring type. The outcome of this stage in the equivalency question is a known type or types of biodiversity that require compensation, and a site or sites at which these occur or may be restored.

Species, sub-species and populations
For most taxonomic groups there has historically been broad agreement on species definitions. Recently the emergence of the phylogenetic species concept has lead to some authorities re-classifying many relatively indistinct subspecies as full species, based purely on their genetic dissimilarity. If this classification is adopted within the EU, ensuring that offsets cover the same species as those impacted may be challenging. The crux is the value of the impacts and offsets for relevant stakeholders, rather than a scientifically 'correct' answer. For the purposes of offsets, this issue is not a critical impediment, but may create lengthy academic debate within the highly studied systems of the EU.

Habitats
It is often difficult to define habitat types as they show considerable variation and tend to grade into each other. Definitions of habitats vary between countries and

ecologists. Although habitat typologies have been produced for the EU (e.g. CORINE), these are not universally accepted and do not treat many habitats in detail, especially semi-natural artificial habitats (e.g. grasslands or arable farmland). Habitats of Community Interest listed in the Habitats Directive are described in the European Commission's Interpretation Manual of European Habitats (European Commission 2007) and this can be used as a reference for definition for those habitats.

Processes and services

Processes and services from natural habitats include pollination, water filtration, carbon sequestration, connectivity and gene flow, "food, fibre, fuel" and other biodiversity-based livelihoods, and cultural services such as recreation. The Millennium Ecosystem Assessment (MEA) usefully categorises ecosystem services into Supporting, Regulating, Provisioning and Cultural services (Millennium Ecosystem Assessment 2005). In theory a systematic classification system based on the MEA could be developed as part of an EU habitat banking system. However, accounting for such services as part of the biodiversity credit created complicates the system (see Section 10.10). Furthermore, information on the ecosystems services that are provided by biodiversity in many habitats is often lacking and therefore the identification and full valuation of benefits are difficult. In practice, habitat equivalency analysis often combines the area of habitat and percentage of service loss as proxy metrics.

What methods provide solutions?

Pre-existing maps and data for impact and offset sites may exist (e.g. from SEAs) and these can be used if they are comparable in spatial scale, data quality, date and classification system used. Normally, ground truthing or full surveys will be required (typically as part of an EIA). In most cases, consideration of whether impacted species or habitats and those in proposed offsets or banks are of the same type will require:

- Use of the same classification system (e.g. habitat types) at impact and offset sites;
- Use of standardised, repeated and accepted/peer reviewed methods implemented at impact and offset sites;
- Equivalent survey expertise at impact and offset sites, such as the same team or principle investigator to control for subjective bias: ornithologists or entomologists of varying expertise and experience may record significantly different lists of species from the same site, and
- Agreement amongst competent authorities (e.g. statutory conservation agencies), the project proponents, civil society groups that the offset is like for like. This may need subjective, stakeholder consultation methods. Sometimes other stakeholders also need to be involved as many habitats provide important benefits (ecosystem services, including aesthetic values) that are not necessarily captured in consideration of commonly recognised ecological values.

These issues will all be important in demonstrating like for like offsets, and also in the determination of whether the like for not like offset constitutes true trading up.

(ii) The amount of biodiversity – how much of it is lost and gained.

Once the type of biodiversity to be compensated has been identified, equivalence needs to answer two further questions:

- Quantity: e.g. how large is the area impacted?; and
- Quality: e.g. in what kind of condition is the biodiversity impacted (e.g. degradation of a habitat compared with a pristine state, species abundance, the connectivity of a habitat block, or magnitude and duration of the ecosystem process in operation)?

Quantity and quality are probably the most important metrics to take account of in ensuring equivalency. For this reason, BBOP has suggested that "No net loss might be defined in terms of 'an equivalent number of hectares of equivalent quality of suitable habitat before and after a development[32]' " (Treweek and ten Kate 2008). Most offset systems around the world have developed bespoke methods which can be broken down into these two principles. Unlike carbon, where there is a single currency of exchange (CO_2e), the nature of biodiversity itself requires many currencies of exchange most of which are based on different measures of quality or condition of biodiversity and how it is utilised by end-users.

It is important to realise that, as a result of secondary issues, the amount of biodiversity lost and gained can rarely be expressed by a 1:1 equivalence of quantity and quality. Emerging offset and banking systems around the world are developing methods to account for further issues which include risk of offset failure, time preference and time discounting, social equity, and meeting conservation targets (see case study Appendix for some examples).

What methods provide solutions?
The most popular equivalency methods combine quantity and quality into a single metric (as in the habitat equivalency analysis). Often these methods use a benchmark to measure quality: a benchmark is an ecosystem in a pristine state that can be regarded as 100% quality. These methods include the habitat hectares method of Victoria State, Australia and the emerging 'hectare equivalents' method of South Africa (see Box 4.7 and cases studies in the Appendix).

Many habitat banking systems, and habitat conservation goals, in countries that retain a high proportion of natural habitats are based on areas of land. However, nature

[32] In this report, we refer to 'without development/damage incident' (the baseline) and with development/ damage incident.

conservation objectives in much of the EU differ considerably and are more complex as most remaining biodiversity is associated with semi-natural or even highly artificial habitats. Remaining natural habitats are now very rare, and these and some semi-natural habitats that are listed in Annex 1 of the Habitats Directive are of considerable nature conservation importance in their own right. But in much of the EU nature conservation now focuses on the maintenance of habitats as resources for particular species of conservation value (e.g. artificial wetlands such as gravel pits for waterbirds). Therefore, it is essential that any habitat banking system calculates credits on the basis of the ecological quality of habitats in addition to habitat area. In this respect ecological quality may be assessed using similar criteria to those used for defining favourable conservation status of HD habitats, and/or the carrying capacity of the habitat in terms of particular species of conservation importance.

Box 4.7. Habitat hectares and habitat equivalents

Habitat hectares

Victoria State in Australia developed the habitat hectares method as an aggregated quantity and quality metric to determine the amounts of biodiversity lost and gained within the State offset system. This approach is based on units of measurement that take into account the area affected and the quality or condition of the vegetation impacted. Most importantly, quality if measured against a benchmark site which represents the pristine condition of the habitat in question. Put most simply, the loss of 100ha of forest at '50% quality' is expressed as the metric of 50 "habitat hectares" and can be compensated for with offset gains of 50 habitat hectares. This can be achieved, for example, through the gain of 25% of 'condition' (=quality) over an area of 200ha, or 100% 'condition' over an area of 50ha. It was originally designed to focus on habitat structure, and thus provide proxies for composition and function. In practice, some aspects of composition and function have been included as attributes and are thus measured directly. The attributes can be chosen to represent particular species of value, if necessary.

The method is explained by Parkes et al. (2003) and critiqued by McCarthy et al. (2004).

Habitat equivalents

Kotze et.al (2005) describe this system, which has been developed for use within a proposed wetland mitigation banking system currently under development in the grasslands biome of South Africa. It uses a similar logic to habitat hectares, but a bespoke set of indicators of quality which focus on 'wetland health'. Kotze summarises the equivalency metrics by saying: "Based on the size of the wetland area affected by the rehabilitation, the change in health can then be expressed in terms of "hectare equivalents" of intact wetland, which provides a "common currency" for comparing different rehabilitation projects or scenarios. If in the example given above, the area rehabilitated was 60 ha then this would be equivalent to re-instating 30 ha (60 ha x 5/10) of wetland integrity. If, however, the integrity score had only been increased from 3 to 5 (i.e., an increase of only 20%) (perhaps because of insufficient plugs in the drains) then this would be equivalent to re-instating 12 ha (60 ha x 2/10) of intact wetland."

Risks in implementation of benchmark quantity / quality approaches
There are obvious trade-offs between the breadth of applicability a method offers (e.g. across ecosystem types) and the appropriateness of its metrics for the biodiversity in question (rarely will the same metric be an equally appropriate proxy for different values, e.g. species diversity and the water purification services of an ecosystem). A full review of the risks can be found in Ekstrom et al. (2008) and more specifically in McCarthy et al. (2004).

(iii) Secondary issues: managing risk, accounting for time preference, conservation targets and social equity

Risk of offset failure
Offsets may fail because of many factors such as restoration failure, lack of connectivity etc. Where there are greater risks of offset failure, some systems advocate increases in the amount of biodiversity in the offset. The mitigation ratios of US Wetland Banking are a good example of this. As noted above, larger offsets may sometimes reduce the risk of offset failure.

Time preference
The loss of 100 ha of recreational woodland in 2010 is clearly not appropriately compensated for by the creation of 100ha of recreational woodland by 2090. This is because the losing stakeholders are not the gaining stakeholder, and consumers and societies have a naturally positive rate of time preference (for benefits sooner than later). Hence the amount of biodiversity in the offset must take account of the time lag between losses and gains.

Economic methods use discount rates to adjust for time preferences. Three reasons are defined for discounting (HM Treasury, 2003):

i. Catastrophe risk;
ii. Pure time preference; and
iii. Expected increasing per capita income.

It can be debated whether iii) is applicable to biodiversity resources. While society may expect to be richer in the future, biodiversity is not an asset which is expected to become more common in the future. Therefore the applicability of this motivation depends on whether biodiversity is regarded as substitutable for other sources of welfare. Biodiversity is subject to pure time preference (i) and catastrophe risk (ii) the other motivations for discounting. The application of discount rates to biodiversity is considered to be an important ethical issue, which is now being considered as part of the TEEB initiative (Sukhdev 2008).

An advantage of banking systems is that there can be a requirement for the offset to already be in place, avoiding many of these problems.

Social equity and distributional issues

Many offset systems require that offset sites are located as near as possible to impact sites, such as within the same watershed and local political unit. As well as ensuring like for like habitat, this rule of thumb also manages many social equity and distributional issues. In a similar manner to time preference, the loss of 100ha of recreational woodland in one province is not appropriately offset by the gain of 100ha of recreational woodland in another province. This is because the losing stakeholders are not the gaining stakeholders.

This distance effect operates through costs (e.g. travel time), and preference for benefits within a culturally defined area[33]. Social equity therefore needs to be taken into account to ensure the amounts of biodiversity offset are translated into appropriate metrics of value to relevant stakeholders. Sufficient stakeholder consultation is the primary method to deal with these issues. Careful processes exist to ensure this takes place within e.g. EIA systems around the world.

Conservation targets

Where offsets are based on averted risk and there are targets for the conservation of certain ecosystems or species within a political unit (EU, country, province), these targets act as a cap on the total amount of loss allowed within the system. In order to prevent certain species or habitats becoming more threatened, the amount of biodiversity in the offset may have to be much larger than the amount of biodiversity impacted. Such 'ratios' or 'multipliers' based on conservation targets are already implemented in the Western Cape offset system of South Africa (see case study Appendix).

Where offsets are based on averted risk and there is either a limited amount of habitat/ecosystem/species range available and/or where conservation targets exist at the landscape/political unit level for this biodiversity, a 1:1 quality and quantity ratio of losses to gains will eventually result in a 50% net loss of biodiversity. This 'endgame' result occurs when all the biodiversity is taken up either by development or offsets. This is a very real possibility within the EU. A 2:1 ratio (twice the gains to the losses) will result in a 33% net loss of biodiversity at the landscape level. Using this logic, high ratios are required to prevent significant losses to biodiversity through policy implementation over a number of decades. This work is further discussed by Brownlie et al (2008) and Ekstrom et al (2008).

[33] As revealed in the non-use benefits reported in some stated preference surveys.

4.4.5 Governance requirements and legal frameworks

The risks discussed above are theoretical at present in Europe, but are real issues in parts of the world where habitat banking and offsets have been used. These risks can be tackled by regulation, and an essential prerequisite for any system of regulation is the existence of a robust, transparent, adequate and impartial governance system. This is particularly necessary for the control of biodiversity impacts as many of the important values of biodiversity are not captured in economic systems, resulting in widespread biodiversity loss and degradation through ongoing market failures. In such circumstances there are strong financial incentives for minimising actions for biodiversity as the costs of such actions normally outweigh their direct short-term benefits.

There is, therefore, a risk that project proponents will use offsets to avoid other more costly measures and to save time (and therefore additional costs from project delays). There are also financial incentives to underestimating potential impacts, overestimating the reliability and benefits of offsets (or other mitigation measures if these have lower costs) and avoiding implementation of agreed measures.

It is therefore essential that offset and habitat banking systems are developed hand in hand with appropriate regulations and the establishment of adequate administrative capacities. These measures are necessary to ensure impacts are properly assessed (e.g. under SEA and EIA) and offset measures are properly implemented, monitored and managed in perpetuity. Without strong regulations and enforcement there is the risk that offset may be misapplied, for example with regard to the application of the mitigation hierarchy principles.

In the EU there are strong regulatory frameworks for controlling impacts on Natura sites, in particular through Article 6.3 and 6.4 of HD (see Section 5), and in relation to SEA and EIA. However, the regulatory effort of some Member States to fully implement the requirements of these nature conservation Directives is not always sufficient (ecologic (2008a). Any constraints are likely to be even more severe with respect to countries' current ability to properly oversee offset (and especially habitat banking related) decisions and scrutinise and assess their implementation. The availability of capacity (e.g. biodiversity monitoring expertise and regulatory structures) to develop and implement an appropriate regulatory approach to habitat banking in the EU, if required, is considered in the case study Appendix (see 'Other European Experience'). Generally the skills required to regulate habitat banking exists, and relevant capacity could be readily developed, although there are exceptions.

4.5 Principles for maximising biodiversity benefits

The various potential benefits and risk of offsets and habitat banking as outline above have been recognised by many authors and organisations (e.g. Bean et al. 2008; Carroll et al. 2007; Morris & Barham 2007; ten Kate et al. 2004). As a result of this, many schemes have adopted a number of key principles that aim to avoid the most serious risks to biodiversity. In particular, most systems aim to ensure no net loss of biodiversity, follow the mitigation hierarchy and sometimes ensure additionality. A wider set of principles have been promoted by BBOP for some time, the most recent version of which is provided in Box 4.8.

The principles establish a framework for designing and implementing biodiversity offsets and verifying their success. In their preamble to the principles, BBOP state that "*the goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity*". They also note that biodiversity offsets should be designed to comply with all relevant national and international law, and planned and implemented in accordance with the Convention on Biological Diversity and its ecosystem approach, as articulated in National Biodiversity Strategies and Action Plans.

The principles are designed to be generic and address common issues concerning offsets worldwide. They therefore deal with all the risks and constraints described above that potentially relate to the use of offsets and the establishment of a habitat banking system in the EU. Indeed the principles are generally well founded and relevant to the issues being addressed in this study. It would therefore seem appropriate to consider these principles in the establishment of any habitat banking system for the EU.

However, as noted in Section 4.1.5 above, the mitigation hierarchy is often misinterpreted, with insufficient consideration given to which avoidance and mitigation measures are appropriate. This can lead to poor biodiversity outcomes, e.g. where all feasible avoidance and mitigation measures are put in place rather than compensation measures that would have provided greater and more reliable biodiversity benefits.

Box 4.8. Biodiversity and Business Offsets Programme Principles on Biodiversity Offsets

SUPPORTED BY THE BBOP ADVISORY COMMITTEE
(Agreed text, 3 December 2008)

1. ***No net loss:*** A biodiversity offset should be designed and implemented to achieve *in situ*, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.

2. ***Additional conservation outcomes:*** A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.

3. ***Adherence to the mitigation hierarchy:*** A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimization and on-site rehabilitation measures have been taken according to the mitigation hierarchy.

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

5. Landscape Context: A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.

6. Stakeholder participation: In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation and monitoring.

7. Equity: A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.

8. Long-term outcomes: The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the project's impacts and preferably in perpetuity.

9. Transparency: The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.

10. Science and traditional knowledge: The design and implementation of a biodiversity offset should be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.

As discussed above it is not always appropriate to undertake all possible avoidance and reduction measures and restrict compensation measures to remaining residual

impacts. For example, the avoidance of "direct crossing" the newt pond in the hypothetical development illustrated in Figure 4.1 may not be appropriate. This is because the realignment now results in the isolation of the two ponds and the two populations may become unviable especially given the likely high mortality rates from the road. A better alternative may be to compensate for the habitat loss because the creation of suitable habitat for Great Crested Newts is relatively straightforward, inexpensive and reliable. Therefore, the remaining pond could be enlarged considerably and or another large pond created alongside to receive the translocated newts from the lost pond. Funds might also be provided to ensure the long-term management of the surrounding habitat, which would be highly valuable as many newt ponds are lost without such interventions due to natural succession processes. Such management benefits would not be provided if the impacts are 'avoided'. Similarly, the habitat bridge would probably be expensive and might not be cost-effective compared to compensation options, such as increasing the size or management of the forest block (if it is in poor ecological condition).

The key issue in the interpretation of the mitigation hierarchy is the consideration of what are *appropriate* measures. This is not explained in most references to the mitigation hierarchy and the BBOP principle. It is assumed that the hierarchy aims to minimise the risks of biodiversity losses occurring as a result of developers taking easy least cost actions, i.e. using offsets and mitigation banking as a "licence to trash". However, in practice, it is becoming apparent that many mitigation measures (e.g. protected species translocations) can have the same draw back and may be favoured because they are easy and provide a high certainty that developments will be approved (e.g. despite their poor biodiversity benefits).

On the other hand, authorities that insist on extremely expensive avoidance measures (e.g. tunnels or viaducts) may not be obtaining good value for money for the millions of Euros that are spent on such measures. This is particularly the case in Europe, where additional funds are urgently required to address the principal threats to biodiversity in the wider environment, which are inappropriate land management, habitat fragmentation and climate change. As discussed above, with careful planning and regulation the strategic use of compensation measures could provide significant conservation gains that significantly outweigh development impacts on habitats of relatively low conservation value.

It is therefore essential to emphasise the importance of the term "appropriate" when considering the principle of the mitigation hierarchy. In particular the aim should be to compare the conservation benefits of the various potential mitigation and compensation measures (taking into account their cost-effectiveness, risks and reliability) to identify the combination that provides the greatest reliable conservation benefits. Figure 4.9 below illustrates how this can be achieved by selecting options in order of their marginal cost benefit (as shown by the slope of the cost benefit curve). Thus in the example, the optimum combination of measures would be to take the

action 1 avoidance and then the offset action 1. None of the reduction measures in this example provides a better outcome than the avoidance and offset measures and therefore would not be appropriate. For simplicity, this example assumes that the benefits of each measure are independent of each other. In reality, the benefits would need to be recalculated to take into account the effects of chosen measures.

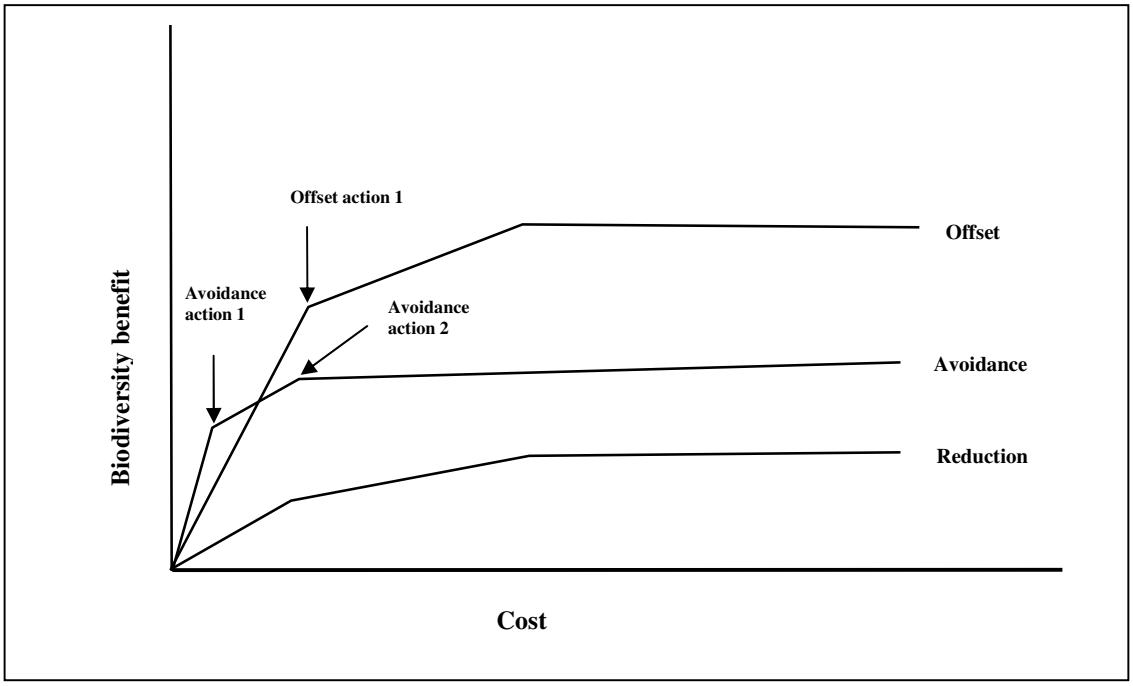


Figure 4.9: An illustrative example of the appropriate selection of mitigation and compensation measures according to their costs and conservation benefits

The reliability of measures also needs to be taken into account in accordance with the precautionary principle. Uncertainty can affect all types of mitigation and compensation measures depending on the circumstances. Some mitigation measures may be more reliable than compensation measures or vice versa. Furthermore, the weight given to the reliability of measures should increase with the importance and irreplacability of the habitats and species that may be impacted. Thus risky compensation options should be avoided for habitats and species of high conservation importance with measures focussing on avoidance actions (assuming they are most likely to be reliable).

As noted above, an advantage of habitat banking is that the risk of compensation failure is very low because the chosen measures for habitats and species populations can be required to have taken place before the development impacts and therefore their existing benefits (credits) can be measured directly. The likelihood of the ongoing value of the benefits (e.g. in relation to climate change or other external pressures) does, however, need to be taken into account.

4.6 The economic context of habitat banking

This section evaluates habitat banking against the alternative market based instruments identified in Section 3.2 in the context of current EU biodiversity trends and policy interventions outlined in Section 2.1. This section is restricted to theoretical comparison of habitat banking to other market based instruments for the environment. Section 5 considers the legal issues surrounding habitat banking in the EU, and Section 6 draws lessons from global experience on habitat banking.

4.6.1 Efficiency goal

The first aim of no net loss policy is prevention of damage to the environment. Mechanisms to implement no net loss will internalise the externality caused by damage to biodiversity that is uncompensated. Compensation actions place increased costs on damaging activities, and therefore increase their costs relative to other non-damaging activities. The effect of this should be to reduce damaging activity (in line with the appropriate Mitigation Hierarchy) to an 'efficient' level – one that takes into account the impacts on human welfare that were external to the costs of the activity.

Subsequent to this, habitat banking can facilitate efficient delivery of compensation requirements. The combination of both these factors is a key aspect of an economically efficient biodiversity protection system that uses habitat banking.

4.6.2 Theoretical evaluation of habitat banking as a market based instrument

Habitat banking has a number of theoretical advantages as a market based instrument to deliver biodiversity policy. These centre on the efficiencies attributed to market mechanisms, such as attainment of economies of scale, and competition to minimise prices. As an MBI, habitat banking is effectively a market in compensation liabilities. In fact as the different biodiversity resources it covers are not interchangeable it is a series of related markets, connected by the complementarity in delivering biodiversity resources[34]. Habitat banking is entirely the product of the regulations that establish it, and hence the instrument design, geographical coverage, target population group, timeframe and all other factors discussed above can be determined through analysis of optimal ecological and economic design.

In theory habitat banking offers economic efficiencies through economies of scale. They may reduce the costs of delivering offset credits and/or increase the efficiency

[34] For example, mudflat and saltmarsh may not be substitutable as credits and debits, but they are generally the joint product of inter-tidal habitat creation.

through which land is allocated to development and conservation objectives. This may help smaller firms' competitive situation, by helping them obtain compensation for development or pollution incidents. Without banking they may not be able to obtain reduced costs of offsets using economies of scale (unless pooled offset activities were available to them).

These economies of scale also bring ecological benefits - as noted above, habitat banking may result in larger habitat/biodiversity resources which are more resilient (e.g. to climate change). Also, the possibility of selling 'excess' credit (over and above what is needed to offset a given debit) creates an incentive to invest in larger offsets.

However, as habitat banking can move biodiversity resources between locations, care needs to be taken to ensure that some stakeholders do not lose important benefits as a result of relocation of resources. This may constrain relocations or require additional offsets to address specific lost functions. For example, habitat banking elsewhere might compensate for the impacts of the loss of a pond on a population of newts. But it might be necessary to create another pond or some other form of desirable natural features to compensate for the loss of aesthetic or amenity values at a site.

The regulations would need to be developed to establish a banking system and address the potential risks mentioned in Section 4.2 also lead to transaction costs. A balance needs to be struck between the need to address potential risks and to keep the transaction costs at a level that enables trading.

As the product of a regulated market, the price of habitat banking credits may be susceptible to price volatility, particularly until rounds of trading have spread information amongst market participants. Similar volatility has been observed in the EU ETS, a market created by regulatory measures.

Carbon markets also offer a lesson in relation to averted risk offset credits. Many carbon offsets are based on avoiding some activity (e.g. deforestation or burning of fossil fuels). The baseline for these actions is therefore a predicted future scenario, with the benefit arising by averting the risk of future emissions (e.g. by preserving forest, or supply renewable energy technology, respectively). The baseline for averted risk offsets actions is also a predicted future scenario. In both cases the assessment of averted risk makes verification of baselines, and therefore the additionality of environmental outcomes, difficult to monitor and audit.

4.6.3 Comparison of habitat banking to other market based instruments

The two main advantages of habitat banking over most other MBIs stem from achievement of economies of scale and creation of a value for property rights over particular biodiversity resources. Habitat banking can bring opportunities for

economies of scale at several stages in the offsetting process, such as in the roles of regulators, the creation and management of biodiversity credits, and monitoring and auditing procedures. These economies are proportionate to the level of detail, and therefore resources, required in biodiversity policies. As EU policies have some detailed and complex requirements, the potential economies of scale are regarded as significant.

Establishing a market for property rights for biodiversity resources (as potential credits) provides an incentive for conservation measures on private land. Furthermore it introduces market forces to regulate prices and prevent the inefficiencies of monopoly positions of buyers and/or sellers. In other words competition minimises costs by sending price signals that encourage the lowest-cost offsetting options to come forward and provide compensation.

The largest tradable permit scheme in the EU is the emissions trading scheme (ETS) for CO_2. Table 4.2 below compares some of the main features of the EU ETS with the theoretical qualities of habitat banking. The comparisons suggest that the diverse nature of biodiversity resources, compared to the standardised nature of CO_2 emissions, gives habitat banking a range of different qualities compared to the EU ETS. Because CO_2 emissions are a perfectly fungible resource, and emissions trading faced less political resistance to EU-wide taxation measures, a tradable permits scheme was clearly the preferred market based instrument option leading to the design of the EU ETS.

Table 4.2: Comparison of EU ETS policy and habitat banking

EU ETS Policy Feature	Habitat Banking
Creates market price for emissions of CO_2.	Creates market price for damage to biodiversity resources covered, price can reflect scarcity and difficulty of offsetting.
Covers larger emitters.	Sources of biodiversity loss heterogeneous, and sometimes diffuse and difficult to define. Requires policy driver requiring compensation for losses to stimulate demand for offsets. Policy could determine the 'significance' of damage thereby including or excluding types and quantities of damage
National allocations of emissions but EU-wide trading	Possible inter-Member State trading within bio-geographical areas, but market subdivided into different biodiversity types to help ensure equivalency.
Emissions permit allocation process can mitigate competitiveness effects	Offsets price determined by cost of compensation actions and availability of substitutes. Credits are not allocated prior to trade.
Verification process being standardised.	Complex rules required to define roles and responsibilities of regulators and those responsible for damage and delivering offset.

The case for habitat banking is more complex, so it needs to be carefully evaluated against other market based instruments. Table 4.3 compares habitat banking to the range of market-based instruments reviewed in Section 3. Some positive features of habitat banking are:

- Implementation of the polluter pays principle;
- Avoiding the deadweight loss associated with taxation;
- Implementing the principle of no net biodiversity loss, and potentially net gain;
- Potential economies of scale over offsetting; and
- Opportunity to build in requirements for permanent outcomes (e.g. endowment funds).

A negative factor is that habitat banking is a quantity instrument (fixing the level of outcome rather than the price) so that its costs to developers are unknown ex-ante. Trading over time will establish a record of price data that can help estimation of the expected costs of credits. However, just as with carbon trading, the permits (credits) can be subject to price fluctuations. These are linked to fluctuations in related markets, such as oil prices in the case of carbon. For habitat banking, the economics of alternative uses of land (including agriculture and development opportunities) will influence the price of land, and therefore the market price for biodiversity credits.

Table 4.3: Initial Comparison of MBI's for Environmental Policy

Instrument			Economic Rationale			Environmental Effectiveness	
Type	Theory	Practical Issues	Burden	Gain	Efficiency	Effect	Long-term
Subsidies	• Support good behaviour	• Trade impacts • Rent-seeking	• Public finance • Deadweight loss	• Public goods generation	• Not for policy failure • Difficult for market failure	• Dependent on uptake	• Secondary effects difficult to predict • Establishes vested interests (i.e. reduces policy adaptability)
Taxes/ Charges	• Polluter pays • Defined price • Good for inelastic demand curves	• National level • Often too many exemptions/low level (political risk)	• Private finance • Deadweight loss	• Revenue generating • Internalise externality	• Abatement allocated according to polluters' costs.	• Environmental outcome uncertain	• Costs could change over time, tax must adapt
Perfor-mance bonds	• Clear obligation of environmental performance	• Risks non-compliance and evasion	• Private risk • Ties-up capital	• Safeguard public welfare	• As efficient as environmental regulation is	• Ensure compliance with regulation already in place	• Time-limited effect
Tradable Permits	• Polluter pays • Better when demand for firms outputs are elastic	• Transaction costs • Difficult to monitor and enforce • Allocation issues (political risk) • Price volatility	Depends on allocation • Private finance • Minimise deadweight loss	• Abatement at lowest cost	• Trade allows more efficient internalisation • Dependent on heterogeneous costs	• Environmental outcome certain	• Ratchet up gains
Liability and	• Polluter pays • Flexible	• Assessing risk of reparations/co	• Private liability	• Safeguard public welfare	• More efficiency in gain if	• Compensation substitutability	• Reparations should be

Compensation	compensation • Mitigation hierarchy	mpensation • Requires supportive insurance market			substitutable compensation • Shared risk	allows for environmental damage	permanent • Indirect incentive against riskier development
Habitat Banking	• Polluter pays • Can deliver fixed policy objective (e.g. no net loss), but cost (price) can fluctuate.	(see review of case studies)	• Private finance	• Avoid biodiversity loss	• Economies of scale	• No net loss • Potential for net gain	• Direct resources to conservation priorities (e.g. valuable habitat or climate change adaptation)

5. Review of the legal framework

The main objective of this section is to examine the extent to which habitat banking is consistent with the requirements of the Habitats Directive (OJ 1992 L 206/17), the Wild Birds Directive (OJ 1979 L 103/1) and the Environmental Liability Directive (ELD) (OJ 2004 L 143/56) and also to determine whether habitat banking could be used more widely to implement existing EC nature conservation policy objectives[35].

The section therefore considers:

- The content of these EC Directives;
- How a habitat banking system might support the requirements of these Directives;
- What (new) methods or approaches to habitat banking might be permissible under these nature conservation directives, and
- The legal issues that need to be taken into account when considering implementing habitat banking schemes or associated methods.

There is already a requirement for compensating damage to protected natural resources under the legal frameworks created by the Habitats Directive, the Wild Birds Directive and the Environmental Liability Directive. These key Directives are therefore reviewed to determine whether they support a banking-type mechanism and if this is the case, to what extent. Relevant paragraphs of these Directives are analysed. However, to determine under which conditions habitat banking might be an effective instrument, some more general issues also need to be addressed. These issues are linked to the wider policy framework that probably needs to be introduced to ensure that habitat banking becomes an effective, reliable and useful tool.

Section 5.1 presents an analysis of the Environmental Liability Directive, including the Annex to the Directive that provides a "*common framework in order to choose the most appropriate measures to ensure the remedying of environmental damage*", Annex II. Section 5.2 examines the Habitats and Wild Birds Directives and specifically art. 6(4) of the Habitats Directive, which stipulates that under certain conditions, Member States have to take "all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected". Finally, Section 5.3 focuses on some more general issues, relevant for a reliable and effective habitat banking scheme.

[35] It is noted that habitat banking might play a role in other EC Directives. Examples in this respect are EIA Directive (OJ L 175, 5.7.1985, p. 40) and Directive 2001/42/EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment (SEA) (OJ 2001 L197/30). However, this issue not addressed further in this report.

5.1 Environmental Liability Directive

Before addressing the question of whether or not habitat banking can be used under the Environmental Liability Directive (ELD), a short introduction to this *ex post* regime is provided.[36] In April 2004, the European Parliament and the Council adopted Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage.[37] The Directive is another step in the development of the EU's nature protection policy. It complements existing ex ante EC nature conservation regimes such as the regimes established by the Wild Birds and Habitats Directives.[38]

The ELD imposes a strict or fault-based liability - depending on the type of activity involved - on the operator of an occupation activity for damage to the species and natural habitats protected by the Wild Birds and Habitats Directives, contamination of land and damage to waters covered by the Water Framework Directive[39] (provided the damage is above a certain threshold) (Art. 3 jo Art. 2(1)).[40] Operators who undertake an activity that is covered by the EC legislation listed in Annex III of the ELD, can be held strictly liable for above three types of harm (for which the overarching term 'environmental damage' is used). A fault-based liability is imposed on operators of non-listed occupational activities. These operators can only be held liable for damage to protected species and natural habitats and not for the other types of harm mentioned. It is to be noted that an operator may under certain conditions escape liability and that several situations are exempt from the ELD[41].

Liability under the ELD does not have a ceiling. This does, however, not mean that liability is unlimited. Under the ELD damages are preferably assessed on the basis of the actual costs of remediation. The ELD contains a set of guidelines on selecting the most appropriate measures to remedy the environmental damage caused (see Annex II of the ELD). These guidelines have been introduced to, among other things, prevent liable operators from being confronted with disproportionate costly restoration measures or a disproportionate claim. According to these guidelines, only reasonable restoration measures are to be taken to remedy the environmental damage caused,

[36] For a more detailed overview of the regime see Krämer (2006), Fogleman (2006) and Brans (2006).
[37] Directive 2004/35/EC, 21.4.2004, OJ 2004 L 143/56. Member States have until the end of April 2007 to transpose this Directive into domestic law.
[38] Resp. Directive 79/409/EEG, OJ 1979 L 103/1 and Directive 92/43/EEG, OJ 1992 L 206/7.
[39] Directive 2000/60/EC establishing a framework for Community action in the field of water policy, OJ 2000 L327/1.
[40] Member States may decide to include species and natural habitats not covered by the Wild Habitats and Wild Birds Directives. However, this can only be done if these natural resources are protected by national protection and conservation laws. In this part of the report, no attention is given to this aspect of the ELD.
[41] See Art. 4 and 8(4) ELD.

thereby taking into account - among other things - the costs of implementing the various restoration options.[42]

5.1.1 Determination of remedial measures

According to Art. 7 of the ELD, operators

> "shall identify, in accordance with Annex II of the ELD, the potential remedial measures and submit them to the competent authority for *its approval* [..]" (italics added). (Art. 7(1) ELD)

Art. 7 notes further that

> "the competent authority *shall decide* which remedial measures shall be implemented in accordance with Annex II, and with cooperation of the relevant operator as required" (italics added). (Art. 7(2) ELD)

Before getting into the consequences of these provisions for use of habitat banking as a method to compensate for significant damage caused to the species and natural habitats covered by the ELD, it is important to consider how damages are measured under the ELD and the framework that has been introduced in Annex II of the ELD to choose the most appropriate measures "to ensure the remedying of environmental damage".[43]

Measure of damages and the objective of remediation measures
One of the primary objectives of the ELD is to restore damage caused to the species and natural habitats protected under Wild Birds Directive and the Habitats Directives and to the waters covered by the Water Framework Directive. The ELD therefore emphasizes restoration and chooses restoration costs as the primary and preferred method to assess damages.[44] However, because it takes time to restore the damaged natural resources to baseline condition - that is the condition of the natural resources before the injury occurred - the operator will also be held liable for the loss or impairment of natural resources and natural resource services during the restoration period (interim losses).[45] In addition to restoration costs (and interim losses), the responsible party can be held liable for the costs of assessing damages as well as the administrative, legal and enforcement costs, the costs of data collection and monitoring and oversight costs.[46]

[42] See para. 1.3.1 of Annex II.
[43] See Annex II ELD, p. L143/67. Taken the focus of this report, this chapter does not address the issue of soil pollution.
[44] See Art. 7(1) ELD.
[45] See Art. 2(11),(13) and Annex II, para. 1(c) and (d).
[46] See Art. 8(2) jo 2(16) of the Directive.

According to Annex II of the ELD, restoration of damage to waters and protected species and natural habitats is to be achieved by way of so-called primary, complementary and compensatory remediation measures. Before getting further into this, it should be noted that the objective of these remediation measures is not only to bring damaged natural resources back to their baseline condition, but also to restore impaired natural resource services to baseline condition[47]. Natural resource services – the ELD also uses the term 'services' - are defined in the ELD as:

> "the functions performed by a natural resource for the benefit of another natural resource or the public" (Article 2(13) ELD. See also paragraph 1(d) of Annex II).

For example, a coastal wetland provides food and nesting habitats for birds and other species, clean water for fish populations, and is important for biodiversity maintenance and for pollution assimilation. Examples of human benefits deriving from a coastal wetland include recreational fishing and boating, beach use, wildlife viewing, hiking and hunting. This means that, when developing reasonable remediation options under the ELD, the loss of natural resource services contributing to human welfare must also be taken into account.

It should be noted that neither Art. 6(4) of Habitats Directive, nor any other provision of this Directive, refer to the human benefits deriving from the species and natural habitats covered by this Directive (and the Wild Birds Directive).[48] So unlike the ELD, such human benefits are not a relevant consideration when identifying compensatory measures to fulfil the obligations under Art. 6(4) of the Habitats Directive. This difference between the ELD and the Habitats Directive may have an impact on the usefulness of certain habitat banking credits and could force the public authorities and/or the potential responsible party to make a distinction between credits used to offset a liability under the ELD or under the Habitats Directive (provided that habitat banking can be used to offset damage to natural resources under these Directives (see further below)).

Primary, complementary and compensatory remediation measures

As noted earlier, according to the ELD, damage to waters and protected species and natural habitats is to be restored to baseline condition by way of primary, complementary and compensatory remediation measures. Primary remediation is defined in Annex II as

[47] See Article 2(15) and Annex II, para 1(b)-(d) of the ELD.

[48] This issue is also not addressed in the relevant EC guidance documents *Managing Natura 2000 Sites*. The provisions of Article 6 of the Habitats Directive, Luxembourg 2000 and *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC*, Brussels 2007.

> "any remedial measure which returns *the* damaged natural resources and/or impaired services to, or towards, baseline condition". (Italics added)

This is also the purpose of primary remediation. The focus of these measures is thus on directly restoring the natural resources and services that have been impacted to baseline condition.[49] Taken the goal of these measures, it is unlikely that habitat banking can replace primary remediation. Ecologic (2008b) also comes to this conclusion. Primary remediation is the priority of the ELD.

This is probably different for complementary and compensatory remediation measures. 'Complementary' remediation is defined in Annex II as:

> "any remedial measure taken in relation to natural resources and/or services to compensate for the fact that primary remediation does not result in fully restoring the damaged natural resources and/or services". (para. 1(b)

The purpose of this type of remediation measures is to provide a

> "*similar level* of natural resources and/or services, including, as appropriate, at an *alternative site*, as would have been provided if the damaged site had been returned to its baseline condition. Where *possible* and *appropriate* the alternative site should be *geographically linked* to the damaged site, taking into account the interests of the affected population." (Italics added) (para1.1.2)

Compensatory remediation is defined in Annex II as:

> "any action taken to compensate for interim losses of natural resources and/or services that occur from the date of damage occurring until primary remediation has achieved its full effect." (para 1(d)).

It is noted in Annex II that this type of remediation measure consists of:

> "additional improvements to protected natural habitats and species or water *at either the damaged site or at an alternative site* [..]." (Italics added) (para. 1.1.3)

With regards to both the identification of complementary and compensatory remedial measures and the determination of the scale of these measures, it is further noted in Annex II that there is a preference for the use of resource-to-resource or service-to-service equivalence approaches. It is in that respect noted in Annex II that under these approaches:

[49] See in this respect para. 1.1.1 and 1.2.1 of Annex II.

> "actions that provide natural resources and/or services of the *same type, quality and quantity* as those damaged *shall be considered first*. Where this is not possible, then *alternative* natural resources and/or services shall be provided." (Italics added) (para. 1.2.2)

Given the above guidance on choice of complementary and compensatory remedial measures and especially the wording of some of the quoted paragraphs of Annex II, it seems that the ELD is relatively flexible where it concerns the objectives of complementary and/or compensatory remedial measures and the types of measures that can be taken in that respect. For instance, with regard to both types of remediation measures it is noted in Annex II that such measures can be taken on alternative sites. However, with regard to complementary measures, it is noted that, where possible and appropriate, these alternative sites should be geographically linked to the damaged site (para. 1.1.2). The latter is not specifically required with regard to compensatory measures. However, taken the criteria listed in 1.3.1 of Annex II, also with regard to these measures, there seems to be a preference for a geographical linkage between the place where the compensatory measures are taken and the damaged site.

It should be noted that Annex II does not provide any criteria with regard to the geographical linkage issue. Striking in that respect is that there is no reference to the Natura 2000 network or the biogeographical regions that have been identified in for instance, Art. 1 of the Habitats Directive.

Secondly, with regards to the scale of the compensatory and complementary measures to be taken, a preference is expressed for measures that provide natural resources and/or services of the same type, quality and quantity as damaged (para 1.2.2). However, it is noted also that if this is not possible, then alternative natural resources and/or services may be provided.[50] This is also affirmed by para. 1.1.3 of Annex II, where it is noted – only with regard to compensatory remediation measures – that such measures may

> "consist of additional improvements to protected natural habitats and species or waters [..]".

It is not stipulated that these improvements should concern the very same protected natural habitats and species or waters as have been impacted by the incident.[51]

[50] It is to be noted that Annex II does not explain what is meant with "not possible" and what the extent of the burden of proof is with regard to this is issue.

[51] In para 1.1.2 of Annex II it is noted that the purpose of complementary remediation measures is to provide a "similar level of natural resources and/or services [..]". It is not entirely clear to us what is meant with "similar level". However, para 1.2.2 makes it clear that under certain

Given the above, it seems that the ELD is relatively flexible where it concerns the objectives of the compensatory and complementary measures that have to be undertaken to compensate for damage caused to species and natural habitats covered by the ELD. This certainly seems to be the case with the measures that have to be taken to compensate for interim losses, but is also likely for the complementary measures.

As a side note, Article 6(4) of the Habitats Directive is in this respect stricter that the ELD. This provision of the Habitats Directive requires under certain conditions that Member State "take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected". In addition, according to the EC guidance document on Art. 6(4), the compensatory measures that have to be taken on the basis of this provision should address "in comparable proportions, *the* habitats and species negatively affected [and] provide functions comparable to those which had justified the selection criteria of the original site, particularly regarding the adequate geographical distribution".[52] (Italics added).

Habitat banking under the ELD

Given the intent and requirements of the ELD, as outlined above, it seems that habitat banking could be used under the ELD to compensate for interim losses and thereby as a compensatory remediation measure[53] and could in fact have a positive effect on the extent of the compensatory remediation measures to be taken under the ELD (Stahl *et al.*, 2008). However, this would depend on the environmental quality and/or condition of land included in a habitat bank (Scanlon 2007). If it takes years for these sites to reach the level of quality necessary to provide a comparable level of natural resources and/or natural resource services to those on the impacted site, habitat banking might not be a suitable mechanism.

As noted earlier, the ELD seems to express a preference for compensatory remediation measures that provide natural resources and/or services of the same type, quality and quantity as those damaged (see para. 1.2.2. Annex II). This is, however, not entirely certain as para. 1.1.3 of Annex II stipulates that compensatory remediation measures may consist of additional improvements to protected natural habitats and species or waters. It is not stipulated in the ELD or Annex II that these improvements should concern the very same protected natural habitats and species or waters as have been impacted by the incident.

Only in cases where this is impossible, may compensatory remediation measures be put in place and provide alternative natural resources and/or services. As a result of

conditions other natural resources and/or services may be provided by these measures than impacted.

[52] See EC 2007, p. 13. See further on this subject, section 3 of this report.

[53] See also in this respect Ecologic (2008), p. 4.

this, it might well be that not every piece of land in a habitat bank can be used to compensate for interim losses; or it might be that alternative compensation may be allowed after it has proven to be impossible to locate lands in banks that provide (in the near future) natural resources and/or services of the same type, quality and quantity as those impacted.

It seems that habitat banking could also be used to implement complementary measures and that habitat banking might be a useful and cost-effective tool for this purpose.[54] Land already included in a habitat bank is in principle available and less time is likely to be needed to locate appropriate remediation sites. However, with regard to complementary measures, the ELD expresses a clear preference for measures that provide natural resources and/or services of the same type, quality and quantity as those damaged (see para. 1.2.2. Annex II). Only where this is impossible, may alternative natural resources and/or services be provided. So also with regard to complementary measures, it might well be that some credits cannot be accepted or they can only be accepted after it has been proven that it is impossible in the near future to find credits that concern lands that are able to support natural resources and/or services of the same type, quality and quantity as damaged.

So the ELD expresses a preference for 'like for like' compensation, but under certain conditions it allows for 'trading up' or 'out of kind' compensation. However, neither the ELD nor its Annex II does provide any further information or guidance on the latter.

5.1.2 Approval of remediation plans

According to Art. 7(1) ELD operators have to identify, in accordance with Annex II of the ELD, potential remediation measures and submit to the competent authority a remediation plan for approval. These plans identify various reasonable remediation options, each consisting of primary and compensatory remediation measures, and if necessary complementary remediation measures. It is up to the Competent Authority to decide which remediation option is to be implemented (Art. 7(2) ELD).

A consequence of the requirement for the competent authority to approve the remediation plan and decide which remedial measures will be taken, is that if an operator proposes to compensate for, i.e. interim losses through purchase of habitat banking credits, the public authorities are forced to check whether this is an appropriate alternative and is acceptable under the ELD. It might force the public authorities to take all kinds of decisions. They need to check, for instance, if the land on which habitat credits are offered is suitable for compensation of interim losses under the ELD. And if the available credits have been bought in anticipation of an

[54] Id.

(unknown) damaging event and the credits are now used to offset a liability. The Competent Authority needs to check whether the land included in a bank still adequately represents the number of credits awarded (Stahl *et al* (2008)). In addition, as with all habitat banking systems, the public authorities need to characterize and quantify the relevant gains and losses of the impacted site and the site in bank in a manner that allows comparison. Furthermore, whether the management and maintenance of the lands in bank are guaranteed, and whether there are sufficient funds for this, in particular in the long run should be investigated. There are other relevant issues that need to be considered in order to allow habitat banking under the ELD which are discussed in Section 4.

So accepting habitat banking as a tool to implement complementary and compensatory remediation measures will bring some new and extra responsibilities for the public authorities of MS. According to the ELD, they have to approve the remediation plan and to decide which remediation option is to be implemented. Thus, if habitat banking is part of such a plan, the public authorities need to determine whether this is in the given case and under the specific circumstances acceptable and can be accepted as part of a remediation option. These responsibilities would be an extension of what needs to happen in implementing ELD on a case-by-case basis.

5.1.3 Is there a need for amending the ELD?

Taken the above, the ELD does not seem to preclude the use of habitat banking. However, also in line with mitigation hierarchy, habitat banking is not an alternative for primary remediation. Habitat banking can probably only be used to facilitate the compensatory measures that have to be taken under the ELD to compensate for interim losses and the complementary measures, if such measures need to be taken (which is not always the case). In order to facilitate the implementation of habitat banking (if it is to go ahead), guidance document should be issued to Member States incorporating the findings of this project and in particular how banking might best be used to compensate for liability under the ELD.

However, given the existence of some important general issues surrounding a habitat banking scheme, even if no amendment of the ELD is necessary, introducing the banking scheme itself might require legislation. This is explored further in Section 5.3.

5.2 Habitats Directive

In May 1992, the Council of the European Communities adopted the Habitats Directive. The main aim of the Habitats Directive is to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the

European territory of the Member States.[55] The Habitats Directive provides for the creation of a coherent European ecological network, existing of special areas of conservation (SACs), in order to ensure the restoration or maintenance of natural habitats and species of Community interest at a favourable conservation status. This network is called the Natura 2000 network.[56]

The Habitats Directive provides for a number of provisions to ensure the quality and coherence of Natura 2000. This report focuses on Article 6 of the Habitats Directive. It is this article that - in short - demands that damage to Natura 2000 is compensated. However, it is noted that Article 6 does not stand alone in its aim of enhancing Natura 2000. Article 10 is particularly relevant at this point. This article demands that Member States endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora. Perhaps a system of habitat banking could play a role in the management of these features of the landscape, e.g. when lands harbouring such features are placed in a bank and thus protected against negative influences to their ecological qualities.

5.2.1 Article 6(1,2,3) Habitats Directive

Article 6(1) of HD obliges Member States to establish the necessary conservation measures for SACs. [57] These measures shall include, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types listed in Annex I and the species listed in Annex II present on the sites. In contrast to Article 6(2,3,4), Article 6(1) provides for positive measures, which aim to achieve the general objective of the Directive, instead of preventive measures to avoid deterioration, disturbance and significant effects in the SACs.[58]

The rest of this section focuses on Article 6 (2,3,4) of HD. It follows from Article 7 of HD that these provisions also apply to areas designated as SPAs under the Wild Birds Directive. This means that what is concluded in this report regarding habitat banking under Article 6 (2,3,4) of HD in relation to SACs under the Habitats Directive also holds true for SPAs under the Wild Birds Directive.

[55] Art. 2(1) Habitats Directive.
[56] Natura 2000 includes the special protection areas classified under the Directive 79/409/EEC (Wild Birds Directive).
[57] Art. 6(1) does not apply tot SPAs under the Wild Birds Directive.
[58] EC (2000), p. 16.

Article 6(2) of HD requires Member States to take appropriate steps to avoid the deterioration of natural habitats and the habitats of species in SACs, as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive. It is clear from the rulings of the European Court of Justice that Article 6(2) concerns an obligation to achieve the protection described, not merely an aim to achieve.[59] This obligation has a permanent nature and is not linked to any procedure of decision making as the obligations arising from Article 6(3,4) are. The European Commission has indicated that habitat deterioration occurs in a site when the area covered by the habitat in this site is reduced or the specific structure and functions necessary for the long-term maintenance or the good conservation status of the typical species which are associated with this habitat, are reduced in comparison to their initial status.[60] Disturbance of a species occurs on a site when the population dynamics data for this site show that the species can no longer constitute a viable element of it in comparison to the initial situation.[61]

Articles 6(3) and 6(4) of HD concern the assessment of plans and projects not directly connected with or necessary to the management of a SAC. Whenever the possibility that a plan or project will have a significant effect on a SAC, either individually or in combination with other plans or projects, cannot be ruled out, the phased procedure of assessment laid down in these subsections must be followed.[62] The first phase of the assessment consists of a *screening*. Only when this screening incontrovertibly shows that no significant effects on any SAC will occur, can the plan or project be approved. If it cannot be excluded, on the basis of objective information, that the plan or project will have a significant effect on that site, either individually or in combination with other plans or projects, an *appropriate assessment* must be carried out of its implications for the site in view of the site's conservation objectives.[63]

Such an assessment implies that all the aspects of the plan or project which can, either individually or in combination with other plans or projects, affect those objectives must be identified in the light of the best scientific knowledge in the field. Those objectives may, as is clear from Articles 3 and 4 HD, in particular Article 4(4), be established on the basis of the importance of the sites for the maintenance or restoration at a favourable conservation status of a natural habitat type listed in Annex I to that Directive or a species listed in Annex II thereto and for the coherence of Natura 2000, and of the threats of degradation or destruction to which they are

[59] ECJ 13 June 2002, C-117/00.
[60] EC (2000), 2000, p. 27.
[61] EC (2000), 2000, p. 28.
[62] The European Commission has described the phased procedure of assessment in "Assessments of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC" of November 2001.
[63] ECJ 7 September 2004, C-127/02, par. 45.

exposed.[64] The key term in this assessment, "significant effects", is not defined in the Directive. Case law stipulates that in light of the first sentence of Article 6(3) of HD in conjunction with the 10th recital in its preamble, the significant nature of the effect on a site of a plan or project is linked to the site's conservation objectives. So, where such a plan or project has an effect on that site but is not likely to undermine its conservation objectives, it cannot be considered likely to have a significant effect on the site concerned. Conversely, where such a plan or project is likely to undermine the conservation objectives of the site concerned, it must necessarily be considered likely to have a significant effect on the site. In assessing the potential effects of a plan or project, their significance must be established in the light, inter alia, of the characteristics and specific environmental conditions of the site concerned.[65]

In light of the conclusions of the assessment of the implications for the SAC, the competent national authorities are to agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the SAC concerned and, if appropriate, after having obtained the opinion of the general public.[66]

5.2.2 Article 6(4) Habitats Directive

When it is concluded that a plan or project *does* have a negative effect on the integrity of a SAC, the project can be approved by the authorities nonetheless, if it meets the demands of Article 6(4) of HD. This reads as follows:

> "If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to *ensure* that the *overall coherence of Natura 2000* is protected. It shall inform the Commission of the *compensatory measures* adopted. [italics added]
>
> Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."

The focus of our analysis is on two terms that are used in Article 6(4) of HD: "alternative solutions" and "compensatory measures". However, for a proper

[64] ECJ 7 September 2004, C-127/02, par. 54.
[65] ECJ 7 September 2004, C-127/02, par. 46 and following.
[66] ECJ 29 January 2004, C-209/02, par. 22, ECJ 26 October 2006, C-239/04, par. 18 and ECJ 20 September 2007, C-304/05, par. 56.

understanding of the scope of Article 6(4) the term "imperative reasons of overriding public interest" is also discussed hereinafter.

Alternative solutions

Under Article 6(4) the Competent Authorities must first examine the possibility of resorting to alternative solutions which better respect the integrity of the site in question. All feasible alternatives[67], in particular, their relative performance with regard to the conservation objectives of the Natura 2000 site, the site's integrity and its contribution to the overall coherence of the Natura 2000 Network have to be analyzed.[68]

Imperative reasons of overriding public interest

In the absence of alternative solutions - or in the presence of solutions having even more negative environmental effects on the SAC concerned, with regard to the above-mentioned conservation aims of the Directive - the Competent Authorities have to examine the existence of imperative reasons of overriding public interest, including those of a social or economic nature, which require the realisation of the plan or project in question.

The Habitats Directive does not define the meaning of the term "imperative reasons of overriding public interest". It can be inferred from the second subparagraph of Article 6(4) that human health, public safety and beneficial consequences of primary importance for the environment are examples of what is meant by "imperative reasons".

The European Commission concludes that it is reasonable to consider that the "imperative reasons" refer to situations where the plans or projects envisaged prove to be indispensable (1) within the framework of actions or policies aiming to protect fundamental values for the citizens' life (health, safety, environment), (2) within the framework of fundamental policies for the State and the Society, or (3) within the framework of carrying out activities of economic or social nature, fulfilling specific obligations of public service.[69]

The Opinions of the European Commission show various examples of projects judged to be necessary for "imperative reasons", including projects which are part of the TEN-network, infrastructural projects aimed at opening up economically underdeveloped regions, providing for employment in an area where great redundancies have been made, maintaining or improving the competitive position of a big harbour cluster or

[67] *Every* realistic alternative as to be examined. ECJ 26 October 2006 C-239/04, par. 36 and further. Cf. Opinion A-G of C-209/04, 72.
[68] EC (2007), p. 6.
[69] EC (2007), p. 8.

projects necessary to act on an urgent need for water in agriculture.[70] Only public interests, irrespective of whether they are promoted either by public or private bodies, can be balanced against the conservation aims of the Directive. Thus, projects developed by private bodies can only be considered where such public interests are served and demonstrated.[71]

Compensatory measures

If a negative effect on the integrity of a SAC due to a plan or project is unavoidable, no alternative is available and the plan or project must be carried out for imperative reasons of overriding public interest, compensatory measures must be taken. These compensatory measures must (Article 6(4):

> "ensure that the overall coherence of Natura 2000 is protected".

The Habitats Directive itself does not explain this phrase or provide much guidance on the meaning of the term. The European Commission, in explaining the phrase "overall coherence of Natura 2000" looks to Article 3(1). This reads:

> "*A coherent European ecological network of special areas of conservation* shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, *shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range*." [italics added]

The European Commission considers that the "overall coherence of Natura 2000" in Article 6(4) matches with the phrase "coherent European ecological network" of Article 3(1). This Article contains two criteria in relation to the coherence of the network:

> (1) the targeted species and habitats in terms of quantity and quality; and
> (2) the role of the site in ensuring the adequate geographical distribution in relation to the range.

So with regard to a plan or project, compensatory measures defined to protect the overall coherence of the Natura 2000 network will have to address these criteria too. This means that compensation should refer to the site's conservation objectives (quality) and to the habitats and species negatively affected in comparable

[70] For more opinions by the European Commission see http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm.
[71] EC (2007), p. 7.

proportions in terms of number and status (quantity). At the same time, role played by the site in relation to the biogeographical distribution has to be replaced adequately.[72]

Compensatory measures should provide properties and functions comparable to those which have justified the selection of the original site to Natura 2000. They must result in the full restoration of the coherence of Natura 2000.

The Wild Birds Directive does not provide for bio-geographical regions, or selection at Community level. The European Commission considers that the overall coherence of the network is ensured if:

(1) compensation fulfils the same purposes that motivated the site's designation in accordance with Article 4(1) and 4(2) of the Birds Directive;
(2) compensation fulfils the same function along the same migration path; and
(3) the compensation site(s) are accessible with certainty by the birds usually occurring on the site affected by the project.[73]

The European Commission also provides an indication of the nature of the compensatory measures appropriate or necessary to compensate for adverse effects of a plan or project on Natura 2000 sites. The Commission lists the following measures:

- Restoration or enhancement in existing sites: restoring the habitat to ensure the maintenance of its conservation value and compliance with the conservation objectives of the site or improving the remaining habitat in proportion to the loss due to the plan or project on a Natura 2000 site;
- Habitat Recreation: recreating a habitat on a new or enlarged site, to be incorporated into Natura 2000, and
- Proposing a new site under the Habitats and Wild Birds Directive, in association with other measures.[74]

5.2.3 Habitat banking under Article 6(4) of Habitats Directive

A system of habitat banking would – in short – consist of an entity owning and/or managing land. This might be in one or several locations. The land in the bank will have certain ecological values and/or the capacity to (further) develop these values. Through the proper conservation and management of the land these ecological values remain intact and may even be enhanced. The additional biodiversity or ecological

[72] EC (2007), p. 11/12.
[73] EC (2007), p. 13.
[74] EC (2007), p. 14.

value produced on that land is used to offset the significant effect of a plan or project[75] (or incident).

The question that arises is whether habitat banking can be used as a mechanism for delivering the compensation for damage or loss prescribed under Article 6(4) of HD. This question is of interest if a public authority or a private entity would want to carry out a project that would have an adverse effect on the integrity of a SAC. If there are no alternatives to the project, and the project is necessary for imperative reasons of overriding public interest, Article 6(4) HD allows for the project to be carried out if appropriate compensatory measures are taken. Whether habitat banking might be appropriate in these circumstances is considered below.

Last resort

First, it must be clear – as was noted earlier - that carrying out a project under Article 6(4) is a matter of last resort.[76] Under the regulatory system of the Habitats Directive, adverse effects are to be avoided as much as possible. Execution of the plan under Article 6(4), including taking compensatory measures, can be considered only when adverse effects have to be accepted in the absence of any alternative, for overriding reasons of public interest.[77] The preservation of existing natural resources, however, is always preferable to taking compensatory measures.[78]

This means that habitat banking can never provide for a licence to carry out any project that affects a SAC, for which an alternative exists or which is not necessary for overriding reasons of public interest. At this point it would be appropriate to stress that Article 6(4) of the directive must, as a derogation from the criterion for authorisation laid down in the second sentence of Article 6(3), be interpreted strictly.[79]

Contents of compensatory measures

As noted earlier the European Commission, in its "Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC", expresses the opinion that compensatory measures defined to protect the overall coherence of the Natura 2000 network:

> "[…] should refer to *the site's conservation objectives* and to *the habitats and species negatively affected* in *comparable proportions* in terms of *number* and

[75] Where in this report in relation to Article 6(4) HD the word "plan" is used "project" can also be read, and vice versa.
[76] EC (2007), p. 11.
[77] The question can be asked whether Article 6(4) prescribes that alternatives are examined first and the existence of imperative reasons of overriding public interest after that. Various Opinions by the A-G to the ECJ suggest that no such order exist. Cf. Opinion of A-G of 27 April 2006, C-239/04, par. 44-46 and Opinion of A-G of 27 October 2005, C-209/04, par. 72.
[78] Cf. Opinion of A-G of 27 April 2006, C-239/04, par. 35.
[79] ECJ 20 September 2007, C-304/05, par. 82.

> *status*. At the same time the role played by the site concerned in relation to the biogeographical distribution has to be replaced adequately." [italics added]

This does not really give a clear answer to the question of what the exact nature of the compensatory measures should be if a specific habitat type or species is affected. It seems, however, that a strict connection must exist between the affected habitat type and its functions or the affected species on the one hand and the contents of the compensatory measures on the other hand. If habitat type X is affected, compensation should consist of creating or enhancing a comparable amount of (new) habitat type X (compensation "should refer to the site's conservation objectives"). And what is more, within that habitat type, the compensation must refer to the same functions of that habitat type. If species Y is affected, compensation should be carried out to the same species Y.

However, the European Commission's Guidance document does not give absolute clarity in this respect. Another description of the contents of the compensatory measures also seems to lay a strict connection between affected habitat type or species and the habitat type or species to be compensated, but seems to leave some room where it concerns the functions of the habitat affected:

> "In order to ensure the overall coherence of Natura 2000, the compensatory measures proposed for a project should therefore:
> a) address, in comparable proportions, *the* habitats and species negatively affected;
> b) provide *functions comparable* to those which had justified the selection criteria of the original site, particularly regarding the adequate geographical distribution. Thus, it would not be enough that the compensatory measures concern the same biogeographical region in the same Member State."[80] [italics added]

The words "functions *comparable* to those which had justified the selection criteria of the original site" seem to indicate that – even though compensation must refer to the same habitat type that was affected – there is no duty to compensate for the same exact functions that were damaged. As long as the functions provided for by the compensatory measures are "comparable". This view seems to be supported by the guidance the European Commission issued with regard to compensatory measures under Article 6(4) earlier, in the year 2000.

> **"Compensation**
> Finally, if all the above conditions are fulfilled then comes the question of how to compensate for the loss of the site so as to maintain the overall coherence of the Natura 2000 Network. Again, there is little jurisprudence on this matter

[80] EC (2007), p. 13.

to help guide Member States but the Commission considers that certain conditions must be respected as regards compensation measures, which should:

- be additional to the normal practices of implementation of the 'Nature' Directives,
- address, in *comparable proportions*, the habitats and species negatively affected,
- concern the *same biogeographical region* in the same Member State,
- provide *functions comparable* to those which had justified the selection criteria of the original site,
- be operational at the time the original site is being damaged unless it can be proven that this simultaneity is not necessary to ensure the integrity of the Natura 2000 Network."[81] [italics added]

It seems, however, that this margin – if in fact present – must be regarded as very small. Further on in the Guidance document of 2007, the European Commission states:

> "Once the biological integrity likely to be damaged and the actual extent of the damage have been identified, *the measures in the compensation programme must address specifically those effects*, so that the elements of integrity contributing to the overall coherence of the Natura 2000 network are preserved in the long term. Thus, these measures should be the most appropriate to the type of impact predicted and should be focused on objectives and targets clearly addressing the Natura 2000 elements affected. *This requires that measures clearly refer to the structural and functional aspects of the site integrity, and the related types of habitat and species populations that are affected.*"[82] [italics added]

The overall view is that compensatory measures that have to be taken under Article 6(4) must be related very strictly to the types of habitats and species that are affected and to the functions for which the affected site was selected.

Contents of compensatory measures in relation to habitat banking

The requirement for compensatory measures to address the same habitat type and functions of the habitat that are affected by a project, seems to form a considerable obstacle for the use of habitat banking as a method of compensation. This is so if to provide compensation, land in a habitat bank would have to consist of the same habitat type and have to provide for – highly (see above) – comparable functions as the affected site. This potentially raises a lot of technical difficulties.

[81] EC (2000)a, p. 4.
[82] EC (2007), p. 17.

In general, the chance that the land in the bank is the exact same habitat type as the site affected, and fulfils the exact same functions, is likely to be very small. It is probably because of these difficulties that the European Commission considers:

> "The option of habitat banking as compensatory measure under Article 6(4) is of very limited value due to the tight criteria mentioned in relation to the need for compensation to ensure the protection of the coherence of the network […]."[83]

In light of the strict demands posed by Article 6(4) to compensatory measures, this conclusion seems justified.

A specific problem is that to be economically profitable, a habitat bank must sell credits connected to specific habitat types and functions in bank. This means that the lands in bank have got to meet a demand. Seeing how there are a lot of different habitat types with various different functions, it is hard to predict which exact habitat types will be affected by a project in the future, i.e. which habitat type will require compensation. A bank would perhaps need to hold different habitat types in bank to be able to meet at least one demand in the future. Uncertainty over which habitat type is the right one to invest in may very well be judged too great an economical risk by investors. On the other hand, if it *is* for some reason clear that a specific habitat type will be affected in the future, it may very well be very difficult for a potential banker to find lands that consist of or can be turned into the same habitat type with the same functions to put into the bank.

All in all one could state that in theory habitat banking might provide for compensation (if the exact same habitat type with the same functions happened to be included in a bank), but in practice a system of habitat banking might not prove to be workable or financially attractive to potential suppliers of credits.

Solutions for obstacles to habitat banking

With regard to the contents of compensatory measures, the Habitats Directive states only, as was noted earlier, that these measures should ensure that the overall coherence of Natura 2000 is protected. No further explanation is given. Case law does not provide for a clearer definition of the necessary contents of the compensatory measures either. The only clear guidance is provided for by the European Commission. This guidance is laid down in the documents quoted above: European Commission DG ENV Nature Newsletter, issue 12 (2000) and the Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (2007). Also available is the guidance document by the European Commission called "Managing Natura 2000 sites, The provisions of Article 6 of the Habitats Directive 92/43/EEC" (2000). With regard to the aspect of

[83] EC (2007), p. 14.

compensatory measures, this last document largely corresponds with the document of 2007.

The interpretation of Article 6(4) in these guidance documents is well founded. We see no reason to argue the given interpretation. And although the guidance documents are not legally binding, they are in practice followed in legal proceedings.[84]

These documents by the European Commission make clear that compensatory measures should have a strict connection with the affected habitat type and its functions. It is this requirement that in our view poses the largest obstacle to habitat banking. The question arises how to circumvent this obstacle.

One option would be to argue that the Directive allows for a less strict interpretation of Article 6(4). A solution could then be found in issuing a new guidance document, containing a more lenient approach on this matter. However, apart from the fact that issuing new guidance after only two years may seem strange, in our view the Directive does not support a more lenient approach to the contents of the compensatory measures that have to be taken under Article 6(4).[85] So in that light the issuing of a new guidance document would not suffice.

In order to use habitat banking as an alternative to the compensation measures that have to be taken on the basis of Article 6(4), we consider that adjusting the Habitats Directive is likely to be necessary, especially when the aim is to use habitat banking on a large scale and as a common alternative for the compensation measures to be taken. However, we also envisage exceptions to this; there may be cases where there is no problem using banking because the habitats affected are easily restored in a relatively short time-frame, suitable land is available and other criteria are met.

It goes beyond the scope of this report to outline the contents the revised Directive would need to have to support habitat banking as a method to fulfil the obligations under Art. 6(4). It is clear, however, that the strict connection between the habitats and functions affected and the goal of the compensatory measures that must be taken, would have to be removed. Instead, one could think of a provision allowing under certain conditions for the creation or enhancement of different habitat types as a form of compensation than the habitat types that are affected.

5.2.4 Habitat banking and Articles 10, 12 and 13 of the Habitats Directive

[84] See e.g. ECJ 7 September 2004, C-127/02, par. 41. Cf. e.g. Opinion A-G of 23 October 2008, C-362/06, par. 97.
[85] It has been stressed that Article 6(4) of the directive must, as a derogation from the criterion for authorisation laid down in the second sentence of Article 6(3), be interpreted strictly. See ECJ 20 September 2007, C-304/05, par. 82.

A system of habitat banking in the EU could also give consideration in relation to the Articles 10 and 12(1) of the Habitats Directive.

Article 10
Article 10 states:

> "Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora.
>
> Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species."

Article 10 does not require that certain features be strictly protected, nor that damage to those features is to be compensated. However, Art 10 measures should be taken when Member States regard them as necessary to achieve the overall objectives of the Habitats Directive, especially with regard to the maintenance or restoration of species and habitats favourable conservation status (FCS). A European Commission paper[86] considers that 'FCS can be described as a situation where a habitat type or species is prospering (in both quality and extent/population) and with good prospects to do so in future as well'.

The Commission's paper also notes that 'Member States are expected to take all requisite measures to reach and maintain the objective of FCS' (COM 2005). Therefore, in principle Article 10 measures, and other connectivity provisions, should be implemented whenever they are necessary to maintain or restore FCS of habitats or species of Community Interest. Furthermore, the Commission states that 'The concept of FCS is not limited to the Natura 2000 network'. Thus, even though a system of habitat banking is not a logical extension of Article 10 requirements, it could provide useful mechanism that Member States could use on a voluntary basis to manage landscape features.

Such a voluntary system could, for example, provide for valuable features of the landscape in member states to be put in a bank in order to protect them against negative influences. Another option would be that lands where valuable landscape

[86] Assessment, monitoring and reporting of conservation status – Preparing the 2001-2007 report under Article 17 of the Habitats Directive (http://circa.europa.eu/Public/irc/env/monnat/library?l=/reporting_framework/dochab-04-03-03/_EN_1.0_&a=d)

features are restored or created qualify as credits in a banking system, and are used to provide for compensation for damage to existing valuable features. Such compensation would either be on a voluntary basis, or through Member State policies (e.g. planning regimes) extending the implementation requirements of this Article. We do not anticipate that this is likely to result in a significant level of demand in a habitat banking system, without the law being strengthened so as to prescribe compensation.

If Article 10, which now does not do much more than urge Member States to consider the management of valuable features of the landscape, would be amended, it could provide for a more solid basis for a system of habitat banking. This would mean that the Directive would have to hold a distinct obligation not to damage the valuable features of the landscape meant in Article 10 HD and, if damaged, to compensate for this damage. Such an obligation is at present found in Article 6 HD in relation to Natura 2000-sites. However, the question can be asked whether it lays within the competence of the EC to issue legislation on the protection of features of the landscape which are not incorporated in Natura 2000 and -apparently - not deemed to hold specific importance on a community level.

Article 12

Similarly, Article 12 (1) does not provide a clear basis for habitat banking. It specifically demands that existing protected species and their territoria are protected, but does not specifically require compensation for damage. However, its interpretation in Member States has led to compensation measures.

Article 12 HD states:

> 1. Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:
> (a) all forms of deliberate capture or killing of specimens of these species in the wild;
> (b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration;
> (c) deliberate destruction or taking of eggs from the wild;
> (d) deterioration or destruction of breeding sites or resting places."

Article 12 (1) demands that Member States take measures to establish a system of strict protection of certain listed animal species, prohibiting the killing, disturbance, etc. of those species and the deterioration or destruction of their breeding sites and resting places. Article 16 (1) holds that Member States may derogate from this provision in certain cases (listed under a-e of Article 16 (1)) if there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species concerned in FCS. Under these two provisions, a system can be set up under which (e.g.) the deterioration of resting places is allowed (by legal

permit), as long as there is no alternative and the maintenance of the population of animals involved is not endangered. Within such a system, compensatory measures (such as offsets or habitats banks) may be used ensure that the impacts of the project do not have detrimental impacts on the overall conservation status of the population. This practice is seen in The Netherlands, where permits for projects that go against the provisions of Article 12 (1) frequently involve a compensation plan that ensures that the project corresponds with the demand of Article 16 (1) that populations are not to endangered.

Thus, while, Article 12 (1) (in relation to Article 16 (1)) does not mention compensation itself, and the two provisions do not demand that the Member States implement the possibility of compensation in national law, Article 12 (1) holds room for a system of compensation ex ante. This is different for Article 6 HD. Articles 12 (1) and 16 (1) HD leave the matter to the discretion of the member states. In some member states where compensation measures are carried out for these reasons (e.g. in the UK and Denmark), there is evidence that compensation measures are piecemeal and therefore unnecessarily expensive and ecologically ineffective (See Section 4.x.x).

Therefore, in Member States where national law does provide for the possibility of compensation ex ante, a system of habitat banking could well play a part in discretionary implementation of Article 12 (e.g. when a resting place is destroyed, credits that are equivalent to the damaged features, as defined in the Directive, could be used as compensation). However, because the Directive does not call for compensation, the Directive does not provide a (clear) legal basis to come up with (binding) rules on habitat banking for this purpose. This being said, there could be substantial conservation benefits from the wider use of carefully regulated and strategically planned habitat banking as a means of maintaining and restoring FCS in Article 12 species. This could be facilitated by a (non binding) notification/ communication by the Commission in which it gives guidance on how a system of habitat banking can contribute to the maintenance or restoration of FCS, when is it appropriate and under what (minimum) conditions. This could be used by Member States to guide establishment of their own (domestic) habitat banking systems.

In conclusion, Article 12 does not directly not require compensation for damage to animal species or their territoria (this, again, in contrast to Article 6 HD). Compensation ex ante, for instance through habitat banking, is therefore not implemented throughout the EU in relation to Article 12 HD. However, Member State implementation of Article 12 in conjunction with Article 16 may be aided by a system of habitat banking. These links are explored further in Sections 4.1, 4.3, 5.2, and 8.2.2. This also holds for Article 13, which, mutatis mutandis, holds the same provisions for plant species as Article 12 does for animal species.

5.2.5 Options for habitat banking

As said, a system of habitat banking could, in theory, work if the bank would be able to provide for land of the same habitat type and with the same functions as the site that is affected. In that case the question arises, however, what the nature of the maintenance of the land in bank would have to be to provide for compensation under Article 6(4). Interesting in this respect are the comments by the European Commission given in its 2007 Guidance document. The Commission indicates that:

> "Compensatory measures appropriate or necessary to adverse effects on Natura 2000 site can consist of:
> − Restoration or enhancement in existing sites: restoring the habitat to ensure the maintenance of its conservation value and compliance with the conservation objectives of the site or improving the remaining habitat in proportion to the loss due to the plan or project on a Natura 2000 site;
> − Habitat Recreation: recreating a habitat on a new or enlarged site, to be incorporated into Natura 2000;
> − As described above and in association with other works, proposing a new site under the Habitats and Birds Directive."[87]

In this light various options for habitat banking could be thought of.

Perhaps the most far sought would be to put an existing Natura 2000 site in bank. But credits from such a bank would qualify only if the conservation status is enhanced *further* than the conservation objectives demand.[88]

A second option would be to create a new habitat, which meets the functions and conservation objectives of the (potentially) affected site, on lands which do not harbour that habitat type and functions yet. To form proper compensation, these new habitats would have to achieve the same conservation status as the affected SAC at some point in time. This would mean the lands in bank qualify at a certain moment as a Nature 2000 site themselves. Some authors consider this a problem, because, in their opinion, lands could no longer form compensation if they are (or should be) a SAC themselves (Dodd, 2007)[89]. We do not see a problem in this. The fact that the lands in bank in the end live up to Natura 2000 standards, will be because of thorough measures of enhancement and maintenance, so they can be regarded as additional. If these measures would not have been carried out, the lands would never meet Natura 2000 standards. The fact that the lands eventually qualify as Natura 2000 is, if anything, proof of the high level biodiversity created by the additional measures.

[87] EC (2007), p. 14.
[88] Enhancement would have to go further than the conservation objectives to qualify for "additionality". The demand to reach the conservation objectives themselves already follows from Article 6(1) and (2) HD.
[89] Dodd speaks of a "Catch 22".

There seems no reason to conclude that the creation of the new habitat could not form proper compensation (all the more seeing that the European Commission indicates that compensation can consist of "recreating a habitat on a new or enlarged site, to be incorporated into Natura 2000")[90].

What is more, the incorporation of the new site into Nature 2000 would have a positive effect regarding the protection of the newly created habitat, because the regime of protection of Article 6 (or the laws of the Member State implementing Article 6) would apply.[91]

A third option could be to hold lands in bank that already live up to Natura 2000 standards, but have not been (and do not have to be[92]) designated as a SAC. If a SAC is affected by a project, the lands in bank could – if they corresponded to the affected habitat type – be designated as SAC. Thus, lands that were not protected in the past are conserved. This could be seen as a form of compensation.[93]

A fourth option would be to use habitat banking to compensate for interim losses.

As a rule, when a SAC will be negatively affected by a project, compensation for this negative effect on the habitats or species must be in place, at the latest, at the same time as the deterioration of the SAC. That way, the requirements regarding measures to ensure the coherence of Natura 2000 will be satisfied.[94] The European Commission states that:

> "as a general principle, a site should not be irreversibly affected by a project before the compensation is indeed in place. However, there may be situations where it will not be possible to fill this condition. For example, the recreation of a forest habitat would take many years to ensure the same functions as an original one negatively affected by a project. Therefore, best efforts should be made to assure compensation is in place beforehand and in the case this is not fully achievable, the competent authorities should consider extra compensation for the interim losses that would occur in the meantime."[95]

[90] It can be even argued that then it is compulsory to designate the new site as a SAC. See EC (2007), p. 18.
[91] Cf. par. 4.2.7.
[92] It follows from Article 3(2) that a Member State does not have to appoint all qualifying areas as SAC under Natura 2000.
[93] Although the European Commission mentions this form of compensation specifically, it also places doubts over the validity of this form of compensation. See EC (2007), p. 14. Neither the Directive itself, nor case law, provides clarity on this matter. It does however seem clear at least that the appointment of a new SAC could not form sufficient compensation by itself.
[94] Cf. e.g. Opinion A-G of 27 October 2005, C-209/04, par. 82.
[95] EC (2007a), p. 13.

Interim losses exist when a habitat is affected and measures are taken to the habitat itself to take way the negative impact[96], which take a considerable period of time to mature. The Commission seems to allow for interim losses to exist in compensation, at least to a certain degree. This is a more flexible approach then the Commission took to this matter earlier.[97] It seems that in a case where interim losses occur, temporary overcompensation will have to be in place. A system of habitat banking could have a function in that respect. During the period that the measures to take away the negative impact to the habitat itself do not prove sufficient yet, lands in a habitat bank consisting of the same habitat type and functions, could provide for temporary compensation.

Also, the fact that interim losses are allowed if over-compensated, opens up the possibility that a bank is only formed when a specific project is proposed. At the point where it is clear which habitat types and functions will be affected by that project, a banker can search more specifically for lands to create similar habitat types or functions on. This way he does not run the risk of developing habitats that later turn out not to be in demand. The fact that the land in bank would not yet have the proper conservation status and the same functions when the project is approved, would not be a problem, as long as this interim loss would be overcompensated through the fact that the lands in bank are larger than the affected site.

Even in case of these small-scale solutions, the question of *where* these compensatory measures should be taken arises. On this point the European Commission considers:

> "Compensatory measures should be located to accomplish the highest effectiveness in maintaining the overall coherence of the Natura 2000 network. This entails a set of preconditions that any compensatory measure should meet:
> – The area selected for compensation must be within the *same biogeographic region* (for sites designated under the Habitats Directive) or within the same range, migration route or wintering area for bird species (i.e. sites designated under the Birds Directive) *in the Member State* concerned. […]
> – The area selected for compensation must have -or must be able to develop- the specific features attached to the ecological structure and functions, and required by the habitats and species populations. […]
> – Compensatory measures must not jeopardize the preservation of the integrity of any other Natura 2000 site contributing to the overall coherence of the network. […]
>
> In addition, there is general agreement that the local conditions necessary to reinstate the ecological assets at stake are found as close as possible to the

[96] These measures would not be considered compensatory measures *sensu stricto*. Cf. EC (2007), p. 10.
[97] EC (2000), p. 45.

> area affected by the plan or project. Therefore, locating compensation within or nearby the Natura 2000 site concerned in a location showing suitable conditions for the measures to be successful seems the most preferred option". [98] [italics added]

It is clear from this that the lands in the habitat bank should be located in the same biogeographic region as the affected site, in order to provide for proper compensation. The European Commission also considers that the area selected should be within "the Member State concerned". This opinion cannot be found in case law – as this matter has not yet come up before the ECJ/ CFI. It is also the question of how this requirement for compensation within the same country compares to other points of view provided by the European Commission, especially where it states that "the distance between the original site and the place of the compensatory measures is not necessarily an obstacle as long as it does not affect the functionality of the site, its role in the geographical distribution and the reasons for its initial selection." And also where the Commission states that compensatory measures could indeed contribute to the objectives of the Directive, if a project will result in a loss for this habitat type at Member State level but it does provide for a new site at Community level.[99] In this light the question seems to remain unanswered whether compensation has to take place within the same Member State. If this does hold true, this would, obviously, pose as an additional obstacle for habitat banking, especially for smaller Member States.

What does stand out clearly is that compensatory measures should in the first instance be examined as close as possible to the affected habitats. This requirement is not surprising because the habitats affected have to be compensated by the same habitat type with the same functions. These are usually found in or next to the original SAC.

There have been examples where compensation was found in the SAC in which the affected habitat types are located. In the "Project Mainportontwikkeling Rotterdam" for instance, the Commission has accepted that negative effects to certain habitat types within the SAC are compensated by enhancing habitat types within the same SAC.[100]

It is said above that if a habitat bank would be able to provide for the (enhancement of the) same habitat types and functions as the affected habitat, the system of habitat banking may provide for a useful instrument of compensation. In the case of the "Project Mainportontwikkeling Rotterdam" this would mean that if the area now used for compensation would in the past have been put in a bank and the habitat type and functions found there enhanced, the developer could have bought credits from this bank.

[98] EC (2007), p. 18.
[99] EC (2007), p. 13/14.
[100] See the Advice of the Commission of 24 April 2003 C(2003) 1308 def.

5.2.6 Conclusions

It follows from Article 6(4) that a plan or project that will adversely affect the integrity of a SAC may only be carried out if there is no alternative, it is necessary for imperative reasons of overriding public interest and compensatory measures are taken. These compensatory measures must ensure that the overall coherence of Natura 2000 is protected. This last phrase is not explained in the Habitats Directive. The European Commission states that compensatory measures should (a) address, in comparable proportions, the habitats and species negatively affected and (b) provide functions comparable to those which had justified the selection criteria of the original site, particularly regarding the adequate geographical distribution. These terms seem to have to be interpreted strictly. This is likely to form a considerable obstacle for the use of habitat banking as a compensatory measure under Article 6(4). After all, to provide for compensation a bank would have to hold lands of the exact same habitat type which provide for – highly – comparable functions as the affected site provided for.

In our view, this obstacle cannot be circumvented by the issuing of a new Guidance document on Article 6(4) HD by the European Commission, in which it would give a more lenient explanation of the demand that compensatory measures ensure that the overall coherence of Natura 2000 is protected. This is because the Directive does not seem to support a more flexible approach. In order to use habitat banking as an alternative to the compensation measures that have to be taken on the basis of Article 6(4), we consider adjusting the Habitats Directive as necessary, especially when the aim is to use habitat banking on a large scale. We see however a few – small scale – options to use habitat banking to provide for compensation necessary under Article 6(4) HD.

Perhaps the most far sought would be to put an existing Natura 2000 site in bank. Offsets would in that case be created by enhancing the conservation status further than the conservation objectives demand. A second option would be to create a new habitat, which meets the functions and conservation objectives of the (potentially) affected site, on lands which do not harbour that habitat type and functions yet. To form proper compensation, these new habitats finally would have to have the same conservation status as the affected SAC. As a third option lands that already live up to Natura 2000 standards, but have not yet been appointed as a SAC could be put in a bank. The fact that once in bank they are protected under Natura 2000 could be seen as a form of compensation. A fourth way for habitat banking to be used as a compensatory measure under Article 6(4) would be to use the lands in bank to compensate for interim losses. However, for all these options it seems to stand that the compensatory measures to be taken under Article 6(4) must provide for an almost like-for-like compensation of the affected habitat types/ species and functions. This causes considerable limits to the use of habitat banking as a compensatory measure.

5.3 General issues about ensuring the long-term protection of the offsets

As noted earlier, in order to determine under what conditions habitat banking can be a useful and effective tool to provide compensation for damage to protected habitats and species, some more general issues need to be addressed. These issues are linked to the wider policy framework that (probably) needs to be introduced to ensure that habitat banking is used effectively and becomes a reliable instrument to compensate for damage to the natural resources protected by the EC's nature conservation directives. It is to be noted that this section limits itself to the legal issues. These are discussed in the following paragraphs with some inevitable overlaps with the issues discussed in Section 4.

One of the basic objectives of habitat banking is to offset impacts to protected habitats in perpetuity (Gardner 2008). To facilitate this and to support a mechanism that is aimed at delivering biodiversity offsets that adequately compensate for impacts to EC protected natural resources, certain (basic) requirements need to be fulfilled. Especially the long-term horizon of offsets requires consideration of establishing certain permanent legal and other mechanisms (BBOP 2008). These should guarantee for instance that the offset is managed properly and (finally) adequately compensates for a certain impact(s) to protected habitats and species, that adequate funds are available to manage the offset on a short and long-term basis and that the rights and responsibilities of the various stakeholders involved are clear. Apart, from that legal mechanisms may be needed to support the buying and selling of compensation "credits" and to respond adequately to, among other things, the transfer of the ownership of the land that is being used as offset. Thus, the issues dealt with here include:

- Selection of lands for biodiversity offsets and involvement of the public authorities;
- Determining credits;
- Long term management and conservation;
- Habitat banking agreements;
- Public register of habitat banking sites, agreements and credits;
- Registration of credits and of credit transactions;
- Funding;
- Protecting potential Natura 2000 sites, and
- Regulatory control and legal tools to facilitate habitat banking.

i. Selection of lands for biodiversity offsets and involvement of the public authorities

One of the aims of habitat banking is to encourage and secure investments in nature conservation (through trading up to conserve more threatened biodiversity or including net gain). It is a mechanism that ensures – if applied properly - the long-term conservation of habitats and species at the banking site by offering landowners the opportunity to earn credits for creating or maintaining nature sites and by improving the quality thereof (Christensen 2008).

If habitat banking is used to compensate for damage caused to Natura 2000 sites, then presumably it is necessary that the land that is used to compensate for such a damage is located in environmentally interesting areas (i.e. areas located close to Natura 2000 sites or nationally protected nature areas and that these areas support protected species)[101]. It may also have a certain environmental quality, already providing a certain level of natural resource or services, as this is likely to provide a more efficient location at which to undertake enhancement actions and provide credits of the necessary, equivalent, quality. However, there is no minimum[102] requirement for the pre-existing quality of the land from which credits are created, providing the credits meet the necessary ecological conditions. If habitat banking is to compensate for loss of non-biodiversity benefits from the environment (such as recreation space), then this can also become a factor in choosing locations for credits.

For these reason, it could be considered to let public authorities identify key sites or areas for habitat banking (BBOP, 2008). Another option would be to develop strategies that encourage landowners and others to locate offsets in areas better for conservation than others, for instance close to Natura 2000 sites so that corridors are established that accommodate migration. However, it should also be encouraged that habitat banks are located on large parcels of land, that allow for the compensation of a number of developments or incidents (DOI, 2003 and DECC, 2007)[103]. Not only do these larger sites often have a higher nature value, they also prevent the compensatory or remediation measures that have to be undertaken on the basis of the Habitats Directive or the ELD resulting in many small and fragmented compensatory or remediation projects[104].

As noted above in ecological analysis, managing and maintaining larger areas will often also be economically and environmentally more efficient than smaller, project-specific compensatory or remediation projects. Also the monitoring of these larger areas will often be easier and relatively cheaper than smaller sites (Scanlon, 2007). In addition,

[101] Another advantage is that such sites are more quickly available for credit trade and do not depend on the success of habitat restoration or creation efforts (though proper management remains required) (Ell 2008).
[102] There will be a maximum limit, above which enhancements to the necessary quality to deliver credits would be too small to be considered additional.
[103] The advantage would be that large and robust habitats are created and that if these sites are managed properly, there is less need for performing on-site remediation or compensation projects on small pieces of property (Gillespie and Hill 2007).
[104] See further: DOI 2003, pp. 1-2.

it might also well be that "postage stamp" lands do not produce – in the long term – natural resources and natural resource services sufficient to provide compensation under Article 6(4) Habitat Directive or Articles 6 and 7 ELD. Larger areas will often provide better habitat continuity and benefit multiple (protected) species.

ii. Determining credits

For a successful application of a habitat banking scheme, it is likely that the person who is willing to buy credits to compensate for an existing or future liability would like to be certain that these credits can compensate for the (anticipated) damage to natural resources. An important step in that respect is that the number of credits that are assigned to a certain site represents the actual natural resource service condition of that site (ELI, 2008). Stahl et al (2008) suggest letting the public authorities asses the natural resource service condition of the site – taking into account the type, size and condition of the site - and to assign to it a number of credits. This is also the starting point of the New South Wales Threatened Species Conservation Amendment (Biodiversity Banking) Bill 2006[105]. According to this bill, on the basis of which a so called 'biodiversity biobanking and offset scheme' has been established, the public authorities determine the number of credits for the land that is in bank.[106] The number of credits not only depends on current condition of the land, but also on the management actions that are going to be taken by the property owner (in accordance with an agreement that has been concluded between the public authorities and the owner).[107]

It might be that despite the management actions of the landowner, the habitats in bank decline in environmental quality. In the case where credits are bought in anticipation of a certain (unknown) damaging event and these credits are needed after a few years to offset a liability, it might be necessary to check whether the quality of the habitats in bank still adequately represents the number of credits awarded. Stahl et al (2008) suggest that such a final assessment is to be undertaken by the public authorities and that the result depends on "the validation of the service flows at the time when the credits are applied to offset a liability".[108] The issue is relevant for the subject of this report as it is required under both the ELD and the Habitat Directive to provide adequate compensation for, briefly put, significant harm to habitats and species protected under the EC Directives.

[105] http://www.environment.nsw.gov.au/biobanking/infosheet06135.htm (the bill has been incorporated in the NSW Threatened Species Conservation Act).
[106] See art. 127W NSW Threatened Species Conservation Act.
[107] Id.
[108] Stahl et al (2008), p. 9.

iii. Long term management and conservation

For a habitat banking scheme to be successful, it is necessary that the credits assigned to the habitats in bank remain at the same level over time or increase. That places a certain burden on the property owner. He should ensure a certain level of long term management of the habitats in bank in order to preserve the level of natural resource services. This is even more important if the credits have been sold and (part) of the land in bank is an offset for certain developments that have taken place in a Natura 2000 site or some incident occurred that caused a significant harm to EC protected habitats and species. This might require the property owner to, for instance, restrict developments on his land, to limit public access, to eliminate invasive species and to take other actions to ensure the environmental quality of the site (Stahl et al, 2008).

If the habitats in bank are part of a protected area not being a Natura 2000 site, existing national nature conservation laws may require that these habitats are managed on a long-term basis according to certain standards and management and conservation plans. However, if this is not the case, these habitats are managed independently. In that case it might be necessary to make available legal avenues to ensure the viability and long-term management and conservation of these habitats. If this is not done properly and incentives are missing to manage the offset according to certain conditions, there is a high change of failure (Burgin, 2008).

There are various options available to try to ensure long-term management of the offsets, including regulatory instruments, contracts (habitat banking agreements), conservation easements, and funding (and combinations thereof). An interesting example of a mix of these instruments can be found in the Biobanking Trust Fund established in New South Wales. Owners of the lands in bank receive an annual payment out of this fund if they adequately carry out the management actions that have been set in an agreement concluded between the Minister of the Environment and the owner. If not, they do not receive the payment or have to repay the money paid (Art. 127E).

It is to be noted that in order to determine whether the lands in bank are managed properly, monitoring is required. For that reason it could be argued that strict monitoring and audit requirements need to be set, for instance in a habitat banking agreement.[109]

[109] According to art. 127E NSW Threatened Species Conservation Act, a habitat banking agreement may include provisions regarding monitoring, reporting and audit requirement. See further on the advantages thereof, Scanlon (2007), p. 124. Others consider monitoring essential to the success and credibility of a habitat banking scheme. See *i.e.* DOI (2007), at V.

iv. Habitat banking agreements

As noted earlier, the long-term horizon of offsets may require the establishment of certain legal mechanisms. An example of such a mechanism is a habitat banking agreement. Such an agreement or contract should clarify and capture the rights and responsibilities of each party involved. Various approaches to the content of these agreements are possible, highly dependent on whether a habitat banking and offset scheme is established by law or not. Relevant is also whether public authorities are required to be a party to these agreements or that, for instance, a right of approval suffices.

Taken the fact that EC protected habitats and species are involved, the rather strict obligations under the ELD and Article 6(4) of Habitat Directive with regard to compensating damage to such natural resources, and the limited experience in Member States with regard to habitat banking and offset regimes, it is conceivable that there is a preference for public authorities being party to habitat banking agreements. This is also the starting point in various countries in the world. An interesting example in this respect is New South Wales (see also ELI 2008).[110]

Apart from the public authorities it is conceivable that a credit holder, taking his interests in the environmental quality of the habitats in bank and thereby the adequate long-term management of these habitats, likes to be a party to the habitat agreement or some other contract that is concluded with the property owner.[111]

Habitat banking agreements should at least contain provisions regarding the following matters:[112]

- Duration of the agreements (these agreements have, in principle, effect in perpetuity);
- A management plan;
- Management actions required by the owner according to that plan (also after sale of credits);
- Number of credits that can be created (linked or not with the management actions to be taken);
- Timing of the creation of credits and their release for sale (depending or not on the successfulness of the management actions);
- Use restrictions of the site in bank;
- Monitoring, reporting and auditing requirements;

[110] See art. 127D NSW Threatened Species Conservation Act.
[111] See further on this issue: Stahl et al (2008), p. 9.
[112] For an overview of the main components of such agreements, see: DOI (2003), pp. 14-17, DSE (2006), p. 3 and art. 127E NSW Threatened Species Conservation Act. For an example of such an agreement, see appendix II of Carroll et al (2008).

- Performance standards;
- Permitting access to the site in bank by specified persons;
- Issues relating to the transfer of the land in bank, and
- How to deal with unforeseen incidents that impact the habitats in bank, such as fires and floods.

Habitat banking agreements, as all contracts, are legally binding upon the contracting parties. However, since the land being used as offset needs to be managed and maintained in perpetuity, habitat agreements should also be binding on future owners of the site (BBOP 2008). There are various options to arrange this. However, legal options and approaches may differ by country. It could be considered for instance to include in a habitat banking agreement a perpetual clause (in Dutch: *kettingbeding*). Another, in most cases legally more solid, option would be to arrange that the agreement "runs with the land". Such an arrangement has been made in the New South Wales Threatened Species Conservation Act. Art. 127J of this act stipulates the following:

> "A biobanking agreement that has been registered by the Registrar-General and that is in force is binding on, and enforceable by and against, the successors in title to the owner who entered into the agreement and those successors in title are taken to have notice of the agreement."[113]

Interesting about this Act is also that not only the contracting parties can enforce the agreement but also third parties such as NGOs. It is thereby not required that that person's rights have been infringed by the breach of the habitat banking agreement (see art. 127L; Peden, 2007). The justification for this (far reaching) arrangement is that biodiversity values are involved.

Depending on the nature of the offset, and especially if the offset is intended to compensate for (anticipated) damage to Natura 2000 sites, it could be considered to let public authorities play a role in the development of habitat agreements (provided they are not a party to the agreement and no adequate legislation is in place). This to ensure that in case of a change in ownership of the land, the transfer of established responsibilities for offsets located on the land is done in a proper way.

[113] According to art. 127J(2) of this act successors in title include "a mortgagee, chargee, covenant chargee or other person, in possession of a biobank site pursuant to a mortgage, charge, positive covenant or other encumbrance entered into before or after the registration of the biobanking agreement."

v. Public register of habitat banking sites, agreements and credits

a) Registration of habitat banking sites

A number of States have introduced habitat banking or a comparable regime. To support habitat banking, some of these States have introduced a public register. Examples in this respect are Victoria (DSE 2006) and New South Wales[114], both in Australia. Although there are (considerable) differences between the various public registers, most of these public registers seem to register on a state-wide basis – among other things - the availability of habitat banking sites and of habitat banking credits.[115]

One of the advantages thereof is that it makes it easier for third parties, who need to compensate the (anticipated) damage to (protected) natural resources, to locate offsets and the availability of habitat banking credits. Another advantage is that a potential purchaser of the land on which credit is located can easily verify whether the land is used for habitat banking or not.[116] The information is probably relevant for the potential purchaser and may influence his decisions regarding the purchase of the land and the price he is willing to pay for it.

b) Registration of habitat banking agreements

In addition to the above, it could be considered to register the habitat banking agreements that have been concluded. This is done in New South Wales under the Threatened Species Conservation Act (art. 127I). The advantage hereof is not only that it is clear for third parties, including environmental groups, that land has been designated as a habitat banking site, but also what type of (long-term) management actions can be expected from the landowner, what restrictions have been set for the use of the land and the number and class of credits that can be created in respect of the management actions that have been agreed (provided these terms are included in the agreement).

c) Registration of credits and of credit transactions

For a successful and reliable habitat banking scheme, it is essential to know the number of credits created for a certain site, how many of these credits were sold and how many are still available. This will prevent the double selling of credits from the same land.

[114] See Part 7A of the 2006 NSW Threatened Species Conservation Act, www.legislation.nsw.gov.au/viewtop/inforce/act+101+1995+first+0+N, 13 March 2009.
[115] See Explanatory note to the New South Wales Threatened Species Conservation Amendment (Biodiversity Banking) Bill 2006 (Act 2006 No 125), p. 7 and DSE 2006, p. 3.
[116] DSE 2006, p. 4.

To prevent misuse, it is conceivable that the creation of credits and the trade therein is being registered. Interesting in this respect is again the New South Wales biobanking scheme, according to which a credit has no force or effect until it is registered.[117] In addition, under this scheme a transfer of a credit does not have effect until the transfer is registered in a public register.[118] No literature could be found on this aspect of the New South Wales biobanking scheme, but it likely prevents misuse and provides certainty to the buyer of the credits that these credits actually represent certain natural resource service values. A disadvantage may be the administrative burden of the regime.

d) Registration of monitoring results

Apart from registering credits and credit transactions, other mechanisms may be needed to provide certainty that the credits adequately represent the expected natural resource service values. As noted earlier, monitoring is used to guarantee the long-term management and maintenance of the lands in bank. It could be considered to make these monitoring reports available via the public register. This is done for instance in Victoria. The monitoring reports that are supplied by the public authorities of Victoria to the registry describe the management actions undertaken by the landowners of the land on which the credits are located and the progress that is being made with regard to the agreed improvements to the land (vegetation, etc.). In Victoria a minimum of four reports is required over a ten-year period.[119]

vi. Funding

Since the aim of habitat banking is to compensate for the (anticipated) damage to biodiversity, with a 'no net loss' of such natural resources as a starting point, sufficient funds should be available for the long-term management and conservation of the land in bank and for long-term monitoring. A lack of financial resources increases the risk of failure of an offset and may finally result a 'net loss' of protected habitats and species (Burgin 2008).

To guarantee that the offset is managed well by the banker, it could be considered to require the establishment of a fund. Such a fund would act as insurance for the long-term management and maintenance of the offset, even in case of bankruptcy of the banker. This is being done for instance in the US (DOI 2003 and Dodd 2007). Pooling funds from different entities to support various offsets could also be considered (Burgin 2008). This is probably more efficient.

[117] See art. 127W(8) NSW Threatened Species Conservation Act.
[118] See art. 127ZB(1) NSW Threatened Species Conservation Act. Credit registration has also been introduced in Victoria (DSE 2006).
[119] invullen

Another option would be to establish a sort of Trust Fund. An interesting example in this respect is the Biobanking Trust Fund that is being established under the New South Wales Threatened Species Conservation (Biodiversity Banking) Bill 2006. The purpose of this fund is to provide funding for management actions carried out by land owners in accordance with arrangements specified in so-called biobanking agreements.[120] It is intended that the main source of revenue for the Fund will be a requirement, imposed by regulations, that a specified amount be paid into the Fund whenever a biodiversity credit is first sold or transferred.[121] There are of course also other long-term assurance mechanisms available (Burgin 2008).

vii. Protecting potential Natura 2000 sites

It might well be that the land which is not legally protected at the time of its inclusion in the bank ends up qualifying for designation as a Natura 2000 site. An advantage of such a designation would be that the site is protected under the Wild Birds Directive and/or the Habitats Directive. However, before designation the compensation land has no legal protection, at least not under EC law. This might give rise to certain problems and risks. For instance, if the land in bank is legally unprotected, it is vulnerable to private developers and rules such as Article 6(4) Habitats Directive do not apply (Dodd, 2007).

A solution might be to protect these potential Natura 2000 sites under the national nature conservation laws of the Member State. It could be considered for instance, to designate such sites as national nature protection area or to give some other status to such sites and to bring these lands under the nature conservation laws of the Member State.

Other options are, as was noted earlier, the registration of the land in bank in a public land register, managed by an administrative body or some private entity, and/or to set out in a habitat banking agreement provisions regarding the obligation to protect and manage the land in accordance with a certain management and monitoring plan. To prevent that succeeding owners are not bound by these provisions of the banking agreement, it could be considered to include a perpetual clause or to establish a conservation easement. It could also be considered to register these habitat banking agreements in a public register and on the land title (See Section 4.2.5).[122] An advantage thereof would be that developers and/or others can easily verify whether the land they are interested in is in bank or not.

viii. Regulatory control and legal tools to facilitate habitat banking

[120] See Explanatory note to the Threatened Species Conservation (Biodiversity Banking) Bill 2006, p. 6.
[121] Id.
[122] This is being done in New South Wales in Australia. See DECC (2007), p. 6.

Given the importance of the issues addressed above, the question arises whether there is a need for a strong involvement of the public authorities concerning habitat banking. According to Dodd (2007), strong regulation is essential for a successful habitat banking system. Not only the public authorities have a role in securing the sustainable supply of credits, in order to "avoid the temptation of setting up new banks and cause oversupply in the market before existing ones are financially stable".[123] Also regulatory oversight is needed to ensure that the bank is meeting its agreed ecological targets and actually contributes to 'no net loss' of habitats and species (Dodd 2007; Scanlon 2008).[124] This is in our view especially relevant if habitat banking is used to compensate for impacts to the habitats and species protected under the various EC nature conservation directives. Apart from this, it is likely that regulations are needed that require that habitat banks are subject to an appropriate conservation easement or other legal mechanism "to guarantee it in perpetuity and be appropriately funded to guarantee against the banker going bankrupt".[125]

Taken the many choices to be made, it is at this stage difficult to suggest what legal regime, if any, is to be established in the EU to support habitat banking. Our estimation is that taken the complexity of the subject, the limited experience with habitat banking in the EU and the fact that EU protected habitats and species are involved, an EC guidance document like *Managing Natura 2000 sites* (EC 2000) is not adequate. More stringent legal tools are probably necessary to facilitate habitat banking, to support the buying and selling of credits and to ensure that offsets are managed and maintained properly and in perpetuity. Such a legal framework could be set up on EU or Member State level. However, taken the complexity of the issues involved, the involvement of habitats and species that are protected under various EU Directives and the goals that have been set in that respect, a preference for an EU regime would be understandable.

Whatever regulatory system will be set up, if any, the EC and/or Member State need to make sure that a habitat banking system if introduced is in line with the EC nature conservation directives and is audited against the requirements of art. 6(4) Habitats Directive and of art. 6 and 7 and Annex II of the ELD.

[123] Dodd (2007) p. 56.
[124] Scalcon refers to a report of the US National Academy of Science of 2001 according to which more highly regulated banks have a higher change of success, and suggests *i.e.* stricter monitoring requirements, a more stringent collection and recording of data regarding the status of banks, and a greater transparency in accountability should a bank fail. Scalcon (2008) p. 118-119.
[125] Dodd 2007, p. 56.

5.4 Summary of legal analysis

This legal review has identified that it may be more likely that habitat banking can be used to fulfil remediation obligations that may arise under the ELD than to fulfil compensatory obligations under the HD (Article 6(4)). However, a range of opinion exists on this issue, and it requires further discussion. In the ELD there is a preference for on-site remediation, but if this is not an option and complementary remediation measures need to be taken, then such measures may be taken on an alternative site. Under certain conditions, lands in bank can be used to provide for complementary remediation. The ELD also requires that compensatory remediation measures are taken to compensate for interim losses (see Annex II ELD). It seems that habitat banking can be used to implement compensatory remediation measures.

Compensatory measures under Article 6(4) HD should address, in comparable proportions, the habitats and species negatively affected and provide functions comparable to those which had justified the selection criteria of the original site. It is clear – also from the guidance issued by the Commission – that compensatory measures should provide for an almost like-for-like compensation of the affected habitat types species and functions. These terms seem to leave room for habitat banking as a compensatory measure under Article 6(4) HD only on a limited scale. However, within the strict terms options do seem to exist.

One option would be to put an existing Natura 2000 site in bank and create offsets by enhancing the conservation status of the site further than the conservation objectives demand. But this is likely to be difficult for practical reasons. Another option would be to restore or create habitat, which meets the functions and conservation objectives of the (potentially) affected site, on lands which do not harbour that habitat type and functions yet. However, restoration measures for Natura habitats are unlikely to be feasible or otherwise appropriate in many circumstances.

As a third option lands that already are up to Natura 2000 standards, but have not yet been appointed as a Natura 2000 site could be put in a bank. The fact that once in bank they are protected under Natura 2000 could be seen as a form of risk aversion based compensation. But as discussed in Section 4.4.1 the additionality of compensation measure is often highly uncertain (especially as habitats that are of equivalent value to Natura sites are likely to have at least some form of national or local protection status). Finally, lands in a habitat bank could also be used to compensate for interim losses. However, for all these options it seems to stand that the lands in a habitat bank have to represent the same habitat type and provide for - highly - comparable functions as the affected site provided for. Therefore, although habitat banks could provide compensation for some habitats (e.g. restorable or creatable wetlands for some species) in some circumstances, they would not normally be appropriate forms of compensation under Article 6(4) HD.

In order to ensure that habitat banking is used effectively and becomes a reliable instrument to compensate for damage caused to the natural resources protected under the EC's nature conservation directives, certain (legal) requirements need to be fulfilled. One of these requirements concerns the long-term protection and management of the offsets. Various mechanisms may be considered to facilitate this, such as the introduction of habitat banking agreements, the registration of such agreements, the sites included in the banks and credit transactions, and the introduction of monitoring requirements. Apart from this, it is probably also necessary to introduce a legal mechanism that facilitates the buying and selling of credits and the protection of lands in bank that are (not yet) appointed as Natura 2000 site.

6. Institutional framework for habitat banking

6.1 Institutional roles

The development of an efficient habitat banking system that provides significant overall conservation benefits is critically dependent on the establishment of an effective and robust institutional framework with clearly assigned responsibilities. The review of theory and the case studies indicates that there are a number of approaches to delivering biodiversity offsets and habitat banking, which create a variety of institutional roles.

Regulated habitat banks, which are the focus of this study, typically involve three key actors: the damager, regulator and credit provider (Figure 6.1). This is, for example, the arrangement for implementing the compensation pools within the Impact Mitigation Regulation scheme in Germany (see Case Study Appendix). Other stakeholders' involvement is also important, and best practice principles are to ensure close stakeholder involvement with all key actors, with consultations involving regulator. In reality however, the arrangements are often more complex and also change over time.

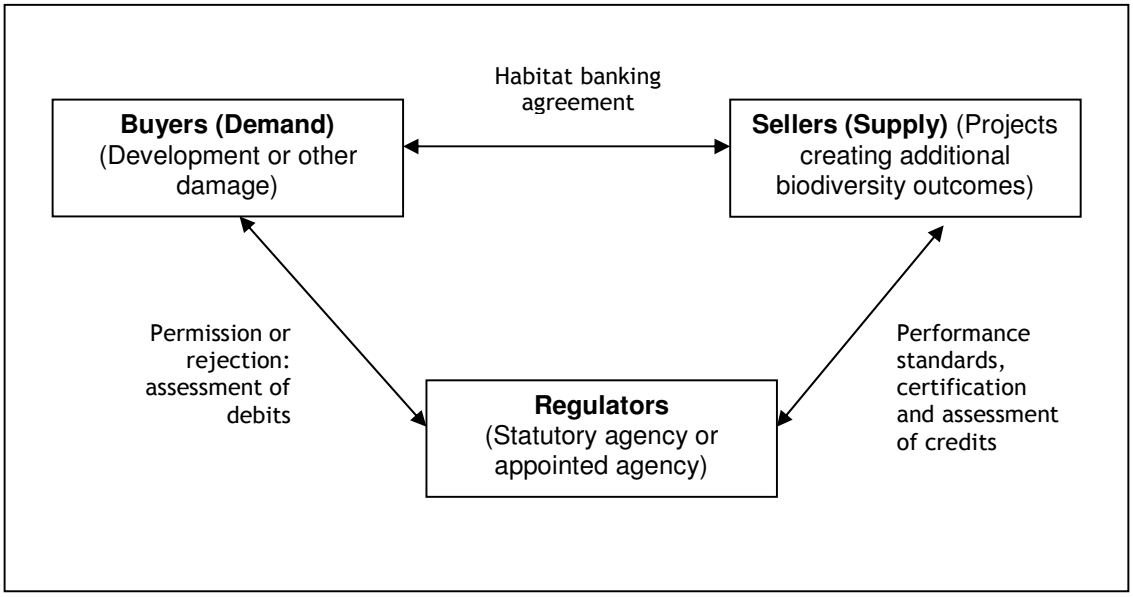


Figure 6.1: Typical key actors and roles in habitat banking systems

- Buyers (Demand)

Demand for credits in a habitat banking market to compensate for damage can arise in a number of ways. The simplest arrangements are where unregulated voluntary offsets are carried out, for example by private developers (or other organisations whose activities damage biodiversity) to meet corporate social responsibility objectives. Developers may also be governmental bodies (e.g. highways agencies), which may be subject to obligations to offset residual impacts. In such cases offsets may be carried out by developers themselves with no or minimal formal involvement of nature conservation authorities. Consultations with stakeholders would, however, normally be carried out, and conservation organisations often advise on the offset.

Some larger developers may undertake the offsets themselves, and even establish habitat banks, particularly if they have large land holdings and expertise in land management. But this is unlikely to be cost-effective for most developments, and most developers are not conservation land managers. Third parties, such as conservation organisations are therefore often contracted to undertake offsets and longer-term management. Land ownership may also be transferred to such organisations, with legal clauses included in the deeds that ensure that the land will be used for nature conservation purposes in perpetuity. Alternatively, developers may purchase credits from habitat banks or make in lieu fee contributions to independent bodies that in turn purchase credits from banks or undertake other offset actions.

- Regulators

Regulation is the control and supervision of activities by Government. Regulators often provide guidance to those they regulate, in order to create certainty and minimise the costs and risks resulting from regulation. An effective regulator is especially important in habitat banking. Although offsets and habitat banks may be carried out voluntarily, the results of this study (Section 8) indicate that a viable EU market will only be created by regulation. Regulation is needed both to enforce compensation obligations on those creating debits, and to set the rules for establishing equivalence between those debits and credits. Therefore there is an essential public sector role within any viable EU habitat banking market.

Furthermore, without strong regulation, monitoring and enforcement there are significant risks of: weak implementation of the mitigation hierarchy (i.e. encouraging a 'licence to trash'); use of inappropriate or ineffective compensation actions; limited additionality from compensation; and the possibility that actions may not be carried out at all. We have little empirical evidence of the importance of regulation in ensuring effective compensation in the EU, but Treweek (1999) notes that mitigation measures in the UK are generally ineffective as a result of inadequate monitoring and a lack of enforcement by planning authorities and statutory agencies. Furthermore, there is no evidence that the situation has improved at all in recent years, despite

political agreements to halt biodiversity losses (Hill, 2009). Accordingly, projects in the US have all involved reasonably strict safeguards, including both quality control by relevant authorities, the requirement of insurance bonds from habitat banking organisations, and regular ongoing monitoring (Briggs et al., 2009).

The key role of the regulator is to establish and oversee the policy and legal framework for habitat banking schemes. This includes any necessary policy tools, including the establishment of incentives and/or property rights to stimulate demand for and supply of biodiversity credits.

The regulator must therefore define and produce guidance on the procedures and performance standards for habitat banks and the estimation of debits and credits and their equivalency, and may then license approved banks and certify credits. Trading across political boundaries will require coherence of monitoring and management practices (e.g. mutual acceptance of data), and cooperative governance arrangements. Such agreements should also, in consultation with stakeholders, provide guidance on the types of habitat bank that need to be established and their location to help deliver strategic conservation goals (e.g. delivery of national biodiversity action plans). A regulator should also be responsible for assessing individual developments in terms of the need for and appropriateness of compensation (i.e. appropriate application of the mitigation hierarchy and assessment of residual impacts/debits), the adequacy and feasibility of compensation, the adequacy of stakeholder consultation and responses to these, compliance with agreed actions, and eventual biodiversity impacts (from monitoring results). If necessary the regulator needs to instigate enforcement actions.

Given these key roles, it is essential that regulators are:

- Independent (e.g. not part of governmental departments that also have development responsibilities);
- Have the necessary levels of expertise and experience (covering nature conservation policy, planning and land management, land use policy and planning regulations, environmental legislation, business law and financial administration);
- Are adequately financed and have sufficient staff capacity to undertake their work effectively and within reasonable time-frames; and
- Open to scrutiny, with publicly available audits of their activities and decisions etc.

These are requirements for basic success, but expertise in ecology and biodiversity conservation planning, and a desire to maximise conservation outcomes are particularly important to fully realise the potential strategic benefits of habitat banking (e.g. using banks to address conservation priorities such as reversing the most important habitat losses, reducing habitat fragmentation and facilitating climate change adaptation).

A public nature conservation or environmental authority typically plays the main regulatory role. However, the statutory functions of the regulator can feasibly (and possibly optimally depending on the existing roles and expertise of public bodies) be split between more than one public sector body. For example, it may be one body's responsibility to determine whether compensation for biodiversity damage is necessary, and another body's responsibility to regulate a trade of debits and credits to ensure equivalence of compensation.

There is potential for many governmental bodies to be involved in habitat banking. An EU system is likely to involve national and local planning bodies, national policy makers, regional administrations and other environmental agencies, creating a potentially complex institutional structure. Regulators may also appoint independent agencies to oversee the licensing of habitat banks and their operations. Monitoring may also be contracted out.

Finally, the public regulator should ensure transparency of any habitat banking system. Full documentation of all aspects of debit and credit calculation and trades should be placed on the internet to allow public access and scrutiny of trading, the execution of roles outlined above, and decisions taken by the regulator.

- Sellers (Supply)

Biodiversity enhancements that can supply credits to a habitat banking system may be established by developers themselves, though more often they are set up by others (such as private landowners, environmental businesses or conservation organisations) in response to market demand, or by government bodies to address strategic needs. For example, the Environment Agency for England and Wales (a statutory conservation agency) is effectively establishing 'credits' by procuring land that may be used in future to offset the loss of salt marsh habitats as a result of necessary flood defence works and sea-level rise.

In some Federal States of Germany, regulatory incentives are used to stimulate the creation of compensation pools, and suppliers provide a broad range of services including the design, implementation and maintenance of the compensation measures. In the state of Saxony the State Ministry of the Environment opened a competitive bidding for the creation of a state-wide compensation agency. The final choice was based on several criteria, including technical and methodological expertise as well as economic capacity and reliability. Thus, the ministry opted for a combined responsibility by the Sächsische Landsiedlung, a registered charitable institution, and the Nature Conservation Fund at the Saxon State Foundation for Nature and the Environment. Such an approach provides the assurance needed for a supplier of credits to purchase land and commence compensation actions and it may provide strategic

advantages by pooling habitat restoration etc. However, it significantly reduces the influence of market forces on the supply of credits, negating some potential benefits.

In the state of Brandenburg, the State Ministry of the Environment certifies compensation pools/agencies if they fulfil a series of nature conservation criteria, such as:

- A minimum area of 30 hectares, of which 10 hectares is a coherent area;
- Having a pool development and management plan, specifying for the site: nature conservation objectives and management measures (aligned with the plans of the local nature conservation authority and the municipality); how maintenance in perpetuity is secured; monitoring requirements, etc; and
- Proof of the tenure of sites, and their property rights if they are not owned by the compensation agency.

If a project proponent buys credits of a certified pool, the compensation amount could be reduced by 10 per cent and furthermore reduced by another 3 per cent per year when measures are implemented prior to an impact (up to a maximum 30 per cent).

Brokers may be used to find land owners with suitable land for habitat banks, for example for protection of existing biodiversity, as is the case with the Bushbroker scheme in Victoria, Australia (see Case Studies Appendix). This was established to gain market information on the availability of credits and their likely price (Treweek et al., 2009). The scheme helps to avoid the need to procure land, which can be time consuming and result in the distortion of land prices. But a drawback of this approach is that it may limit the ability to strategically locate compensation measures in areas that will provide the best biodiversity observation outcomes.

- Independent trust funds

Another possible institutional framework, which we consider may be appropriate for delivering compensation for very low level but cumulative significant impacts, incorporates an independent multi-stakeholder governed body that allocates funds received in lieu of biodiversity debits (Figure 6.2). A key aim of this arrangement is to simplify the banking system to lower transaction costs and thereby enable compensation for minor impacts on widespread biodiversity, which would otherwise be unlikely to be covered by more complex compensation mechanisms. Another advantage is that it could have an explicit role to purchase credits according to strategic conservation priorities to maximise the benefits of delivering no net loss. The central involvement of stakeholders in the process is also likely to encourage support for the banking system (e.g. by reassuring conservation organisations that real biodiversity benefits are being achieved).

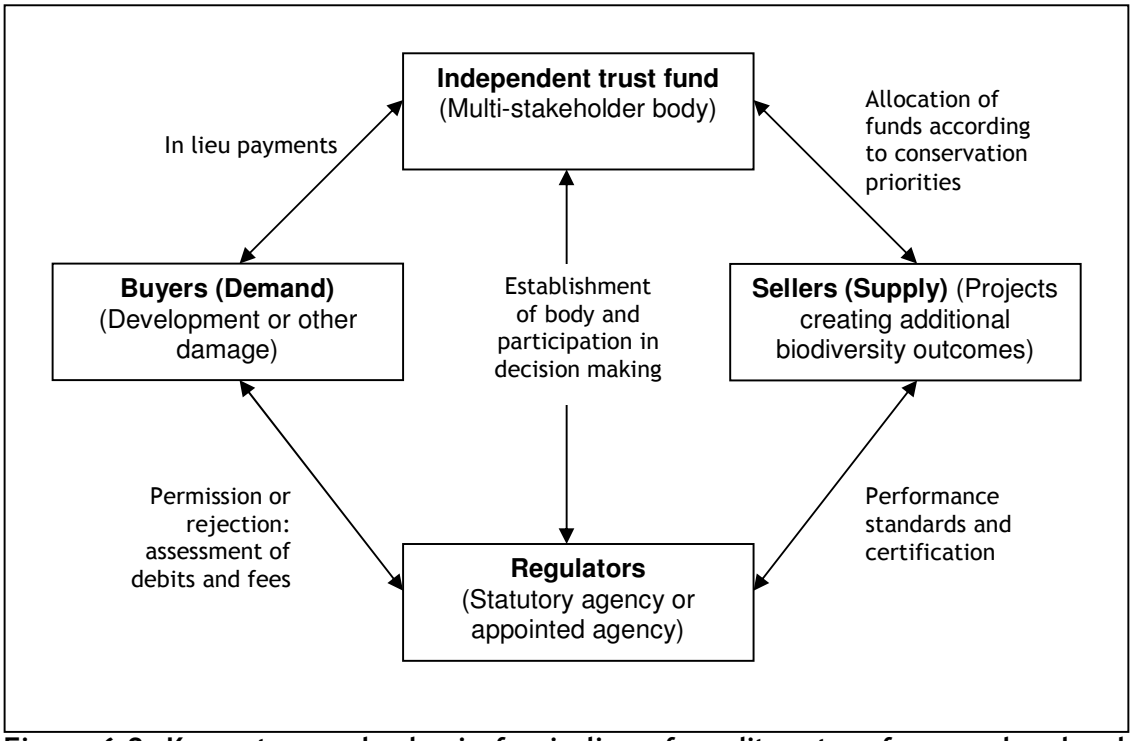


Figure 6.2: Key actors and roles in fee in lieu of credit system for very low level impacts

Evidence from the use of fee in lieu of credit systems (e.g. in the US) indicates that the adoption of such a system bring specific risks. However, it is possible these risks could be managed through the careful design of the system. Of particular importance is the need for the body that allocates the purchase of credits to be free of political interference.

- Other Stakeholders

A range of other ("3rd party") stakeholders, who may not play mandatory roles but will be essential to the success of habitat banking, include:

- Local communities whose agreement to proposed land use changes is a key aspect of the planning process.
- NGOs that manage land may be significant suppliers of credits. For example, when undertaking habitat creation or enhancement projects, they could sell part as credits to raise funds (and retain part as net biodiversity gain). The credits created will of course have to be additional to the status quo activities of the relevant NGO. Long term land management activities might also be appropriate for NGOs to undertake, as the management objectives would be aligned with their charitable objectives.
- Insurers and other financial service providers will have increasingly important roles (e.g. to manage endowments capital in terms of risks and underwriting

payments) in particular to guarantee credits over long periods of time or even perpetuity.
  - Brokers and traders currently specialising in other markets (e.g. carbon trading) could also be involved in habitat banking to act as 'bankers'.
  - Technical experts (ecologists, lawyers, traders, economists and others) will also be involved in determining debits, credits and equivalency, and monitoring and auditing on behalf of the regulators.

- Working groups

Briggs et al (2009) advocate the establishment of a working group that has responsibility for overseeing the entire banking process, and involves all key actors (e.g. planning authorities, habitat bank owner/sponsor and statutory conservation agencies). This would be similar to the US system where a working group is established and a Memorandum of Understanding agreed, which contains the following:

- Bank goals and objectives;
- Ownership of bank lands;
- Bank size and classes of habitat proposed for inclusion in the bank;
- Description of baseline condition at the bank site;
- Geographic service area;
- Habitat classes or other resource impacts suitable for compensation;
- Methods for determining credits and debits;
- Accounting procedures;
- Performance standards for determining credit availability and bank success;
- Reporting protocols and monitoring plan;
- Contingency and remedial actions and responsibilities;
- Financial assurances;
- Compensation ratios, and
- Provisions for long-term management and maintenance.

6.2 Analysis of institutional issues/framework

The key institutions and other stakeholders that could be involved in these roles, or otherwise affected by the development of a habitat banking system in the EU are listed in Table 6.1 and their potential roles identified. This also takes into account this study's review of current biodiversity challenges and policies (Section 2) and the more detailed analysis of relevant legislation (Section 5). Further discussion is provided below of their current structure, duties and powers, and whether these may need to change to fulfil their potential roles.

In general, it is apparent that the EU has in place most of the institutional structures that would be required to establish and run an effective habitat banking system. This

is in part because there are already institutions involved in the key components of habitat banking, including:

- Development of biodiversity conservation policies and regulations: European Commission, European Parliament and European Council and national / regional governments and agencies (e.g. the development of Biodiversity Action Plans);
- Enforcement of regulations concerning the EU nature conservation directives (e.g. with respect to Appropriate Assessments): European Commission and European Court of Justice, and national / regional governments and agencies;
- The assessment of biodiversity impacts under SEA, EIAs and Appropriate Assessments: environmental consultancies, planning authorities and environmental agencies, and scrutiny by nature conservation NGOs and other stakeholders etc;
- Land use planning: governmental departments responsible for national sustainability policies and regional and local planning authorities;
- Conservation land management and habitat restoration (including land purchase, and contractual arrangements): governmental and non-governmental biodiversity conservation bodies, and land owners (e.g. under agri-environment schemes);
- Implementation of remediation measures and biodiversity offsets (though currently at low levels, mostly for Natura 2000 sites and voluntary measures): developers (private and governmental bodies), environmental consultancies, planning authorities, environmental agencies, nature conservation NGOs, landowners and other stakeholders; and
- Biodiversity monitoring: governmental and non-governmental biodiversity conservation bodies, consultancies.

It is clear that a substantial increase in the capacity of many key institutions would be required to develop and implement a widespread system of habitat banking effectively. For example, at the EU level, there is already a comprehensive biodiversity policy and legislation framework, with relatively effective control of developments in Natura sites through the enforcements of Articles 6(3) and 6(4) provisions in the European Court of Justice (European Commission, 2006). However, it is clear that DG Environment already has an exceptionally high workload and is not able to scrutinise all potentially damaging developments and Appropriate Assessments. Opportunities to develop new legislation to support habitat banking (such as a Framework Directive) or guidance on key issues (e.g. the use of habitat banks for Article 6(4)) compensation would also be limited, though some work could be done through service contracts. There is also a risk that habitat banking could increase the number of requested derogations from the Habitats and Birds Directives which will need to be carefully scrutinised, thus increasing pressure on the Commission.

Table 6.1: Roles and expectations of stakeholder groups in habitat banking

Stakeholder	Capacity*	Potential Roles	Examples of Possible Expectations
EU Institutions – Commission, Council, Parliament	Policy development	System design, monitoring and enforcement	Increased biodiversity; Synergy with other policies (e.g. economic development)
Nature agencies	Policy implementation; possible future regulator	Scheme design, implementation, monitoring and enforcement	Increased biodiversity; Natura 2000 network integrity and site conditions
Other environmental agencies, including those for the marine environment	Policy development and overlap with duties or powers with respect to natural resources (e.g. on flood risk)	Implementation, monitoring and enforcement	Balancing range of regulatory duties on environment
Member State and Accession State Governments	Policy development or transposition	System design, implementation, monitoring and enforcement	Synergy with other policies (e.g. economic development); Subsidiarity considerations; Increased biodiversity
Regional (e.g. autonomous region, federal state) Governments	Policy implementation	Scheme design, implementation, monitoring and enforcement	
Local authorities	Possible regulation	Implementation and enforcement	Local biodiversity enhancement or damage
Planning authorities	Planning policy implementation	Implementation and enforcement	Synergy with planning processes; Integration with spatial plans
NGOs	Wildlife conservation	Scrutiny (legal), implementation, monitoring and enforcement	Increased biodiversity; Heritage value; Possible provision or management of biodiversity 'credits'
Land developers: housing, windfarm, energy, transport, minerals	Land use change/ development; productivity	Implementation and monitoring	Corporate responsibility; Public relations; Access to development
Land Managers: farming, forestry, fisheries - individual landowners/ enterprises - industry associations (e.g. unions)	Land use/production	Implementation and monitoring	Improved environment and productivity; provision and management of land that could be offered for offsetting
Environmental consultancies	Implementation; accreditation; monitoring	Implementation and monitoring	Business opportunities
Insurance industry	Agents for developers, intermediaries	Implementation	Access to credits for clients
Contracting parties	Specific role in contract	Implementation, monitoring and enforcement	Legal accountability, transferability of property rights

*This is clearly dependent on the type of habitat banking system, if any, identified and outlined in the research.

There would probably be a strong need to increase the institutional capacity of many governmental conservation agencies in order to develop habitat banking systems and especially to regulate them. At the moment, many conservation agencies are significantly under resourced and are struggling to implement existing conservation legislation (such as the designation and management of Natura sites) and other initiatives such as the Biodiversity Action Plans. This is particularly the case in the newer Member States, such as Romania and Bulgaria, where potential sites for Natura designation have only been recently identified.

Training and increased resources would be needed in many nature conservation agencies and other involved governmental bodies, to create the institutional capacity to develop banking systems, assess and certify banks, and scrutinise debit / credit exchanges and other trade aspects. This could result in new capacity in existing agencies, and/or in new bodies entirely. Either way, an increase in resources would be required. In the longer term, the additional resources required to regulate habitat banking could be covered through administration fees charged to developers and banks. However, there would be a requirement for initial investment, and this could be a challenge in many member states.

Capacity limitations in national environmental agencies could be further exacerbated by stronger and/or more widespread (in terms of the biodiversity damage they apply to) compensation triggers. This compensation would be expected to increase the costs of damage, which is advantageous in that it gives an increased incentive to avoid damage. But it also increases the incentive to avoid damage being detected / caught[126]. To counteract this it may be necessary to increase the scrutiny of impact assessment screenings, scoping and statements etc and enforcement of compensation measures. As noted in the UK, there is already insufficient scrutiny and enforcement of mitigation measures. It has therefore been suggested that a new governmental body should be established (e.g. an Office for Standards in the Environment) to regulate planning authorities and ensure that environmental mitigation for development activities is enforced, monitored and delivered (Hill, 2009). Such bodies may be required in other Member States, and it seems logical that their remit should extend to the assessment and enforcement of offsets and habitat banking systems.

Many governmental, NGO conservation organisations and consultancies, particularly in the longer established Member States, have the technical ability to plan, implement and monitor the main practical activities involved in establishing and managing habitat banks, including habitat management, enhancement, restoration and creation measures. This is a result of the experience gained from a wide variety of similar projects that have been carried out to meet governmental or NGO conservation aims.

[126] A similar incentive has been observed in other environmental policies, for example with an increase in landfill tax rates in the UK, illegal waste disposal (fly-tipping) increased, necessitating an associated increased enforcement effort by regulators.

Most of these will have been supported by internal funds or grants such as from the EU's LIFE nature programme, though a few will have been carried out as compensation measures.

Some NGOs, consultancies and governmental agencies would therefore be generally technically able to undertake the practical implementation of many habitat banking needs. Although there may be capacity constraints at first, it would seem unlikely that these would be significant or long-term. Provided that such organisations carried out the necessary works with full-cost recovery, then it would be expected that their capacity and expertise would increase in line with the scale of any market.

However, there could be capacity constraints on the other important roles that NGOs would have in habitat banking systems. NGOs already play an important role in scrutinising development proposals and impact assessment statements etc and may advise developers on appropriate mitigation measures etc when consulted. The development of a habitat banking system may increase the scope, complexity and number of development proposals that would benefit from this third party scrutiny. However, this scrutiny is generally unpaid and as a result most NGOs have a severely limited capacity for such work. Therefore it should not be relied upon as a feature of a habitat banking system unless a system for remuneration for professional assessments of development proposals and habitat banking systems is considered. For example, participation by NGOs in multi-stakeholder bodies that oversee the allocation of in lieu fees could be fully funded through an administrative charge to developers include in the fee.

7. Review of habitat banking and related experience

This section reports on the review of habitat banking and other related experience including the functioning of the carbon market. Further detail of the experience can be found in the Case Studies Appendix and the key findings from this review have been incorporated into the definition of habitat banking, legal review and institutional analysis reported above, and further recommendations below.

7.1 Overview of experience reviewed

The major examples of the limited number of habitat banking and biodiversity offset systems worldwide that have been reviewed are:

- The **German** planning system's development of banking practices where mechanisms (such as pooling) have developed over time to implement previously overlooked compensation requirements.
- A pilot biodiversity 'credit' project in **France**, where offsets are required by law, but little guidance or policy action has enforced their implementation.
- The system in **Sweden** applying offsets to certain developments, particularly roads.
- State-level offset and banking systems in **Australia** (e.g. Bushbroker in Victoria and Biobanking in New South Wales), where the principles and frameworks for banking systems have been established and are now being implemented.
- Two compensation regimes in **Brazil**: a forest reserve system that allows trading between landowners to deliver their obligations to protect forest cover; and an environmental compensation fund that raises a levy on developers and hypothecates this into the management of protected areas.
- Two public-sector led systems in **South Africa**: a biodiversity offset system operated in the Western Cape; and a national wetland banking system.
- The well-developed systems of conservation banking and wetland banking in the **USA**.

There are only a very small number of examples of habitat banking practices in the EU to date. In order to increase coverage of relevant experiences in the EU, a selection of other relevant practices and examples was reviewed:

- Biodiversity project funding in **Poland**, **Hungary** and **Bulgaria**, where activities within biodiversity projects include components of habitat banking;
- Strategic compensation activities in **the UK** for large-scale offsets of impacts from ports and coastal management on intertidal habitats, and

- Planning laws in the **Czech Republic**, providing a comparison to German compensation requirements.

Many of the issues and concepts considered through the review of habitat banking outlined above also arise in implementation of other environmental policy. Lessons can be drawn, with appropriate lateral thinking, from carbon markets that help understand the practical implementation of habitat banking in Europe.

7.2 Lessons from the experience reviewed

The review of experience has produced the following observations on:

- Ecological factors;
- Economic factors;
- Legal and policy factors;
- Governance and rules, and
- Monitoring.

7.2.1 Ecological factors

A credit is invariably defined in the habitat banking systems examined as an area of habitat subject to certain management prescriptions. The one exception to this is the funding of research activities (e.g. as in Brazil). Different types of habitats (for which a debit must be compensated by habitat of the same type) are usually defined with reference to existing national biodiversity conservation objectives.

In a number of habitat banking systems, the mechanisms used to calculate ecological equivalence are adjusted to increase biodiversity beyond the amount required in compensation (resulting in net biodiversity gain) in two ways:

i. Ratios: One mechanism used for additional enhancement is the application of a ratio such that the credit is larger than the debit by some proportion. However, use of ratios is not always for biodiversity gain, as they are also used to adjust for different levels of habitat quality between credit and debit sites[127].
ii. Trading up: Equivalence usually aims to deliver compensation on a like-for-like basis, but some systems (e.g. South Africa, New South Wales in Australia) can involve 'trading up', such that the credit involves a different biodiversity resource with higher conservation priority habitats and species.

[127] As noted in Section 4.1.4 compensation for temporary damage can involve restoration of a smaller area than that damaged but for a longer period of time, with adjustments for different time periods carried out using discount rates.

The case studies suggest that 'financial offsets' (compensation through financial payments rather than actual offsetting actions) are regarded as risky. The additional step between debit and credit (of a payment to a third party) is viewed suspiciously, as it provides an opportunity to weaken the equivalence of credits, and therefore compromise objectives of ensuring no net loss. However, it should be pointed out that the case study schemes do not address cumulative low level impacts, which are considered to be important in the EU and are therefore addressed in this report. Also, the ecological conditions of some of the case study countries are such that 'financial offsets' are not necessary because simple rules-based like-for-like offsets are normally appropriate and feasible. This is in contrast to the typical environmental conditions in the EU where simple rules for debit and credit calculations would be inappropriate for low level impacts.

The ecological benefits of habitat banking are contingent on the successful delivery of the credit, and problems have been identified (e.g. in the US, ELI (2007) have identified several flaws with mitigation banks[128]). For this reason, some banking systems (e.g. the US) prefer that credits are achieved before they can be purchased as compensation and the development causing the debit can be permitted. Habitat banking has also led to ecological benefits through reduced habitat fragmentation and improved capacity to address strategic conservation considerations. Strategic considerations that have been addressed in habitat banking systems include:

- Defining banking rules to deal with the risk of crowding out of other biodiversity conservation actions;
- Linking banking activities to wider biodiversity policy goals, for example by adjusting compensation ratios to reflect national biodiversity priorities;
- Anticipating development pressures on habitat resources;
- Linking to tourism and regeneration needs; and
- Reduced competition for resources, (e.g. competition for land with agriculture in Germany, avoiding airspace required for aviation in the US).

Many of these strategic considerations are informed by detailed information on national biodiversity resources. These help establish baselines and justify biodiversity policy objectives. In South Africa existing GIS systems are being used to provide this function.

The challenge of establishing the policy baseline against which to assess outcomes is common to habitat banking and other current and potential biodiversity policy

[128] And the outcomes in the US would not be a success if achieved in the EU because the institutional and policy baseline (e.g. signature of the Convention of Biological Diversity (CDB)) and systems of regulation are different.

instruments in the EU. While not complete, policy baselines are considered well enough developed in most of Europe to inform effective use of habitat banking.

7.2.2 Economic factors

A range of economic benefits can be observed within the habitat banking and offset-trading systems around the world. Habitat banking can introduce new market incentives for private landowners to undertake conservation actions on their land. In particular it provides an incentive for those undertaking compensation actions (offsets) to go beyond the minimum required – because they can sell the excess. Habitat banking can also solve timing issues between the occurrence of residual adverse impacts on the environment (debits) and the delivery of offsets (credits). It can also facilitate a faster and more efficient land use planning process.

Habitat banking systems allow market forces to influence the price of land required for delivery of credits. It can also allow more flexibility in land use planning with respect to biodiversity objectives. Deals involving large habitat creation (net gain) sites in the UK have included flexible credit trades, effectively providing of credit 'options'. These options give the right to purchase a credit from part of the site in future. Which part of the site is not specified in advance, and can be determined once the precise nature of the damage is known. This flexibility removes the demand-side risk in anticipating future compensation needs - in particular, the requirement to obtain land that will provide the compensation (the credit) specific to the damage (the debit) assessed under the Habitats Directive.

Habitat banking systems benefit from a number of economies of scale compared to the delivery of mitigation and individual offsets as need for them arises. Economies of scale arise at several stages in the compensation process, including:

- Negotiating for and purchasing larger areas of land;
- Investing in larger biodiversity restoration/creation projects;
- Coordination of responsibilities amongst public agencies across a smaller number of projects;
- Ongoing management of the (larger) credit sites; and
- Monitoring costs for regulators and compliance costs for smaller number of credit providers.

Habitat banking experience also highlights some potential problems. The very specific offset requirements in some systems can create numerous (sometimes hundreds) of debit and credit types (as in the case of New South Wales, where over 700 types of credit combinations are defined). This subdivides the market and brings concerns as to whether enough supply and demand will exist for markets to function. In contrast

systems with weaker rules have shown that offsets with lower standards can undercut banking efforts. For example, permanent damage compensated by offsets with short (e.g. five year) maintenance timescales will be cheaper than permanent credits, but will probably fail to deliver no net loss objectives in the long term.

Brazil's approach uses an area-based equivalence system and does not enforce any quality considerations in determining equivalence. This leads to conservation obligations being traded onto the lowest land value (and therefore away from some biodiversity-rich habitats). Lourival et.al (2007) suggest that a value-based trading ratio is introduced on conservation credits to avoid this (i.e. if land is half as valuable, double the area required). This may mitigate the distortion of biodiversity equivalence due to land price, but also mitigates the efficiency incentive in a market where land prices are a major influence. Land market feedbacks can make land purchase conservation suboptimal for wider ranging species, leading to suggestions that such purchases should focus on species and habitats that can only thrive in protected areas (Armsworth et.al 2006). This may apply to credits derived from strict protection of habitats or species, but credits may also be derived from changes to land-management (e.g. enhancement of measures within agri-environment schemes).

Several other regulatory factors can limit trade. Regulation is intended to reduce the risk to society of habitat banking failing to deliver no net loss of biodiversity. However, uncertainty of regulators' decisions introduces risk to traders of credits and debits. Uncertainties about banking rules, guarantees for and responsibilities of credit providers, and the legal status of credit purchases, may each limit trade. However, these uncertainties and the associated risks, can be reduced by, for example: establishing clear guidance; codes of practice; and appropriate design of habitat banking systems.

7.2.3 Legal and policy factors

Habitat banking can be used to help implement clear biodiversity policy goals. In most developed economies (e.g. Australia, Germany) the policy goal is no net loss of biodiversity. In Brazil, the goal of trading mechanisms for offsets is to maintain minimum areas of natural habitats.

The approach in Brazil may be understandable given its vast biodiversity resources. However, it results in simplifying assumptions being made about habitat values and baseline levels of threat. All natural habitats are classified as under threat, so that any preservation is counted as an additional offset based on averted risk. This demonstrates the importance of baseline definition in the design of habitat banking. The simplifying assumptions in Brazil have meant that additionality may be reduced by displacement or crowding out of existing conservation activities.

The case studies demonstrate the key role played by legal drivers in habitat banking. The strength of planning laws is a foundation of successful banking systems in two respects. Firstly, planning laws require the implementation of the mitigation hierarchy, so that banking only applies to offsets for residual damage.

Secondly, strong legal frameworks exist requiring compensation or other forms of offsetting for residual damage regardless of location not just within protected areas. In several parts of the EU such national requirements (beyond those required under the Habitats Directive) may exist but are not systematically enforced (e.g. Sweden, France), or may not exist for significant parts of the landscape (e.g. Czech Republic).

Although there are examples of voluntary offsets, they have not been observed on a large enough scale to stimulate habitat banking. As a result, enforcement of compensation requirements is a necessary condition of habitat banking, because this stimulates demand for offsets. Therefore, the lack of enforcement of compensation requirements identified above hampers the development of habitat banking.

7.2.4 Governance and rules

None of the habitat banking systems examined have developed as free markets in response to voluntary offsetting of compensation requirements. The minimum level of involvement from public sector agencies is to define the rules through which the system operates, and oversee its monitoring. Clear rules are essential for effective habitat banking, and in the US publication of rules has stimulated banking activity. Rules must be established to define organisational roles and responsibilities, and issue guidelines on processes (e.g. links between planning procedures and obtaining credits), methods (e.g. on equivalence) and permanence (timescales).

The role of public sector agencies need not be limited to defining the rules of a habitat banking system. In some cases, public agencies also own land where banking takes place, manage habitat, handle funds and have roles in strategic planning (e.g. defining biodiversity conservation in different landscapes). In Germany, most pooled offsets are delivered and managed by local government (municipality) administrations, but some are delivered by private companies or third sector organisations. Public agencies executing such roles usually have a strong existing capacity for biodiversity management and policy planning (e.g. as in South Africa).

The presence of pre-defined rules may not allow for innovation in delivering offsets. Some offsetting activities are undertaken voluntarily, and in these cases pre-defined rules will add transaction costs without necessarily enhancing the result. However, as noted above, most offsets in the EU are driven by legal requirements, and innovation is also possible here. For example, in the UK offsetting compensation arrangements relating to Natura 2000 sites have, in addition to standard offset features, involved

option contracts and pre-damage assessment compensation deals. However, the lack of offsetting rules in the UK (of the kind established within habitat banking), has also limited offset purchases. For example, uncertainty over the geographical range across which compensation can be delivered has prevented private sector involvement in some projects.

Several case studies describe how rules that have developed in response to the expansion of offsetting and habitat baking practices are now being consolidated into national rules and guidelines. This suggests that incremental development of habitat banking systems may not be efficient, particularly if subsidiarity in planning activities results in different approaches or methods within a country, which then need to be combined into a consistent system.

A habitat banking system also needs to be supported by sufficient professional skills and institutional capacity (e.g. in Government agencies and contracted experts). Many of the activities within the biodiversity projects examined in the Eastern European countries demonstrate the skills necessary to implement components of habitat banking. The expertise, and very often the data, required to assess biodiversity values and to enable a habitat banking system are generally present. In most cases these are believed to be present to a sufficient extent to support habitat banking (e.g. where they are supporting development of comparable activities), but this requires further investigation.

As discussed in Section 6.2, the institutional capacity required to regulate habitat banking is not present in all Member States. However, there is experience of relevant governance structures being established, although not always successfully, in relation to agri-environment schemes. In addition, more wider-scale biodiversity monitoring may be needed for assessment of losses of biodiversity outside of Natura 2000 sites.

7.2.5 Monitoring

Effective monitoring of the biodiversity impacts is an essential component of any of offsets and habitat banking scheme. Monitoring is necessary to:

- Ensure legal compliance, with respect to:
    - actions/processes (e.g. types of species used for habitat creation, area of habitat created, methods used for works),
    - biodiversity impacts i.e. credits and overall biodiversity gain, and where possible their additionality (by comparison with sites over time);
- Facilitate adaptive management of individual projects;
- Provide scientific feedback on the effectiveness and cost of particular measures (e.g. habitat restoration) to authorities responsible for schemes;

- Provide feedback to other stakeholders, e.g. conservation organisations and local communities etc; and
- Inform policy development.

In particular biodiversity monitoring must be carried out in such a way that it can reliably establish whether or not the offset /habitat bank has met its overall objectives of providing sufficient biodiversity benefits (credits) to compensate for observed or expected losses (debits), which must also be monitored adequately. Thus, credits need to be defined in terms of ecological performance standards / objectives that are defined in terms of specific, measurable, achievable, realistic and time-tabled (SMART) impacts on key biodiversity components (indicators). The key components would typically relate to the features of highest conservation importance that need to be compensated for (e.g. key habitats or species). Objectives should quantify the required amount of these features, but also very importantly their condition. For example, objectives for a forest restoration scheme, might stipulate the area of forest to be restored, the tree species composition to be attained, average tree and shrub density, ground flora species composition and the density of particular indicator species (e.g. forest birds) at certain times after restoration (e.g. 1, 3, 5, 10, 15, 20 years and every 10 years thereafter).

To carry out such monitoring, a monitoring strategy and plan is normally required. This would identify the objectives to be monitored, as described above, and also:

- Define the timetable for monitoring and the methods and sampling strategies to be used;
- Establish who will carry out the monitoring, analysis and reporting;
- Identify any capacity-building or financial resources that will be needed;
- Establish procedures for adaptive management, including the setting of thresholds that should trigger corrective measures, and
- Identify authorities and other stakeholders who should receive the results of the monitoring, and establish reporting procedures.

The design of the monitoring schemes in case study systems has not been investigated in detail in this study. Nevertheless, it is clear that many of the schemes include mandatory monitoring and give a high priority to ensuring that it is effective. For example, the Queensland draft offset policy requires a monitoring and reporting plan including environmental indicators to be monitored and regular reporting periods. Similarly in the USA, the 2008 federal guidelines now require the production of a mitigation plan for wetland banks, which includes ecological performance standards and monitoring requirements (US ACE and US EPA, 2008).

The costs of monitoring are typically borne by the developer, whilst the monitoring is carried out by the regulator (e.g. government agency Australia) or accredited third

parties (see Section 6). In South Africa, clear success criteria are being developed for habitat banks that are to be monitored and audited by third parties. Success criteria are a set of standards that are employed in order to evaluate the status of a bank's physical and functional development. They will be determined by the bank using monitoring techniques that have been agreed to and documented in the banking agreement, and include performance "thresholds" that can be explicitly linked by the authorising agency to certification of credits (SANBI 2008).

7.2.6 Monitoring lessons from selected country systems

The US and Germany are the only two developed countries with well-established habitat banking or similar systems. Therefore, they are of greatest relevance in considering development of a system in the EU.

- The US System

The US experience with monitoring has provided valuable lessons learned but have also shown difficulties in establishing the success of mitigation and conservation banks. There are several flaws that have been identified with monitoring of mitigation banks, including: failing to comply with permit conditions; consistent submissions, and not always meeting longer-term maintenance requirements. A nationwide study by the NRC showed that 63% of sites are insufficiently monitored (ELI 2007).The 1995 Banking Guidance established that monitoring provisions must be outlined in the banking agreement, which is then approved by the US FWS at the time the conservation bank is created. The bank is responsible for accurate and timely monitoring of the bank. The Banking Guidance recommended several aspects to monitor, such as vegetative growth, the presence of invasive species (animal and plant), water quality, and listed species presence. The guidance also suggests that monitoring provisions should be "tailored to the specific restoration, creation or enhancement activity at the bank site or through the use of an appropriate functional assessment methodology" (US ACE 1995).

In the US experience, many banks have not been able to replace the functions of the types of wetlands destroyed. A five-year monitoring period may also not be sufficient for determining whether mitigation goals will be achieved, particularly for many restored systems. It is recommended that banks tie their required monitoring periods directly to achieving final performance criteria. With past failures in mind, the 2008 federal guidelines have established new monitoring requirements. They require monitoring of mitigation projects for a minimum of five years with longer monitoring periods required for aquatic resources with slow development rates (US ACE and US EPA, 2008). Any State and local agencies that participate in the bank agreement should be part of the Conservation Bank Review Team (CBRT) that is established to monitor the development use, and operation of the conservation bank.

- The German System

Currently the Impact Mitigation Regulation in Germany does not require monitoring and follow up, and this is an aspect of potential improvement of the Regulation (Darbi et al. 2009). However, in compensation pool practice (e.g. certifying of compensation agencies), there are well developed monitoring approaches in place for quality assurance reasons. There is also expert guidance for planning practice concerning monitoring / follow up.

For example, the Environmental Ministry of Brandenburg (MLUV 2009) outlines:

Monitoring of compensation measures should encompass not just the implementation/establishment of the measures, but also monitoring of the success of reaching the targeted ecological functions (control of ecological function). This is made by a comparison of targets and actual state of ecological functions. The monitoring measures are to be designated within the license/approval document. The results of the monitoring action have to be journalised and reported to the licensing authority as well as to the nature conservation authority. Depending on the nature conservation targets and type of measure the monitoring action has to iterate with a certain time interval. If necessary, additional measures have to be realised or the development or maintenance concept has to be modified. The possibility of additional obligations has to be determined in the license/approval document. GIS-based compensation registers/cadastres are important and helpful as management tools for compensation pools both for pool operators as well as for competent authorities to fulfil monitoring tasks (see Wende et al. 2005).

A checklist for the monitoring of compensation measures is provided by the Environmental Ministry of Brandenburg (MLUV 2009) (Table 7.1).

Table 7.1: General data of the project and the compensation measure in the German system	
Information about the project	
Project name	
Section of the project	
Licensing authority	
Reference number	
Kind of licensing procedure	
Project proponent	
Information about the compensation measure	
Number of the measure (e.g. within the landscape conservation support plan or within the detail plan)	
Date of realisation	
Initial state (biotope type)	
Target state (biotope type)	
Location (district, municipality)	
Basis for monitoring (landscape conservation support plan)/date of approval/license document	
Information to the control	
Date of controlled	
Image-Nr. (photographical documentation)	
Data of on-site controls (field survey)	
Targets	**Results of control**
Specific location (concession, lot or parcel) map for on-site controls	
Plantation and other measures	
Landscaping measures[1]	
Plantation measures (species/sorts/varieties)	
Plantation measures (quality of the plantation)	
Plantation measures (plantation scheme/plan)	
Establishing maintenance [2]	
Other measures[3]	
Long term maintenance measures (only if establishing maintenance is completed)	
Assessment of the results	
Establishing of the measure – completeness Has the compensation measure been realised at all?	Realisation rate in percent
Establishing of the measure – quality Has the compensation measure been realised properly (quality of plantation, establishing)?	How many plantations dead?
Maintenance – completeness and quality In which extent maintenance measures has been accomplished? Were they realised properly?	Which maintenance measures missing?
Overall result:	in 5 steps: ++ / + / 0 / - / --

[1] only earthworking measures, e.g. construction of a water body

[2] anchoring (stability, constrictions), protection against evaporation, protection against damage caused by game animals, small border for irrigation, irrigation, pruning, mowing, etc.

[3] game animals fence, facilities for diurnal birds of prey

7.3 Analysis of comparable policies – carbon markets

Carbon has some significantly different characteristics to biodiversity (in particular the homogeneity of impacts from emissions). However, there are some similarities in terms of development of a regulated market in actions to offset and environmental externality. Comparisons to efforts to include carbon stored in natural habitats, particularly forests, in market trading systems are particularly interesting in relation to habitat banking, as they involve some similar land use management issues.

Many of the challenges in developing a habitat banking system have been encountered in the EU's Emissions Trading Scheme (EU ETS) for carbon. Therefore, in order to better understand how a regulatory market for biodiversity protection, in the form of habitat offsetting and banking, might work, it is useful to review relevant previous experience from carbon markets. There are a number of aspects of carbon markets that are particularly relevant, and they are reviewed here in the context of habitats banking:

- **Defining Credits** – Characterising the criteria of environmental market credits such as baselines, permanence, leakage, and additionality.
- **Actively- and Passively-generated Credits** – Comparing carbon sequestration projects through afforestation and reforestation (A/R) to reduced emissions from deforestation and forest degradation (REDD) in order to better understand the differences between habitat credits from restoration compared to risk aversion.
- **Voluntary and Regulatory Markets** – Understanding the difference between the voluntary and regulatory markets to make a more educated judgement on whether or not it is valuable to create a regulatory market for habitat offsetting and banking.
- **Other Environmental Market Characteristics** – including fungibility, retiring credits.

Review of each of these topics illuminates overarching suggestions for developing habitats banking in the EU, but also highlights some of the issues still remaining.

7.3.1 Defining credits

Baseline

As with any impact assessment of projects or policies, the baseline scenario for forest carbon is what would have happened without implementation of a forest carbon project. More specifically, under the Clean Development Mechanism (CDM) the baseline is defined as "the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the

proposed project activity[129]." That scenario is often business as usual (BAU), but not necessarily so.

There are various accepted methods of determining the baseline under the CDM, but the basic definition holds across methodologies. Further, the UN lists a number of criteria for defining the baseline, a few of which are more general principles that methodologies must follow, specifically that baselines should be established[130]:

- In a transparent and conservative manner;
- On a project-specific basis; and
- Appropriately accounting for national and/or sectoral policies

There is further definition within each of these principles (e.g. better defining which policies to take account of), but it is the basic principles that can help guide definition of habitat credits.

One other key issue for A/R projects under CDM is which crediting period project proponents apply for. They may apply for either[131]:

- 20-year period that can be renewed up to two times, but requires third-party certification that the original baseline is still valid or has been appropriately updated moving into a new crediting period; or
- A single 30-year period that cannot be renewed, but only requires the baseline to be certified once, at the beginning of the project.

The former option allows for a much longer project life, with a potentially greater return on investment. The latter option, however, improves certainty of project delivery, although only allowing half the total potential project time. Similar criteria could be considered in relation to time-limited credits within habitat banking, which may be required in some circumstances, such as to compensate interim losses defined by the ELD. However, habitat banking should also cover compensation actions in perpetuity (to offset permanent damage) where these considerations are not relevant.

When considering how to define a baseline for a biodiversity offset, the basic principles used for A/R projects under the CDM can provide a strong starting point. Europe also has directives in place for both Environmental Impact Assessments and Strategic Environmental Assessments which provide significant experience with determining baseline scenarios. This experience should be drawn on to maintain greater parsimony in European regulation.

[129] (3/CMP.1, Annex, paragraph 44).
[130] 5/CMP.1, Annex, paragraph 20
[131] 5/CMP.1, Annex, paragraph 23

The CDM principles of baseline setting also potentially indicate that baseline setting in the European context may be relatively easier than under the CDM. Generally speaking, Europe has a fairly long and well-documented history of land use and land use change. Further, with policies such as the Habitats and Birds Directives, along with the EU's biodiversity strategy, a significant amount of research has been carried out on land use and habitat types. If such data were made readily available to habitat banking project proponents, assumptions about the baseline could be carried out in a transparent and conservative manner without much difficulty. Further, taking account of national and/or sectoral policies would be in large part defined by the shape of European policy, potentially making project proposals somewhat more homogenous and so easier to evaluate. Overall, there may be scope under an EU habitat banking scheme to have a relatively streamlined baseline establishment process.

Permanence

Under the Clean Development Mechanism (CDM) of the Kyoto Protocol, permanence risk is accounted for in projects that fall in the category of land use, land use change and forestry (LULUCF). Non-permanence is related to the temporary and reversible nature of terrestrial carbon sinks, which are more vulnerable than other climate change mitigation options to anthropogenic and natural disturbances. Simply, there is a risk that carbon dioxide (CO_2) sequestered from the atmosphere by trees or through agricultural techniques will be re-released in future years as those trees are cut down, agricultural practices revert back to previous methods, or due to natural disturbances.

In order to avert some of this risk, the practice is to issue credits from LULUCF projects for limited time periods. There are two types of such credits, temporary Certified Emissions Reductions (tCERs) and long-term Certified Emissions Reductions (lCERs). Both types of credits essentially view carbon sequestration as an ecosystem services that is "rented" over a period of time (International Tropical Timber Organisation, 2006). tCERs are issued for an A/R project for a specific commitment period (5 years) and can be renewed or replaced once expired and the project undergoes re-verification. lCERs are issued for the length of an A/R project, so do not have to be replaced unless the project fails re-verification or until the project crediting period ends (20 or 30 years) (COP-9, advance decision).

Under a habitat banking system, permanence would be a similar issue as for A/R projects. Taking the approach of limited crediting periods would appear to be the most sensible approach to dealing with the risk of non-permanence, especially considering the experience gained from LULUCF projects under the CDM. The main analysis that would have to be done when establishing a habitat banking system, however, would be to determine the appropriate length of crediting periods. Under the CDM, 5 years is a generic crediting period based on the commitment periods under the United Nations Framework Convention on Climate Change (UNFCCC). Although there is heterogeneity in the habitat types from which CERs are created, it is mainly

forest and agricultural land. There will likely be far greater heterogeneity of habitat types under a habitat banking scheme, each of which faces different levels of risk of human or natural disturbance, and hence different levels of risk of non-permanence.

The question then arises, if credits are only temporary, how will the benefits be maintained into the future? The two solutions are to place liability for maintaining or continually offsetting impacts on the entity that affects those impacts. Alternatively, credits can be retired.

Leakage

Leakage occurs when the project alters activity outside the project boundary, in a way that negates some of the project benefits. There are two main types of leakage[132]:

- Activity Shifting – Direct displacement of activity from within the project boundary to outside the project boundary; and
- Market Leakage – For example where once a tract of land is no longer available for traditional uses (e.g. grazing), market prices increase, signalling producers to clear land elsewhere and take advantage of the producer surplus offered by these higher prices.

It is also important to understand leakage on a geographical scale: local, national, regional or international leakage is possible. UN guidance on leakage for small CDM biomass projects requires analysis of leakage. It provides a table to help define project boundaries, and rules on which types of leakage beyond these boundaries can be dismissed as negligible[133].

Significant amounts of research have been expended in attempting to understand leakage. Generally these have found, in accordance with economic theory, that in relation to forest carbon projects leakage[134]:

- Is not usually an issue for A/R projects on land with low opportunity costs;
- Can be significant for land previously producing commodities traded on regional markets (i.e. with high opportunity costs); and
- Can be an important issue for REDD projects, although there are ways to reduce the effect (see discussion of actively- and passively-generated credits below).

In terms of the geographic scope of leakage, it is possible that well-functioning markets actually expand the potential scope of leakage, simply because well-functioning markets expand the geographic boundary of market transactions.

[132] USAID report for Nature Conservancy
[133] http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf
[134] LBNL review of Asia and LAC leakage

Experience with forest carbon projects present two lessons for considering leakage in the design of a habitats banking scheme, but three primary issues are highlighted here. Firstly, the level of leakage will be in part dependent on raw market forces pushed by the opportunity cost of the land that habitat credits are generated on. If land is marginal then leakage will be low, whereas if it was previously used for commodities traded on a regional scale, the leakage risk is high. The opportunity cost of converting land on which regionally traded commodities are grown, however, may be high enough to make it less likely that such land would be used for habitat banking in the first place. Nonetheless, if compensation was a legal obligation, credit prices would be high for credits in habitat types that require types of land with higher-value alternative uses and therefore higher opportunity costs (e.g. floodplains).

The strength and extent of existing markets for alternative activities to habitat banking need to be considered. In the context of Europe, some markets that may compete with habitats banking (e.g. some agricultural commodities) are well-functioning and far reaching. Therefore, the risk of market leakage may be quite high. The questions to ask in the design of habitat banking would include how much competition between agriculture and habitat banking there will be and where market leakage could occur: within and/or outside the EU.

The second point is that the leakage risk is high for REDD, which is conceptually similar to habitat credits created through risk aversion (rather than restoration activities, which are equivalent to A/R projects). The comparison of REDD and A/R credits and what can be learned for habitats banking is discussed more below Nonetheless, the issue of leakage highlights the classic issue around any form of environmental credit derived from avoiding risk of damage. In contrast, A/R projects pay to actively sequester carbon. Where A/R projects actually engage property rights holders (e.g. local communities and/or farmers) in the action of carbon sequestration and "keeps them busy", the former does not, permitting a high risk of leakage due to activity-shifting. This is one outcome of the now very familiar dichotomy seen throughout economic instruments for ecosystem and biodiversity protection: paying people to protect the natural environment by doing something good, or to protect by stopping them doing something bad.

Additionality

Additionality in environmental markets can be generally defined as outcomes that occur over that which would have occurred under the baseline scenario. In the context of A/R projects under the CDM, projects are additional if:

"…the actual net greenhouse gas removals by sinks are increased above the sum of the changes in carbon stocks in the carbon pools within the project boundary that would

have occurred in the absence of the registered CDM afforestation or reforestation project activity…"[135]

As with defining the baseline, there are various approved methodologies for determining additionality. Overall, however, all methodologies should generally follow the additionality tool[136] provided by the UNFCCC. Following that tool, there are three primary analyses carried out to determine additionality of an A/R project (in this order):

1. Barriers Analysis;
2. Investment Analysis (if needed); and
3. Common Practice Analysis.

Briefly, the barriers analysis identifies all land-use options in the proposed project boundary and determines which, if any, are currently possible to achieve. Barriers to land uses being implemented that should be considered are:

- Investment barriers (e.g. lack of capital, not insufficient return on investment, which is reserved for investment analysis);
- Institutional barriers;
- Technological barriers;
- Barriers related to local tradition;
- Prevailing practice barriers;
- Barriers due to local ecological conditions;
- Barriers due to social conditions; and
- Barriers relating to land tenure, ownership, inheritance, and property rights.

If the proposed forestry project is subject to one or more of the above barriers and there are other options for land use, the baseline scenario can be defined at this point as the land use that allows the highest baseline level of greenhouse gas (GHG) removals by natural sinks. Alternatively, project proponents can proceed to the investment analysis.

The tool provides more details to the investment analysis, but the overriding principle is that this analysis should show that the return on investment of the project is below the normal benchmark return (e.g. required rate of return), but the inclusion of income from carbon credits raises the rate of return over the benchmark. Basically, a project could be additional if it only makes financial sense when carbon credit sales are included.

[135] (5/CMP.1, Annex, paragraph 12(d))
[136] EB 35, Annex 19

Finally, the common practice analysis is complementary to the barrier and investment analyses. Simply, this analysis determines the extent that similar non-CDM forestry activities are already proposed or underway in the geographic area of the proposed project. Here, similar activity is defined as:

- Of similar scale; and
- Taking place in a comparable environment; with respect to the
    - Regulatory framework; and
    - Geographical area.

Although additionality as discussed above is specifically for A/R projects, all CDM projects face similarly stringent criteria. In complete contrast to these rigorous criteria for additionality through regulatory project-based markets, the Chicago Climate Exchange (CCX, a voluntary allowance-based market) applies a sort of sectoral additionality approach. CCX pre-approves classes of projects based on their high-likelihood of additionality and requires relatively simple standards of eligibility. It is generally argued that this allows for high-quality, small-scale projects that could not overcome the financial burden of proving additionality and so never come to fruition, as has been the case under the CDM, which has been criticised for its long, backlogged approval process.

Under a habitat banking system, additionality will be a significant concern, especially considering the common practice test. Throughout Europe there is increasing environmental regulation, improving environmental behaviour by businesses and individuals, and well-established conservation NGOs and trusts. In that context, would generation of a credit be additional above current common or future practice? Potentially yes, but a test for additionality would have to be designed carefully. Such a test should perhaps focus on a barriers and investment analyses.

Alternatively, no additionality criteria may be required (except that basic criteria that credits cannot be generated from land that is protected under current regulation). Since habitats are a highly heterogeneous good and there are specific priority habitats based on level of vulnerability and geographical locations of ecologically strategic importance, a CCX-type approach may be the most valuable in halting biodiversity loss. Under this approach, categories of habitat and location could be pre-approved for credit generation. Crucially, this approach would require flexible mechanisms for habitat credit equivalency, and include trading-up, to assist the targeted placement of conservation banking effort.

7.3.2 Actively- and passively-generated credits

Credits in environmental markets in general, but particularly in biodiversity- or ecosystem-based markets (BEMs), can be classified as actively- or passively-generated.

Actively-generated credits are those generated by a positive action above a neutral baseline. These types of credits, such as A/R (for forest carbon) or restoration (for habitats banking), are generated through positive action to create credits where there was no forest or habitat previously present. Passively-generated credits do require action to arise (e.g. through change to property rights), but the focus of that action is on stopping an activity that directly and negatively affects the environmental resource. These are risk-aversion credits, such as REDD (for forest carbon).

One major difference between these types of credits is that, again speaking primarily for biodiversity- and ecosystem-based markets (BEMs), actively-generated credits require desired action by individuals or firms to create. In contrast, passively-generated credits specifically reward individuals or firms for not carrying-out an activity they previously did and that is not desired. As seen with REDD carbon credits, this presents a large risk of leakage as individuals or firms simply shift that activity elsewhere to maintain livelihoods or profit-generation.

The solution presented in the REDD discussion is to provide alternative livelihoods and improved governance. That solution is heavily based on the fact that REDD is a climate change mitigation strategy focused on developing countries. Providing alternative livelihoods is a solution for areas where forests are threatened by local communities that do not necessarily desire to deforest, but often must for their livelihoods. Improving governance is a solution for areas, such as the agricultural frontier of the Amazon, that are under threat from larger-scale, usually commercial and criminal ventures.

Speaking of habitat banking in the EU, these issues of local livelihoods and the agricultural frontier do not precisely translate. Nonetheless, the overall concept of providing alternatives may be worth adopting. If industries are ecologically restricted in their activities and there is a goal of avoiding leakage, the alternative activities need to be identified. Perhaps in the EU context the most appropriate solution would be to generate risk-aversion credits by supporting innovation to reduce the impact of current activities or diversification of activities to those that have less ecological impact.

7.3.3 Voluntary and regulatory markets

In addressing the feasibility of habitat banking, it is also important to address the need for such a system. In scoping the potential for any regulation, but particularly market-based policy instruments, policy-makers should determine if there is need for a *regulated* market.

There are two important issues in this respect that can be at least somewhat addressed from lessons learned by the experience of carbon markets. Specifically, carbon markets are reviewed here to help address questions of:

- Voluntary vs. regulatory markets; and
- Project-based vs. allowance-based markets.

Total global carbon market transactions in 2008 were estimated to represent 4,212 – 4,811 million tonnes of CO_2 equivalent ($MtCO_2e$) at a value of US$120 – 126 billion (Table 7.2). Voluntary markets, however, only represented 3 percent by volume and 1 percent by value of the entire global market (Table 7.3).

In voluntary markets, project-based transaction is of lower volume than allowance-based, but higher value. It may be that this is due to less perceived risk in transaction and delivery due to personal interaction between buyers and sellers in such bilateral transactions. Allowance-based voluntary transactions only occur on the CCX, where there is no formal guarantee of credits so more uncertainty, and hence risk associated with delivery of emissions reductions those credits represent. Higher risk would be expected to be associated with higher returns, and therefore require a lower price.

In regulated markets, project-based transactions are lower in volume *and* value. In contrast to the CCX, these allowance-based markets are highly regulated, which decreases uncertainty and risk associated with carbon credits transacted on exchange platforms (as opposed to bilateral transactions). Additionally, regulated cap-and-trade markets usually limit the number of project-based offsets that participants are allowed to use towards their mitigation target, thus potentially devaluing project-based credits to some degree.

Table 7.2: Volumes and Values of Transactions in Global Carbon Market, 2008

	World Bank[137]		Ecosystem Marketplace[138,139]	
	Volume ($MtCO_2e$)	Value (US$, millions)	Volume ($MtCO_2e$)	Value (US$, millions)
Voluntary				
Voluntary OTC*	54	397	54	397
CCX	69	309	69	307
Other	-	-	0	1
Total Voluntary	*123*	*706*	*123*	*705*
Regulated Markets				
EU ETS	3,093	91,910	2,982	94,972
New South Wales	31	183	31	152
RGGI	65	246	27	109
AAU	18	211	16	177
Alberta's SGER	-	-	3	31
Primary CDM*	389	6,519	400	6,118
Secondary CDM*	1,072	26,277	622	15.585
JI*	20	294	8	2,340
Total Regulated Markets	*4,688*	*125,640*	*4,090*	*119,483*
Total Global Markets	**4,811**	**126,346**	**4,214**	**120,188**

*Project-based transactions, as opposed to all other transactions listed that occur in allowance-based markets.

OTC: Over-the-Counter; CCX: Chicago Climate Exchange; ETS: Emissions Trading Scheme; RGGI: Regional Greenhouse Gas Initiative; AAU: Assigned Amount Units; SGER: Specified Gas Emitters Regulation; CDM: Clean Development Mechanism, JI: Joint Implementation.

[137] *State and Trends of the Carbon Market 2009*

[138] *Fortifying the Foundation: State of the Voluntary Carbon Markets 2009*

[139] Total values listed in table may be slightly different from sum of transaction types. The Ecosystem Marketplace Report presents results to one decimal place and then aggregates, here those values are rounded to the nearest integer for comparison the World Bank report.

Table 7.3: Comparing Transaction Types in Global Carbon Market, 2008				
	World Bank[140]		Ecosystem Marketplace[141,142]	
	Volume ($MtCO_2e$)	Value (US$, millions)	Volume ($MtCO_2e$)	Value (US$, millions)
Voluntary				
Project Based	44%	56%	44%	56%
Allowance Based	56%	44%	56%	44%
Regulated Markets				
Project Based	32%	26%	25%	20%
Allowance Based	68%	74%	75%	80%
Total Global Market				
Project Based	32%	27%	26%	20%
Allowance Based	68%	73%	74%	80%
Total Voluntary	***3%***	***1%***	***3%***	***1%***
Total Regulated	***97%***	***99%***	***97%***	***99%***

Although only an overview, the comparison of project-based and allowance-based carbon credits is important when considering voluntary and regulated environmental markets. Voluntary markets, although they trade less project-based credits, appear to prefer them (as indicated by the higher value). In contrast, regulated markets trade more allowance-based credits and prefer to do so.

When structuring a habitat banking system, it will be important to consider whether it will be based on:

- Project-based transactions, dependent on bilateral transaction between organisations that supply and demand credits; or
- Brokered transactions, where buyers and sellers indirectly transact credits through some intermediary market overseen by a third party; and in either case consider if markets should, or
- Require certification of credits based on stringent government standards, allow third-party certification along the lines of Voluntary Carbon Standards (VCS) and other such certification schemes, or allow some mix of these options.

[140] *State and Trends of the Carbon Market 2009*
[141] *Fortifying the Foundation: State of the Voluntary Carbon Markets 2009*
[142] Total values listed in table may be slightly different from sum of transaction types. The Ecosystem Marketplace Report presents results to one decimal place and then aggregates, here those values are rounded to the nearest integer for comparison the World Bank report.

In reality, there are degrees of regulation that could be enforced for a habitat offsetting and banking system (Figure 7.1). It is vital in the design of such a system to understand the risks associated with each and the type of transaction preferred by the market in each case. The indication from carbon markets is that regulated markets deal with risk by placing a higher value on brokered credits, while voluntary markets appear to deal with risk by undertaking a more hands on approach and preferring bilateral, over-the-counter (OTC) transactions.

Level of Regulation	Offsetting	Credit Standards
Highly Regulated	Regulatory requirement	Strict government standards
		Basic government standards, supported by additional voluntary standards
	Voluntary	Strict government standards
		Basic government standards, supported by additional voluntary standards
Wholly Voluntary		Voluntary standards only

Figure 7.1: Level of regulation associated with offsetting and credit standards in environmental markets

In considering whether it is necessary to impose a *regulatory* habitats banking system, as opposed to facilitating a voluntary one, it is actually not particularly illuminating that voluntary transactions only make up 3 percent by volume of the global carbon markets. This is not surprising as the vast majority of major emitters in Europe are now covered by regulations. The real question is what volume would occur if all markets were voluntary? There is no evidence they would be anything near the scale of current regulated markets, as pre-regulation volumes of voluntary trades, and current voluntary activity are both low relative to the current market.

7.3.4 Verification of Carbon Emissions

The system for monitoring and verification of carbon emissions and credits within the EU ETS can also provide information that is useful in considering the design of habitat banking systems.

As with most international systems and agreements, the EU ETS is confronted with conflicts of interests, perverse incentives and potentially high monitoring costs.

Furthermore, with the inclusion of the Linking Directive in 2004, concerns about additionality were raised by allowing the Kyoto project-based mechanisms; the Certified Emissions Reductions (CER) from the Clean Development Mechanism (CDM) and Emissions Reduction Units (ERU) from Joint Implementation (JI), to be used as compliance credits.

This section will discuss the compliance process built into the EU ETS, which establishes a set of well defined roles for each actor, and is designed to restructure incentives, verify emissions levels and confirm additionality. These mechanisms, are set out in the 18 July 2007 Commission Decision: establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council (EC 2007d).They work as a set of checks and balances across different levels of authority in order to ensure transparency and accountability.

i. Issuance of allowances[143]

Although Member States are responsible for determining the total allowances that will be distributed ex-ante, and how they will be distributed, they are constrained by 12 criteria set out within the EU ETS. Each Member must submit their National Allocation Plan to the Commission a minimum of 18 months before trading commences. The National Plans include details regarding allocation methodology, rules for new entrants and a list of installations and their allowances. Phase I (2005-2007) stipulated that 95% of allowances be grandfathered and Phase II (2008-2012) reduced his amount to 90%, indicating that 5-10% will be auctioned. Before trading is permitted the Member State's National Plan must be approved by the Commission. All plans are to be consistent with national Kyoto targets; be cost-effective; contain sufficiently flexible approaches for different sectors, technologies, installation sizes and ages; refrain from excessive allocation of allowances; and be subjected to public consultation.

ii. Monitoring, reporting and verification of CO_2 emissions

Following the conclusion of each calendar year, operators are required to report their greenhouse gas emissions in accordance with compulsory EU-wide monitoring and reporting guidelines (EC 2007d). All installations within the EU ETS are required to hold a permit from the relevant authority**.** Permits are not granted unless the operator is capable of monitoring and reporting the levels of all six of the greenhouse gases emitted by the installation. A permit is not the same as an allowance. Allowances are the tradable units within the ETS, whereas permits relate specifically to the operator's Annual Emissions Report (EC 2007d).

[143] For more details see (CAN 2006), on which this paragraph relies.

The emissions report covers annual emissions of a calendar year in the reporting period. The verified report is then made available to the public. Each report is required to include installation details, emissions data, methodology, conversion factors and any items not accounted for in emissions (i.e. biomass combusted). To temper excessive monitoring costs, installations are differentiated according to size and grouped into "tiers" (Ellerman and Joskow, 2008). Larger installations fall under a higher tier, and more accurate (and costly), monitoring techniques are then applied to emissions measurement procedures for these entities.

All self-reported emissions must be verified by an independent third party, according to a set of legislated ETS criteria, before reports can be published (Ellerman and Joskow, 2008). The role of the independent third party verifier is to reduce the incentive for operators to understate their annual emissions. Operators whose reports are not verified will not be permitted to participate in the market as a supplier of allowances and will be required to produce a revised report (EC, 2007d).

The verification procedure is governed by five processes (2007/589/EC) which aim to address the cost of enforcement and the potential for conflicting interests. The *strategic analysis* considers the monitoring plan and the extent to which it is current, accurate and engages sound technical processes. The examination of the risks leading to misstatements and non-conformities, and how the verification plan can be structured to avoid such problems is addressed in the *risk analysis*. During the *verification* stage a decision is made regarding the completeness and validity of the data and the accuracy of calculations. The *internal verification* of the report records all evidence from the strategic and risk analysis, provides information to support the verification opinions and sets out the final decision by the verifier as to whether or not there are any miss-statements or non-conformities within the emissions report. The final step is the *verification report*, which rationalises the verifier's methodology, findings and opinions.

iii. Surrendering of Allowances

Although Member States are tasked with certification of verifiers and compliance enforcement via adjusting allowances in national registry accounts, all compliance penalties are determined in the Emissions Trading Directive (EC, 2007d). This EU law automatically imposes monetary consequences for non-compliance. Those operators who have exceeded their emissions limits must either surrender their emissions allowances or purchase available offset credits through valid CDM and JI projects (CAN, 2009).

Additonality is a requirement for validation of CDM and JI projects, and must be confirmed first by a designated operational entity (DOE), and second by a panel of experts (CDM Rulebook, 2009). DOE companies specialise in quality standard assessments and are a key feature of CDM. Unless three members of the executive

board request a further review, the CDM is approved by the DOE and the expert panel with verified additionality. The further review can be a major challenge for CDM projects and to improve the project success the Executive created a Validation and Verification Manual in 2008 focusing on cost-effectiveness, barrier, and common practice analysis and also the identification of alternatives

If regulated operators do not meet their commitments, either by surrendering allowances or purchasing credits, they will be fined €100 per missing allowance (as of 2008). In addition they will be "named and shamed" and required to surrender the missing allowances in the following periods (CAN 2009).

The entire process is executed electronically, wherein each Member State must create an electronic register in which each installation has an account. The Member State issues the allowances that are held in the account. When a verified emissions report is submitted a deficit is created in the compliance account and the operator must transfer allowances to balance the compliance account (CAN 2009).

7.3.5 Lessons for Habitat Banking

The systems established around the EU ETS have some design features that are relevant to establishing habitat banking. There are independent roles for monitoring and verification, undertaken by public bodies or registered 3rd party contractors. There are also specific penalties for non-compliance with the trading system, including fines and trading constraints. The system demonstrates the level of planning required to oversee a large and complex market established by regulation, and the key problem of establishing additionality of compensation actions (offset credits).

8. Analysis of potential supply and demand of compensation credits in Europe

Policy development in relation to habitat banking in Europe is only worthwhile if there is a reasonable prospect of sufficient supply and demand occurring to support a market. Demand and supply of credits are difficult to predict, but this Section attempts to look at relevant evidence to try to anticipate likely market activity. This analysis is uncertain both due to these difficulties of looking ahead, and exogenous policy decisions that will influence both supply and demand.

In particular the level of demand is predominantly the product of regulatory drivers. It is suggested that these policy drivers need to be strengthened to stimulate sufficient compensation liabilities to support habitat banking in Europe. Supply of credits will also be influenced by policies that govern land use (such as the CAP), through influence on the opportunity cost of land.

8.1 Analysis of demand

This analysis looks at current and future determinants of demand for biodiversity credits in the EU, demand in some Member States and draws on evidence from other habitat banking systems. The following are included in the analysis of demand:

- Current voluntary demand for compensation;
- Requirements of the Habitats Directive;
- Requirements of the Environmental Liability Directive;
- Requirements of Environmental Impact Assessment and Strategic Environmental Assessment;
- The example of demand for compensation measures in Germany;
- Demand through national biodiversity protections in other Member States;
- The example of demand for compensation in the US;
- The example of demand for compensation in Australia;
- Impacts on widespread non-designated biodiversity, and
- Actions to stimulate demand.

8.1.1 Current voluntary demand for compensation

Voluntary activity is defined as that which is not legally obligated, although its motivation may be to increase chances of regulatory approval. There are significant offset activities worldwide that are undertaken on a voluntary basis, for example those motivated by a long-term business case based on acceptance of activities

("license to operate") or corporate social responsibility (CSR). Compared with regulation derived activity, CSR is unmonitored, and often heavily motivated by image and corporate communications. In the EU while there is voluntary compensation activity, it is at a low level.

This situation is similar to the carbon offsets market before regulation introduced offset (compensation) requirements. Voluntary offsets were operating at a much lower level than the current volumes of the EU ETS, which is a market created entirely by regulation. The size and significance of the EU ETS owes itself to regulations that require offsetting of excessive emissions, not voluntary involvement. Voluntary offsets now make up around 1-3% of the global market in carbon emissions (see Section 7), however the persistence of this activity points to changing perceptions of appropriate behaviours and what is socially responsible activity in terms of compensation for impacts.

It is possible that a habitat banking system could accommodate both voluntary and regulation driven demand for compensation. The inclusion of voluntary demand could be a positive feature, and route through which flexibility for future changes and innovation are introduced. These might involve:

- Changes to society/public opinion – creating a social norm in favour of compensation for biodiversity damage (as seen in voluntary carbon offsets).
- Emergence of multi-functional offsets – such as combined actions that deal with impacts on climate, biodiversity and local people, or other ranges of ecosystem services? The increasing drivers for all of these may provide an additional source of demand.

The level of voluntary activity to compensate for biodiversity damage is not likely to change significantly in the near future in Europe, and therefore it is concluded that voluntary motivations are unlikely to be sufficient on their own to support the necessary demand to produce a functioning habitat banking system. In other word habitat banking needs regulation behind it.

8.1.2 Requirements of the Habitats Directive

The Habitats Directive has a limited scope for habitat banking for protected biodiversity within the Natura 2000 network: the predictable impacts within Natura 2000 sites could generate some demand for credits but this are thought to be too small to support a market system on its own. Under the Directive, there is a distinction between the potential for trade for debits within and outside the Natura2000 network. Within Natura2000 sites the legislative process is in place for the limited number of cases where habitat banking might provide compensation, but guidance and test cases are necessary to show how it can function. Developers will need to know which rules

apply and therefore a coherent system needs to be defined. Outside Natura2000 sites, there may be demand for credits in relation to Article 12 species. Although this may require more flexibility, and appropriate guidance, in relation to compensation requirements.

Other considerations here are whether the Directive's strict compensation requirements (like-for-like) limit demand to within Member States or allow international trade within relevant biogeographical regions. If international trade is permitted, it may mean that even though damage from individual activities is offset, overall a Member State may not be able to meet favourable conservation status within its borders.

8.1.3 Requirements of the Environmental Liability Directive

The Environmental Liability Directive (ELD) was adopted in 2004 and transposition into Member State legislation is recent and ongoing. Therefore no track record of incidents covered by the Directive exists to judge potential demand for compensation under a habitat banking system. Furthermore, an objective of the Directive is to deter pollution incidents, and therefore past frequencies of damaging incidents are not necessarily an accurate guide to the future.

There are few estimates of the expected number of incidents each year that will be covered by the Directive. Analysis of transposition options in the UK estimated that there would be approximately 60 damage cases per year under ELD[144]. A proportion of these would be expected to be compensated on site. The number of cases producing residual damage which requires compensation would probably be insufficient to support habitat banking on its own. However, it would be expected to produce some demand for credits.

8.1.4 Requirements of Environmental Impact Assessment and Strategic Environmental Assessment

Both the EIA and SEA Directives involve assessment of impact on the environment, including biodiversity, with the general purpose of informing project proponents and planning authorities etc of their likely impacts, so that they can be avoided, reduced or compensated for. However, neither Directive explicitly requires compensation for damage, and therefore neither stimulates significant activity that could translate into demand for habitat banking. Both these legislative instruments could be strengthened by the availability of compensation credits in a habitat banking market, as this would

[144] http://www.defra.gov.uk/environment/policy/liability/pdf/la-regs09.pdf

reduce transaction costs and other barriers to pursuing their objectives to reduce impacts on the environment. However, to stimulate significant volumes of demand within habitat banking, there would need to be clearer policy guidance or legal obligations for authorities to base development decisions on the findings of SEAs and EIAs with respect to the delivery of a no net biodiversity loss objective.

8.1.5 The example of demand for compensation measures in Germany

In most federal states in Germany the authorities of the regional governments (as subdivisions from the government of the federal state) are responsible for Natura 2000. This includes responsibility for notifying the European Commission of cases of compensation for impacts into Natura 2000 sites. However, state ministries and state offices for the environment hold almost no information about the level of compensation measures for Natura 2000 sites. This may be because there have been very few cases where Natura 2000 sites were impacted and compensation measures had been necessary. Some States are in the process of improving the information they store. For example, the environmental ministry of North Rhine-Westphalia is currently developing a database of completed Habitats Assessments, which includes compensation measures required for impacts on Natura 2000 sites.

There are estimated to be more than 1,000 compensation pools currently operating or which are under development (i.e. which are currently in the planning phase and have not sold all their credits) in Germany. Most of them are managed by German municipalities, although several are managed by private compensation agencies. Many municipalities primarily fulfil their compensation requirements within the area of the detail plan (i.e. through the initial steps of the mitigation hierarchy) and then use case-by-case compensation or compensation pools to provide any further credits required for full compensation. Most of the municipalities aim only to serve their own compensation requirements and not to sell credits to third parties. This makes assumptions about the volume of the market difficult, and suggests that market forces are not influencing compensation actions as extensively as they might do in a wider market system.

The Bavarian State Office for the Environment conducts a register/cadastre of "ecologically important sites" which compasses compensation sites as well as other sites designated for nature conservation purposes which are secured by land registry charge or provided with help of public finances. This register is legally required pursuant to Article 39 of Bavarian Nature Conservation Law. Every licensing authority and municipality in Bavaria, as well as nature conservation authority, has to announce compensation sites from current projects. However, as not all relevant authorities follow the legal requirement of site announcement, these figures may be an underestimate: in total there were 101,488 sites registered at the end of September 2009, of which around 21,500 are compensation sites (including currently operating

sites and those that have sold their credits) resulting from the German Impact Mitigation Regulation. These sites cover both single compensation sites (case-by-case compensation of impacts) and aggregated offsets (compensation pools). The distribution of these sites is shown in Figure 8.1.

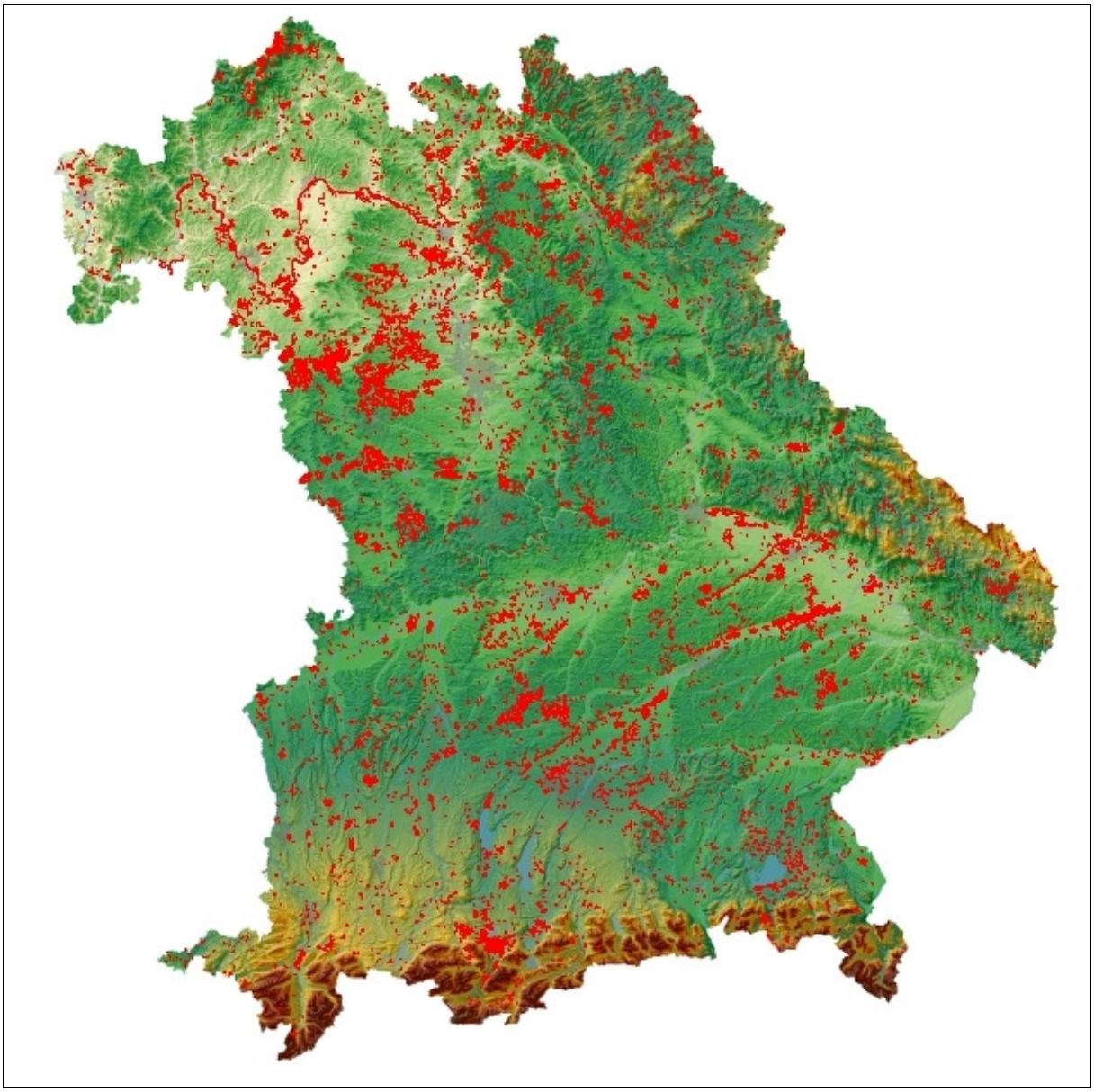


Figure 8.1: Ecologically important sites registered in the Bavarian *Ökoflächenkataster*
Source: Bavarian state office for the environment 2009. Last updated: 2009-03-31[145].
Note: about 20% of the red marked areas in the map are compensation sites, another 20% are environmentally high valuable sites which are bought to protect them against changes in land

[145] See: http://www.lfu.bayern.de/natur/fachinformationen/oekoflaechenkataster/datenhaltung/pic/oefk_datenhaltung_gr.jpg

use, and about 60 % are sites owned by the water management authority or residual areas from land consolidation processes (these may be of varying environmental value, even low value).

The rate at which sites are added to the register in Bavaria gives an indication of potential compensation activity in a habitat banking system. In the six months to September 2009, 1,459 sites were added to the register, of which compensation sites from the Impact Mitigation Regulation were 1,078, suggesting a rate of over 2,000 compensation cases per year. Compensation sites are about 19,880 hectare, which is 0.3% of the total area of Bavaria. But, since not all parties fulfil their requirement to announce their sites, it is most likely that more sites than reported exist.

Comparison of the area of compensation sites to the number sites would suggest a very low average size. However, this comparison is inaccurate and misleading because the registered compensation sites reflect the number of compensation cases (i.e. number of debits). Each registered site corresponds to a separate debit, even if they are just a part of a larger credit site.

The demand for compensation (credits) in Germany is strongly dependent on economic and political developments (e.g. housing policies of German municipalities, major and minor infrastructure projects, etc.). Statistical data about land consumption from settlement and the transport sector are used as an indicator within the Federal Environment Agency's core environmental indicator system, to provide information about the state of the environment in Germany. The indicator "land use" represents a potentially negative impact on natural areas and natural soil functions as a consequence of sealing and urban sprawl (Federal Environmental Agency 2009). In many cases, legal requirements for compensation measures under the German Impact Mitigation Regulation arise. Thus the indicator gives a rough measure of demand for biodiversity compensation.

The daily demand for land during the period 2004 – 2007 declined from 129 ha (period 1997 - 2000) to 113 ha but this is still a high level. The decline is mainly due to a reduced investment in construction, a consequence of the global economic downturn. Thus a long-term downward trend is unlikely. Economic recovery can be expected to lead to an increase again. It is envisaged that construction of new settlements and transport infrastructure are unlikely to decline significantly, and therefore neither will demand of compensation credits.

The German Government's Strategy for Sustainable Development has a target to reduce the daily land consumption for housing and transport to 30 hectares by 2020. Meeting this target might involve a gross reduction in land demand, but could also be defined as a net reduction, delivered in part through compensation. Unfortunately, the proportion of activity within the German system that relates to Natura 2000 sites is not reliably monitored, although there are signs this is changing.

8.1.6 Demand through national biodiversity protections in other Member States

The strength and extent of enforcement of existing EU Member State laws and regulations that stimulate the need for compensation is generally weak. Most planning requirements involve activity to be carried out to meet requirements of EIA, but not to actually compensate for damage. For example, in the UK there is a biodiversity duty on public bodies and other requirements that suggest compensation for biodiversity damage should occur, but in practice it is not binding. Similarly in France, national laws could be interpreted to require compensation for biodiversity damage, but they are not effectively enforced. In other countries laws are unclear and not enforced (e.g. Sweden and Czech Republic).

Legal biodiversity compensation requirements, and/or their enforcement, will therefore need to be strengthened in many (probably the majority of) Member States. There is a danger that if strengthened compensation requirements are seen as too onerous then damage is not recognised in the first place in order to avoid needing to fulfil requirements of regulations.

There can also be problems that in some cases options for avoidance of damage are limited by geographical distribution of biodiversity resources and development pressures. Some vegetation types and habitats are inherently restricted in their distribution. In highly fragmented and constrained landscapes, there may be very little space available in which to locate a habitat bank which will provide the required type of credits. This would be the case for any vegetation type or habitat restricted to particular soils or geology, for example, calcareous grassland.

Treweek et al (1998) illustrated how the strategic trunk road network coincided with quite a large number of km squares in which lowland heathland was located, but only a very small number in which such heathland could also be expected to support the Dartford warbler and the sand lizard (two possible indicators of higher quality habitat). Therefore, options to compensate for impacts on these two species would be limited. These distributions are illustrated in Figures 8.2 and 8.3 below.

Studies of this kind also emphasise that one example of lowland heathland selected purely on the basis of dominant plant species might not be the same as another, partly because landscape context is so important. Like for like rules might have to take such considerations into account. It also emphasises the possible need for planning systems to secure suitable banks at an early stage, particularly in cases where the stock of suitable land is limited and declining. Habitat banks are potentially useful in such contexts because they are a means of conserving viable habitat in relatively large units in suitable locations or locations where the habitat remains in a fragmented landscape.

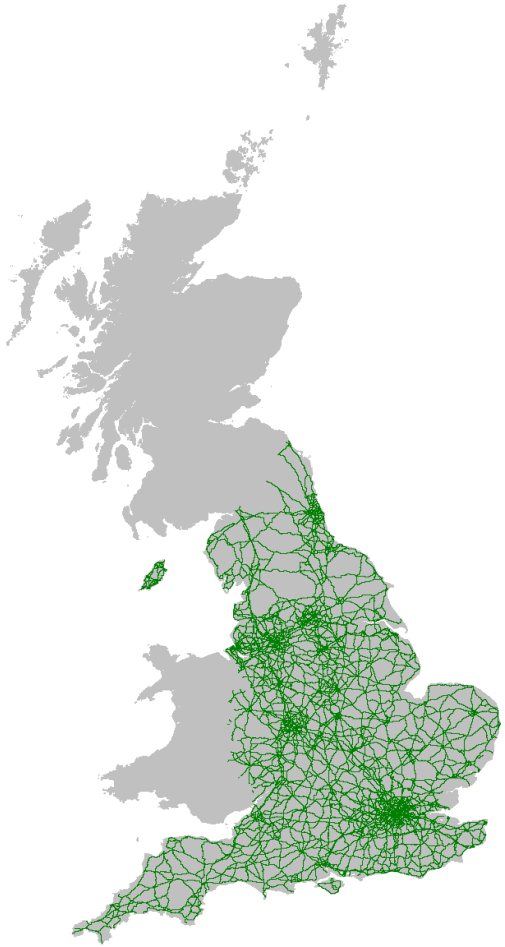


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Figure 8.2: UK National trunk road network

Figure 8.3: Lowland heathland with sand lizard and Dartford warbler

The number of uncompensated cases relating to widespread biodiversity in the UK is estimated to be significant by one NGO, with around at 200 – 300 cases a year that are recognised for a species such as Great Crested Newt[146], and perhaps thousands more cases for this and other species that are ignored[147].

Demand for more flexibility to carry out development projects in the EU can be expected to rise due to economic and population pressures. Therefore demand for compensation measures may also increase if they provide means for overcoming barriers to planning decisions. However, there is a fine line between flexibility, and permitting developments that would not otherwise be allowed to proceed (license to trash).

The pilot habitat banking project in France involves a rare ecosystem type, but is located to anticipate future development pressures in the surrounding region. It remains at risk that if development in the region is limited (e.g. due to the global economic downturn), there may be limited demand for credits on a like-for-like basis. While trading up might provide an alternative source of demand, there are currently insufficient compensation triggers at lower biodiversity levels from which trading-up could take place. This illustrates the clear need for stronger and/or extended compensation requirements to stimulate sufficient demand to support a habitat banking system in France.

8.1.7 The example of demand for compensation in the US

Major sources of demand for compensation credits within US habitat banking systems are housing and commercial development; transport projects, in particular because of road building; and environmental cleanups. The demand for mitigation and conservation credits rely in large part on the expansion of residential and commercial real estate development and on an increase in public infrastructure projects. Bank owners adjust the price of credits to reflect current market conditions, for example, discounting credits where demand is low and increasing the price when demand is high and the supply of credits is limited. In the US, demand for credits has fallen in recent years as private development has slowed due to the global recession. Banks however are still developing new habitats and saving these credits in anticipation of a real estate recovery (Lamb 2009). In addition, conservation banks may see an increase in demand for credits as government infrastructure projects such as highway and bridge construction begin to be approved through the recent stimulus bill.

[146] Although the Great Crested Newt is protected under Article 12, this does not explicitly require compensation for damage to the species or its habitats and in this context is therefore a 'widespread' species, and may be impacted by cumulative impacts on its habitats.
[147] Tony Gent, Arc-trust, UK, pers comm.

Local economic factors and local planning and environmental policies can also play a key role in the demand for conservation credits. Development in a fast growing area (e.g. California) creates a steady demand for options such as credits, while smaller, more stable areas (e.g., New England) may create low demand for such wetland mitigation and conservation banks. Demand is also subject to changing regulatory conditions. For example, if priority habitats identified in State plans do not support federally listed species, then there will be no opportunity to use federal conservation banks as a way of protecting those priority habitats. In areas that have adopted fee-based mitigation schemes, parties or developers can pay a fee to the county or agency (usually based on approval of a multi-species habitat conservation plan). Fee-based mitigation can eliminate demand for these credits at a private conservation bank.

8.1.8 The example of demand for compensation in Australia

Habitat banking in Australia is carried out through two state-administered schemes, in Bushbroker in Victoria and Biobanking in New South Wales.

Victoria

Biodiversity offsets in Victoria are few in number and small in scale. Historically, approximately 50% of Victoria's native vegetation had been cleared for agricultural and urban development up to the last few decades, including 80% of the original cover on private land. Subsequently, the rate of clearing has been reduced considerably under the regulations to implement the government's 'Net Gain' policy objective (adopted in 2002). Consequently, there is only a modest market for biodiversity credits. Applications to clear only a few hundred hectares of private land per year have been received since the offset system was established in 2002. This is seen as an appropriate balance between the objective of discouraging damage to biodiversity by internalising the cost of compensation, and allowing the market to function to provide an efficient compensation route.

It is important to note that while applications for clearing are few, a 2008 State-wide assessment of progress on the government's 'net gain' policy showed a net loss. This is because these figures encompass not only areas lost/gained through new clearing, but also the losses/gains through changes in quality/condition in circumstances that have not involved clearing permits, such as certain exemptions, some illegal clearing but are principally due to slow degradation over large areas.

Credit trading through BushBroker has only been taking place since 2007 (the programme was announced in 2006). Since that time, there have been approximately 140 transactions, including the 'Over the Counter' transactions, with a total value of over Australian $5 million as of 1st December 2009. Many of these trades involved a full habitat hectares assessment.

New South Wales

The biobanking scheme is still at a very early stage, and unfortunately no analysis of market activity is possible.

8.1.9 Impacts on widespread non-designated biodiversity

Most damage to less scarce and/or more widespread biodiversity in the wider environment, for example from very small developments or very low impacts, are not currently compensated individually, but cumulatively can have significant impacts. A recommendation from the recent UK study for Defra (Treweek et.al. 2009, see Box 8.1 below) was that biodiversity offsets might provide an important possible mechanism for capturing cumulative impacts on wider biodiversity, which are not effectively dealt with by other existing mechanisms. This damage to be compensated would require policy measures to be extended and/or strengthened. This compensation could be sourced through a habitat banking market, and under this scenario, compensation for impacts on widespread non-designated biodiversity would be a source of demand for credits.

The potential strength of demand for credits for this reason depends on a) the amount of non-designated biodiversity, and b) the level of damage to it. While Natura2000 is the primary conservation designation within the EU, it covers only 17% of the total land surface, and many areas of high conservation importance are outside the network of sites. Natura 2000 sites are designated primarily to protect either specific habitat types (those listed in Annex I of the Directive) or specific species (those listed in Annex II or in Annex I of the Birds Directive). Preliminary results from the European Red List indicate that there are a number of globally threatened species (Critically Endangered/Endangered/Vulnerable) that are not on Annex II of the Habitats Directive and thus potentially not covered by the existing network.

Similarly, although exact data are lacking, it is clear from an inspection of EEA maps that large areas of farmland habitat of High Natural Value are outside Natura sites (EEA, 2004b). Much European biodiversity is dependent on some level of human intervention on the land, a result of long habitation in this continent. Moreover, virtually all native biodiversity is of some value, even if only in relation to the provision of basic environmental services (e.g. green space). Therefore there appear to be abundant biodiversity resources outside the Natura2000 network in the EU to support a habitat banking system.

The long habitation history of Europe gives rise to extensive areas of semi-natural habitat, of varying biodiversity value. The biodiversity in these areas may not be rare enough to warrant specific protections (that require compensation for damage). However, it is often significant enough that cumulative impacts on it can have major

effects on overall biodiversity (such as declines in some bird species as a result of the cumulative effects of changes to agricultural practices). This biodiversity can often also be enhanced in a sustainable manner. These conditions mean that 'credit' actions may be feasible, and that habitat banking could be an efficient mechanism for undertaking compensation obligations on these habitats.

8.1.10 Actions to stimulate demand

The preceding analyses in this Section and in Sections 2 and 5 suggest that demand for credits (for example to compensate for major infrastructure projects, under the Environmental Liability or Habitats Directives, or through voluntary action) is unlikely to be sufficient to support a viable habitat banking system. The total numbers of possible transactions (e.g. up to 60 under the ELD in the UK), could in total be sufficient for a market, but it must be remembered that this market would be subdivided several times by equivalency requirements (i.e. effectively creating a series of separate sub-markets, with limited inter-linkages depending on flexibility in approached such as trading-up).

Therefore, it is concluded that to support a viable habitat banking market in the EU, there must be new measures taken to stimulate greater compensation for biodiversity damage (see Box 8.1). Indeed, further detailed research into habitat banking would be best undertaken in conjunction with consideration of new compensation requirements.

New compensation requirements could involve completely new laws or regulations, and/or the strengthening and/or extension of existing compensation requirements to cover more biodiversity damage. Greater coverage could involve inclusion of more species and habitats by the relevant protections, and/or reducing the threshold above which damage is deemed significant enough to warrant compensation.

Further Commission guidance on the appropriateness of habitat banks or offsets for H Habitats Directive (Article 6(4)) compensation could also be useful. Existing guidance favours compensation measures that are within or nearby the site concerned (European Commission, 2007), but this simple rule of thumb will not necessarily provide the best conservation outcomes in many situations. Amending the guidance such that the location of compensation is more flexible and primarily based on the option that is most likely to provide the optimum conservation outcome could increase the options for using habitat banks as compensation. It might also increase the options for combining small compensation measures, which in isolation may not be of high biodiversity value, into larger pooled banks that could be more viable ecologically and economically.

Overall, such policies must be considered in the context of the review of the policy objective to halt biodiversity loss. The original timeline for this target (2010) is clearly

being missed, suggesting that existing policy tools are not sufficient to deliver it. However, the target is expected to remain in place, suggesting that new policy tools are necessary to achieve it.

Box 8.1: Does the European Union need new, or clearer, policy to require no net loss of biodiversity and enable conservation banking as a means of achieving this? A case study from the UK

Biodiversity offsets in the UK could be stimulated by policy requirements and incentives, or by the business case for developers to undertake offsets. Do policy requirements and incentives in the UK result in no net loss of biodiversity and are they enough to stimulate conservation banking? Relevant policy in the UK comes both from EU Directives such as the Birds, Habitats and Environmental Liability Directives, and the implementing regulations in the UK, and from the 'Biodiversity Duty' under UK domestic legislation and policy guidance. This includes the Countryside and Rights of Way Act 2000 and the Natural Environment and Rural Communities (NERC) Act 2006, together with planning guidance such as Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS9; ODPM, 2005).

A recent study (Treweek et.al. 2009) concluded that biodiversity offsets are unlikely to be implemented to any great extent under current EU law and associated regulations, particularly for biodiversity which is not designated or protected at European level. Further, the 'Biodiversity Duty' is open to interpretation with respect to requirements for enhancement and for compensation for residual adverse effects of any given development proposal. Under the current system in England, some offsets have been implemented, but there is no consistency in requirement or approach. So far, offsets have only occasionally been used for 'wider biodiversity' – i.e. for the full range of biodiversity components (beyond listed species and habitats) that comprise the richness of English wildlife and which are increasingly lost to cumulative impacts and fragmentation of habitat. The following text shows why this is the case.

The 'Biodiversity Duty' (Defra, 2007) requires that:

- '*every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*'.

According to legal advice originally prepared for the Welsh Assembly Government, this means that the conservation of biodiversity:

- '*is a factor that they* [planning authorities] *must consider [*along with other factors which are not necessarily of an ecological nature*] when deciding whether to, and how to, exercise their functions*'.

The public authorities to which this duty applies include local planning authorities, which must therefore exercise the Biodiversity Duty when assessing planning applications. However, the extent to which local planning authorities must '*have regard*' to, or consider the conservation of biodiversity is not clearly defined in NERC, and language such as 'so far as is consistent' softens the requirement. Also, the 'Biodiversity Duty' rests with government. One interpretation is that developers should demonstrate how their proposals respect the Biodiversity Duty to be viewed favourably by planning authorities. However the extent to which they are required to demonstrate appropriate application of the mitigation hierarchy depends on the expectations and requirements of the local authority and indeed the specific case. It is certainly not regular practice for developers to propose 'no net loss' biodiversity offsets in order for their proposals to be satisfactory to local authorities.

8.2 Analysis of supply

The potential supply of credits within habitat banking is dependent on the availability of land and expertise to undertake additional biodiversity enhancement measures. It is thus closely related to the opportunity cost of alternative land uses, which in the cases of agriculture and forestry in Europe are closely related to the relevant subsidy regimes under the CAP.

Supply of credits will depend on availability of appropriate land. For some habitats, this may be a constraint, especially where the physical requirement of the land coincides with other high-value land uses, such as coastal floodplains. However, for other habitats, there is likely to be sufficient supply of land, in particular arising from land that is economically marginal in terms of agriculture or forestry. Evidence that this land exists in the EU can be drawn from the problems in rural development and nature conservation of abandonment in these sectors.

One measure of the availability of land is a report from the European Environment Agency that concludes that approximately 19 million hectares of land will be available for bioenergy crops in the EU-25 by 2030[148]. This suggests that land supply can become available if demand is strong enough. The availability of this land for habitat banking is of course dependent on relative price. In this respect, the market system of habitat banking has an advantage of providing price signals that can help allocate land between different uses. If biodiversity compensation is required by law, the market gives an incentive for credits to be priced at a level sufficient to secure appropriate land for their delivery.

The following is covered in the analysis of credit supply:

- The example of US land supply;
- Feasibility and incentives for supply, and
- Measures to enhance supply.

8.2.1 The example of US land supply

The supply of credits for conservation or mitigation banking in the US depends on many factors such as geography, technology and ecology. For wetland mitigation, it is preferable to develop on-site mitigation, which restricts the availability of credits as geographic options are limited. Banking does allow for off-site mitigation in the same watershed area because wetland functions are typically very localised. The goal of the conservation banking is to offset the impacts to listed species; so mitigation can be either on-site or off-site, depending on whether the species affected is endemic to the locality.

[148] See http://www.eea.europa.eu/articles/if-bioenergy-goes-boom

The location of the wetland mitigation bank is critical to the success of the mitigation project. While the mitigation banker has sole authority for determining the site location, the US Army Corps of Engineers determines credits from which banks are appropriate compensation for different debits. The cost of real estate is also a major factor that affects site selection, which has lead to a shift from urban to rural areas and from more complex to more simple wetland systems (ELI, 2007). In addition, a site needs to be either capable of supporting a viable population or contribute to the maintenance of such a population by expanding an existing area managed for the species. It is also important to consider surrounding land use trends, management activities, topographic features, and ecological factors such as habitat quality and species use of the area. Technological issues include the ability to better recreate effective habitats. Past experience in the US has shown that in some cases, banks were not successful in recreating such habitats.

8.2.2 Feasibility and incentives for supply

The feasibility of restoration of different types of biodiversity is a key constraint on potential supply of credits. Biodiversity resources that take longer to restore are less suited to being supplied as credits into habitat banking in the form of credits based on restoration actions. This is because the long time-scales means they will take longer to demonstrate full biodiversity delivery, leading to increased monitoring and management costs during restoration activity, and depending on the rules adopted, a longer period of time over which all the credits generated are released. This makes them a riskier investment for potential suppliers. Such biodiversity may be supplied as credits based on rehabilitation actions and as averted risk if these can be shown to be additional.

A potential advantage of habitat banking is that it can encourage those undertaking biodiversity enhancement actions to go further than they would do otherwise, in other words increasing supply of biodiversity enhancement actions. Figure 8.4 shows the progression of a biodiversity offset for a single incidence of biodiversity damage (as in Figure 4.5), from predicted impact of a development, through on-site avoidance, mitigation and restoration (in line with the mitigation hierarchy), and the use of an offset to return to parity or produce a net gain (as necessary for the offset). If this offset is achieved through a credit purchase in a habitat banking system, this may be the end of the considerations.

If the body responsible for the impacts also undertakes the offset (as they often do, particularly in larger cases of damage) (or a habitat banking credit), further steps can arise. Biodiversity enhancement on top of the requirement of the offset may lead to additional conservation actions (further net gain), being undertaken on a voluntary basis or for some other motivation outside habitat banking.

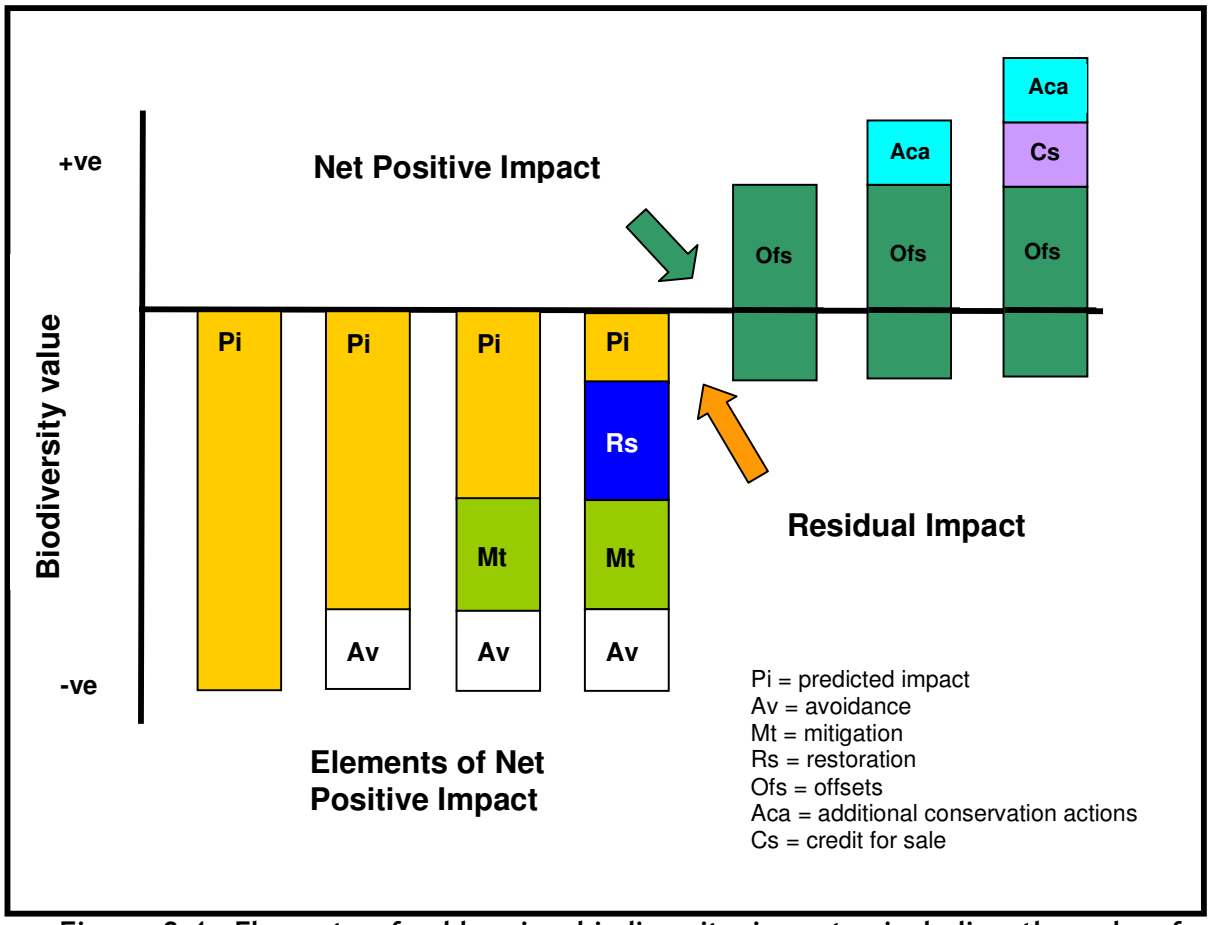

Figure 8.4: Elements of addressing biodiversity impacts, including the role of habitat banking. (Credit: Adapted from RioTinto and govt of Western Australia, via Kerry ten Kate.)

The right-hand column of Figure 8.4 introduces a further box as a result of habitat banking. The vertical axis is the status of the biodiversity resource, so up to zero impact, compensation offsets the damage for which it was designed, impacts above the zero impact line are net gains. Some gain may be included in the offset as a requirement of trading, or to manage risks that ex-post offsets do not realise their intended biodiversity value. Positive impacts in excess of the offset may be made for the purposes of enhancing biodiversity (additional conservation actions). However, within a habitat banking systems, these additional actions may qualify as credits, and therefore attract a value within the market (credits for sale). If sold within habitat banking, these credits are being used to compensate for damage elsewhere, and therefore are no longer a source of additional conservation benefits.

Additional actions are taken on top of the offset in order to produce biodiversity credits for sale in a habitat banking market. Habitat banking has the benefit of

introducing an incentive for such actions, which was previously lacking. This incentive may mean that cost-effective opportunities for biodiversity gain associated with individual offset sites are taken up, where otherwise they would not have been. The diagram also highlights the possible conflict between producing biodiversity gains for sale as credits (in which case they compensate for damage elsewhere, helping to ensure no net loss at a landscape scale) and using opportunities for biodiversity gain to undertake additional conservation actions that result in net gain at a landscape scale.

8.2.3 Biodiversity management costs

The costs of undertaking biodiversity conservation actions are not an extensively analysed area. Information is often processed internally within Government agencies, and data are rarely published. However, what little information available can act as a guide to the possible cost of undertaking enhancements to biodiversity that may qualify as credits, and therefore to part of the price that the credits would need to sell for (as a minimum, to cover costs).

- UK Biodiversity Action Plan Costs

A study in the UK for Defra (Rayment et.al. 2006) reviews the costs of providing individual Habitat Actions Plans (HAP) for the UK Biodiversity Action Plan within the UK. In most cases they find the costs of HAPs to be highly variable and site specific. The costs of managing land for biodiversity vary significantly between different habitats and staffing requirements (e.g. to manage visitors)[149]. There are some complexities to costs which must be addressed in all cases, and assumptions must be made on:

- When lumpy costs will arise (i.e. one-off investments and time limited activities) (BirdLife International 2009), and
- How to attribute activities undertaken at the sites that do not directly contribute to conservation (i.e. maintaining walking trails, educational support) but promote the sites popularity and local acceptance (BirdLife International 2009).

The methodology used in the Rayment et.al. (2006) study includes accounts for any revenue generated and provides the net cost of action; uses relevant existing grant rates, includes administrative and central costs and is expressed in 2005/06 prices. They include the costs of land purchases only where they are essential, and for most HAPs, they are not required. However for some habitats, such as saltmarsh and mudflat creation, land purchases are a major factor in costs. In such a case land purchases and payment incentives can be very similar tools and cost similar amounts:

[149] Malcom Ausden, RSPB, pers comm.

for example, either scheme might be completed by buying land at €5,000 to €7,000 per hectare or by compensating the farmer for income foregone, paying an agri-environment payment of €500 - €700 per hectare per year for ten years. Table 8.1 below provides a range of costs of providing various habitats within the UK[150]. The following tables show average 10-year costs of either restoring (Table 8.2) or re-establishing (Table 8.3) a habitat type. The Total 10-Year Average Cost are derived over ten years from the average management cost per year over nine years and the midpoint of the range of capital costs for year 1.

Table 8.1: UK HAP Restoration Average 10-Year Total Cost (€/ha)

	Management Range of Costs (€/ha/yr)	Average Total 9-Year Management Cost (€/ha/yr)	Range of Capital Costs (€/ha)	Average Total 10-Year Cost (€/ha)
Wood Pasture, Parkland and Native Woodlands	63 - 207	1,215	1,955 – 3,450	**3,918**
Heathland	43 - 230	1,229	172 - 402	**1,516**
Bog	9 - 172	815	575 - 5,721	**3,958**
Reedbeds	40 - 115	698	939	**1,167**
Coastal & Floodplain Grazing Marsh	117 - 230	1,562	1,472	**2,298**
Purple Moor Grass and Rush Pasture	92 - 230	1,449	594	**1,746**
Grassland varieties	109 - 230	1,526	357 – 2,372	**2,890**
Hay meadows	103 - 230	1,499	520 -1431	**2,474**
Hedgerows (€/m)	0.23 - 0.48/m	3.2/m	3.5 - 5.75/m	**7.8/m**
Arable field margins	243 - 384	2,822	N/A	**3,135**
Fens	40 - 105	653	661 - 0	**983**
Coastal vegetated shingle	57	257	3,565	**2,039**

[150] These numbers were taken from the Rayment et al (2006) UK BAP costings analysis report, which originally provided the data in pounds. An exchange rate of 1.15 was used to convert the values into Euros.

Table 8.2: UK HAP Re-establishment Average 10-Year Total Cost (€/ha)				
	Management Range of Costs (€/ha/yr)	Total 10-Year Average Management Cost (€/ha/yr)	Range of Capital Costs (€/ha)	Total 10-Year Average Cost (€/ha)
Heathland	52 – 517	2,561	402	**2,848**
Bog	105 - 437	2439	937	**5,583**
Reedbeds	1,094 - 437	6,900	1,565	**7,359**
Coastal & Floodplain Grazing Marsh	143 – 362	2,273	1,472	**3,009**
Purple Moor Grass and Rush Pasture	184 - 322	2,277	569	**2,574**
Grassland varieties	169 -322	2,210	357 – 2,415	**3,574**
Hay meadows	178 - 322	2,250	645 – 1,960	**3,226**
Hedgerows (€/m)	0.23 - 0.48	3.2	2.5 - 6.1	**3.6**
Arable field margins	243 - 384	N/A	288 – 426	**3,183**
Fens	105 - 437	2,439	937	**2,770**
Coastal vegetated shingle	299	1,346	11,500	**3,128**

Wood pasture, parklands and native woodlands were omitted from the HAP Re-establishment costs table because restoration and re-establishment costings depend on the size of the site and were not differentiated within the Rayment et al. (2006) report. For these habitats, costings for expansion of habitat areas were provided (see Table 8.3) and are based on agri-environment payment rates set on a per hectare basis (Rayment et al. 2006).

Table 8.3: UK HAP Expansion Estimated 10-Year Cost (€/ha)				
	Management Cost	Total 10-Year Estimated Management Cost (€/ha/yr)	Estimated Capital Cost	Total 10-Year Estimated Cost (€/ha)
Wood Pasture and Parkland	180	1,800	350	**2,150**
Native Woodlands	200	2,000	1,500	**3,500**

- German Restoration Costs

Some habitat creation costs are available from Germany, where costs differ significantly due to different land prices, and complexity of restoration and maintenance measures. According to FGSV (1999) costs for habitat creation measures (inclusive of twenty five years maintenance, and including land purchase) range

between about €17,500 per ha for wet grassland to €55,000 per ha for afforestation (mixed forest), or even higher for some habitats. Note that the UK costs above exclude land purchase prices.

Land purchase is not necessary to create credits in habitat banking, as a change in land ownership is not essential. Therefore, these German costs are likely to be significantly higher than the costs of creating credits for habitat banking.

- Natura 2000 Costs in Macronesia

The estimation of costs of the Natura2000 network in the Macaronesian region (Sunyer, 2002) for TERRA provides an estimation of the direct costs of the Natura 2000 network in the bio-geographic region of Macaronesia, which comprises the regions of the Azores, the Canaries and Madeira, from Portugal and Spain (see Table 8.4). The study considers the individual cost of each site class and attempts to resolve the issue of lumpy costs by differentiating the data into two time horizons. Horizon 1 is the initial costs of site establishment, which is when the most costly items occur. For their calculation, these costs have been distributed equally over a five year period. Horizon 2 refers to costs incurred in the years following the initial site establishment, which are consistently lower than for Horizon 1.

Table 8.4: Natura 2000 Management Costs in Macronesia

	Average cost (€/ha/year)		**Total cost (€/year)**	
	Horizon 1	Horizon 2	Horizon 1	Horizon 2
Macaronesian Pine forests	17	11	660,283	425,266
Thermo-mediterranean and pre-desert scrub	217	32	2,005,535	295,841
Endemic oro-mediterranean heaths with gorse	30	3	469,233	52,051
Macaronesian laurel forests and endemic macaronesian heaths	190	56	3,352,682	989,345
Olea and Ceranonia forests	64	-	7,670	-
Fields of lava and natural excavations	12.2	2.8	55,473	12,732
Other habitats from Annex1	54	31	409,968	235,352
Other habitats not from Annex 1	38	31	7,373,330	5,775,721
Marine habitats	29	25	4,872,667	4,200,575

Source: Sunyer et.al, 2002

- Birdlife International Study of Natura 2000 Costs

A recent BirdLife International study estimates the costs of 25 types of activities in the four major cost categories defined by the Financing Natura2000 Guidance Handbook (BirdLife International 2009). Research, one-off restoration activities, ongoing management, land purchase, compensation payments or incentives to land-users and education and communication are among the cost items highlighted by the study. It is difficult to provide cost estimates for specific habitats that are representative of the EU as a whole, as the nature of the costs will vary for each member state. Table 8.5 provides a range of per hectare costs of providing the entire Natura 2000 network in six Member States[151]. The data illustrate the great variation, which can provide insight into the assumptions required to extrapolate UK and Macronesian costs data to the rest of the EU.

The figures show that costs are cheaper in Slovakia and Bulgaria than in Spain, Austria or the UK because of the overall standard of living (BirdLife International 2000). Also, in Spain and the Netherlands the costs are more representative of on-going restoration work, which BirdLife identifies as more expensive than management costs. This theme is consistent across the EU, once a network is established the costs begin to drop: establishment is more costly than maintenance.

Table 8.5: Natura 2000 Management Costs

	Total annual costs (€m)	Size of Natura2000 network (ha)	Average costs per (€/ha/yr)
Austria	207	1,301,300	159
Bulgaria	271	3,759,000	72
Finland	127	4,800,000	26
Netherlands	209	1,100,000	190
Slovakia	62	1,377,425	45
Spain	2,749	14,286,090	192
Total	3,624	26,623,815	136

Source: Birdlife International (2009).

- Summary

Of greatest relevance to habitat banking are those habitats that can be restored over shorter timescales. Timescales over 50 years are unlikely to be commercially feasible (and generally timescales of up to 10 years are more likely). Many of the habitats with higher costs identified above have very long timescales for restoration. Table 4.1 in Section 4 gives estimated restoration timescales for different habitats. Several of the

[151] The report indicates that a lower level cost analysis was conducted by each of the six partners and these figures may be available upon request from each individual BirdLife Partner.

habitats identified in Table 4.1 were specifically considered in Rayment et al. (2006) UK BAP costing analysis.

The costs presented generally exclude land purchase costs (except in Germany). This is considered appropriate as habitat banking credits can be provided without change in land ownership. Indeed it is seen as a feature of habitat banking that it provides an incentive for conservation on private land. However, purchase costs may reflect the opportunity costs of using land to create biodiversity credits.

The data from the UK study suggest the costs of establishing credits will be of the order of €1,000 – €8,000 per hectare for 10 years. Costs for restoration (€1,000 – €4,000 per ha for 10 years) are generally lower than those for re-establishment (€2,500 – €8,000 per ha for 10 years), reflecting the reduced effort involved in the former.

In most (or possibly all) cases, a credit will need to be provided in perpetuity, and so the costs of an endowment or some other provision of long-term management resources should be added to this cost. At between 3% and 5% interest, management costs of €100 – €200/ha/yr would require an endowment of between €2,000 and €6,600 per ha. Therefore total costs for in-perpetuity credits would be expected to cost between approximately €5,000 and €15,000 per ha.

These costs are based on UK prices, which are likely to be higher than average across Europe due, for example, to the relative scarcity of land in much of the UK compared to the rest of the EU.

8.2.4 Measures to enhance supply

There are measures that can be undertaken to enhance supply of credits. Identification through regional spatial planning of what types of habitat are priorities for protection would help encourage supply of credits in those areas, for all levels of trade. Information about market potential is also important to securing supply. At the start of the BushBroker scheme in Victoria, Australia in 2006, in order to line up enough offsets to satisfy the demand under the new system, DSE advertised throughout 2006 to get Expressions of Interest, and DSE staff gave many talks to farmers and others who might contribute native vegetation credits through the scheme.

The existing agri-environment schemes in the EU may provide similar opportunities for investigating and encouraging supply of credits. For example, credits could be created if an area of land moves to a higher 'level' of agri-environment agreement, with the differences in biodiversity features between the two levels providing the credit.

However, it is important to consider whether such actions would be additional in the face of current policy objectives.

8.3 Comparison of supply and demand

The analysis of demand in Section 8.1 above shows a range of potential motivations for habitat banking. These are summarised in Figure 8.5 below. The range of potential sources of demand for credits runs from legal obligations, such as under the Habitats Directive, to purely voluntary actions. Voluntary actions may fully offset damage, be scaled to take account of the level of damage, or not scaled at all.

Our analysis suggests that the level of demand for credits would not be sufficient under current conditions to support a habitat banking system in Europe. Therefore additional drivers of compensation of biodiversity damage are required, which should be linked to further efforts to implement no net loss of biodiversity.

Motivation	Type of Action
Legal Obligation	Habitat Directive (Article 6(4)), Environmental Liability Directive requirements
	Actions required in guidelines but not in law (full footprint). Actions that enable planning permission for CSR purposes/license to operate: Voluntary full offset Voluntary scaled impact Voluntary not scaled impact
Purely voluntary	Corporate Social Responsibility motivated actions Altruistic behaviour

Figure 8.5: Range of Motivations for Demand for Credits in Habitat Banking

The supply of credits is difficult to predict. Analysis suggests that there is marginal land available in the EU that could be used to supply credits for some types of biodiversity. However, where the requirements (e.g. soil, topography, water supply) coincide with those of higher-value economic activities, credit supply could be a constraint on the size of the market. For example, habitats that occur in fluvial

coastal floodplains and require fresh water supplies in summer are likely to conflict with high land value areas for human settlement.

Credit supply also faces several risks, such as due to external market influences on the opportunity costs of land, and the long term management requirements that make some credits very expensive. Measures can be taken to manage these risks. Long term uncertainty can be mitigated by specifying favourable long term discount rates for credits, and defining the role of legal procedures like endowments that can be put in place for when permanent provision of credit is required.

The balance between supply and demand of biodiversity credits is an important consideration in the regulation of a habitat banking market. This is because it is desirable to avoid excessive price volatility, which increases longer term risks to suppliers and buyers, and therefore can restrict activity. Imbalances between supply and demand may not be corrected through market activity because trade may be restricted by the regulations necessary to establish the market and achieve biodiversity objectives. Imbalances can therefore persist, and can create perverse incentives, for example, where supply exceeds demand, there can be a risk that this increases pressure to allow negative impacts to be dealt with through credit purchases, potentially undermining the mitigation hierarchy.

Introducing a floor price can help manage risks with a habitat banking system. This could be achieved by Government commitments to purchase some credits over time. This could provide a minimum long term price for some volumes of certain types of credits, in line with national biodiversity enhancement policy objectives. This state demand could be put in place permanently, or as start-up funding to provide some certainty for suppliers during the establishment of the market.

8.3.1 A guide to price

At this stage of feasibility analysis, it is not possible to anticipate the balance between supply and demand and the likely price level that will result. Costs can vary significantly due to different land prices, and the complexity of restoration and maintenance measures. Given the limited scope of the current experience, there is also very little historical information to use. For example, recent data about prices are not forthcoming from Germany because transactions are undertaken within municipal authorities or state agencies, and private compensation agencies are not willing to give detailed information about costs of credits. In France, the pilot project in La Crau has estimated credit prices at €35,000 per ha. But this may not be representative of a typical habitat bank as the habitat involved is strongly protected and the site requires relatively complex restoration and management actions.

Given that credit trade (even in the fee in-lieu system) will take place only when credit price is at least equal to the cost of credit provision, we can look at the likely estimates of such costs. Section 8.2.3 provides some discussion and estimates of such costs from the UK (present value of €5,000 and €15,000 per ha). However, the market price of a credit will also reflect:

- Other non-biodiversity management costs (e.g. overhead costs, the costs of managing visitor access to land) which may be necessary to deliver a credit;
- The transactions costs involved for the credit provider, and where applicable in terms of any administrative fees charged by regulators to cover their costs;
- The required profit margin for the credit provider (which may be zero for an non-profit organisation);
- The availability of substitute credits that can be purchased if trading up is allowed for relevant debits; and
- The scarcity of the biodiversity resources in question.

Finally, it is expected that the price signals in a habitat banking market would influence supply, and therefore could change prices over time. A habitat banking market could stimulate supply from more cost-effective sources than currently anticipated, leading to reductions in prices.

9. Key design features of habitat banking

This Section provides a theoretical summary of the key design features of habitat banking, independent of the policy and institutional context being considered. Drawing on information presented in previous sections of the report and examples from around the world, this Section highlights key issues to consider when approving, designing and operating sites providing credits, including: legal authorities; site characteristics; credit releases; evaluating equivalence (ensuring that the expected benefits address the anticipated losses); financial assurances; technical operations; engaging stakeholders; and evaluating success. The proposals and discussion in Section 10 develop these issues, taking into account the current policy and institutional situation in the EU.

9.1 Legal authorities

9.1.1 Agency oversight/accrediting

Each Member State should identify an existing agency, (or create an agency if one is not available) to oversee the creation, management, and monitoring of credit sites. To ensure consistency of habitat banking requirements across EU Member States, periodic coordination of EU Member State habitat banking implementation processes should be encouraged.

9.1.2 Ability to transfer credits across country boundaries

While economic efficiency may warrant transfer of credits across Member State boundaries within similar ecosystems or eco-regions, significant accounting and tracking issues would need to be addressed in any trans-boundary transfer.

9.1.3 Habitat banking agreement

Authorities should oversee the creation of model habitat banking agreements to ensure they cover all of the appropriate components. At a minimum, agreements should consider the following:

- Duration of the agreements (usually, these agreements are in principle into perpetuity);

- A management plan (should specify measurable goals; steps to accomplish those goals; and a timeline to meet the goals);
- Management actions required according to that plan (before and after sale of credits);
- Rights and responsibilities of each party involved;
- Number of credits that can be sold (linked or not with the management actions to be taken) from a given area with specific guidelines to address potential double-counting;
- Timing of the creation of credits and their release for sale (*ex ante* or *ex post*);
- Use restrictions of the site providing the credit (e.g. whether to allow the public to use the site for recreation);
- Monitoring, reporting and auditing requirements (should specify measurable goals; steps to accomplish those goals; and a timeline to meet the goals);
- Specific performance standards;
- Financial assurances both for long-term and short-term funding;
- Permitting access to the site providing the credit by specified persons (e.g. for monitoring or verification purposes);
- Issues relating to the transfer of the land providing the credit; and
- A contingency plan (e.g. how to deal with unforeseen incidents that impact the habitats provided by the credit, such as bankruptcy; fires and floods; and the impacts of climate change).

9.2 Site Characteristics

Agencies should consider the following four questions when deciding whether habitat banking is an appropriate approach to offset losses of a species or its habitat, and if it is, what other issues should be considered.

9.2.1 Is it appropriate to use a habitat bank for a particular resource (habitat or species)?

Agencies should determine whether there is sufficient information about the life history of the species, its habitat needs, current and anticipated threats, how long it is expected to take to restore its habitat, and other relevant information to evaluate the feasibility and efficacy of habitat banking. The availability of this type of information helps to reduce the risk of uncertainty and to increase the chances of success.

9.2.2 What type or degree of compensation is necessary?

Agencies have several mechanisms to consider when determining the type of compensation needed for a particular species or habitat in order to offset losses: restoration, creation, protection, and enhancement. In some circumstances, a combination of these mechanisms may also be possible. The mechanism used really depends on the needs (current and anticipated) of the biodiversity in question, which also relates back to the amount of information available for that species or habitat. If, for example, a species requires a lot of contiguous habitat, it may make sense to create additional habitat around existing patches of protected habitat to increase the amount of land available to the species and reduce fragmentation. In this example, restoration may also be a viable option if the restored land is connected to currently protected habitat patches. The mechanism for compensation should be determined on a case-by-case basis, depending on the needs of the biodiversity in question.

9.2.3 How large should the bank be and where should it be located?

The size of the credit site

Credit sites should be large enough to sustain a viable population or habitat in perpetuity. As previously mentioned, many species in the EU are threatened by habitat loss and fragmentation. Credit sites should be located in areas and sized so as to reduce the threat of habitat fragmentation and resulting edge effects. Edge effects are influences on the edge, or buffer area, of a habitat. The inclusion of a buffer area provides separation between the interior and exterior of the habitat. For many species, the amount of interior habitat is crucial for survival.

In writing a contingency plan, site managers should consider the effects of climate change on species or habitat viability and the long-term success of the credit site. Climate change may influence the overall quantity of habitat that effectively provides benefits in the future.

The location of the credit site

When deciding appropriate locations for credit sites, several factors must be considered in relation to ecology, socio-economics and governance issues. First, agencies and site managers should consider whether “in kind” compensation is required or if “out of kind” compensation should be allowed for a given species or habitat type. In-kind compensation refers to conservation of the same type of resource (e.g. specific type of habitat, species, subspecies, or population of a species) as the one that was damaged. In general, we recommend using “in kind” compensation wherever possible. There are, however, circumstances that could justify using “out of kind” compensation. If agencies decide to use “out-of-kind” compensation, they need to provide justification, ensure the compensation is ‘like for like or better’, and ensure that transfer ratios (the rate at which one species or habitat is exchanged for

another) are based on ecologically relevant criteria and provide strict guidelines in the banking agreement.

Agencies and site managers should investigate current and future land-use policies in the areas surrounding the proposed bank. In general, credit sites should not be located on lands where development is likely in surrounding areas or on lands previously designated for other uses, conservation or otherwise. Significant changes in land use in the region can significantly affect the overall functioning of a credit site. An inconsistent surrounding land-use policy can undermine the goal of habitat provision and disrupt the stream of benefits from such a policy.

9.2.4 How should we define a bank's service area?

Related to the idea of size and location of a credit site is the geographic area serviced by the credit site. Service area refers to the area within which habitat or species loss can be offset by a credit from a specific location. It is determined by the type of resource being protected and physical limitation for creating offsets. For example, if the goal of the credit is to offset the loss of wetland habitat and function in a particular watershed, the credit site should be located in the same impacted watershed. If, however, the goal is to protect an endangered species, the credit site should be located in an area that provides high quality habitat suitable for that particular species. Specific biodiversity legislation (e.g. Natura 2000) may determine the relevant distance to ensure coherence of the protected habitat.

In general, credits should be limited to offset damage only within a closely subscribed area (e.g. watershed, eco-region). However other factors may prevail such that offsets occur at some distance from the damage site. For example, if there is no suitable habitat in the area for damage offset (e.g. the watershed in the case of wetland mitigation).

Defining the service area also has social equity implications. Credit sites far away from the damage may not provide the necessary benefits to stakeholders adversely impacted by the losses. As a result, agencies should solicit stakeholder input when defining the service area, as well as the size and location of the credit site. To the extent possible, stakeholders who realise losses should realise the benefits offered by the credit site.

9.3 Credit releases

9.3.1 Ex ante and/or ex post

One of the main issues agencies and site managers should consider with regard to credit releases is whether to allow credits to be sold before the credit site is fully functional (ex ante) or only after the bank is fully functional (ex post). By fully functional, we mean that the credit site provider has already created, restored, enhanced, or protected viable habitat, ecological improvements have occurred and been documented and there is management, monitoring, and funding in place to ensure that the expected credits will materialise in the future as planned. It is preferable that credits be fully functional before they are sold.

Releasing credits before the credit site is fully functional transfers risk from the credit provider to the purchaser of credits, and possibly regulatory agencies, and should only be allowed if the banking agreement includes certain provisions stating that the responsible party is released of its obligation to compensate for losses only when the credit site becomes fully functional at expected levels. These provisions should provide a timeline for when the credit site should become functional and a process for what to do in the event that the credit site does not become functional within this stated time. If regulatory agencies allow credits to be released before the bank is fully functional, they will have to determine the length of time before the bank is functional at which this is acceptable. The earlier credits are released, the greater the risk to purchasers and agencies.

9.4 Evaluating equivalence

Determining the equivalence between the type of damage and offsets or habitat banking credits is a significant technical challenge in habitat banking and biodiversity offset systems. This is partly because of the breadth of disciplines spanned by the subject, including ecological methods, environmental economics, mathematics of time discounting, and social equity issues. Nevertheless, our ability to reasonably estimate equivalence between gains and losses is possibly the issue most critical to the idea of biodiversity offsets. Without sufficient consensus on equivalence, the credit provision remains a type of compensation and not a true biodiversity offset that has achieved no net loss.

The idea that compensation through offsets or habitat banking credits can achieve a no net loss or a net gain of biodiversity rests on the assumption that it is possible to measure what has been lost and what has been gained, and that these measurements are meaningful to the impacted stakeholders and authorities. The units for measuring the expected benefits (credits) of a habitat bank must be the same as the expected losses (debits). Ideally, the units would measure the losses directly (e.g. some biological criterion); however, in practice, this proves difficult. Most often, indirect units (or proxies) are used, such as acres of habitat or the number of species protected.

To calculate equivalence most accurately, we recommend choosing a unit on a case-by-case basis and providing justification for this choice in the habitat banking agreement and clearly defining what categories of damage any credits may be applied against. However, in other cases (e.g. where damage is so small that the transactions costs of case-by-case assessments are not justified), simplified checklist-based equivalence calculations may be appropriate.

When determining categories against which credits may apply, agencies should at a minimum consider and incorporate the following:

- Quality of habitat selected for the credit site;
- Ecological connection to damage;
- Proximity of bank to damage site;
- Temporal differences between when damage occurs and credits begin;
- Social equity (Who suffers from the loss and who benefits from the gain?);
- Amount of available information on the species or habitat;
- The contribution to regional recovery efforts, and
- Anticipated threats to resource(s) for which compensation will be required (e.g., invasion of exotic species, development around the credit site).

Agencies should evaluate these considerations in a formal manner through the use of equivalency analysis tools depending on the type of resource being protected by the credit site (e.g., habitat, species).

Agencies must also consider the incidence over time of biodiversity losses and gains. Any time lag between when the injury occurs and the compensation benefits are received results in a temporal loss of resources or functions. Two ways to minimise this temporal loss are (1) to prohibit credits from being released ex ante of their delivery, and (2) to prevent project proponents from causing damage until they have purchased credits. If temporal loss is unavoidable (for example, if the injury has occurred from an unforeseen accident), agencies should use equivalency methods to address temporal differences between when damage occurs and credits begin.

9.5 Financial assurances

A key part to ensuring a credit site's success is securing both short-term and long-term funding in advance of selling credits. The details of the financial assurances should be provided in the banking agreement, including a plan for contingency funding in the event of a natural disturbance (e.g., fires and floods) or other phenomenon (e.g., invasion of exotic species). Sufficient funding in the form of an endowment or annuity for credit site management, ecological monitoring and oversight should be in place prior to the sale of credits.

9.6 Technical operations

9.6.1 Management

Successful operation of a credit site requires a management plan that anticipates the needs of and threats to species/habitat/wetland being protected by the site (e.g. provisions to prevent illegal dumping, off-road vehicles, invasion of non-native species, etc.). Long term management plans, reviewed by relevant stakeholders, should be an integral component of any banking agreement. Management plans should identify performance goals and take into account risks and uncertainties including the potential effects of climate change on the overall functioning of the site. Adaptive management actions to ensure the credit site's performance goals are met should be described in the overall management plan, and should indicate how monitoring data will be used in making adaptive management decisions. Financial resources should be identified to address the needs of potential adaptive management actions.

9.6.2 Monitoring

The Management Plan should include both financial and ecological monitoring plans to ensure viability of the credit site. Financial monitoring plans should follow established and relevant accounting principles. Ecological monitoring plans should detail monitoring goals, timing and reporting mechanisms and should establish criteria to monitor the status of the protected area or species. For example, if trying to replace a wetland function, the specific indicators that will be monitored for that wetland function should be identified. Both financial and ecological monitoring plans should be made available to the public on an annual basis. Ecological monitoring can further distinguish between monitoring the actions required by a management plan, and the outcomes actually obtained from the credit.

9.7 Engaging stakeholders

Agencies should allow input from impacted stakeholders before approving any credit for sale. Stakeholders' involvement is important so that they do not engage in activities that reduce the function of the credit site's habitat (e.g., illegal dumping, improper habitat use) and so that they understand the purpose and goals for the site. Site management plans should include stakeholder involvement.

9.8 Evaluating success

A habitat banking system in the EU will be considered a success if it supports biodiversity protection, and sustains delivery of ecosystem services in locations beneficial to European citizens, even in the face of climate change and continued economic growth. Assessing the factors of such success will involve defining the likely objectives of the habitat banking scheme(s), and include criteria and methods for:

1) Evaluation of *programmatic success*, and the role of credit sites in helping achieve goals such as reversing the decline in biodiversity, and
2) Evaluation of *specific offset projects* (from the perspective of both the damage site and credit site) against the original banking agreement and their success in meeting targets for biodiversity goals (overlap to monitoring and evaluation above).

These two levels are closely related because one of the difficulties in programmatic success can be the failure to establish consistent metrics for the success of individual projects (NRC 2001; Breaux and Serefiddin, 1999).

10. Considerations for designing a successful habitat banking system in the EU

Based on all the theoretical and case study reviews presented earlier in this report and its Appendices, this Section outlines suggested considerations for designing a successful habitat banking system in the EU. It presents the overall habitat banking system design in the context of the EU's overall biodiversity policy; illustrates how habitat banking would work and who would be involved; identifies possible mechanisms for trading; describes the habitat banking market, including the types of resources that could be traded, where they could be traded, and when they could be traded; and presents the trade-offs of using a fee in lieu of credit system and a bespoke debit-credit system.

This section also highlights some key challenges associated with habitat banking such as avoiding perverse incentives and ensuring additionality of credits and displacement of impacts. Finally, this section concludes with challenges associated with using ecosystems services (as an alternative metric to biodiversity) to calculate credits and debits and with ideas to integrate other policy goals (e.g. climate change adaptation, nature conservation objectives, ecosystem services, social equity issues, and planning and economic development objectives) into the habitat banking system.

Some of the design suggestions and guidelines described below will be subject to necessary policy developments, in particular new legal requirements to stimulate sufficient demand for credits to make habitat banking a viable system. The formulation of such laws would influence the final form of habitat banking and thus this guidance.

10.1 Overall system design

The overall habitat banking system design is the product of the existing drivers for demand (as outlined in Section 8), the benefits and additional flexibility habitat banking could provide and the potential (but very real) risks that may threaten its success. We suggest three different ways that credit provision within a habitat banking system could potentially support EU biodiversity policy, particularly regarding the achievement of no net loss:

A. **Providing credits to meet the requirements of current EU level legislation.** One relevant context for this option is compensation for residual impacts on Natura 2000 sites. Since Article 6(4) HD specifies strong like-for-like rules, credits will have to be specific to the type, location and scale of debits (biodiversity

damage)[152]. This restriction is likely to reduce (but not eliminate) the opportunities for habitat banking for Natura 2000 sites. It also means that equivalence must be determined through bespoke assessment of each case. Our analysis of major infrastructure development types in the EU suggests that there would be little demand from Natura 2000 compensation requirements for the types of credit that most habitat banks would provide (see Section 2.1.3).

Another relevant context is HD articles concerning the conservation of important landscape features (Art 10) and strictly protected species (Art 12). These Articles imply the objective of no net loss of biodiversity, but do not explicitly require compensation actions. Improved and strengthened guidance recognising a role for habitat banks as a mechanism for residual biodiversity damage to be used as offsets in relation to these Articles could potentially stimulate substantial demand, but this would depend on individual Member State's interpretation and implementation of national laws/policies.

The ELD requirements for compensation are also relevant for this option. These requirements can be viewed as less stringent than HD requirements in terms of having a like-for-like match, though care still needs to be taken to ensure habitat banking achieves no net loss. For this reason, habitat banking is more likely to be suitable for ELD (including interim losses) than HD. However, ELD related credit demand may, for two reasons, also be low and unpredictable. Firstly, the ELD has so far not yielded a significant number of damage cases in most Member States due to the slowness of transposition and implementation. Secondly, the primary objective of ELD is prevention of incidents by making the financial cost of likely damaging activities greater to those undertaking them, and hence lead to more prevention rather than more compensation actions. In situations when compensation is necessary under the ELD, if a functioning habitat banking market has developed for other reasons, it might also involve transactions in this context.

Finally, the EIA and SEA Directives also have potential relevance for this option, as they provide many of the steps required to identify debits. At present, however, they do not lead to much actual compensation activity.

B. **Providing credits to offset residual damage on species populations and their habitats, which are of conservation importance, but for which compensation is not currently a legal requirement.** Here, new EU-wide regulatory drivers would be required to create demand for credits to compensate for residual impacts on biodiversity outside Natura 2000 sites (e.g., from substantial infrastructure projects). Although such requirements exist in some Member States (e.g. through

[152] Under Natura 2000, compensation measures tackle significant impacts (that have to be avoided as much as possible) and are envisaged only in the absence of alternative solutions and if the project can justify imperative reasons of overriding public interest.

planning regulations[153]), their strength and enforcement is currently variable. Existing practice could be strengthened by policies that require no net loss of biodiversity and the use of habitat banks. As habitat banking can often provide compensation at lower per unit costs, its use could reduce obstacles to achieving any such requirements. The nature of the biodiversity resources affected (being of conservation importance) would require bespoke calculation of equivalency between debits and credits.

C. **Providing credits to offset cumulative impacts on biodiversity that are currently not covered by any legal requirements.** This option covers cumulative impacts on biodiversity other than that covered in options A and B above. The type of biodiversity that will typically fall under this category includes widespread and common species rather than endangered or threatened species. Impacts on widespread and common biodiversity are often insignificant when considered in isolation, but when considered cumulatively are a significant factor in ongoing biodiversity decline in the EU. New legal drivers would be needed to generate demand beyond what there would be voluntarily. The credit trade for this type of damage needs to be simpler to reduce transaction costs since the individual, low level impacts (e.g. housing developments on previously agricultural land or damage covered by ELD but not deemed significant) may not justify bespoke calculation of equivalency between debits and credits.

Both B and C could enable more effective application of the mitigation hierarchy. The aim should be to compare the conservation benefits of the various potential mitigation and compensation measures (taking into account their cost-effectiveness, risks and reliability) to identify the combination that provides the greatest net conservation benefits.

The options above identify the relevant laws and policies in the EU that could accommodate a habitat banking system. They also highlight the need for new laws and policies to address types of biodiversity loss that are not currently covered under existing laws or policies. Option C would represent a new compensation obligation for biodiversity damage, covering biodiversity impacts that do not qualify under options A and B above because a) the biodiversity is not in an endangered state or they are not rare enough (i.e. widespread and common species), or b) the impacts are not significant enough.

The design features of a habitat banking system should be based on three attributes: the conservation status of the biodiversity impacted, the scale of the damage and the options available for compensation (e.g. additionality and feasibility of protection and/or restoration). These attributes are the axes of Figure 10.1.

[153] For example, the Impact Mitigation Regulation in Germany.

As shown in the bottom left of Figure 10.1, compensation measures are generally more appropriate when they address residual impacts on biodiversity that is more widespread/less threatened and when there are more compensation options available (additional protection, restoration or re-creation).

Towards the top right of the diagram, biodiversity is of very high value and even irreplaceable, thus equivalency of credits cannot be ensured. This type of biodiversity is not suitable for habitat banking and strong legal instruments need to be in place to protect these resources and avoid impacts on them.

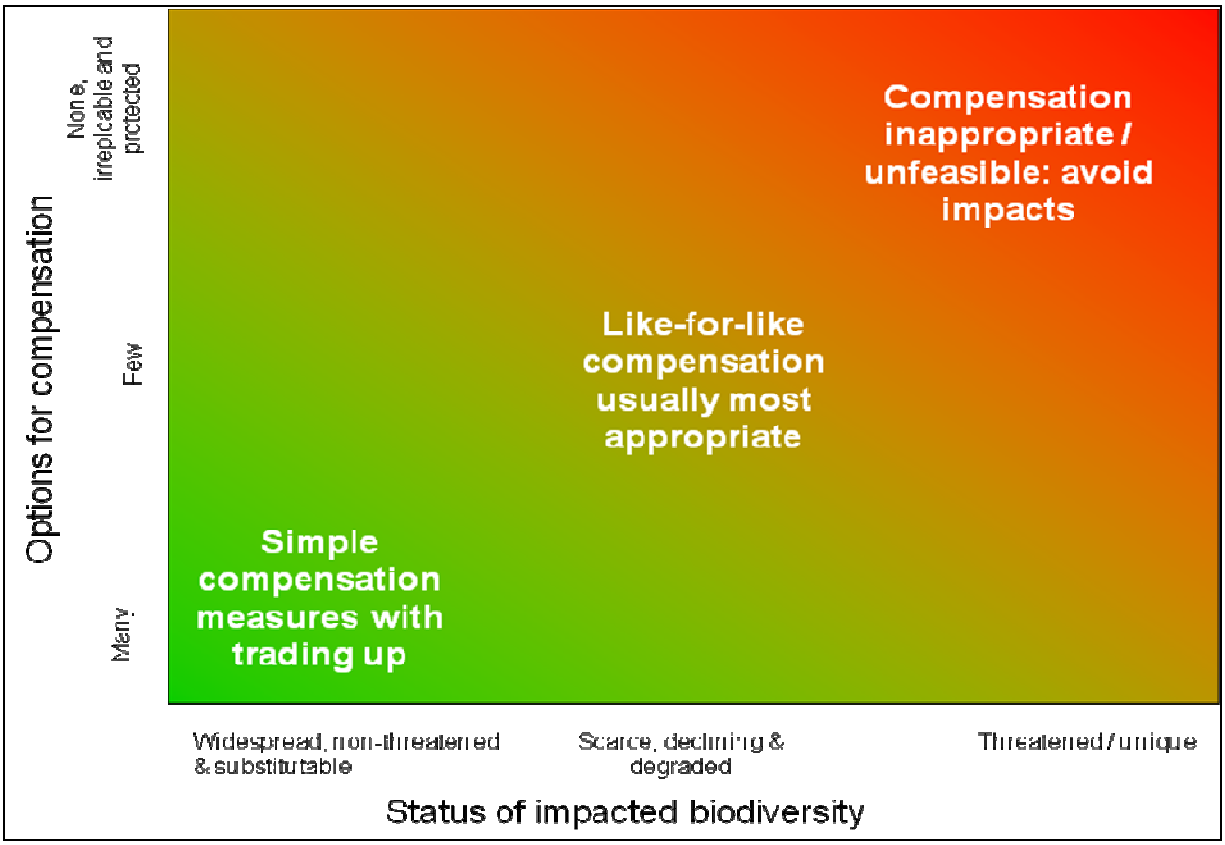

Figure 10.1: Appropriateness of compensation in relation to the type/importance of impacted biodiversity and availability of reliable compensation options
Source: adapted from BBOP (2009).

Table 10.1 presents our analyses of four categories of biodiversity, which are based on the attributes in Figure 10.1: (I) critical and protected, (II) threatened and protected, (III) scarce or declining and unprotected, and (IV) widespread. It outlines the current compensation regime that applies to each category and indicates the possible future regimes and policies that are needed for habitat banking to be appropriate and functional (in particular for Categories II and IV). Finally, the table concludes with an indication of whether habitat banking would be an appropriate mechanism for

compensation, and what type of habitat banking would be appropriate for each category.

Thresholds between the biodiversity categories need careful definition, based on existing thresholds in current laws and policies where possible and appropriate. The definition of the categories in Table 10.1 combines two further dimensions to those used in Figure 10.1: policy and legal requirements for protection and compensation, and irreplaceability. This may give rise to difficulties in precise ex-ante definition of the categories, and therefore expert judgement may be required to interpret conservation data to determine which category an impact falls in.

Thresholds between the biodiversity categories in Table 10.1 can be defined using information identified in impact assessment requirements under HD Article 6(3) (i.e. Appropriate Assessments) and the SEA and EIA Directives. Further, impact assessments should be the standard process to assess the importance of potentially impacted biodiversity and to deduce the need / appropriateness of compensation measures. These assessments should take into account existing biodiversity policy objectives and appropriate criteria/thresholds for the evaluation of biodiversity importance. However, they should be programme/project specific as the importance of biodiversity resources will vary according to location etc. The main reference legislation for such impact assessments is the Habitats and Birds Directives, but lists of important sites (e.g. Important Bird Areas) and species of national or local conservation importance (such as included in Biodiversity Action Plans) should also be considered.

Category I biodiversity includes protected biodiversity with critical conservation status. Compensation systems are not relevant here, as it is viewed as off-limits for damages due to its critical status, the long time frame for habitat restoration/creation or the long regeneration time for the impacted species (i.e. irreplaceability).

Category II biodiversity captures species and habitats (other than those in Category I) of Community interest and nationally protected species that are designated features of Natura 2000 sites that clearly require compensation measures under HD Art 6(4). Other species and habitats that receive similar protection and are subject to legal compensation requirements also fall within this category.

Identifying thresholds between biodiversity categories III and IV is particularly complex and further guidance will be necessary to address this issue. For example, there are species that are widespread in the EU but rare in particular countries, so the appropriate level for categorisation would need to be decided. But as noted above, decisions on appropriate compensation would normally be dealt with through a programme or project specific impact assessment.

Alternatively category IV could be defined through functionality (ecological parameters) and ecosystem services (benefits to humans). This would bring benefits of

simplicity, through a checklist for the main ecosystem services based on broad habitat provision. However, it would bring a significant risk of undermining no net loss biodiversity objectives, as it could lead to compensation efforts being directed into interpretation and social appreciation of nature rather than actual biodiversity outcomes.

The eventual design of any system should consider the outcomes for biodiversity, as well as the legal and practical issues discussed above. This depends partly on the key factors that are preventing achievement of the no net loss biodiversity objective, and where the focus of new policy efforts should be, for example, with respect to the need for additional protection of sites, restoration of habitats or measures to deal with cumulative impacts in the wider environment. The appropriate policy objectives will clearly vary according to the status of biodiversity and pressures on it in each Member State.

Two other issues are raised in discussing the use of habitat banks as compensation to different biodiversity categories: trading between biodiversity categories; and identifying an appropriate compensation framework. Trading between biodiversity categories in Table 10.1 can occur in the case of purchasing credits from a higher category (trading-up from the right to the left). If trading-up is allowed, guidance will be needed on how equivalency methods should be used to determine the appropriate trading ratio. Trading in the other direction (trading-down from the left to the right) is not appropriate.

Three types of compensation frameworks emerge from the above discussion and the conclusion in Table 10.1[154]:

- **Bespoke offsets** (for Category II in Table 10.1) – when strictly regulated compensation is required due to legal instruments but when compensation options are limited. Debit and credit calculations need to be specific to the damage case. Bespoke offsets will likely be too limited in number and too case-specific to predict and prepare credit in advance of damages. Therefore, although possible, compensation for damages to Category II biodiversity will not usually be delivered through a habitat banking market.
- **Credit trading using bespoke equivalence methods** (for Category III and in some cases Category II in Table 10.1) – when compensation for residual damage is encouraged or required due to policy instruments (such as impact assessment and planning processes) and there are appropriate reliable compensation options, credits may be estimated in advance. Debits and credits need to be assessed on a damage specific basis, using the most appropriate methods for each case (equivalence methods). There is currently some demand for trade, but this would

[154] Note that Category I in Table 10.1 is not suitable for any form of offsetting or credit trading. No negative impact should be allowed.

be significantly increased by an EU No Net Loss (NNL) policy underpinned by strengthened legislation.

- **Credit trading using a simple checklist-based assessment of debits** (for Category IV in Table 10.1) – when compensation is currently not required but could be encouraged by an EU NNL policy and new legislation, and when individual debits would be too small to justify estimating bespoke equivalence. Here debits could be determined using a pre-defined list of biodiversity features. The purpose is to keep the transaction costs sufficiently low to ensure cumulative effects that are not compensated for at the moment are compensated under a habitat banking system. These debits could then be compensated using one of three methods:

  i. Purchases of equivalent credits in a habitat banking system, with equivalence also assessed through pre-determined rules;
  ii. Purchase of credits over-the-counter from a public agency (which manages the supply and price of credits); or
  iii. A fee in lieu of credit system, with payments made to an independent fund, which would purchase credits from habitat banks to offset several debits at once.

  Options (i) and (ii) are carried out in Victoria, Australia for compensation for the loss of native vegetation (see Case Studies Appendix). However, that scheme has notable differences from the situation in Europe. It focuses on native vegetation, addressing biodiversity components of higher importance than envisaged under a checklist based system in Europe. In Europe low level impacts would not involve native vegetation that would clearly require like-for-like compensation rules (if they did, it would trigger higher level – Category III compensation requirements). For example, the loss of an arable field to a development would have some impacts on biodiversity, (e.g. on associated farmland birds). However, it would not be appropriate to compensate for its loss by creating another arable field.

  In option (iii), the suggested independent fund would have the ability to purchase credits to execute strategic conservation priorities and maximise the benefits of delivering no net loss. The rationale for creating an independent body to allocate funds is that a rule based system for calculating credits would be either too simple to optimise biodiversity benefits or too complex to administer with reasonable transaction costs. The independent body would include biodiversity conservationists who would use their combined expertise to use credits in the most strategically beneficial manner. In contrast a simple rule-based scheme (i or ii above) can incentivise strategic benefits (e.g. from trading up), but cannot ensure it. However, the suggested independent fund would need to be carefully designed to guard against possible risks of introducing fee-based systems, including political interference, by:

- Being legally constituted with appropriate biodiversity expertise and multi-stakeholder governance (i.e. not a purely government run body);
- Having the sole purpose of using the fees to ensure no net loss (and wherever possible, net gain) of biodiversity; and
- Having an obligation to adjust damage costs according to the costs of purchasing credits, ensuring that they remain adequate to implement no net loss of biodiversity.

Many aspects of Table 10.1 will need to be examined in more detail. In particular, the effectiveness of a habitat banking system in the EU will depend on:

- Accurate assessment of the status of biodiversity by types, and the likely impacts;
- Clear definition and enforcement of thresholds for the level of damage that is significant enough to trigger compensation requirements;
- Reliable assessment of the risks and benefits of compensation options generating credits; and
- Appropriate implementation of the mitigation hierarchy.

Table 10.1: Relevance of habitat banking under alternative potential EU compensation approaches				
Biodiversity categories \ Features**	**I. Critical (irreplaceable) and protected**	**II. Threatened and protected** (e.g. HD habitats/species in Natura sites)	**III. Scarce or declining and unprotected** (e.g. in national Biodiversity Strategies and Action Plans)	**IV. Widespread** Widespread, stable, common, of sub-national significance
Compensation strategy	Untouchable/ not offsetable.	Implementation of existing legal requirements for compensation for habitats & species in Natura 2000 sites.	Development of compensation requirements for nationally protected sites and species; biodiversity included/ targeted in national Biodiversity Strategies and Action Plans.	Development of simple low-cost compensation requirements for biodiversity of sub-national significance and/or current low conservation priority. Also biodiversity of local interest.
Factors to consider:	Irreplaceable defined as long time frame for habitat restoration/ creation, or long regeneration time for species.	Formal protection in place with requirement to maintain conservation status of populations and integrity of sites (strict No Net Loss (NNL) policy with associated legal requirement)	Prioritised for conservation action and subject to specific targets. These can form the basis for NNL policy. Modification of policy required together with introduction of legal requirement for broader range of European biodiversity	Mechanism needed to deal with cumulative impacts.
Importance and/or condition of biodiversity	Extremely rare / highly restricted distribution; or otherwise highly threatened	Rare or otherwise threatened globally and/or in significant parts of the EU. Habitats and species theoretically restorable within reasonable timeframes	Rare, scarce or declining in at national or sub-national levels, although potentially common in parts of the EU. Habitats and species theoretically restorable within reasonable timeframes	Ecologically valuable habitats and native species that are widespread and common with stable ranges and populations. Also ecologically insignificant populations of scarce declining species. Short timeframe for recovery/ regeneration and techniques straightforward.

Biodiversity categories \ Features	I. Critical (irreplaceable) and protected	II. Threatened and strictly protected (e.g. HD habitats/species in Natura sites)	III. Scarce or declining and unprotected (e.g. in national Biodiversity Strategies and Action Plans)	IV. Widespread Widespread, stable, common, of sub-national significance
Significance of potential impact (scarcity, replicability, threat)	Significant proportion of resource affected; viability or integrity of remaining resource compromised, resulting in high threat of extinction & like for like replacement not feasible	Significant residual impacts which cannot be avoided or reduced to acceptable levels, such that integrity of site compromised or conservation status of population declines. No acceptable options for on-site mitigation.	Significant residual impacts which cannot be avoided or reduced to acceptable levels. Offset required to achieve NNL or a Net gain.	Significant cumulative impacts possible from small individual impacts. If NNL required to be demonstrated for every development proposal, notional minimal impact can be assumed to avoid need for impact-specific loss/gain accounting (e.g. through in-lieu payment that minimises transaction costs).
Legal status	Likely to be under strict international protection (HD)	Strict international protection (HD)	National protections	Limited or nil (may exist but not triggered by individual impacts because small)
Example	Iberian Lynx, Primeval forest	Intertidal saltmarsh	Freshwater grazing marsh	Farmland hedgerows
Legal mechanism	Habitats and Wild Birds Directives	Habitats and Wild Birds Directives	Less strong, depending on national law	Usually none at present
Damage impact that triggers compensation/ offsets	Any impact on the condition of the biodiversity resource	Any significant impact on habitats and species on Community interest that are notified features within a Natura site	Any significant* impact on the condition of the biodiversity resource *Thresholds would need to be defined	Impacts that are individually insignificant, but which are likely to contribute to significant cumulative impacts
Appropriate-ness of compensation/ offsets	Nil (not possible)	Only in very limited circumstances (i.e. no alternatives and overriding public interest)	Often appropriate	Usually appropriate (but lower benefits mean need to minimise transaction costs)

Biodiversity categories \ Features	**I. Critical (irreplaceable) and protected**	**II. Threatened and strictly protected (e.g. HD habitats/species in Natura sites)**	**III. Scarce or declining and unprotected (e.g. in national Biodiversity Strategies and Action Plans)**	**IV. Widespread Widespread, stable, common, of sub-national significance**
Level of demand for credits	None for like for like trading. With trading up, demand possible.	Very small for most habitat types- as per overriding public interest test. Compensation currently favoured on or close to site. But see trading up.	Low at present, more could be stimulated by stronger requirements on damaging activities (new/reinforced compensation trigger)	Would need new instrument to trigger compensation
Level of supply of credits	N/A for like for like trading. Possible supply of highly protected biodiversity under trading up.	Limited ex-ante of damage because of low demand and strict legal requirements (specific habitat and species equivalence). Can be possible (e.g. established block of habitat within larger area of recreation/ restoration only sold ex-post of establishment) OR possibly through other additional actions within N2K sites.	Potentially strong for some habitats, mostly like-for like, (wider margins of delivery & fewer legal restrictions than HD). Depends on supply of land, timescales of restoration, etc.	Feasible – some like for like (e.g. enhancement/restoration) but trading up to other BD status categories will usually provide better biodiversity outcomes.
Equivalency methods	N/A because irreplaceable	Like for like (based on area x quality measure), with high multiplier reflecting scarcity	Strict but may allow trading up: like for like or better.	To minimise transaction costs, apply value-cost method or other methods through a 'menu' / 'checklist' approach.
Appropriate mitigation hierarchy	Avoid impacts at all costs	Avoidance and appropriate mitigation legally required: compensation is last resort	Chose combination of measures that provide the greatest reliable biodiversity benefits	Following minimisation of impact, compensation with trading up usually most appropriate
Conclusion	Offset not appropriate because of high scarcity of the resource and infeasibility of replacement.	Mostly dealt with through bespoke offsets – habitat banking may play a role, but demand too weak to support most banks for most habitat types on their own	Better enforcement of existing requirements and addition of new compensation trigger(s) needed – then habitat banking could be widely used	New compensation trigger(s) needed – then payment-based habitat banking could be widely used

10.2 How will habitat banking operate?

This section highlights more aspects about how habitat banking in the EU could actually operate in practice. Based on the discussion in Table 10.1 regarding the types of biodiversity loss that may, and may not be offset by habitat banking, Figure 10.2 places habitat banking within the overall context of compensation for residual biodiversity damage. It shows that habitat banking is appropriate when there is damage that requires compensation but does not require bespoke offsets to be created (i.e. Categories III and IV in Table 10.1).

Figure 10.3 outlines how credit trading using the bespoke equivalency methods and checklist-based options outlined in Section 10.1 could operate in practice. Figures 10.2 and 10.3 introduce different actors in the habitat banking market: 'buyers' who seek ways to compensate the damage they cause; 'sellers' who create credits; and 'third parties' who play different roles. As a market driven by regulation, there must also be a public body who is the regulator overseeing the process, (other public bodies may be buyers and sellers) including the third-party roles, and ensure the system runs smoothly and is not affected by the risks outlined in Section 4. These parties and their roles are described in more detail in Section 6.

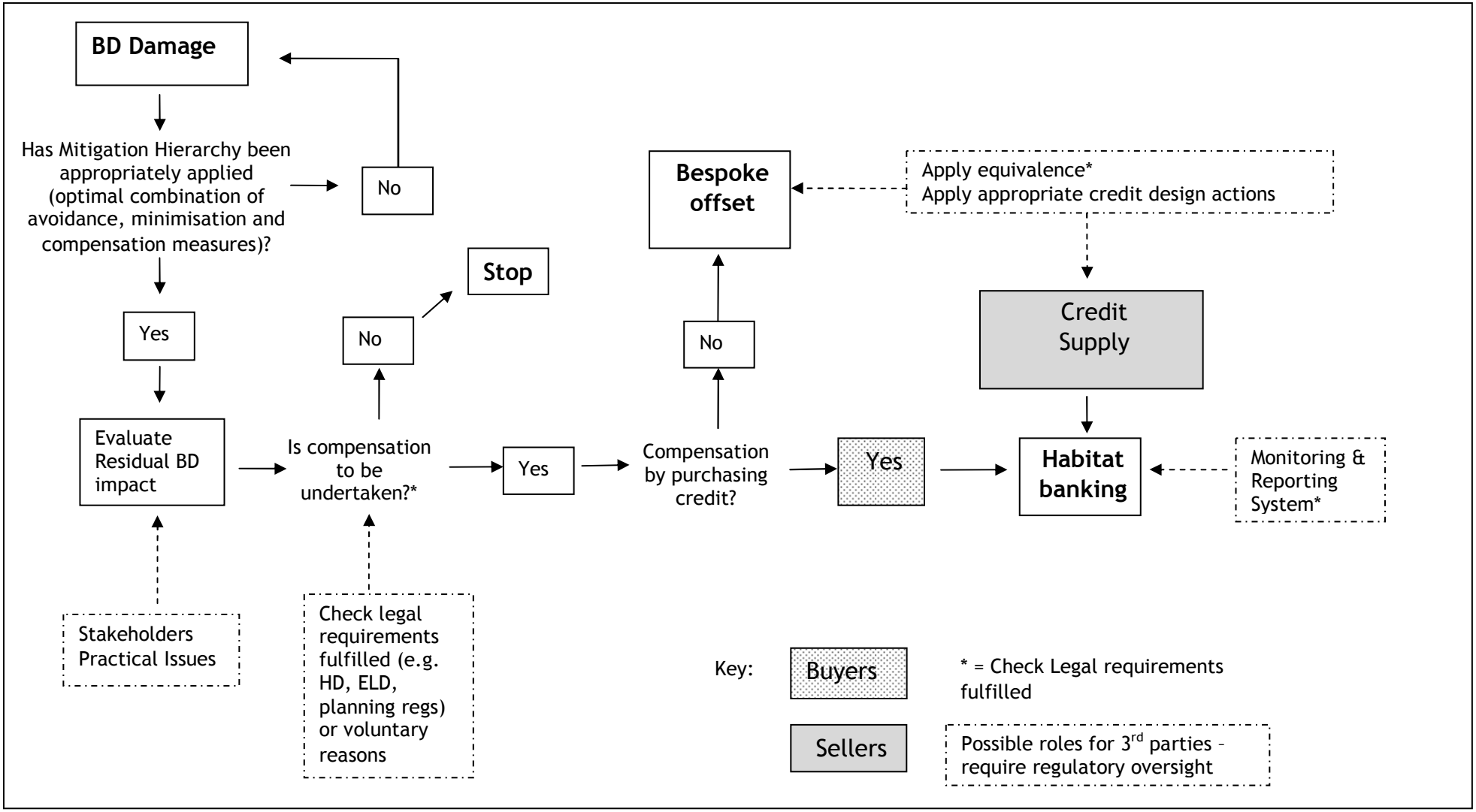

Figure 10.2: Role of Habitat Banking in Process of Compensating for Residual Biodiversity Damage

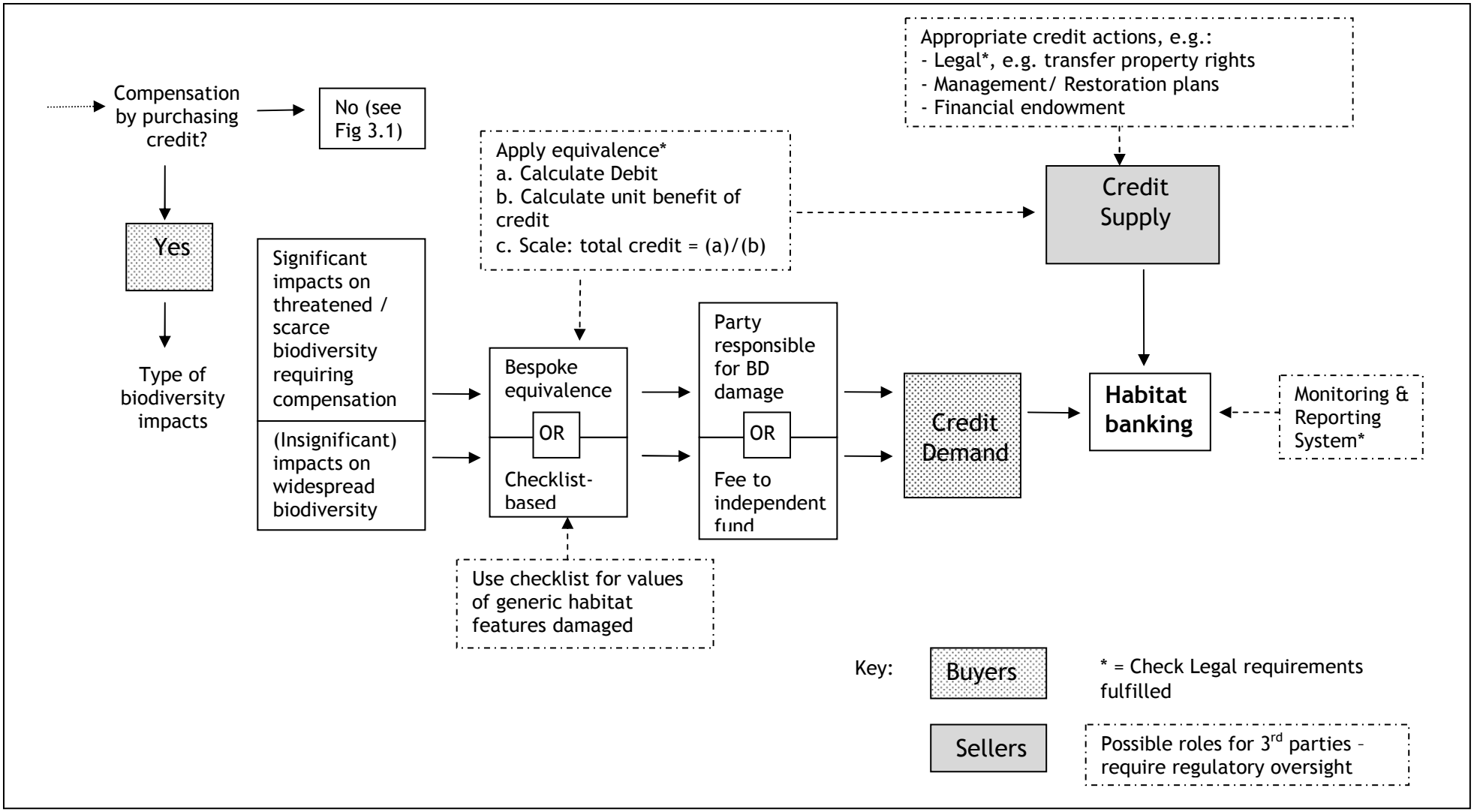

Figure 10.3: Process of Matching Debit and Credit in the Habitat Banking System

The bullets below describe the different actors involved in a habitat banking systems outlined in Figures 10.2 and 10.3:

- **Buyers**

Buyers will be those who seek ways to compensate the residual impact of their activities on biodiversity (e.g. developers or those liable for damage from pollution incidents). While buyers could seek compensation both because of legal obligations or voluntarily, our analysis of the potential for habitat banking in the EU indicates that the voluntary demand will be low.

Currently, outside the designated Natura 2000 sites, legal requirements for compensation in the EU are limited to weak planning agreements. These planning agreements are not always fully enforced, which means that most offsets are usually voluntary and driven by corporate social responsibility. The voluntary nature of these agreements could mean that current demand for compensation credits is likely too low for a habitat banking system to function extensively (hence the need for new regulation / guidance expressed in Table 10.1). So the level of demand from buyers will mainly be driven by the extent and adequacy of the enforcement of compensation laws and regulations.

In the case of the checklist-based system resulting in a fee in lieu of credit, the funds would be used to buy biodiversity credits from within the habitat banking system, making the independent body administering the fund (e.g. a Trust) a buyer.

- **Sellers**

Suppliers of compensation credits will be those with suitable land for whom creating and selling credits offers profit opportunities. Establishing a habitat banking system will potentially incentivise all types of landowners and land managers (e.g. private, corporate, NGO and possibly public sector) to supply credits.

Supply involves several steps: securing the property right over the appropriate land, planning and taking the relevant actions to create the credit, and making the credit available in the market (including relevant regulatory approval). These steps may be undertaken by one party, or by several different parties. Therefore a landowner may create and sell the credits themselves, or enter agreements with others to create credits (e.g. with some legal basis with respect to the relevant management of the land), or to act as an agent to sell credits. Agents may also act as brokers to organise supplies of credits (e.g. in securing credits from multiple sources to compensate for a large or complex damage case). Thus suppliers may be landowners, or an agency working with a landowner.

The supply of credits will be determined, inter alia, by the feasibility of protection or restoration of the biodiversity involved, and the opportunity cost of suitable land. It will also be influenced by the ability to demonstrate additionality of the biodiversity in the credit over an appropriate timescale, and the propensity of potential credit sellers to actually enter the market.

- **Regulators**

Regulators are needed to set up the legal basis for a system like habitat banking and also oversee its functioning. Regulators should be a competent nature conservation or environmental authority (or a publicly appointed, specially created body with a similar remit).

Such a body would oversee the monitoring and auditing of ecological, legal (e.g. property rights) and financial requirements. It would also ensure that habitat banking is used strategically and effectively, and that it becomes a reliable instrument to compensate for damage caused to biodiversity protected under the current EU's nature conservation directives. To ensure an effective habitat banking system, regulators should also consider other current and future legislation, the fit (with necessary adjustments) of habitat banking within the existing programming and planning processes, and other nature and wildlife legislation, spatial planning, agricultural, climate, energy and transport policies and institutions.

In order to achieve this, the regulators should issue guidance on how to estimate debits and credits and ensure equivalency between the two; certify credits; monitor and audit ecological, financial, and legal (e.g. property rights) requirements; and protect the public interest.

In some systems, the State also has a role in brokering deals between buyers and sellers, registering credits, and sometimes acting as a buyer. Their purchases may be either for long term land management of high biodiversity value areas or on a rolling fund basis, securing high conservation priority land that can later be established as a conservation bank. The costs would be covered retrospectively by developers' purchase of credits.

Finally, the public regulator should ensure transparency of any habitat banking system. Full documentation of all aspects of debit and credit calculation and trades should be placed on the internet to allow public access and scrutiny of trading, the execution of roles outlined above, and the decisions made and actions taken by the regulator.

- **Other Stakeholders**

A range of other ("3rd party") stakeholders, who may not play mandatory roles but will still be essential to the success of habitat banking, include: local communities, NGOs,

insurers and other financial service providers, brokers and traders, and technical experts (e.g. ecologists, lawyers, traders, economists and others).

The habitat banking system outlined in Figures 10.2 and 10.3 includes the following roles for the above parties:

1. ***Debit and credit assessment and verification*** - although buyers and sellers may calculate their debits and credits, at a minimum this calculation should be independently verified (e.g. by a regulator or an independent contractor);
2. ***Regulation -*** oversight ensuring trades are executed to deliver legal/other requirements; and
3. ***Independent audit*** – giving an independent judgement on equivalence between debit and credit, and monitoring the delivery of the credit over its lifetime. This could be conducted by the same agents as (1).

Within the proposed checklist-based system, the roles described above would be simplified and/or merged in order to reduce the transaction costs of the system without compromising its quality. For example, the debit and credit assessment and verification role would be limited to verifying that the pre-determined checklist is applied correctly rather than doing bespoke assessment of debit for each transaction.

One option for a simple checklist-based system is a fee in lieu of credit system. Within this system, an independent biodiversity fund (e.g. a Trust comprising biodiversity conservation NGOs, statutory biodiversity conservation bodies and other biodiversity experts) would be responsible for dispersing the accrued funds. The rationale for this is that an independent body would ensure that funds are used to deliver clear biodiversity outcomes and would be best able to judge how to use the collected funds for the highest conservation benefit (e.g. the type and location of credits that should be purchased).

There may be a need for professional qualifications and skills for agents performing some roles within a habitat banking system (e.g. such as those responsible for monitoring and auditing). These qualifications could potentially be organised through professional bodies. They may create new sources of employment, which may replace jobs that had previously been supported by other land uses, or create net new jobs (depending on the employment baseline, which is declining in some land use industries e.g. agriculture).

10.3 What will be traded in a habitat banking system?

Most biodiversity offset systems and habitat conservation goals relate to both the size of land and its ecological condition (i.e. quality). Therefore it is logical that credits and debits in a banking system are also calculated on the basis of habitat area and

quality, with additional considerations handled through adjustment factors (e.g. to allow for presence and/or abundance of different species). Habitat banks that are for specific species can use the carrying capacity of a habitat (e.g. number of breeding pairs that a site can support) for the species as the basis of credits.

The type and quantity of credit that can be used to compensate a given debit are determined by equivalence requirements. Equivalency methods are used to ensure that the compensation for damage is adequate (i.e. credit is equivalent to debit). Experience to date (see Section 7) shows that equivalence methods are a key determinant of the appropriate balance between establishing a functioning market and delivering biodiversity objectives (i.e. between oversimplification and overregulation in a habitat banking system). Key factors in establishing this balance in the EU will include: equivalency-related issues such as the type of resource or service being compensated, locations and minimum sizes of areas used to provide credits, legislative requirements for compensation, bio-geographical boundaries of the banking system(s), the biodiversity management systems already in place, and transaction costs of addressing these issues.

Different equivalency methods are available, which are covered in depth by the REMEDE Toolkit[155]. The Toolkit, which is based on the experience with these methods in the US and similar methods in the EU, is applicable to both HD and ELD contexts. It presents a conceptually simple framework for ensuring equivalency between the debit and credit, as described below:

a) Add up all the losses (debits) caused by the damage;
b) Determine the amount of benefit expected per unit of credit; and
c) Divide (a) by (b) to get the total units of credits needed.

In practical application, the choice of equivalence methods can be complex. It is dependent on a mixture of technical and practical considerations (e.g. baseline condition and abundance of the biodiversity that has been damaged at credit sites), which are reviewed further in Section 4.

The checklist-based system requires a simpler implementation of the equivalency principles. It could involve a menu of values for damage to generic biodiversity features, from which debits can be calculated. Determining the content of such checklists would require detailed fieldwork in advance. There is precedence for using such generic estimates, for example within the systems for agri-environment schemes, which in some cases, are administered based on generic costs of maintaining or restoring valuable features in the landscape (e.g. hedgerows, streams, mature native trees).

[155] www.envliability.eu – forthcoming as a book in 2010 (Lipton et al, published by Springer)

10.4 When and for how long will the credits be needed?

Credits will be needed to compensate only for residual damage. Residual damage is that left after mitigation in HD and impact assessment terminology, and in ELD terminology after primary remediation and any complementary or compensatory remediation carried out at the damage site. For other policy instruments, the definition of residual damage, and the 'appropriate' application of the mitigation hierarchy, may need further guidance to ensure consistency. In practical terms, potential buyers should consider whether they would need credits as early as possible: for example, when they start their planning application for a development, when a damage causing incident occurs or when an imminent threat is identified.

In terms of the provision of credits over time, as long as it delivers biodiversity policy objectives (i.e. presumably of no net loss), the system should be flexible in order to:

- Operate both ex ante (e.g. for HD), and ex-post (e.g. for ELD interim losses) of damage occurring;
- Apply discounting (where appropriate) to adjust for impacts over and between different time periods and interim losses; and
- Allow flexibility of timing of some credit sales (e.g. for compensation measures with a high certainty of success), for example through allowing the sale of a portion of credits at regular stages of implementation actions (i.e. securitisation). This would reduce the time lag in receiving revenues from, and therefore increase the profitability of, investments in credits.

Discounting can be used to adjust the value of flows of goods and services in different years. In other words, discounting is used to calculate equivalence over time. This implies that the number of credits may not be the same as the number of debits in absolute units (e.g. ha), but the value of the two is equated when the different timing and duration of debits and credits are taken into account. Under the ELD, if a debit occurs for a limited period (until the baseline conditions are recovered) and an equivalent credit (in terms of hectares) is delivered over a longer time period (e.g. in perpetuity), taking discounting into account, the number of credit hectares can be less than the number of debit hectares.

A more technical issue is what discount rate to use when evaluating debits and credits over time. An extensive literature discusses the theory of discounting in relation to environmental assets and what the discount rate should be[156]. Guidance should be provided by the regulators as to what discount rate should be used in equivalency analysis.

[156] e.g. as applied in Stern (2006) and European Commission (2008).

A further timing issue is the period over which debits occur and credits must be guaranteed. Some damages requiring compensation may be temporary (e.g. under ELD), and so credits may be required only over a limited time period. On the other hand, biodiversity policy objectives, including HD requirements, are not time-limited. Therefore, credits will be required in perpetuity to compensate for permanent damage. Perpetuity is extremely difficult to guarantee, but credits can be secured within the current land-use systems by firstly establishing appropriate property rights over the land in question, and secondly allocating sufficient resources to manage the biodiversity. The latter can be delivered through an endowment, a capital asset that provides revenues that are sufficient to fund the management of the credit in perpetuity (or a time-limited period if appropriate).

10.5 Where can trading take place?

The geographical scope of the habitat banking system will be defined in relation to criteria on:

- Ecology - appropriate geographic scale to deliver compensation (e.g. within coherent bio-geographical units for habitats and in appropriate locations for species, taking into account their genetic variation and any requirements for functional connectivity to maintain viable populations and migration routes etc). For example, it might be appropriate to trade inter-tidal saltmarsh within the southern North Sea (e.g. between the Netherlands and Eastern England), and wetland habitats within major river basins (e.g. Lower Danube). Compensation for migration sites must fulfil the same staging post functions within the same flyway;
- Socio-economics - recognising the needs and location of specific groups impacted by the biodiversity damage (such as cultural ties to particular habitats or species). Compensation should aim to benefit the same human population that suffered the damage, and/or fulfil other social goals (e.g. regeneration through improved natural environments). This will need to be worked out on a case by case basis, depending on the biodiversity benefits being considered in the credit (e.g. the ELD requires services to human populations to be considered, but HD does not); and
- Governance - systems being in place to monitor and manage the banking (credit and debit) activities across the area defined.

Governance restrictions do not imply that credits and debits must be within the same Member State. However, if the area where trades will occur crosses political boundaries, the authorities for the different areas will need to work within a framework that ensures effective governance so that biodiversity objectives are delivered.

This issue requires further consideration, but this can only take place following definition of some key factors about habitat banking in different Member States, such as:

- Development of appropriate policy and guidance at EU level;
- Determination of the compensation drivers necessary to stimulate sufficient demand for credits to support and habitat banking;
- Identification of the regulatory body for habitat banking; and
- Definition of the baseline status of biodiversity resources (as per the Categories in Table 10.1), in order to apply appropriate compensation provisions.

10.6 Possible use of a fee in lieu of credit and an independent fund

A suggestion from this study is to have a low transaction cost system for compensating for individually minor, but cumulatively significant, impacts on widespread biodiversity (See Section 10.1). Lower transaction costs would enable compensation for such impacts, which would otherwise be unlikely to be covered by more complex compensation mechanisms.

Such a system would use simple rules. Debits could be determined using a pre-defined system of habitat/vegetation classes, using lists, tables and multipliers[157]. These debits could then be compensated through purchases of equivalent credits in a habitat banking market. Equivalence could also be assessed through pre-determined rules (rather than by selecting and applying different equivalence methods on a case by case basis).

An alternative is to compensate the debits through a fee in lieu of credit system, with payments made to an independent fund (for example, managed by a Trust) that would purchase credits from habitat banks to offset several debits at once. It would have the ability for the purchase of credits to execute strategic conservation priorities to maximise the benefits of delivering no net loss. For example, it could purchase credits for biodiversity that has a higher conservation priority (trading up). Table 10.2 below compares the features of a simple debit-credit exchange system and a fee in lieu of credit system.

[157] These (for use only with the least significant impacts) would be based on earlier fieldwork that established average requirements.

Table 10.2: Potential simple low transaction cost systems for compensating low level biodiversity impacts and their likely advantages and disadvantages

	Simple direct debit – credit system			Fee in lieu of credit system & trust fund		
Scheme approaches / components	**Approach**	**Advantages**	**Disadvantages**	**Approach**	**Advantages**	**Disadvantages**
Equivalence						
[**Nature/equivalence/exchange criteria**] How is equivalence determined?	Simple checklist system	Transparent and consistent	Ecologically simplistic, inappropriate for impacts on habitats of very low biodiversity importance	Equivalence is determined in monetary terms, not ecologically for each debit	Flexibility to respond to wider biodiversity priorities	Declines in some habitat types may occur, (but this could be considered as part of the decision making process)
How is the kind of biodiversity that can be conserved as an offset for impact determined? Using (a) biodiversity proxies?...in which case, which accounting methods. Or (b) using economic valuation….in which case, which approaches?	Biodiversity proxies within checklist of habitat features	Transparent and consistent	Ecologically simplistic	Coasian Tax: cost of restoring / replacing the damage adjusted for transactions costs, with feedback from delivery costs of NNL objective.	Lower transaction costs, provides flexibility re credits	Controversial system. Political pressure to reduce prices.
Is the offset/credit requirement for strict ecological equivalence (i.e. 'like for like'), or is 'trading up' ('like for better') or net gain supported? If trading up is supported, how is it determined?	Like for like is the norm, trading up and net gain encouraged	Simple and consistent, less prone to abuse	Like for like usually inappropriate for impacts on habitats of low biodiversity value. Trading up or strategically beneficial purchases of credits unlikely to occur without relevant incentives, which could be difficult to organise.	Trading up is the norm, net gain possible	Increases conservation benefits	Declines in some habitat types may occur, though unlikely to be of importance, system needs to react to changes in status of habitats. Risk that legal min becomes de facto maximum, limiting net gain.

Table 10.2: Potential simple low transaction cost systems for compensating low level biodiversity impacts and their likely advantages and disadvantages

	Simple direct debit – credit system			Fee in lieu of credit system & trust fund		
Scheme approaches / components	**Approach**	**Advantages**	**Disadvantages**	**Approach**	**Advantages**	**Disadvantages**
[**Quality**] How to assess that the quality of the compensatory outcomes is equivalent to the loss of biodiversity converted or damaged (defining equivalence of habitats)?	Biodiversity proxies within checklist of habitat features	Transparent and consistent	Ecologically simplistic	Not necessary/ ignored on case-by-case basis. Overall requirement to deliver NNL	System simplification and focus on broader biodiversity conservation needs	Relies on judgement from independent body.
[**Amount**] How is amount of loss/gain determined? (How are the project's impacts on biodiversity quantified and the commensurate amount of offset (conservation gains, in terms of improved condition as well as area) calculated?)	Direct like for like measures or habitat hectares	Simple and consistent quantification aids monitoring and reporting of outcomes, so less prone to evasion	Possibly more skilled input needed in assessment – higher trans costs	Loss measured in simple checklist and converted to €.	System simplification	Net biodiversity change not quantified
System description						
[**When**] When is an offset required? (thresholds of severity of impact – de minimis and de maximis)	Individually significant impacts	More attention to detail of biodiversity damage possible.	Less able to deal with cumulative impacts. May restrict lowness of lower threshold	All impacts can qualify	Can deal effectively with cumulative impacts of low level biodiversity loss	A lower (transaction and compensation) cost system could lead to pressure to raise upper threshold (to save costs of compensation for damage just above it)

Table 10.2: Potential simple low transaction cost systems for compensating low level biodiversity impacts and their likely advantages and disadvantages

	Simple direct debit – credit system			Fee in lieu of credit system & trust fund		
Scheme approaches / components	**Approach**	**Advantages**	**Disadvantages**	**Approach**	**Advantages**	**Disadvantages**
[**Additionality**] Is there a requirement that the offset activities/bank credits demonstrate conservation outcomes (e.g. satisfy performance standards) that would not have happened without the offset, i.e. beyond the status quo? How is this measured and monitored?	Consistent rules on additionality apply to all credits	Reviews of additionality can establish impact of trading and feedback to design	Pressure on regulator to adapt credit rules to accommodate large suppliers? Relatively inflexible, with rule changes needed to adapt to changes in biodiversity trends.	Rules considered by trust in distribution of credits	Improves ex ante consideration of systematic additionality risks	Pressure on Trust to adapt credit approach to accommodate large suppliers?
[**Qualifying activities**] What activities and outcomes qualify as part of the offset/generation of conservation credits? (Improvement, arrested degradation, averted loss?)	Banks decide according to markets		May exclude some additional actions	Considered by trust in distribution of credits	Enables consideration and which activities provide the best long-term biodiversity gains	May exclude some additional actions
[**Location**] Where should biodiversity credits and conservation banks be located? What are the factors that affect site selection? (Ecological, stakeholder preference, political jurisdictions). What approach to site selection is taken? How is the 'service area' for the offset/conservation bank set? To what extent does landscape level and regional planning influence site selection? How, if at all, are minimum viable population/areas for individual offsets or conservation bank service areas defined/required/established?	Determined by market supply within regulatory constraints.		No incentives for strategic location of benefits.	Determined by market supply, and considered by trust in purchase of credits	Increases strategic benefits of credits (e.g. by focussing on priority needs, and location of banks to increase the coherence and connectivity of habitat networks and species populations).	

Table 10.2: Potential simple low transaction cost systems for compensating low level biodiversity impacts and their likely advantages and disadvantages

	Simple direct debit – credit system			Fee in lieu of credit system & trust fund		
Scheme approaches / components	**Approach**	**Advantages**	**Disadvantages**	**Approach**	**Advantages**	**Disadvantages**
[**Timing**] Should the offset gains/conservation bank credits be in place before, during or after the damage to the affected site takes place? What factors affect this?. Is there an obligation to compensate for any temporal loss experienced between the project impact and the offset gains maturing?	Depends on rules		Harder to make supply fit to strategic conservation needs.	Availability of appropriate quality credits may delay release of funds – subject to obligations to release money.	Better long-term, benefits may be secured by appropriate timing. Fund can send signal to market of credits desired.	Benefits may be delayed
Links to other issues and policies						
[**Crowding Out**] Is there any crowding out of other biodiversity-policy objectives, and is any consideration given to this issue in management of the banking system?	Risk for habitat creation/ restoration credits	Govt needs to manage risks	Govt needs to manage risks	Considered by trust in purchase of credits	Crowding out risks can be managed	Fund may dominate market
[**Ecological Networks**] How is network connectivity dealt with, and is any consideration given to climate-change resilience?	Adjustments to equivalence possible	Tailor to local circumstances	Extra complication/cost	Considered by trust in purchase of credits	Strategic benefits from appropriate location of credits	Risk of political capture
The roles and responsibilities of different institutions involved:						
What is the legal, policy and institutional infrastructure for the offsets/conservation banks? (What legal requirements trigger the offset?)	Depends on lower damage threshold, and how policy implemented through planning system			Depends on lower damage threshold, and how policy implemented through planning system		
How does the system undertake local stakeholder consultation?	Case by case	Tailored	Extra complication/ cost	Conservation stakeholders directly involved in decision making	System likely to be supported by key stakeholders	Increases complexity and potential for conflicts of interest

Table 10.2: Potential simple low transaction cost systems for compensating low level biodiversity impacts and their likely advantages and disadvantages

	Simple direct debit – credit system			Fee in lieu of credit system & trust fund		
Scheme approaches / components	**Approach**	**Advantages**	**Disadvantages**	**Approach**	**Advantages**	**Disadvantages**
The 'economic incentives' (intended and perverse) that habitat banking may create:						
How to take into account the locations of impacts and beneficiaries, and the differences between locally realised and population-wide benefits compensated for within offsets?	Case by case	Tailored	Extra complication/ cost	Considered by trust in purchase of credits	System more likely to be supported by impacted communities and other stakeholders	Risk of political capture

Table 10.2 shows that a fee in lieu of credit system offers a number of theoretical advantages, but it also introduces complications and risks that a simple debit-credit exchange system does not face.

Evidence from the use of fee in lieu of credit system (e.g. in the US) indicates that the adoption of such a system for very low level impacts through a checklist-based system would bring a series of design challenges and specific risks. However, it is possible these challenges and risks could be managed through the careful design of the system, as described in Table 10.3 below.

Table 10.3: Risks and mitigating design features in a fee in lieu of credit system

Risk	Design attribute
Funds used to purchase non-biodiversity related 'credits' (e.g. for political, commercial or criminal reasons).	Legal requirement to only use funds for biodiversity credits
Setting the right fee level	Set fee, and adjust it over time, to ensure no net loss objective fulfilled e.g. use public money to provide start-up funds to purchase credits, and base fees on actual purchase prices, with continuous feedback from credit price to fee
Risks of not securing credits	Legal requirement that funds are only used to secure measurable biodiversity benefits directly, which must be monitored and publicly reported.
Loss of direct linkage between impact and compensation may risk loss of important elements of biodiversity	Only applies to very low level (individually insignificant) impacts on widespread biodiversity that would not normally be covered by conventional compensation systems, and for which like for like compensation would usually be inappropriate (see below).
Suppliers competing through lower fees	No competition, single independent body running fee-based system
Temporal losses between payment and credit purchase	Put start-up money into the independent fund to commence credit generation in advance of damages
Fees displace public funding for nature conservation	Legal requirement to only use funds for additional biodiversity credits
Misuse of funds	Independent trust comprising governmental and non-governmental conservation bodies with legal obligation to use funds for no net loss of biodiversity and for transparent, audited and published purchases of credits
Costs of administering systems	Premium on fee to cover administration
Public sector biodiversity agencies become dependent on fees from compensation activities	Maintain legal and financial distinction between role of managing compensation system and other public duties.

An imperative requirement of the system would be that it only applies to low level impacts on biodiversity that are considered to be individually insignificant. Thus, for

example, it could apply to impacted areas (below specified thresholds) of highly artificial habitats such as arable farmland, intensive horticulture, drainage ditches and other small waterbodies; non-native trees and vegetation, parkland and amenity grassland; and former industrial / urban sites that do not contain species of high conservation importance or have other important ecological functions (e.g. in terms of buffers or connectivity). It would not apply to any impacted habitats or species of Community Interest or that are protected by national legislation, unless the area of habitat or population of species involved is clearly trivial.

10.7 Avoiding perverse incentives

Previous sections (in particular Section 4.4) have identified a number of perverse incentives. These are a key area to manage in the design of a habitat banking system and are summarised below in terms of what the risks and the key features suggested to address them are.

- **License to Trash**

This refers to the outcome that by making compensation measures easier and cheaper, habitat banking could lead to some developments, or greater residual damage, being allowed that would otherwise be refused permission. In fact, habitat banking is not a tool to permit a development, and should not be allowed to influence the decision-making behind permitting developments. Habitat banking should come into the equation only after the need for compensation is determined and banking is proposed to meet that need more effectively and efficiently.

The success of habitat banking is dependent on an effective system to ensure that the current rules to decide whether developments should go ahead do not change because of habitat banking. Ultimately, society must determine what constitutes an acceptable trade-off between avoiding and mitigating impacts on-site, versus off-site compensation through offsets or habitat banking. To avoid the 'license to trash', regulators must effectively apply and enforce the mitigation hierarchy, with careful consideration of the appropriateness of avoidance, mitigation and compensation measures.

- **Crowding Out of Biodiversity Gain**

Habitat banking could lead to the most suitable sites for habitat creation and biodiversity gain to be consumed to provide credits that compensate for damage. This would deliver no net loss but remove the opportunity to use the same areas for net gain. Thus, demand for biodiversity credits could 'crowd out' net biodiversity enhancement opportunities, raising the costs of delivery of policy targets for net gains of threatened habitats. While under individual offsets there may be additional

opportunities for net gain at lower marginal cost, habitat banking creates an incentive to sell such opportunities as credits for other debits, rather than use them for net gain. Possible solutions to this problem are that:

i. A public agency intervenes in the market, setting the rules to ensure some net gain (e.g. through higher compensation ratios, see Section 4.3); or

ii. Credits are purchased and 'retired' (without matching them to a debit) by a public agency (or by an NGO with public funds).

- **Accommodating Variable Biodiversity Baselines**

The assessment of both credits and debits is relative to the baseline condition of the biodiversity impacted. There are variable baselines of biodiversity status, and variable implementation of biodiversity protection laws, within different parts of the EU. Reflecting these in a habitat banking system could provide an incentive not to improve, or to allow degradation of, biodiversity. Over time, it may give an incentive to policy makers to weaken/lower biodiversity protection and funding, so that more actions qualify as additional under banking and are removed from State remits. It could also penalise Member States which undertake stronger biodiversity conservation measures, in that States with weaker measures have easier (and cheaper) offsetting opportunities. This could potentially impact on Member States' management of Natura 2000 sites (e.g. with respect to the state of the Natura 2000 network). Again, this can be guarded against by effective enforcement of existing regulations. This incentive is greater if 'averted risk' credits are allowed within the habitat banking system.

- **Landowner Views**

Maintaining the value of existing high nature value land that is not at risk of damage is not additional, so this land would not qualify as credit in a habitat banking system. This may be seen as unfair by owners of existing high nature value land, who may feel they are not being rewarded for their existing stewardship of biodiversity resources. They could therefore have an incentive to allow their land to deteriorate, or may make demands for higher payments in return for the biodiversity they currently conserve (e.g. within agri-environment schemes). The problem is a greater risk if the implicit value placed on biodiversity through the cost of meeting compensation requirements is not reflected in the design of policies that aim to preserve biodiversity. This could put new pressures on existing nature conservation policy incentive mechanisms (e.g. by requiring higher payments for agri- or forestry-environment schemes). The seriousness of this risk, and solutions to it, are not well understood at present.

Furthermore landowners may regard designation of land used for credits for nature conservation purposes as a risk, as it may put permanent restrictions on land use. This

is most significant if credits are time-limited as designation of the land used for credits might prevent it being developed in future (after the period of providing the credit). If credits have been sold in perpetuity, the risk may be lower as future options for developing the land may be restricted anyway. If not, development could go ahead if compensation for loss of the credit site could be provided through purchase of another credit, and designation might restrict this. This risk may be hard to mitigate as conservation status may be an obligation for the relevant agency to designate (i.e. not something they can exercise judgment on). Therefore, particular rules may be needed to clarify whether credit sites that are designated are subject to the same management regimes, in particular any support payments, as designated sites that were not created as credits.

- **Damage in Advance of Baseline Definition**

Implementing the stronger compensation laws/requirements that are necessary to support sufficient demand for a habitat banking system to operate in the EU brings a specific risk. During the period between the announcement of the laws and their implementation, landowners will have an incentive to undertake damaging activities to avoid compensation obligations. The damage would then be part of the baseline conditions, against which debits and credits are judged. This can be avoided by retrospective application (but this is complex and not necessarily workable), or application from the date of the announcement of a proposed law, if implemented. It should be noted that this risk is not specific to habitat banking, but is an issue that relates to creating liability for causing damage more generally.

- **Threshold Effects**

Under a range of different systems for compensation, which system applies will be determined by thresholds of impact. For impacts close to these thresholds, there is likely to be an incentive for those responsible for damage to attempt to qualify for the lower category of damage by fraudulent means, and therefore face less stringent compensation requirements. This can be managed to a certain extent by clear definition of thresholds, and by publication of relevant information on all cases, allowing public scrutiny and clearly establishing relevant precedents. Again it should be noted that this risk is not specific to habitat banking, but is an issue that relates to creating liability for causing damage more generally.

Each of these potentially perverse incentives would need to be borne in mind if design of habitat banking is developed further. In addition, they highlight a potential hidden cost of increased regulatory resources in related areas in order to ensure efficient operation of the system and avoid perverse incentives.

10.8 Additionality of credits and displacement of impacts

A fundamental requirement for all compensation measures is that they must be additional, i.e. credits cannot be based on biodiversity outcomes that would have occurred anyway. Thus offsets and habitat banking should not be used as a mechanism for delivering conservation outcomes that are already required under legislation, such as the Habitats or Birds Directives. The additionality of credits is discussed in previous Sections of this report, particularly Section 4.4.

As a result of practical constraints and the legislative baseline, offsets and habitat banks that rely on risk aversion alone (e.g. without additional restoration benefits), or that are located within existing protected areas, are likely to be inappropriate in many situations in the EU, unless very high credit to debit ratios are used in the schemes (see Section 10.9 below).

Given these risks, it is recommended that regulators should give a high priority to scrutinising compensation proposals with respect to their likely long-term additionality and potential leakage. The onus should be on the seller to provide evidence of the additionality of their credits and displacement risks, which would then be considered by the regulator. Adjustment ratios could then be agreed accordingly, as discussed below.

10.9 Use of adjustment ratios

Adjustment ratios are used in habitat banking to alter the size of a credit, relative to a debit by a certain factor (ratio). For example, Briggs et al. (2009) suggest minimum compensation ratios of 2:1 (credit : debit), and that these are increased for less easily restored/created habitats, less certainty on a site's ability to support the required habitat, and for habitat enhancement options. The main reasons for using adjustment ratios are part of the basic consideration of equivalence, such as:

- Differences in the ecological value and condition of impacted habitats / species populations and habitat bank credits (e.g. to facilitate trading up), and
- The role of impacted biodiversity in terms of ecosystem services and/or services of socioeconomic value to local human communities or society as a whole.

Ratios may also be applied to factor in other considerations to the habitat banking process, such as:

- Uncertainty in measurement of biodiversity debits and credits;
- Uncertainty of the long term success of compensation;

- Advance crediting: Uncertainty of and time lags in future delivery (for ex-ante sales of credits);
- Account for risks of non-additionality, especially for averted risk credits (if they are allowed, see Section 4.2 above);
- Achieve targets for net gain of biodiversity, and
- Role of habitat in landscape in terms of ecological processes.

As these lists show, adjustment ratios may help deliver equivalence between different resources (e.g. in trading up) and therefore increase possible transactions in the market. However, using a ratio adds complexity and transactions costs, and using ratios repeatedly to make adjustments for different factors within a habitat banking system could be confusing. Therefore, they need to be considered collectively as a design feature.

10.10 Ecosystem services

Ecosystem services (ES) are services provided by the natural environment that benefit people (Millennium Ecosystem Assessment, 2005). The protection and enhancement of these services are a key anthropocentric reason for undertaking conservation policies, and can be included in habitat banking systems through adjustments to the metrics used. The inclusion of ES in a habitat banking system could have both positive and negative aspects.

Positively, including consideration of ES in the units of credit and debit measure used should mean that damages can be more fully compensated (rather than just the biodiversity loss). This would support the view that biodiversity is valuable because of links to ES, and potentially would broaden the acceptability of new biodiversity compensation policies, as we suggest are required to support habitat banking. It would also link to the ELD, which requires compensation for the loss of ES, meaning that accounting for ES within a HB system would be beneficial.

On the other hand, focus on ES within equivalency assessments could lead to compensation of biodiversity impacts with credits from another ecosystem service, or to actions that deliver some ES but conflict with optimal actions for biodiversity conservation. Therefore, it could undermine no net loss biodiversity objectives by transferring resources away from biodiversity to provision of anthropocentric ES such as recreational space. However, such risks can be managed, for example by requiring that ES included in credits have a functional relationship to the impact, and prohibiting substitution between services[158].

[158] For example, swapping water purification services for recreational space would not be allowed.

Other ecosystem services are already the subject of separate market instruments in Europe. Carbon already has, through the EU ETS, a tradable permit (i.e. banking) scheme. Water catchment protection rights are the subject of payments under agreements in some Member States (e.g. UK, France). These existing markets could work in parallel to habitat banking, creating potential for simultaneous selling of credits for different ecosystem services (e.g. carbon sequestration services and biodiversity credits), but not different biodiversity resources, from a single unit of land. Therefore, we suggest that habitat banking is developed to primarily deal with biodiversity. Consideration of ES should not dilute the core purpose of habitat banking – to deliver no net loss of biodiversity.

A habitat banking system should be able to include ES as part of habitat banking where desired on a case by case basis, particularly for those services that are related to ecological functions of the biodiversity resource impacted. It should also be compatible with parallel trading of other ES, allowing the sale of several credits from a given hectare of land so long as the intention to provide different credits is registered in advance[159] and the management measures required for one type of credit do not conflict with generation of another type of credit.

Consideration of ES within habitat banking is also complicated by the distinction between the flow of ES values and biodiversity existence values. In economic terms values of both occur as a flow: they recur each year that the biodiversity continues to exist. There is a time-related distinction due to the fact that biodiversity existence[160] is a long term goal – so existence value is related to continuing conservation of a species, not marginal fluctuations in the population (within a range that doesn't damage its viability). With ES, a marginal fluctuation (e.g. less habitat filtering less water or sequestering less carbon, or cultural values from BD) does change the value, as less service is delivered.

For example, if Ospreys became locally extinct in an area of Scotland for 10 years and then recolonised, this could radically affect their cultural value (and value for tourism in some cases[161]), but does not affect the existence value of the Scottish population. The population existence level is a scientific criterion, assessed at national or international level, and at present is the basis for global biodiversity priority setting. This may explain why biodiversity compensation determined using biodiversity

[159] An important condition of this is that credits (for BD or an ES) cannot be claimed retrospectively: for example if actions that had delivered a BD gain were retrospectively used as the basis for a carbon credit, that carbon credit would not be based on any additional benefits. However, if the intention to provide both services is register ex-ante of these actions, then both sources of benefit should be recognised as credits in relevant markets.

[160] Assuming that 'existence' refers to the species not to the individual animals in a welfare sense: i.e. people care that there is a viable population of polar bears, not whether there are 10,000 polar bears or 10,001 in existence (which we don't know anyway).

[161] Dickie, Hughes and Esteban (2006)

indicators (based on scientific criteria) don't always compensate cultural ecosystem services associated with biodiversity.

If habitat banking is used as a tool to deliver only biodiversity conservation goals (supporting existence values) then small temporary population fluctuations don't matter – long term conservation is the goal. If the aim of habitat banking is to deliver other ES value associated with biodiversity, then fluctuations over time do matter. It is difficult to envisage any habitat banking system that ignores wider cultural values of biodiversity completely, and hence fluctuations over time are likely to be important. However, on balance, we suggest that habitat banking is developed to primarily deal with biodiversity. Ecosystem services could be taken into account on a case by case basis, but should not dilute the core purpose of habitat banking – to deliver no net loss of biodiversity.

10.11 Integration of policy goals in a habitat banking system

From a biodiversity perspective, it is desirable to allocate offset effort where landscape-scale or strategic benefits for conservation will be optimised. For example, where it will reduce fragmentation, conserve priority areas, ensure offsets, satisfy minimum viable area requirements or create ecological corridors in the landscape to enable ongoing adaptation of biodiversity to the anticipated effects of climate change. Aggregated offsets fit well with the ecosystem approach. They also tie in well with land use planning at a strategic level, where biodiversity conservation is one of a number of key considerations in a strategic planning exercise and availability of land is limited.

The following policy goals, which could create conflicts, are relevant here:

- Climate change adaptation, for example locating habitat away from areas vulnerable to sea level rise, or accommodating predicted range shifts in species and habitats;
- Strategic nature conservation objectives, like delivering larger habitat blocks or conservation of priority habitats and species;
- Provision of ecosystem services (assuming these are outside the habitat banking system, see Sections 4.4 and 10.9);
- Social equity issues, such as creating accessible natural environments close to certain communities to aid regeneration, and
- Planning and economic development objectives, such as avoiding areas with certain planned land uses in order to accommodate agglomeration of sectors reliant on other land uses.

Each of these factors needs detailed consideration for effective integration into the design of a habitat banking system. For example, in relation to large habitat blocks,

there are certain circumstances or contexts in which combined or aggregated offsets, delivered through a habitat bank, might be considered appropriate. The most obvious is where the same ecosystem or eco-region is exposed to cumulative impacts from several operators (particularly those in the same sector) at more or less the same time. In this context, impacts on biodiversity are likely to be of a similar type, and combined investment in an aggregated offset might offer overall economies of scale, as well as several ecological advantages (Brownlie *et al.*, 2009).

Offsets consolidated in the form of a habitat bank may provide higher quality compensation at lower cost, due to economies of scale and the specialist and management skills required to deliver the offset. Rather than undertaking offset projects on an individual basis, developers are able to pool resources and expertise, and (under some delivery models) are able either to share or transfer responsibility for offset delivery and management.

For habitat banking to support strategic goals, it is necessary to have enabling legislative and planning frameworks in place (e.g. established Biodiversity Action Plans and proposed ecological networks with clear priorities supported by reliable information). It is also necessary to have reputable or certified organisations willing and able to supply the necessary conservation services in a co-ordinated and competent fashion. In the absence of clear strategic biodiversity plans, the wider benefits of habitat banking are likely to be constrained, though some may nevertheless be achieved provided that 'like for like' rules and suitable receiving areas are clearly defined.

11. Conclusions

The conclusions of this report are summarised as answers to a number of key questions. A more detailed summary of the project is provided in the project's Summary Report[162]. Many of the issues discussed will need more attention before a habitat banking system can be piloted. As stated in Section 2.3 and elsewhere, this is contingent on necessary policy steps to create new compensation requirements that are sufficient to support an EU habitat banking market.

11.1 What is habitat banking?

This project defines **habitat banking** as: *"a market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time"*. Biodiversity credits in the context of this project include both habitats and species.

In other compensation systems, debits and credits are quantified specifically in a case by case basis (even though offsets may be pooled into a single site), whereas this is not so in banking. This disconnect between assessment of damage and assessment of offsets (determination of debits and credits) is the key feature distinguishing habitat banking from offsets. This results in several requirements of habitat banking systems in addition to offsets.

11.2 Who will buy credits?

Developers (polluters) who are liable to compensate the residual impact of their development (pollution) are the potential buyers. Their level of demand for compensation will be driven by the extent and adequate enforcement of compensation laws and regulations. Away from designated sites in the EU, legal requirements for offsets are limited to weak planning agreements, and these are not fully enforced (and so many offsets are voluntary and driven by corporate social responsibility). This could mean that insufficient demand for offsets will exist to support the market, but there could also be dynamic effects: by creating a more efficient compensation mechanism, habitat banking could lead to better enforcement of compensation requirements where previously impracticalities or cost concerns were a barrier.

Our legal review has identified that it may be more likely that habitat banking can be used to fulfil remediation obligations that may arise under the ELD (including for

[162] eftec, IEEP et. al (2010) The use of market-based instruments for biodiversity protection – The case of habitat banking – *Summary Report*. http://ec.europa.eu/environment/enveco/index.htm

interim losses) than to fulfil compensatory obligations under the Habitats Directive (Articled 6(4)). This is because compensatory measures under Article 6(4) should address, in comparable proportions, the habitats and species negatively affected and provide functions comparable to those which had justified the selection criteria of the original site, i.e. there are strong like-for-like rules, which reduce (but do not eliminate) opportunities for habitat banking.

Our analysis of major infrastructure development types in the EU suggest that they will not create large requirements for offsets. However, there is also the possibility that habitat banking could help address widespread small-scale but cumulative impacts on biodiversity in the wider European landscape. Further consideration of Article 10 of the Habitats Directive may be relevant here. Habitat banking could help deliver achievement of favourable conservation status, and the objectives of HD Articles 10 and 12, but there are no specific requirements in these articles to trigger compensation for biodiversity damage.

11.3 When will the credits be needed?

The mitigation hierarchy will be implemented so that credits will be needed only for the residual damage (after mitigation in HD terminology and primary and complementary remediation in ELD terminology). Further consideration of detailed design criteria will be needed here, dependent on the policy context and exact purpose of a system. Some criteria (e.g. determination of significance) may be best left to the discretion of Member States so long as transparency is established. In practical terms, potential buyers should consider whether they would need credits as early as possible: for example, when they are starting their planning application for a development, when a damage causing incident occurs or an imminent threat is identified.

11.4 Who will sell credits?

All types of landowners (private, corporate, NGO and possibly public sector) will be incentivised to supply biodiversity credits, possibly in conjunction with land management or credit sales agents. Analysis suggests that there is marginal land available in the EU that could be used to supply credits for some types of biodiversity. However, where the requirements (e.g. soil, topography, water supply) coincide with those of higher-value economic activities, credit supply could be a constraint on the size of the market. Further analysis is needed on the availability of land resources in the EU, but supply cannot be fully predicted in advance.

11.5 How will the transaction be organised, certified and monitored and by whom?

There will be an essential role for the public sector to design and monitor the system. In order to ensure that habitat banking is used effectively and becomes a reliable instrument to compensate for damage caused to the natural resources protected under the EC's nature conservation directives, certain (legal) requirements need to be fulfilled.

Exactly who would do what, when and where, and who would have overall control, would depend on the exact design and jurisdiction of the habitat banking system. Responsibilities to undertake the public sector role within habitat banking may require additions to the objectives and/or remits of institutions so they are able to effectively deal with habitat banking.

Overall, there is appropriate expertise in most of the EU to undertake the roles and functions required within habitat banking. There may be limited institutional capacity at present, but in most of the EU this can be expanded to respond to the needs of any market. One feature that may be lacking is role for a public body with oversight of all planning and other activity that negatively impacts on biodiversity to ensure the thorough and consistent application of requirements to compensate for biodiversity damage. Such a role could be beneficial to carry out current requirements, and would be beneficial to any new habitat banking system.

It may be beneficial to establish a fee in lieu of credit system, whereby minor biodiversity damage is compensated through a payment (calculated through a pre-determined checklist) to an independent fund (e.g. a Trust). This fund would need to be independently managed solely for the purpose of securing credits as appropriate compensation for the debits generating payments.

11.6 How to calculate credits?

Many habitat banking systems, and habitat conservation goals in countries that retain a high proportion of natural habitats, are based on a combination of quality and size of the land area. However, nature conservation objectives in much of the EU differ considerably and are more complex as most remaining biodiversity is associated with semi-natural or even highly artificial habitats. Remaining natural habitats are now very rare, and these and some semi-natural habitats that are listed in Annex 1 of the Habitats Directive are of considerable nature conservation importance in their own right. But in much of the EU nature conservation is now focused on the maintenance of habitats as resources for particular species of conservation value (e.g. artificial wetlands such as gravel pits for waterbirds). Therefore it is essential that any habitat

banking system calculates credits on the basis of the ecological quality of habitats in addition to area. In this respect ecological quality may be assessed using similar criteria to those used for defining favourable conservation status of HD habitats, and/or the carrying capacity of the habitat in terms of particular species of conservation importance. The level of availability of baseline information on current biodiversity resources (possibly in GIS systems), and consideration of how strict equivalence should be under different compensation regimes will help determine calculation methods.

As habitat conservation goals are based on a combination of quality and size of the land area, it is logical that credits are calculated as a certain habitat condition on an area of land, with additional considerations handled through adjustment factors (e.g. to allow for different densities of certain species). The level of availability of baseline information on current biodiversity resources (possibly in GIS systems), and consideration of how strict equivalence should be under different compensation regimes will help determine calculation methods.

11.7 How to ensure equivalency between debits and credits?

Equivalency rules are a key determinant of achieving the appropriate balance between a functioning market and delivering biodiversity objectives. Key factors in establishing this balance in the EU will include: the type of resource or service being compensated, area and ecological quality of compensation areas, transactions costs, bio-geographical boundaries of the banking system or systems (if banks will be specific to each area), and the biodiversity management systems already in place. Experience to date shows that equivalence methods are a key issue in determining the balance between oversimplification and overregulation in a habitat banking system.

We have suggested two different types of equivalence calculations, based on the different categories of biodiversity that habitat banking might apply to in the EU (see Section 10.1). Bespoke equivalence requires the appropriate equivalence method to be determined for each damage case. Simpler, checklist-based systems can use predetermined information to calculate debits and credits, reducing both transaction costs and ecological accuracy. Each of these types can be further defined depending on the way compensation for damage to biodiversity in each category is obligated. However, equivalence methods cannot be completely fixed in advance for all the circumstances that habitat banking might be used in the EU, and to some extent need to be applied on a case by case basis.

11.8 Is habitat banking feasible in the EU?

The potential for habitat banking is limited at present due to the limited scope of compensation requirements for damage to biodiversity in relevant supporting laws. If these were strengthened or new requirements introduced in line with objectives for no net loss of biodiversity, then a viable habitat banking market could be developed in the EU.

The effectiveness of habitat banking as a policy tool will depend, inter alia, on:

- The extent of new policy mechanisms implementing the no net loss of biodiversity objective by requiring compensation for damage, and therefore stimulating demand for credits;
- Effective enforcement of these mechanisms, guarding against risks (such as license to trash); and
- Independent regulation of the system, ensuring at least equivalent compensation for damage, and encouraging trading up and strategic considerations in order to maximise benefits.

None of these conditions are effectively established within the EU. However, capacity to undertake/implement them is present, and so they could be developed relatively easily (following the appropriate policy decisions). With these conditions in place, it would be feasible to use habitat banking as a policy tool in addition to existing biodiversity policies in the EU.

The evidence reviewed also suggests that while complex and presenting risks, habitat banking is technically feasible for a significant amount of the biodiversity in the EU. A tentative guide to minimum prices is that would have to cover costs of €5,000 - €15,000 or more per ha, plus transaction costs, profit margins, and rent reflecting resource scarcity. However, price levels of €10,000's per ha may be feasible for high-value developments (e.g. housing which can be worth €100,000s or €1ms per ha).

11.9 Should habitat banking policy be organised at a European level?

Within the appropriate ecological and social criteria, there may be circumstances where trades across political boundaries between EU Member States are beneficial to buyers and sellers. These transactions would require the authorities for the different areas to work together within a framework that ensures effective governance so that biodiversity objectives are delivered. The need for such a framework justifies a possible role for a habitat banking system that is supported by European Community level legislation or by guidance (e.g. to define minimum standards and criteria for acceptable approaches).

Consistency is required at EU level so that:

- Habitat banking is in line with the EU environmental legislation it will support (Habitats and Wild Birds Directives and ELD);
- Potential suppliers and buyers of credits benefit from the certainty and transparency of an EU wide policy; and
- Habitat banking, which internalises a major environmental externality and changes the incentives faced by different economic activities, does not distort the single European market and reaches its full potential for economic efficiency and environmental effectiveness.

As stated above, this consistency will enable trades across political boundaries. These might only occur in exceptional circumstances (e.g. where compensation for a particular damage cannot be delivered within a Member State's boundaries). Alternatively it might facilitate the development of an EU wide scheme that coherently implements HB across Member States, allowing for systematic EU wide trading of credits.

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