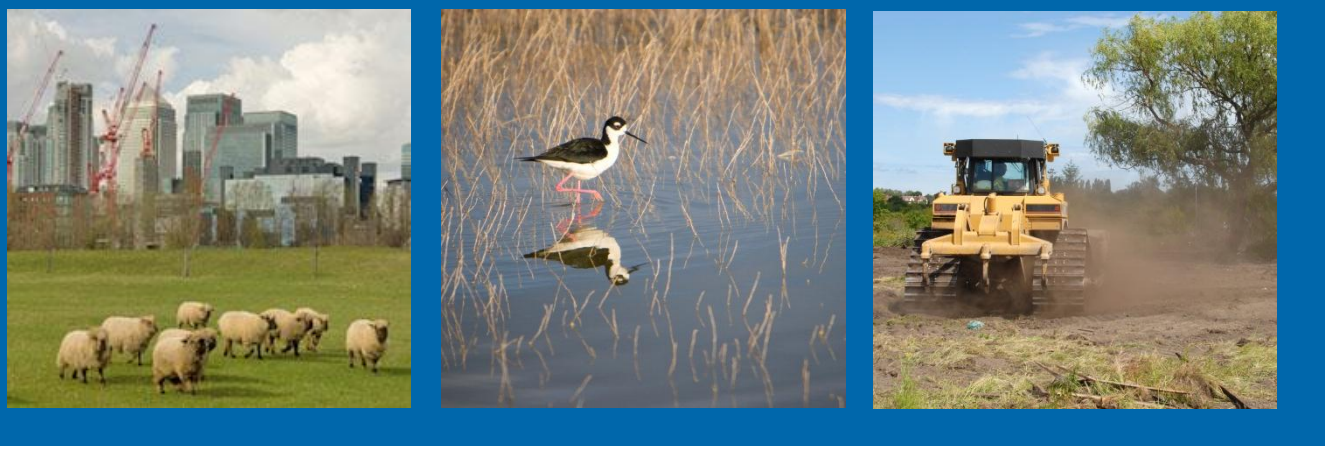

Exploring potential demand for and supply of habitat banking in the EU and appropriate design elements for a habitat banking scheme

Final Report submitted to DG Environment

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Final Report submitted to DG Environment

A report submitted by ICF GHK
in association with

BIO Intelligence Service

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Executive summary

Introduction

This report presents the findings of a research project undertaken by GHK Consulting Ltd (ICF GHK) and BIO Intelligence Service (BIO IS) for DG Environment to explore potential demand for and supply of habitat banking in the EU, and appropriate design elements for a habitat banking scheme.

The research examined the following topics:

- The **legislative framework** for addressing compensation for biodiversity loss in the EU and its Member States;
- The potential **demand** for biodiversity offsets and habitat banking in the EU;
- The **supply** of biodiversity offsets and habitat banking, and the key factors that affect supply;
- The **costs and benefits** of biodiversity offsets and habitat banking schemes;
- Key **design elements** of biodiversity offsets and habitat banking schemes; and
- **Gaps in knowledge** that may be barriers to the design and implementation of offsets and habitat banking schemes in the EU, and **priorities for further work**.

Scope and definitions

The EU 2020 Biodiversity Strategy introduces the goal of 'no net loss of biodiversity and ecosystem services' (Action 7). This is likely to be achieved by, among other actions, schemes to compensate for and offset biodiversity losses.

Compensation must be considered in the context of the 'mitigation hierarchy', which prioritises the avoidance of adverse impacts on biodiversity, calls for reduction of those impacts which cannot be avoided, and supports the use of offsets or compensation only for residual impacts that cannot be avoided or minimised. The mitigation hierarchy can and should also require that measures are taken to rehabilitate or restore affected areas before compensation is considered, although this is not always explicitly included in EU references to the mitigation hierarchy.

The term 'compensation' is sometimes used interchangeably with 'offsets', although the latter involve more formalised arrangements for delivering compensation designed to achieve a minimum of 'no net loss' (NNL). For the purposes of this report, we distinguish between compensation and offsets. Compensation involves general recompense for loss, and can involve a range of different measures (e.g. payments or conservation actions). Compensation does not necessarily achieve, or seek to achieve no net loss. A biodiversity offset on the other hand, can be seen as a type of compensation activity: a measurable conservation outcome which specifically seeks to achieve no net loss and preferably a net biodiversity gain on the ground.

Habitat banking is an instrument that can be used to deliver compensation by implementing and pooling compensatory measures in advance of a development, enabling developers to purchase credits from established compensation schemes (habitat banks) to offset their impacts. Credits in the context of this study may be earned through measures to conserve both habitats and species.

Legislative framework relating to compensation for biodiversity loss

The EU legislative framework

The EU 2020 Biodiversity Strategy does not define no net loss (NNL), but Council Conclusions provide a preliminary definition and working group discussions are underway. While NNL is not explicitly stated in the EU legislative framework, it is an implicit objective of the nature directives and several directives require that the mitigation hierarchy is followed (Birds, Habitats Directives) or include a reference to the mitigation hierarchy (EIA and SEA Directives). The Directives also explicitly refer to terms related to compensation, such as reference to compensatory measures (Habitats Directive), to compensation for adverse effects (EIA and SEA Directives) and to remedial measures including remedial compensation (Environmental Liability Directive (ELD), which covers accidental biodiversity impacts, among other environmental impacts).

Legal mechanisms that trigger a requirement for compensation are also clearly in place in the Habitats Directive (Article 6) to cover Natura 2000 areas and in the ELD for different types of remediation. In Natura 2000 areas, compensation is a requirement which provides a derogation to the developer so that if residual negative impacts cannot be avoided and if other conditions are met, the project can go ahead. Compensation is determined on a case-by-case basis and no clear criteria or methods to define the baseline and compare losses and compensatory gains are specified. This leaves room for interpretation and leads to differences in approaches between Member States (MS). In addition, the methods used to quantify residual loss and compensation gain may not be adequate to result in no net loss. Guidance documents for the Habitats Directive have been produced by the European Commission to harmonise and help identify requirements so that compensation measures are efficient, although these guidance documents are not legally binding. In the case of certain projects with an impact on Natura 2000 areas, there is a requirement to compensate residual impacts. NNL, however, is not explicitly mentioned. Currently, there is a lack of tools, metrics and guidance to ensure that compensation in Natura 2000 areas is implemented coherently, and to a high standard.

Measures must be identified to compensate for negative impacts in developments covered by the EIA and SEA Directives in the EU territory (including outside Natura 2000 areas). This contributes to compensation for losses outside of Natura 2000 areas, but several gaps have been identified. In particular, the EIA Directives require identification but not necessarily implementation or monitoring of such measures (although monitoring of significant effects is required under the SEA). Under the EIA, there is also a requirement to avoid 'significant' impacts 'if possible', minimise those impacts and, lastly, provide compensation for residual impacts. This only applies to projects that undergo the EIA process, namely projects that may have 'significant' environmental effects. Thus only certain developments are covered. Cumulative impacts from several, smaller developments could also arise that may not be adequately taken into account, although there is a requirement to consider cumulative impacts when conducting a screening to determine whether an EIA is needed and during the EIA, when providing the information requested under Annex IV. Furthermore, the EIA and SEA Directives introduce what are essentially procedural rather than substantial obligations; they are not aimed at achieving compensation, but at providing information on which to base planning and project decisions. Finally, they do not cover all EU developments.

The EU has in place several financing tools that are relevant to the goal of NNL, either by funding measures that could compensate for developments or for impacts currently uncompensated, or by ensuring that (co-)funded projects are implemented with higher standards. It is important to ensure that the polluter pays principle is respected when examining the role of EU funding, that double funding and cost-shifting[1] is avoided, and that the measures funded thus comply with the principle of additionality for compensation measures.

The ELD requires compensation with the aim to return the damaged natural resource and/or services to baseline conditions (i.e. for *ex-post* compensation; compensation under the Habitats, EIA and SEA Directives is *ex-ante* compensation). The requirements under the more recent ELD are more detailed than those specified in the Habitats Directive, including the definition of baseline conditions, compensation types (resource-to-resource or service-to-service equivalence approaches are preferred and other options prioritised) and interim losses.

Legislative Framework in the Member States

Each MS has implemented the EU requirements in different ways and with different ambition levels. Thirteen MS were investigated in this study and categorised into three groups according to the degree of development of their policies to require and implement compensation for biodiversity loss.

In general, MS are implementing the EU framework, but few MS have gone beyond its requirements. In line with EU requirements, compensation is mostly required and implemented in Natura 2000 areas, and for certain types of developments (e.g. linear transport infrastructures), but some MS are leading the way in requiring wider use of compensatory measures (and in some cases establishing systems for more formalised offsetting), developing and applying methods for measuring and compensating for biodiversity loss, and implementing or testing habitat banking. The most advanced policies are found

[1] 'Cost-shifting' refers to a situation in which governments reduce their funding allocation for biodiversity conservation because they regard private sector investment (eg through compensation) as reducing the need for public funding.

in Germany, while other Member States (e.g. France, Netherlands, Sweden and the UK) are also making progress. Compensation does not always require the delivery of conservation actions with measurable biodiversity benefits. It sometimes involves monetary compensation rather than compensation in kind, and it is not always clear that the resultant funds will be used for biodiversity projects.

Implementation issues arise when: the mitigation hierarchy is not followed, development consents do include sufficient requirements, there are unclear or contradictory requirements in different pieces of legislation, there is a lack of control and monitoring and difficulties arise in requiring long-term commitments. Authorities and regulators are often unaware of the available requirements and methodologies for requiring compensation, which is a barrier to implementation. Where compensation does occur, its design and implementation are generally considered to be insufficient, but data and monitoring of compensation measures are lacking or insufficient to give a robust and objective picture.

Potential for EU instruments to support offsets in future

In general, compensation requirements for impacts on the Natura 2000 network are relatively well developed, even if methodologies to assess the baseline and compare losses with gains could usefully be improved. In other areas, significant gaps exist in policies that compensate for biodiversity loss, suggesting that the goal of achieving no net loss of biodiversity in the EU is dependent on the need to develop unambiguous EU and/or MS legislative frameworks.

The study identifies five main possibilities to improve existing EU instruments and their use:

- Close gaps in existing instruments, by ensuring that the mitigation hierarchy is sufficiently followed, widening the coverage of EIA/SEA requirements, or providing systems to compensate in different ways, and strengthening (long-term) implementation. The on-going review of the EIA Directive and the forthcoming review of the SEA Directive may be a relevant opportunity, and/or a specific instrument to achieve biodiversity compensation/offsets outside Natura 2000 areas could be proposed.
- Strengthen the requirements in EU funding instruments to achieve NNL, avoiding potential risks. This could be implemented by adding requirements in (co-)funding criteria.
- Continue delivering improvements in the status of EU biodiversity by supporting restoration, recreation and improvement measures, which help to achieve NNL by indirectly compensating for adverse impacts. This could be accomplished by, for instance, upgraded support through LIFE+ (e.g. supporting ecological restoration projects) and the Structural Funds, and possibly some additional measures to frame and support the role of agricultural stakeholders to implement offsets.
- Develop a policy framework to define the role of habitat banking in the EU, which could offer ecological and administrative benefits but would initially require more government involvement than *ad hoc* compensation implemented by developers. Clearer specification is needed of steps at the MS and EU level to implement banking. This should follow a discussion on *scope* (ecological, geographic and in terms of circumstances when offsets are required and can be provided through banking), *principles and standards* for habitat banking, and legal and financial instruments needed for implementation.
- Raise awareness amongst regulators and authorities (e.g. on the local and regional level) about the mechanisms currently available to them to require compensation for adverse impacts on biodiversity.

The breadth of issues at stake is large and experience shows that no net loss systems in countries with more experience in this area than the EU have evolved over a period of 10-15 years. With this in mind, demand for offsets and habitat banking are only likely to increase if robust and comprehensive frameworks and formal requirements for NNL are put in place.

Demand for offsets

The demand for biodiversity offsets depends on:

- **The extent of biodiversity and ecosystem services loss** in the EU as a result of development and other activities;
- **The degree to which compensation is required** for this biodiversity and ecosystem services loss through the regulatory requirement for offsets; and
- **The metrics that could be used to determine offset requirements** arising from biodiversity losses.

The demand for habitat banking as a means of meeting these offset requirements depends on the regulatory framework in place to implement offset requirements, as well as the relative advantages, disadvantages and costs of habitat banking compared to other means of meeting offset requirements.

Offsets demand assuming a 'no net loss' scheme

Biodiversity may be lost through a number of pressures, including:

- Direct losses through habitat conversion;
- Indirect impacts of habitat conversion affecting both habitats and species;
- Indirect impacts through degradation caused by pollution and changes in land management systems;
- Losses to global biodiversity caused by the actions of EU actors (e.g. food production, logging, mining, etc); and,
- Losses to biodiversity caused by climate change.

Direct losses through habitat conversion

Compared to other pressures on biodiversity, direct losses through land use change are the easiest impacts to identify and quantify and are an obvious starting point when considering biodiversity offsets.

CORINE data is the sole source of EU land cover data showing changes over time and has been used to assess trends in land use change. Under a 'no net loss' policy, offsets would potentially be required where changes in land cover occur as a result of human activities. The most significant human-induced changes are likely to result from developing undeveloped land and through natural disasters, where these have occurred as a result of human actions. It is unclear to what extent compensation for these losses would be required, and therefore whether they would give rise to a demand for offsets under a goal of 'no net loss'.

CORINE data suggest that approximately 114,000 ha of land were developed in the EU each year between 2000 and 2006. Excluding the development of brownfield land and the transfer of artificial surfaces back to other uses suggests that the net decline in undeveloped land was 86,200 ha per annum in the EU between 2000 and 2006. If this trend continues, this would represent the level of development that would require offsets in order to achieve no net loss of biodiversity. However, brownfield land can also have a biodiversity value and could therefore also give rise to demand for offsets if required.

The vast majority of undeveloped land used for development over this period was agricultural land, which suggests that the greatest potential demand for offsets resulting from development could be for losses of agricultural land, if there was a requirement to offset these losses (i.e. on a like-for-like-or-better basis). This was followed by losses to forests and woodland shrub, sclerophyllous vegetation and natural grasslands, which would also require offsets under a 'no net loss' policy.

These trends are based on data up to 2006 and therefore fail to take account of the economic downturn and decline in development activity that has taken place since 2008. However, an analysis of three EU land-use models developed since 2008 has helped to validate the above trends as appropriate for projecting to 2020. Based on these models and the CORINE data, a projection of

50,000 to 100,000 ha per annum is likely to be a realistic, yet conservative, forecast of the net loss of EU habitats and other greenfield land to development up to 2020.

Undeveloped land can also be lost as a result of natural or man-made disasters including forest fires. Using data from the European Forest Fire Information System (EFFIS) and data relating to the causes of forest fires in Europe suggests that more than 55 per cent of forest fires are a result of human activities. If the responsible persons or organisations could be identified, this could potentially give rise to a significant demand for offsets if it was determined that these losses would need to be compensated for in the context of a no net loss target. For example, if the offsets requirements were extended to this type of damage, this could give rise to a demand for offsets of between 110,000 and 440,000 ha per annum, with an average of 250,000 ha per annum (based only on those which are caused by human activities). Establishing legal liability for this damage would be essential, although insurance schemes are a possible solution for situations where liability cannot be identified.

Combining the estimates of undeveloped land lost to development and areas affected by natural disasters (if the latter were also required to be offset) suggests that overall land use changes totalling 160,000 and 540,000 ha per annum could create a demand for offsets under a policy to achieve no net loss of biodiversity.

Indirect impacts (biodiversity degradation) induced as a result of habitat conversion

In many situations, the direct, physical footprint of a development is just a small part of the overall impact on biodiversity. There are other potential indirect or induced impacts such as pressure from increased footfall, which can reduce a habitat's functionality even if the habitat is not completely lost or directly damaged. In such cases habitat is not converted but biodiversity losses can be large. According to the EIA Directive, indirect and cumulative impacts should be considered in impact assessment. Certainly if a policy goal is no net loss of biodiversity, such losses need to be addressed

Indirect impacts (losses) through pollution and changes in land management systems

Another form of impact that is less visible than the direct effects of clearing a forest or building on a field is the impact on biodiversity from non-point source pollution, such as the cumulative effects on freshwater and marine biodiversity from agricultural run-off. In addition, energy intensive developments (such as extractive industry projects) result in considerable carbon emissions, and climate change is a significant cause of biodiversity loss. A NNL approach would therefore potentially seek to compensate for impacts of this kind as well, perhaps through an approach akin to a scheme for payments for ecosystem services in the first case, and a system of biodiversity-friendly carbon sequestration projects in the second.

Losses to global biodiversity caused by actions of EU actors

Given a goal of achieving NNL, there is also a need to potentially consider what measures might have to be taken to address the considerable cumulative biodiversity losses caused by EU entities' operations outside the EU. Public procurement by MS and the Commission, the consumption patterns of EU residents and the international supply chains of companies headquartered within the EU all give rise to biodiversity losses.

Level of impacts to be compensated

Another aspect to consider when reviewing demand for offsets is the level (or significance) of residual impacts that would trigger the no net loss requirement. Law, policy and guidance worldwide vary as to whether approaches to NNL should focus on 'significant' impacts only, or use metrics and approaches to impact assessment that would lead to all residual impacts being addressed. It may seem onerous to require developers whose individual impacts result in residual impacts that are less than 'significant' to offset these. However, the cumulative effect of even fairly insignificant residual impacts contributes to the net loss of biodiversity. A number of different responses to this dilemma could be considered that are proportionate and fair, drawing on, for example, experience from Australia and the UK.

Demand for compensation resulting from EU legislation

The Natura 2000 network covers 95 million ha, representing 17.5 per cent of the EU territory. However, there are relatively few cases each year where compensation measures are required for

Natura 2000 sites. Analysis of Commission opinions suggests that developments on Natura 2000 sites may cause damage to 8,200 ha of habitats per annum, representing approximately 10% of the land developed in the EU each year (0.009% of the Natura 2000 network), and giving rise to demand for compensation for the loss of up to 50,000 ha. However, it should be noted that this compensation does not necessarily achieve no net loss, as there may be a need for better metrics, tools and guidance to determine the level of compensation that should be required.

The EIA Directive also creates demand for compensation. However, the analysis suggests that compensation resulting from EIAs arises for only a very small proportion of land affected by development in the EU. Moreover, there is likely to be a high level of overlap with compensatory requirements arising from damage to Natura 2000 sites.

There is a lack of evidence relating to cases brought about by the ELD. Moreover, implementation of the Directive has been slow. Altogether, this suggests that current demand for compensation resulting from the ELD in the EU is very limited, although more ELD cases are reported each year. Nonetheless, offsets and habitat banking could offer a solution to operators who may be called upon to restore biodiversity loss.

Demand for compensation resulting from MS requirements

There is a lack of data on compensation measures resulting from MS requirements. A qualitative assessment of the available evidence suggests that the strongest demand for compensation is in Germany, while there is also some demand for compensation in France, the UK, Sweden and the Netherlands, and much lower demand for compensating for environmental damage in Bulgaria, the Czech Republic, Finland, Greece, Poland, Italy and Lithuania. Demand for compensation within the Natura 2000 network is higher than for damages occurring to areas outside Natura 2000 sites, mostly due to the general lack of supporting legal frameworks.

Demand for voluntary compensation

There is also some, albeit limited, demand for compensation on a voluntary basis, driven by, for instance, companies motivated by corporate social responsibility, reputational considerations or attempts to increase the likelihood of gaining regulatory approval. Voluntary compensation is unlikely to create a substantial demand for offsets at EU level in the near future, or make a significant contribution towards an overall goal of NNL. However, there is potential for growth, and experience with voluntary approaches can inform and shape the nature of a regulated system.

The supply of offsets

The ability to supply effective biodiversity offsets depends on the interaction between four key factors:

- The types of **habitats that are being lost** through pressures that may lead to a 'like-for-like or better' requirement for compensation;
- The **condition of existing habitats** and the extent to which they are in need of activities to improve or protect their conservation status;
- The **limitations which constrain the ability to restore or recreate different habitats**. Several factors will influence whether or not it is possible or not to restore or recreate a habitat, some of which are related. These include:
  - The time it takes for a habitat to be restored / recreated;
  - The extent to which habitats are limited by geographic and ecological conditions;
  - The availability and accessibility of knowledge;
  - Land availability and legal constraints;
  - Financial constraints; and,
  - Social and administrative constraints.
- The **precision with which the requirement for 'like-for-like or better' compensation is defined**. This may differ according to the context and policy requirements, as well as the physical condition of the habitats in question.

There are, for instance, certain types of habitats that have been degraded beyond the point where restoration is feasible, and this could limit the supply of offsets. However, this is only of consequence if there is no alternative option for sourcing appropriate offsets, for instance averted risk offsets (see below) or 'trading up' to a higher conservation priority habitat which presents a 'better' offset option.

Considering all the various factors, available evidence indicates that, for instance:

- The supply of grassland and wetland habitats for restoration / enhancement / re-creation is least constrained;
- The supply of coastal, freshwater, forest, sclerophyllous and heathland habitats for restoration / enhancement / re-creation is slightly more limited; and
- The supply of dune and rocky habitats for restoration / enhancement / re-creation is the most limited.

Aside from their restoration and re-creation, the continued degradation of habitats also provides the opportunity for *averted risk offsets,* where the activity involves protecting a habitat which would otherwise be at risk of damage or degradation (instead of restoring, enhancing or re-creating a habitat that has already been damaged or degraded). Averted risk offsets can result in significant biodiversity benefits by arresting on-going degradation and losses. However, averted risk offsets may be somewhat limited in the EU given that a large proportion of European habitats whose further degradation is worth arresting are already protected at some scale. This is a topic that merits some discussion in the EU.

Although the analysis indicates that there are cases where the extent to which it is feasible for a habitat to be recreated or restored could be very limited, in practice it seems that:

- The factor which currently constrains supply the most is actually **the availability and / or accessibility of suitable land** for compensation to take place. Land suitable for the restoration or creation of required habitats may be short in supply locally because it is in demand for other purposes, because there is no clear market for providers to sell into, little awareness of this as a business opportunity, or because other land uses generate higher income for providers;
- In some cases, the **timescales** required to restore, enhance or re-create habitats present a significant barrier to offsetting;
- On the whole, however, it seems that **other factors which limit the feasibility with which certain habitats can be restored, enhanced or re-created are of less concern**, because:
  - those habitats that are inherently very difficult to restore are not the same ones being affected by development;
  - applying the mitigation hierarchy should limit losses of more distinctive and hard to replace habitats; and/or
  - constraints may sometimes be overcome by like-for-unlike (i.e. like-for-better) compensation.

Policy implications and considerations

Development is less likely to occur on habitats which are difficult to restore / enhance / re-create, if the mitigation hierarchy is followed diligently, if the value of these habitats is appropriately reflected in the chosen metrics and if 'like-for-like-or-better' compensation is required.

Habitats which are relatively straightforward to restore or re-create should present fewer challenges to find 'like-for-like' compensation and might also provide widespread opportunities for 'like-for-like or better' compensation (where 'trading up' is acceptable and where like-for-like compensation is difficult). Conversely, a like-for-like requirement will tend to discourage damage of habitats whose restoration is difficult, lengthy and/or expensive. Where the scope for restoration and/or re-creation is severely constrained and where like-for-like compensation is required, development may be shifted onto other habitats which are easier to restore / re-create and where it would, therefore, be more feasible and cost effective to offset the damage. Alternatively, it could mean that other mechanisms are sought to deliver 'like-for-like or better' additionality (e.g. through averted risk offsets rather than restoration). The metrics that are applied when calculating the offset requirements should reflect these factors.

Similarly, stipulating 'no go' areas where a habitat is highly distinctive and/or the restoration of a habitat is infeasible may also restrict development on these kinds of areas and limit development to areas where affected habitats could be more easily restored or for which their loss may be compensated.

There are potential benefits in a system which allows some flexibility in the precision of the exchange rules set to define 'like-for-like or better' compensation and a broader area for offset delivery, but there may also be potential drawbacks.

Allowing 'like-for-unlike' or, preferably, 'like-for-better', offsets can ease some supply constraints, provided this is based on a sound scientific method for defining what constitutes trading up to 'better' in a manner that does not endanger the biodiversity components affected. Similarly, allowing a broader geographical frame of reference within which offsets can be provided (i.e. a larger 'service area') can also increase flexibility and be used to deliver more strategic, joined up and connected conservation projects that are planned at the regional or landscape scale. However, this must be balanced with a potential lack of political and public acceptance for more coarsely drawn exchange rules and larger service areas. One way to bridge this gap is to plan 'composite offsets' spread across more than one location in which the amenity and livelihood values affected by the project are compensated nearby, while the more intrinsic conservation values (e.g. populations of threatened species) are compensated at a broader spatial scale. Policy decisions on exchange rules and geographical scope, as well as the nature of the policy goals themselves, will affect the extent to which supply is constrained and the extent to which these constraints may be overcome.

Costs of biodiversity offsetting and habitat banking

Biodiversity offsets and habitat banking schemes result in a variety of different costs for developers and regulatory authorities. These include:

- **Habitat management costs** - the costs of habitat creation, restoration and long term management activities designed to deliver a gain in biodiversity equivalent to the losses incurred;
- **Land costs** - the costs of acquiring the land on which this conservation activity is to take place, or of entering into a management agreement to secure a change in land management;
- **Financial costs -** the costs of financing biodiversity offsets, as well as the costs of insurance. Financing costs may be significant for habitat banking schemes, which require up-front capital investments only recouped over a period of years as credits are released to the market based on performance milestones which sometimes take many years to achieve. Other costs may include financial guarantees and/ or insurance to cover the risk of the offset failing;
- **Management and transaction costs** incurred by the developer in meeting the requirements of the policy, by the provider in managing the provision of offsets and habitat banks and by providers and brokers in organising transactions. These include the time, fees and expenses related to applications, project management, management planning, certification, administration, monitoring and reporting; and
- **Administrative costs** - The costs incurred by the authorities in administering and regulating the offsets system, which may or may not be reclaimed through fees paid by developers and/or providers. These may include the costs of receiving, assessing and granting applications, advising on requirements, conducting site visits, undertaking scientific assessments, issuing permits, dealing with disputes or complaints, maintaining records and inventories, enforcing any requirements, and undertaking on-going monitoring and evaluation.

While most national offset systems require some up-front investment by governments, it is possible to run offset systems on a 'cost recovery basis.' The various costs of providing offsets are reflected in the prices paid by developers for credits, which also include any profits made by the offset provider on the provision and sale of credits. Some offset providers (e.g. individual farmers, landowners and conservation banking companies) aim to maximise profits, while others, such as conservation NGOs and some landowners, may be driven primarily by conservation motives and be content to cover the costs incurred.

A large proportion of the overall costs involved – especially habitat management and land costs – will be common to any habitat creation or restoration scheme. However, other costs will vary according to

the type of delivery model. Habitat banking schemes will incur costs other than one-off offsets. For example, habitat banking tends to have significant financing costs (because it often involves conservation work in advance of offset requirements being identified), but should yield economies of scale which will help to reduce management and transaction costs for providers. Habitat banking may also reduce administrative costs by enabling the authorities to deal with known, certified providers with established systems and practices.

Evidence of costs

While detailed cost breakdowns are rarely available, evidence suggests that the initial costs of habitat management works may often be a small proportion of the overall costs of habitat banking and offset schemes. The costs of purchasing or securing rights to land, the administrative and transaction costs of determining offset requirements and entering legal agreements, and the allocation of funding to long term management and monitoring all add significantly to the overall costs involved.

A wide range of cost estimates are available for different countries, reflecting variations in local requirements, land prices and cost structures. Moreover, the prices for credits for habitat banking also vary widely, both between and within countries. In the US, for instance, different transactions for wetland habitat banking can involve total payments of anything between €6,000 and more than €1.2 million per hectare. Most available evidence in the EU suggests that the total (capitalised) costs of offsets are likely to range from between €30,000 and €100,000 per hectare, but could be higher than this in some circumstances. Offset costs represent only a small proportion of total development costs. Globally, the annual market for biodiversity offsets has been estimated to be worth at least $2.4 billion and possibly over $4.0 billion.

While no comparative data could be found, it is widely commented that habitat banking should lead to cost efficiencies over time compared to individually arranged offsets, through economies of scale and the ability to plan and implement compensatory strategies in a strategic and cost effective way.

Benefits of offsets and habitat banking

The benefits of offsets and habitat banking schemes can be measured in terms of their effectiveness in conserving biodiversity and ecosystem services. It is clear that established schemes in the US and Australia have provided many thousands of hectares of habitats to compensate for losses to development. It has been estimated that the global impact of the offset market has been to bring at least 187,000 hectares of land under some sort of conservation management or permanent legal protection per year. Most of this area is in North America, and only a small proportion is currently in the EU. While the methods employed to assess offset requirements do not always guarantee that no net loss is achieved, enhanced understanding and improvements in standards should help to enhance benefits over time. There is little evidence of the monetary value of the benefits of offsets and habitat banking schemes and arguably monetary valuation may not be a high priority where policies are driven by clear sustainability criteria (i.e. the no net loss objective, delivered through biodiversity-based metrics that establish 'like for like or better', and quantified changes in condition of biodiversity in particular areas).

The benefits of habitat banking compared to other means of delivering compensation including its support to larger conservation projects (yielding both economies of scale and conservation benefits), streamlined trading arrangements and reduced transaction costs, can be more reliable and effective where compensation is provided in advance of impacts, and can help to address cumulative impacts by providing an efficient means to compensate for small scale projects for which individual offsets would be difficult to arrange.

Risks of offsets and habitat banking

Offsets and habitat banking also present a number of potential or perceived risks. These include the potential that development of successful schemes could lead to relaxation of the mitigation hierarchy (the so-called 'licence to trash'), that offsets displace existing conservation activities and therefore fail to deliver additional benefits, that they fail to deliver the anticipated benefits and therefore to achieve no net loss objectives, and/or that they are costly and unpopular and face significant opposition from developers. While offsets will never be risk free, most of the potential risks can be minimised or reduced through careful design of offsets and habitat banking initiatives.

Design Elements

A series of key principles have been established that guide the design and delivery of biodiversity offsets and habitat banking schemes, and these have been formalised internationally through the BBOP Standard on Biodiversity Offsets.

Analysis and experience of the implementation of biodiversity offsets and habitat banking in EU Member States and internationally highlights a number of different design elements that need to be considered in accordance with these principles. These issues can broadly be divided into two groups:

- **The design of offset requirements** – issues which effectively determine the scale and type of demand for offsets and habitat banking schemes.
- **Arrangements for implementing offsets and habitat banking** – issues which determine arrangements for the supply of offsets and habitat banking, and how these arrangements are regulated.

Design of Offset Requirements

Objectives of schemes compensating for biodiversity loss may vary in terms of the delivery of no net loss (e.g. US wetland mitigation), net gain (e.g. for native vegetation in some Australian states and for impacts on critical habitat under IFC Performance Standard 6) or more loosely defined compensation requirements (e.g. in South Africa). The BBOP Standard states that there is a spectrum of compensatory activities and that only those designed to deliver no net loss or net gain should be defined as biodiversity offsets. They may form part of an overall no net loss policy or be designed to offset damage caused by particular projects. Similar variations are apparent in the EU. For example, offsets and habitat banking contribute to a formal no net loss policy in Germany and are being trialled to enhance the delivery of existing compensatory requirements in England. However, in Sweden compensation schemes can have more general objectives that do not necessarily deliver no net loss of biodiversity (e.g. communities can be compensated for biodiversity loss through improvements in local amenities which deliver cultural or recreational services). Schemes may also vary in the extent to which they focus on compensation for losses of habitats or species, take account of wider ecosystem functions and services, or address the loss of biodiversity-related benefits to local populations.

Implementation of the mitigation hierarchy is widely emphasised in offset policies and guidance, to ensure that the provision of offsets does not lead to a relaxation of efforts to avoid or minimise losses. Most offset schemes require that compensatory measures should only be used to offset adverse residual effects arising from an activity, once other avoidance and mitigation measures have been taken. However, clear guidelines about how to ensure adherence to the hierarchy and how far to pursue each step along it are often lacking. Policies in Australia, Canada, South Africa and the US stress the avoidance or minimisation of impacts on habitats of higher significance, which are unlikely to be suitable for offsets. The regulatory and planning authorities have a key role in ensuring adherence to the mitigation hierarchy, while the BBOP Standard on Biodiversity Offsets highlights the importance of Biodiversity Offset Management Plans in documenting how the hierarchy has been applied. Effective adherence to the mitigation hierarchy should limit the demand for offsets, and this has been noted in parts of the EU (Germany, the Netherlands and Sweden).

Conditions and thresholds for the application of offsets vary between schemes, both internationally and in the EU. Germany requires the widespread use of offsets for residual biodiversity losses, not only in protected areas or for protected species. But in most Member States compensation tends to be required only in particular circumstances, for example where protected areas or other important sites are affected. These circumstances are often ill-defined – for example planning policy in England requires compensation for 'significant harm' to biodiversity but provides only general guidelines about the definition of significance - relying on the judgement of local planning authorities to determine when compensation is required.

Mandatory and voluntary approaches to offsetting have been applied both internationally and in the EU. Both approaches may be designed to achieve no net loss of biodiversity, but only mandatory requirements can address the residual impacts of a sufficient proportion of projects to make a significant contribution towards no net loss. Mandatory schemes are in place in the US, Australia, Brazil, Canada and South Africa. Compensation is mandatory for impacts on Natura 2000 sites throughout the EU, as it is for impacts on other categories of biodiversity in Germany. England is

piloting a voluntary approach to biodiversity offsets (beyond compliance with EU Directives) in order to test whether they can enhance effective compensation delivery under the planning system. Initiatives in the Netherlands have sought to promote the wider adoption of voluntary offsets at the national level. Offsets are increasingly being applied by companies on a voluntary basis in developing countries, a trend largely driven by the need to demonstrate no net loss or a net gain of biodiversity to satisfy changes in project finance conditions.[2]

'Like-for-like or better' compensation for biodiversity losses is required to varying degrees of precision by biodiversity offset and habitat banking schemes. 'Like-for-like' or 'in-kind' offsets involve similar habitats, functions, values or other attributes to those affected by the project, while 'trading up' allows for compensation of different kinds of higher conservation value biodiversity. There is a general presumption worldwide in favour of 'like-for-like or better' offsets. In some cases, particularly where the biodiversity affected is not especially vulnerable or irreplaceable it may be beneficial to allow the flexibility to 'trade up' to conserve biodiversity of a higher conservation value that that affected. The more vulnerable and irreplaceable the affected biodiversity, the tighter becomes the 'like for like' requirement. In cases where the biodiversity affected is extremely vulnerable or irreplaceable, it would be impossible to offset the impacts concerned. In this case, 'no go' areas should be considered. There are some examples of 'very unlike' compensation arrangements, such as in Sweden where the objective of compensating local people for losses may be delivered through a wide range of options, even including investments in cultural or recreational assets, although at this level of disparity it becomes unclear to what extent the compensation is contributing to a goal of no net loss, if at all.

Metrics to assess offset requirements are an important element in any offset scheme. Good quality metrics endeavour to ensure equity in type, space and time of biodiversity. Key elements of metrics are: biodiversity counts and measures (what is being exchanged, or lost and gained); a currency constructed from these data (how much of what is being exchanged); an accounting model defining offset specifications (how much of what is needed); and separately from the metrics themselves, spatial information to identify potential offset locations. Different approaches have been applied internationally, ranging from using area with a simple multiplier (or ratio) as the metric for compensation actions, to the use of fairly subjective professional judgements by experts, or more sophisticated metrics based on particular assessment methods. Current good practice is to use an approach that reflects not only the area affected but changes in condition or quality of the biodiversity lost or gained (e.g. the use of 'habitat hectares' in Victoria, Australia). As more sophisticated modelling methods are developed and more data on species' abundance, condition and persistence become available, it may be possible to develop metrics based on combined data for changes in many species' populations in the same area. For now, simpler approaches based on area and condition of habitats, supplemented with information on particular species of concern, are more feasible. On top of the basic metric, it is common to apply multipliers to take into consideration factors such as uncertainty in offset success, particular national or regional conservation targets and rare / threatened biodiversity components, time preference and dealing with out-of-kind offsets. In many countries, including some EU MS, offset schemes have been criticised for a lack of uniform, objective and/or transparent methodologies for assessing the equivalence of gains and losses.

Additionality is a widely agreed principle that underpins offset and habitat banking schemes – offsets should result in additional conservation outcomes to what was expected in their absence. Criteria to assess additionality include allowable conservation actions (such as habitat restoration and/or averted risk) and the basis for funding these actions. In some countries mere protection of biodiversity may not qualify as an activity that can be included in offset schemes, while in others it may be eligible subject to certain criteria (e.g. that it protects sites otherwise at significant risk and does not contribute to the fulfilment of existing regulatory requirements). The ability to verify additionality may be an essential prerequisite for regulatory approval, giving providers the certainty to invest in offset or banking schemes prior to a project taking place. In England, providers are required to develop approved Biodiversity Offset Management Plans that demonstrate the additionality of the compensation provided.

Locational requirements vary between offset schemes, with most placing some geographical limit on where compensation can be provided relative to the impacted site (often known in conservation banking terminology as the 'service area'). The 'service area' may be set geographically, often with

[2] For example, IFC PS6 and Equator Banks' project finance conditions

reference to the watershed or within an ecologically defined region, or it may be set by default by defining biodiversity credits with such precision that the same credit types will most likely only be found within that region. Local offsets are normally preferred (in terms of confidence in ecological equivalence given the uncertainties inherent in quantifying no net loss, and in terms of fairness so that those affected by the project benefit from the offset). A highly local approach may not be effective in some cases, however, in terms of benefits for biodiversity and ecosystem services or availability of land. Contrasting approaches are evident in the EU; Sweden normally requires compensation to take place very locally, to compensate the population affected, while England's approach emphasises the use of local strategies for biodiversity offsetting – often spanning the area of several local authorities – to maximise conservation benefits through the delivery of larger initiatives at the landscape scale. Trans-boundary offsets may sometimes be beneficial on both ecological and economic grounds, but raise potential challenges with regard to political acceptability and regulatory enforcement. They may offer particular opportunities to further the conservation of migratory species.

Timing of provision of compensation is also a significant consideration in the design of biodiversity offsets and habitat banking schemes. While project impacts cause immediate and certain losses, the conservation gains of an offset are often uncertain and may require many years to achieve. Habitat banking schemes may address these concerns to some extent, by demonstrating progress in delivering conservation gains prior to the impact taking place. However, most habitat banks release at least some of their credits at an early stage when significant uncertainties about future outcomes still remain. Given the time taken to establish effective habitat banking arrangements, a requirement for compensation to be fully operational prior to a project taking place may be unduly restrictive, especially in the case of new offset policies for which there may not be an established supply of offsets or habitat banking arrangements. The issue of time preference can also be addressed through use of metrics to discount future benefits, and to allow for risk and uncertainty. Such an approach is being applied in the English biodiversity offsets pilots, where time discounting (using a 3.5% discount rate) requires an offset multiplier of 3:1 to be applied for compensation projects that take 32 or more years to reach maturity.

Arrangements for Implementation of Offsets and Habitat Banking

Institutional arrangements need to be effective and based on clearly assigned responsibilities. These can take many different forms, as there are a variety of approaches and institutional roles. Most offsets and habitat banking schemes involve a transaction between a provider and a developer, approved and overseen by a regulator. Brokers can also play an important role. Many systems allow offsets to be implemented by the developer themselves, which can be done voluntarily (e.g. the Road Agency in Sweden) or through case-by-case requirements stipulated by local authorities (e.g. the UK). In these cases, there may be very little formal involvement from nature conservation authorities. A range of government bodies can also be involved, including national and local planning bodies and authorities, national policy makers and environmental agencies, which can make for a complex institutional structure. Public authorities and agencies can play an important role not just as regulators, but can also potentially act as a provider of offsets (subject to additionality), and as a broker, buyer or seller. Other stakeholders can also play a critical role in managing and monitoring the offset, including communities, conservation organisations, NGOs or independent consultants. The evidence suggests that where it exists, offsetting activity in the EU is still quite basic (where a developer often undertakes conservation actions to offset the impacts of its own project) compared to a more sophisticated system whereby offset credits are banked and/or traded and a larger range of stakeholders are therefore involved.

Regulators have a very important role to play in offsets and habitat banking schemes through establishing enabling frameworks and/or property rights which stimulate demand, ensuring fair and transparent monitoring and enforcement to ensure that requirements are properly met and adhered to, and defining standards and performance indicators. Although a public nature conservation or environmental authority can play the main regulatory role, statutory functions can also be split between more than one public sector body. In the EU, different public authorities are involved in different roles, and are responsible for different aspects depending on the context. Public nature conservation or environmental authorities rarely seem to play a significant role except to provide overall guidance and support, although they are the main organisation involved if the case relates to compensation in a protected area (e.g. Sweden). Offsets are normally the responsibility of local or regional authorities (e.g. the Netherlands and the UK). In the US, on the other hand, the regulatory

authority acts as a 'check' on the process to ensure that guidance and standards are followed. Regulators may also appoint independent agencies to oversee the licensing of habitat banks and their operations (e.g. Germany). Overall, the evidence is clear that without a strong regulator, offsets and habitat banking are likely to be unsuccessful, or limited to isolated 'hotspots' of voluntary action.

Instruments and models available for delivering offsets vary considerably, for example, from individual negotiated agreements to habitat banking schemes in which offset requirements are met through the purchase of credits. Experience in the EU seems to be largely based on a principles-based approach, which means that existing mechanisms have to be used through, for instance, the planning system. This kind of approach means that detailed guidance is especially important. The most common approach is to include requirements for compensation as conditions attached to a planning permit, which are then legally binding. These can be quite weak, however, where they relate to compensation outside Natura 2000 sites, and are not always fully enforced. There are some cases where separate legally binding agreements can also be made which can provide greater scope for involving different stakeholders and have the potential to include a wider variety of terms and conditions (e.g. Section 106 agreements in the UK), although these agreements can take much longer to negotiate. Management plans can also be developed (e.g. Biodiversity Offset Management Plan (BOMP) in the UK, which are assessed and need to evidence that a project is capable of delivering the conservation outcomes envisaged). There are some examples of well-developed market mechanisms in the EU (e.g. Germany's compensation pools and a habitat bank in France) although these are rare. In the case of habitat banking (e.g. in the US), habitat banking agreements, or memoranda of understanding, are developed which cover all necessary components (e.g. duration, management actions, rights and responsibilities, monitoring, reporting and auditing requirements, contingency plans and performance standards).

Land availability and accessibility is often cited as a factor hindering the implementation of offsets and compensation more generally in different Member States. A range of options are available, including purchase of the site, leasing of the area, or other models based on management arrangements with the landowner. However, the lack of formal or established mechanisms that enable land to be acquired or accessed for compensation purposes tends to make this a lengthy and drawn out process. Land can also be more forcibly acquired by requiring that the area be included in the protected area network (e.g. Sweden), or agencies can be established that have pre-emptive rights on land for different uses (e.g. France). In addition to a Biodiversity Offset Management Plan, BBOP points out that several systems use covenants, easements or other rights that can be attached to land in perpetuity, to ensure that benefits are maintained in the long term.

Standards and performance criteria play an important role in ensuring implementation is effective, establishing the benefits expected of compensation schemes and providing a benchmark for monitoring. In the US, evidence that wetland mitigation projects were not being effective led to the development of new standards. Performance standards need to be specific, measurable, achievable, realistic and timetabled. Important standards that have been developed are the BBOP Standard on Biodiversity Offsets and the International Finance Corporation (IFC) Performance Standard 6 (PS6). The latter defines a set of circumstances in which companies need to achieve no net loss or even a net gain of biodiversity, using biodiversity offsets, where necessary, as the last step in the mitigation hierarchy. PS6 is a requirement for clients seeking project finance from the IFC and from over 70 banks that have adopted the Equator Principles. In the US, administrative and ecological performance standards are included in mitigation plans. The ecological performance standards are linked to credit release schedules. In Germany, quality standards have been developed for habitat banks to follow. Evidence from the rest of the EU indicates that performance standards are typically decided on a case-by-case, *ad hoc* basis. The lack of a consistent and standardised approach in many cases reflects a lack of detailed guidance as well as limited delivery experience.

Certification and accreditation help to build confidence in offset provision, particularly for providers intending to engage in a multitude of transactions, for example through habitat banking. There are also benefits to the developer and/or provider, in terms of its license to operate and/or reputational advantages, particularly where they are undertaking offsets voluntarily or to access project finance, and not in compliance with detailed national regulatory frameworks. Certification is used in some settings and is beginning to be explored more broadly as an option. In Germany, for instance, compensation pools and agencies are certified if they fulfil a series of nature conservation criteria. The use of a certified pool can reduce the amount of compensation required. Compensation certification is

not evident in other EU countries, although there are some indicative steps towards accreditation (e.g. France). A range of mechanisms are available to implement certification. Accreditation can also occur either in the form of certifying a habitat bank (e.g. Germany) and/or the consultants involved in designing and implementing the offset (e.g. Australia).

Monitoring and reporting are essential to ensuring compliance and transparency, enabling management to be adapted if circumstances change (i.e. adaptive management) and contributing to the evidence base. BBOP recommends that monitoring should cover implementation performance (i.e. the process, covering inputs, activities and outputs) as well the impact performance (i.e. ecological and biodiversity impacts). Monitoring is a key element of some international systems (e.g. Australia). In the US, federal guidelines require ecological performance standards and monitoring requirements to be included in mitigation plans. In Canada, however, consistent offset monitoring and evaluation is often lacking. In the EU, monitoring requirements are often implemented on an *ad hoc* basis. In some cases (e.g. the UK) these systems are largely ineffective whilst in others (e.g. Germany) they are working relatively well. Monitoring may be carried out by the regulator (e.g. Australia), a third party, or by the developer in addition to, or instead of, monitoring by the regulator (e.g. Sweden). Offsets that are independently monitored, verified and audited are regarded as more trust-worthy than those that are monitored and verified by the developer itself. The costs are normally carried by the developer (e.g. Spain). There is considerable scope for other types of stakeholders to be involved in monitoring (e.g. communities and NGOs). Whilst monitoring in itself is important, it is also crucial that the results are shared to develop the knowledge and evidence base associated with offsets.

Compliance and enforcement are required to ensure that actions are appropriately and effectively carried out, particularly where they are a condition of planning approval, permits or project finance. The ability for relevant bodies to discharge their enforcement obligations is linked to the efficacy of legislation and the financial and resourcing capacity of regulating bodies. Experience from the EU indicates that mechanisms to enforce conditions are not always included, and there are rarely penalties for non-compliance. In other countries (e.g. Sweden), this element of the system works relatively well, in that developers are held accountable for the outcomes of the compensatory measures. In Australia and the US, enforcement of conditions is also more prevalent. In Australia, for instance, all tiers of government allocate resources for compliance and enforcement activities. Moreover, financial penalties and criminal convictions can be imposed.

Long term management and contingencies for failure are important to ensure that the measurable conservation outcomes are actually delivered and that they endure over the long term and preferably in perpetuity. This can be ensured through, for instance, the use of endowment funds for on-going management, performance-based payments, easements (e.g. in the US) or other legal restrictions on land use and the inclusion of the terms on the land title deeds which are then included in the Land Registry (e.g. Australia, Germany). These safeguards are largely lacking in the EU, partly because systems are less developed and/or tend to rely on general compensation requirements rather than a more formalised offsetting system. Contingency plans, which would come into play if the project fails, are also rarely incorporated into the agreement or planning conditions, in contrast with the US where a 15 – 25% contingency fund is normally set aside for additional work in case a project fails to deliver. Provisions for bankruptcy are also rare, although there are guidelines in the US on how to avoid financial failure.

Conclusions

Biodiversity offsets have an important potential role to play in delivering the NNL objective of the EU Biodiversity Strategy, by requiring measurable compensation for residual losses of biodiversity, following avoidance, minimisation and restoration or rehabilitation. Habitat banking has the potential to facilitate the delivery of offsets in an ecologically- and cost-effective way. However, the demand for offsets and habitat banking is largely driven by requirements to compensate for biodiversity losses. These are currently variable; there is currently no consistent or comprehensive framework in the EU to drive the need for offsetting or habitat banking.

It is clear that the current legislative framework in the EU and its Member States is inadequate to deliver no net loss of biodiversity. While compensation is required for damage to Natura 2000 sites, it is not known whether this results in gains equivalent to the losses. Outside the Natura 2000 network, requirements for compensation for biodiversity losses are limited. Whilst current demand is difficult to

quantify, it is well short of what would be needed to actually offset the estimated biodiversity losses in the EU each year.

While biodiversity offsets have the potential to compensate for many of these losses, a number of technical, ecological, geographical and economic constraints mean that offsets are not possible or appropriate in all circumstances. Where the components of biodiversity affected are particularly vulnerable and/or irreplaceable, it may not be possible to achieve no net loss, and in these circumstances, questions arise as to whether the development should go ahead (perhaps because there are overriding reasons of public interest), or be dropped. Where no net loss is possible but biodiversity is still fairly vulnerable and/or irreplaceable, 'like for like' offsets are advisable. By contrast, where the biodiversity affected is not particularly vulnerable or irreplaceable, 'trading up' to conserve higher conservation priority biodiversity may be the best outcome.

In order for habitat banking, and offsetting more generally, to be successful, there is a need for a strong regulatory framework to create demand, establish basic standards, and drive the process forward. The framework should clearly define roles and responsibilities, including robust mechanisms for monitoring, enforcement, compliance and safeguarding against potential risks and uncertainties to ensure that benefits are sustained in the long term (i.e. contingencies for failure).

It is crucial that a knowledge base is developed which takes into account the wide range of experience which is growing both internationally and, increasingly, within the EU. European experience with compensation and habitat banking is still relatively limited, so information should be shared as widely as possible, particularly with countries that are well advanced in their systems, such as Australia and the US, in order to help improve, inform and develop systems through iterative learning. Building networks between countries (both in terms of those that already have experience as well as those who are interested in offsets as a potential tool to address biodiversity loss) could therefore prove very useful.

Evidence gaps and further research needs

Key evidence gaps and research needs apparent from the analysis include:

- **Defining the policy framework and the role for offsets and habitat banking**: Within the context of the EU's No Net Loss Initiative, there is a need to identify and appraise potential options at the EU and MS level capable of ensuring implementation of the mitigation hierarchy including through offsets and habitat banking. A key issue is the extent to which policies are defined at EU and at MS level. Another important element is defining the role for offsets and habitat banking in compensating for biodiversity which occurs outside the Natura 2000 areas (i.e. for which compensation is not yet required under EU policies). Research could identify potential policy options for both MS and the Commission, and analyse the pros and cons of each, using a range of criteria such as ecological effectiveness, political acceptability, legal feasibility, economic efficiency and coherence with existing policies.
- **Developing a common understanding of terms**: given the different ways in which aspects of offsetting and habitat banking have developed across Member States, there may be value in additional research to understand how terms have evolved and what they may mean in different contexts and to different stakeholders in order to establish a baseline or frame of reference for further work and future policy developments. For instance, it is clear that some stakeholders have different interpretations of words such as 'compensation' and 'quality hectares', as well as of what qualifies as a 'habitat bank' and 'market mechanism'. Efforts to address this issue are already being made as part of the NNL Working Group.
- **Assessing and mapping biodiversity condition:** there is a need to better understand the type and quality of biodiversity in the EU, especially outside protected areas, as well as current rates of biodiversity loss and the drivers and pressures causing these losses. Many Member State assessments of habitats and species indicate a lack of data and/or knowledge on the state of biodiversity, which makes it difficult to understand the baseline against which a no net loss initiative, and specifically a habitat banking scheme, could work. This could tie in with Action 5 of the Biodiversity Strategy which aims to improve knowledge of ecosystems and their services within the EU.

- **Understanding the level of demand resulting from indirect damage to habitats following developments:** Gathering data on indirect impacts in order to estimate overall demand for offsets in the EU is difficult, but a short study could explore the significance of indirect and direct impacts in several cases and form the basis for an exercise to extrapolate and create plausible scenarios for the level of demand for offsets.
- **Further analysis of design elements for biodiversity offsets and habitat banking:** While this report has identified a number of key design elements that need to be considered in implementing biodiversity offsets and habitat banking schemes, a number of key issues merit further research (e.g. to develop a comprehensive guidance document or toolkit). In particular, it would be helpful to explore in more detail issues such as:
  - **The design of metrics** (i.e. methods to evaluate biodiversity losses and gains) to ensure no net loss in the EU context and balancing requirements for scientific robustness, practicality and cost effectiveness. Further research could examine best practice in Australia, the US, the EU and elsewhere, and assess its applicability in addressing biodiversity losses in Europe.
  - **The scope for offsets and habitat banking schemes to operate across Member State borders**, and the key political and regulatory barriers that might need to be addressed.
  - Potential barriers that might inhibit the growth of offset provision and the development of habitat banks in the EU, and how these might be addressed in order to facilitate the supply of offsets and habitat banks in an ecologically- and cost-effective way.
  - The scope for EU schemes to facilitate effective **delivery of offsets and habitat banking arrangements**, for example through common guidance, standards and performance criteria.
  - Potential **initiatives to promote voluntary offset schemes** to address the impacts of EU businesses on biodiversity outside the EU.
  - Potential **options for land to be acquired, accessed and/or secured into the future** for compensation purposes, and the ways in which habitat banking could affect both land availability and prices.
  - **Mechanisms which are available to secure long term benefits and possible safeguards against risks and uncertainties** (drawing on, for instance, experience in the financial and insurance sectors with regard to bankruptcy and financial assurances). A better understanding of what mechanisms are available, and how these may be limited in different Member States (e.g. the use of easements, endowment funds, performance bonds, etc.) could be useful.
- **Understanding the supply constraints of habitats and how these may vary across Member States**: this study was not able to go into detail with regard to the constraints on, and condition of, the different habitats within different Member States. Instead, only a very general, aggregated assessment was possible. There is potential value in undertaking a more detailed assessment in order to understand how supply constraints may vary across different habitats and across Member States in order to develop a clearer and more detailed picture of the extent to which habitat banking may be constrained in different areas and contexts. One discrete area worthy of study is whether and in what circumstances averted risk offsets (i.e. offsets which prevent future risks of harm to biodiversity from occurring) are applicable and appropriate in an EU context.
- **Understanding the costs and benefits of biodiversity offsets and habitat banking:** The review undertaken for this study found that evidence on the costs and benefits of offsets is patchy. Gaps in the evidence base make it difficult to assess the potential costs of introducing offset requirements at EU level, or to identify the most cost effective options for the design of offsets and habitat banking schemes. More detailed analysis would help to inform further policy design and impact assessment work.
- **Understanding and developing the necessary capacity and institutional structures:** Given the limited experience with biodiversity offsets and habitat banking schemes in many parts of the EU, it is likely that their development could be hampered by a shortage of knowledge, skills and experience, and by limitations in capacity and institutional arrangements. Research to understand the key elements for the effective implementation of offset initiatives would therefore be beneficial. Pilot projects in some Member States – such as France and the UK – are improving understanding of the practicalities of implementing offsets and habitat banking schemes in these countries, and could helpfully be extended to other parts of the EU.

Glossary

There are a range of different definitions for the terms used in this report, which include national definitions and international definitions developed by BBOP and others. Harmonising these definitions helps to reduce the risk that some terms may be used inconsistently or misinterpreted in certain circumstances. The No Net Loss Initiative Working Group has developed harmonised definitions for use in the EU. The following glossary of terms draws on that work, as well as BBOP's glossary of terms. Alternative definitions are used in particular settings (e.g. in particular EU or MS legislation) and appear at appropriate places throughout this report.

For the purposes of this report, and unless otherwise specified, the following definitions will be used:

Adaptive management: A continuous and iterative process of revising management plans to take into consideration results to date (i.e. lessons learned are put in practice in the next cycle).

Additionality: A property of a biodiversity offset, where the conservation outcomes it delivers are demonstrably new and additional and would not have resulted without the offset.

Averted risk: The removal of a threat to biodiversity for which there is reasonable and credible evidence. 'Averted risk offsets' are biodiversity offset interventions which prevent future risks of harm to biodiversity from occurring.

Avoidance: Measures taken to prevent impacts from occurring in the first place, for instance by changing or adjusting the development project's location and/or the scope, nature and timing of its activities.

Baseline: A description of existing conditions to provide a starting point (e.g. pre-project condition of biodiversity) against which comparisons can be made (e.g. post-impact condition of biodiversity), allowing the change to be quantified. In ecological terms, baseline conditions are those which would pertain in the absence of the proposed development. Baseline studies may be undertaken to determine and describe the conditions against which any future changes can be measured.

BBOP (The Business and Biodiversity Offsets Programme): a collaboration between some 75 organisations: companies, government agencies, conservation organisations and financial institutions from around the world. Its aim is to develop shared views and experience of best practice on the application of the mitigation hierarchy, including biodiversity offsets. BBOP has developed Principles and the Standard on Biodiversity Offsets, handbooks on offset design and implementation, a number of resource papers and case studies. (See http://bbop.forest-trends.org/)

Biodiversity loss: Biodiversity loss is usually observed as one or all of the following: (1) reduced area occupied by populations, species and community types, (2) loss of populations and the genetic diversity they contribute to the whole species and (3) reduced abundance of populations and species or condition of communities and ecosystems. The likelihood of any biodiversity component persisting in the long term (the persistence probability) declines with lower abundance and genetic diversity and reduced habitat area.

Biodiversity Offset Management Plan: a form of management plan (often called a Biodiversity Action Plan) typically adopted by developers to address the mitigation measures set out in the impact assessment which is developed as part of the environmental management plan to ensure their implementation. Biodiversity may be integrated throughout the environmental management plan, or may form a discrete component. Such documents may also incorporate biodiversity offsets, but are generally more focussed on project sites (and managing impacts on-site) rather than on offset areas and activities. The BBOP Standard requires a Biodiversity Offset Management Plan to capture the offset's management objectives and general design.

Biodiversity: 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.

Certification: A process whereby an independent third party (a certification organisation) certifies that an activity, company or organisation satisfies the requirements set by a performance standard.

Compensation: recompense for some loss or service, and something which constitutes an equivalent to make good the lack or variation of something else. It can involve something (such as money) given

or received as payment or reparation (as for a service or loss or injury). Specifically, in terms of biodiversity, compensation involves measures to recompense, make good or pay damages for loss of biodiversity caused by a project. In some countries, 'compensation' is synonymous with 'offset'. In this report we distinguish between compensation and biodiversity offsetting, however. The latter can be seen as a specific type of compensatory measure. A biodiversity offset is a no net loss (or net gain) conservation outcome, whereas compensation more generally can involve reparation that falls short of achieving no net loss, for a variety of reasons.[3]

Condition: The terms 'condition' and 'state' are often used interchangeably to describe the intactness or degree of functionality of ecosystems.

Credit: A biodiversity credit is a unit of gain that can be traded in an offset market. Government typically defines a number of different credit types, which may be described as habitat types or in metrics related to particular species, and projects' impacts are converted into a requirement for a certain number of different credit types on the basis of 'like-for-like or better'.

Cumulative impact: The total impact arising from the project (under the control of the developer); other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures and trends which may be unregulated.

Currency: Currencies (or metrics) are the unitary measures of biodiversity lost, gained or exchanged. This varies from very basic measures such as area, to sophisticated quantitative indices of multiple biodiversity components which may be variously weighted.

Direct impacts: An outcome directly attributable to a defined action or project activity (often also called primary impact).

Easement: A right to use a part of land which is owned by another person or organisation (e.g. for access to another property). A conservation easement can be defined as a legally binding agreement not to develop part of a property, but to leave it 'natural' permanently or for some designated and 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. In some countries, 'servitudes' or 'covenants' are legal instruments that can be used to introduce conditions for land-use attached to land title that pass from one landowner to the next successor in title.

Ecological Equivalence (see also: 'like-for-like', like-for-like-or-better and 'trading up'): In the context of biodiversity offsets, the term is synonymous with the concept of 'like for like' and refers to areas with highly comparable biodiversity components. This similarity can be observed in terms of species diversity, functional diversity and composition, ecological integrity or condition, landscape context (e.g. connectivity, landscape position, adjacent land uses or condition, patch size, etc.), and ecosystem services (including people's use and cultural values).

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.

Ex-ante (or prospective): 'Before the event': potential, likely or expected. In the context of biodiversity offsets, a 'prospective offset' is one where the decision to undertake an offset is made, and the conditions in the project area are characterised and documented, prior to any impacts associated with the development project.

Ex-post (or retrospective): 'After the fact': looking back on or dealing with past events or situations. In the context of biodiversity offsets, a retrospective offset concerns a situation where the impacts associated with the development project have already occurred prior to the decision to undertake a biodiversity offset, or prior to the characterisation of pre-project conditions. Retrospective offsets

[3] For example, the conservation actions were not planned to achieve no net loss; the residual losses of biodiversity caused by the project and gains achievable by the offset are not quantified; no mechanism for long term implementation has been established; it is impossible to offset the impacts (for instance, because they are too severe or pre-impact data are lacking, so it is impossible to know what was lost as a result of the project); or the compensation is through payment for training, capacity building, research or other outcomes that will not result in measurable conservation outcomes on the ground.

increase the uncertainty and risk associated with offsets, but can be undertaken successfully if specific conditions are met.

Footprint: The area of land or water covered or affected by a project.

Habitat banking: a market-based scheme that provides a streamlined biodiversity assessment process for development, a rigorous and credible offsetting scheme as well as an opportunity for rural landowners to generate income by managing land for conservation. Habitat banking enables 'biodiversity credits' to be generated by landowners who commit to enhance and protect biodiversity values on their land through a habitat banking agreement. These credits can then be sold, generating funds for the management of the site. Credits can be used to counterbalance (or offset) the impacts on biodiversity values that are likely to occur as a result of development. The credits can also be sold to those seeking to invest in conservation outcomes, including philanthropic organisations and government. Biodiversity credits in the context of this study include both habitats and species.

Bio / conservation / mitigation banking are synonyms in most jurisdictions, although in the US mitigation banking refers to wetland restoration while conservation banking is species-specific. Biobanking is the name of the offset credits markets in New South Wales, Australia and should not be confused with biological banks. The term 'mitigation banking' in the US is actually more akin to a compensatory offset rather than mitigation *per se*, as it refers to off-site measures that are not part of the project itself. Therefore the term has a similar meaning to compensation/habitat banking.

Habitat hectares: Units of measurement that take into account the area affected and the quality or condition of the biodiversity impacted (determined by the quantities of a number of chosen attributes related to the structure, composition and function of that habitat).

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.

Indirect impacts (sometimes called secondary impacts or induced impacts): impacts triggered in response to the presence of the project, rather than being directly caused by the project's own operations.

Irreplaceability (or uniqueness): reflects the number of additional spatial options available for conservation if the biodiversity affected by the project were irreversibly lost. Where biodiversity occurs at many sites (low irreplaceability), many options exist for conservation, whereas where biodiversity is restricted to one or few sites (high irreplaceability), few options exist for conservation elsewhere. Measures of irreplaceability must be clearly referenced to geographic scale. Something is considered irreplaceable if conservation goals for that component cannot be achieved without it.

Like-for-like or better (or like-for-unlike)**:** in which the offset conserves components of biodiversity that are a higher conservation priority (for example because they are more irreplaceable and vulnerable) than those affected by the development project for which the offset is envisaged. This is also known as 'trading up'.

Like-for-like: Conservation (through the biodiversity offset) of the same type of biodiversity as that affected by the project. Sometimes referred to as in-kind.

Metrics: A set of measurements that quantifies results. See also **Currency**.

Mitigation hierarchy: a three step mitigation hierarchy (avoidance, reduction, and compensation) normally followed by impact mitigation and biodiversity / compensation schemes. Implies that one should in the first instance seek to avoid or prevent negative impacts on the environment in general and biological diversity in particular. Secondly, the unavoidable impacts should be addressed through minimisation and rehabilitation measures and only as a 'last resort' should compensation measures (or biodiversity offsets) be established for the residual adverse impacts. This can be done either by restitution or replacement. It is important to note, however, that in following the mitigation hierarchy, offsets cannot provide a justification for proceeding with projects for which the residual impacts on biodiversity are unacceptable, meaning that 'no go' options have to be considered seriously and applied in cases where the destruction of unique habitats or irreversible loss would otherwise occur.

Mitigation: Measures which aim to reduce impacts to the point where they have no adverse effects.

No net loss (NNL): in which the impacts on biodiversity caused by the project are balanced or outweighed by measures taken to avoid and minimise the project's impacts, to undertake on-site restoration and finally to offset the residual impacts, so that no loss remains. Where the gain exceeds the loss, the term 'net gain' may be used instead. No net loss (or net gain) of biodiversity is a policy goal in several countries, and is also the goal of voluntary biodiversity offsets.

Offset: measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity. In some countries, 'compensation' is synonymous with 'offset'. In this report we distinguish between compensation and biodiversity (see '**Compensation**'). Offsets are more formalised arrangements for delivering compensation and are designed to achieve NNL.

Out-of-kind: When the biodiversity conserved through the offset differs in kind from the biodiversity impacted by the project. The option of 'trading up' to an out-of-kind offset may be advisable where an offset arising from project impacts on a common or widespread component of biodiversity may instead be switched to benefit a more threatened or rare component.

Ratio / multiplier: The offset 'ratio' is the area occupied by an offset divided by the area affected by a project's impact. The offset area is often larger than the area impacted (i.e. offset ratio >1), since the offset gains per unit area are often lower than the impact site losses per unit area. 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. The terms ratio and multiplier are often used interchangeably.

Rehabilitation: Rehabilitation shares with restoration a fundamental focus on historical or pre-existing ecosystems as models or references, but the two activities differ in their goals and strategies. Rehabilitation emphasises the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of pre-existing biotic integrity in terms of species composition and community structure. Reclamation projects that are more ecologically based can qualify as rehabilitation or even restoration.

Restoration: The process of assisting the recovery of an area or ecosystem that has been degraded, damaged, or destroyed. The aim of ecological restoration is to re-establish the ecosystem's composition, structure and function, usually bringing it back to its original (pre-disturbance) state or to a healthy state close to the original. An ecosystem is restored when it contains sufficient biotic and abiotic resources to sustain itself structurally and functionally and can continue its development without further assistance or subsidy. Restoration is frequently confused with rehabilitation; while restoration aims to return an ecosystem to a former natural condition, rehabilitation implies putting the landscape to a new or altered use to serve a particular human purpose.

Trading up: Conserving through offset components of biodiversity that are a higher conservation priority (for example because they are more irreplaceable and vulnerable) than those affected by the development project for which the offset is envisaged.

1 Introduction

1.1 This report

GHK Consulting Ltd (ICF GHK) and BIO Intelligence Service (BIO IS) were contracted by DG Environment to undertake a study exploring potential demand for and supply of habitat banking in the EU, and appropriate design elements for a habitat banking scheme.

This Final Report sets out the findings of the work and our conclusions and recommendations to DG Environment.

1.2 Objectives and main elements of the study

The study had four principal objectives. These are listed in Table 1.1, alongside the corresponding sections of the report which address each objective in turn.

Table 1.1 Objectives of the study and corresponding sections of this report

Objective		Corresponding Section
1.	Investigate whether the EU is equipped in terms of **legislation and frameworks** for developing economic instruments to set up and implement offsetting mechanisms and identify any gaps;	Section 2
2.	Identify the **potential demand for and supply of biodiversity offsets** in the EU, and potential associated **costs and benefits**;	Section 3 - Demand Section 4 - Supply Section 5 - Costs & benefits
3.	Identify and compare alternatives for **key design elements** for the development and implementation of biodiversity and ecosystem services offsetting schemes; and	Section 6
4.	Identify and address **gaps in knowledge and information** available that can hinder the design and potential implementation of an EU wide off-setting scheme (such as knowledge base, metrics, standards, capacities, etc.), which can be issues for further work.	Section 7

The study objectives were met through five main tasks:

- Task 1 - Reviewing the biodiversity-relevant legislative framework, addressing its potential to implement 'no net loss' objectives and determining its relevance for supporting offsets in the EU;
- Task 2 - Identifying the potential demand for and supply of biodiversity and ecosystem services offsets in the EU;
- Task 3 - Identifying and analysing key design elements for offsetting instruments and assessing their fitness for EU policies;
- Task 4 – Conducting a workshop (see Annex 1 for a summary note on the workshop); and,
- Task 5 – Developing recommendations and reporting.

1.3 Scope and definitions

Biodiversity offsets and habitat banking are relatively new terms, as are most terms that relate to approaches linked to restoration, compensation and mitigation of biodiversity loss. These terms are defined below, showing the links between them. A full glossary of terms is provided above (see Glossary).

1.3.1 No net loss

The idea of **'No net loss'** was introduced in the US as part of the 1988 presidential campaign by President George H.W. Bush in reference to wetlands. The US Clean Water Act section 404 concerns on Compensatory Mitigation Requirements.[4] The 2002 National Wetlands Mitigation Action Plan affirms as its first sentence its *commitment to the goal of no net loss of the Nation's wetlands.*[5]

The EU biodiversity strategy now includes *Action 7: Ensure no net loss of biodiversity and ecosystem services*. Moreover, Action 7(b) states that *The Commission will carry out further work with a view to proposing by 2015 an initiative to ensure there is no net loss of ecosystems and their services (e.g. through compensation or offsetting schemes)* (EC, 2011). The European Parliament adopted a resolution in April 2012 in which it *[u]rges the Commission to develop an effective regulatory framework based on the 'No Net Loss' initiative, taking into account the past experience of the Member States while also utilising the standards applied by the Business and Biodiversity Offsets Programme; notes, in this connection, the importance of applying such an approach to all EU habitats and species not covered by EU legislation*.

No explicit definition of no net loss is provided in the EU Biodiversity Strategy. The Council of the European Union however provided a preliminary definition in its conclusions in June 2011, updated in December 2011, stating that no net loss requires *that conservation / biodiversity losses in one geographically or otherwise defined area are balanced by a gain elsewhere provided that this principle does not entail any impairment of existing biodiversity as protected by EU nature legislation.* For the purposes of this report, no net loss will be defined as a goal whereby the impacts on biodiversity are balanced or outweighed by measures taken to avoid and minimise these impacts, including on-site restoration and offsetting of residual impacts, so that no loss remains.

Biodiversity offsets are therefore a means of meeting the goals of no net loss.

1.3.2 Biodiversity offsets

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve **no net loss** and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity (BBOP, 2010).

Offsetting aims to ensure no net loss of biodiversity and ecosystem services.

1.3.3 Compensation

Ecological **compensation** is a broader term, which encompasses a wider range of measures which seek to provide recompense for some loss or service. Biodiversity offsets can be seen as a type of compensation measure, but compensation can also involve other actions such as financial compensation which is given or received as payment or reparation (as for a service, loss or injury). Moreover, biodiversity offsets specifically seek to deliver no net loss (or net gain) of conservation outcomes, whereas compensation more generally can involve reparation that falls short of achieving no net loss for a variety of reasons.

Compensation is therefore a more generic term, whilst offsets refer to a more formalised system which attempts to measure losses and gains in order to achieve no net loss. Compensatory measures may be applied either in a formalised offsetting framework or on an *ad hoc* basis.

[4] See: http://www.epa.gov/owow_keep/wetlands/wetlandsmitigation/index.html

[5] The National Wetlands Mitigation Action Plans is available from http://www.epa.gov/owow/wetlands/pdf/map1226withsign.pdf

In the EU, measures are required to compensate for adverse effects on Natura 2000 sites (see Section 2.2). As quoted in the 2007 guidance document on Article 6(4) (EC, 2007), compensatory measures appropriate or necessary to adverse effects on Natura 2000 sites can consist of, for instance (EC, 2007):

- **Restoration or enhancement of existing sites**: restoring habitats and species to ensure the maintenance of 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/or
- Under conditions and as described in the guidance**, proposing a new site** under the Habitats and Birds Directive.

The range of compensatory measures found in current practice within the EU in the frame of the Habitats Directive also includes:

- Species reintroduction;
- Species recovery and reinforcement of populations, including reinforcement of prey species;
- Land purchase (e.g. for conservation);
- Rights acquisition;
- Reserve creation (including strong restrictions in land use);
- Incentives for certain economic activities that sustain key ecological functions; and
- Reduction of (other) threats, usually upon species, either through action on a single source or though coordinated action on all threat factors (e.g. resulting from space-crowded effects)

Mitigation and compensatory measures are distinguished in EU guidance as follows (EC, 2007):

- **Mitigation measures,** in the broader sense, are those measures which aim to minimise the negative impacts on a site that are likely to arise as a result of the implementation of a plan or project. These measures are an integral part of the specifications of a plan or project (see section 4.5 of the leaflet 'Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive'), and
- **Compensatory measures.** *sensu stricto*, are independent of the project (including any associated mitigation measures requested by the project). They are intended to compensate for the negative effects of the plan or project so that the overall ecological coherence of the Natura 2000 Network is maintained.

Compensation is the final stage in the mitigation hierarchy (see below), whilst mitigation measures are typically those adopted earlier on as part of the mitigation hierarchy (e.g. reduction measures).

1.3.4 The mitigation hierarchy

The **mitigation hierarchy** is defined as:[6]

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

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

[6] See BBOP Glossary. Available from: http://bbop.forest-trends.org/guidelines/glossary.pdf

Rehabilitation / restoration measures can also be taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/or minimised. Only as a 'last resort' should compensation measures (e.g. biodiversity offsets) be established for the residual adverse impacts

c. **Compensation**: 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. Compensation can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, and protecting areas where there is imminent or projected loss of biodiversity.

It is important to note that in following the mitigation hierarchy, compensation and offsets cannot provide a justification for proceeding with projects for which the residual impacts on biodiversity are unacceptable, meaning that 'no go' options have to be considered seriously and applied in cases where the destruction of unique habitats or irreversible loss would otherwise occur.

1.3.5 Habitat Banking

Habitat banking is one means of delivering actions to compensate for impacts on biodiversity.

There are a range of different definitions of a habitat bank. For instance, eftec et al. (2010), define a habitat bank 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' (eftec, IEEP et al. 2010).

For the purposes of this study, the following BBOP definition has been adopted:

A market-based scheme that provides a streamlined biodiversity assessment process for development, a rigorous and credible offsetting scheme as well as an opportunity for rural landowners to generate income by managing land for conservation. Habitat banking enables 'biodiversity credits' to be generated by landowners who commit to enhance and protect biodiversity values on their land through a habitat banking agreement. These credits can then be sold, generating funds for the management of the site. Credits can be used to counterbalance (or offset) the impacts on biodiversity values that are likely to occur as a result of development. The credits can also be sold to those seeking to invest in conservation outcomes, including philanthropic organisations and government.

Credits in the context of this study can be earned for the conservation of both habitats and species.

Other terms are also used, including for instance, **bio / conservation / mitigation banking**. These are generally synonyms in most countries. In the US, mitigation banking refers to wetland restoration while conservation banking is species-specific. Biobanking is the name of the offset credits market in New South Wales, Australia and should not be confused with biological banks. The term 'mitigation banking' in the US is actually more akin to a compensatory offset rather than mitigation *per se*, as it refers to off-site measures that are not part of the project itself. Therefore the term has a similar meaning to compensation/habitat banking.

1.4 Structure of this report

The remainder of this report is structured as follows:

- Section 2 provides an overview of the legislative framework relating to biodiversity in the EU and its Member States, and examines its potential to implement 'no net loss' objectives and its relevance for supporting offsets and habitat banking in the EU;
- Section 3 examines the current and potential demand for biodiversity offsets and habitat banking in the EU;

- Section 4 examines factors affecting the supply of biodiversity offsets and habitat banking in the EU;
- Section 5 examines the costs and benefits of biodiversity offsets and habitat banking schemes;
- Section 6 examines key elements in the design of biodiversity offsets and habitat banking; and
- Section 7 presents our conclusions on completion of the study, and examines the implications for future policy and further research.

There are 4 annexes presented in a separate document:

- Annex 1 provides a summary of the workshop conducted as part of this study;
- Annex 2 explains some of the notions of biodiversity offsets, no net loss and compensation under EU policies;
- Annex 3 presents the reviews of the legislative frameworks in a selection of Member States; and,
- Annex 4 presents additional information on the demand assessment presented in Section 3.

2 The legislative framework relating to compensation for biodiversity loss in the EU

This section provides a critical review of the current EU legislative framework in terms of its potential to implement 'no net loss' biodiversity objectives and hence give rise to demand for biodiversity offsets and habitat banking. The section also includes an assessment of how relevant EU policies could support offsetting schemes in the future.

A review is also provided of key national legislative framework in a select number of Member States.

This section meets the requirements specified under Task 1 of the study terms of reference, and delivers the first objective of the study, which seeks to 'investigate whether the EU is equipped in terms of legislation and frameworks for developing economic instruments to set up and implement off-setting mechanisms and identify any gaps'.

2.1 Introduction

The extent of current demand for biodiversity offsets and habitat banking in the EU is driven to a large extent by legislation at EU and Member State level. The following sections:

- Review the EU legislative framework relating to compensation for biodiversity loss in the EU (Section 2.2, with further details in Annex 2);
- Summarise the situation in selected Member States (Section 2.3, with further details in Annex 3); and
- Discuss some of the changes that could be made to existing EU legislation to enhance compensation for biodiversity losses (Section 2.4).

2.2 The EU Legislative Framework

The following section provides an analysis of the requirements under different EU policies as they relate to compensation and biodiversity offsetting. A more detailed description and review of the various EU policies and instruments is provided in Annex 3, which discusses in turn:

- The 2020 EU Biodiversity Strategy and its targets;
- Council Conclusions of 2011;
- The Birds and Habitats Directives (BD and HD);
- The Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) Directives;
- The Environmental Liability Directive (ELD);
- The Water Framework Directive (WFD), the Blueprint to safeguard Europe's water resources and the Floods Directive;
- The Common Agricultural Policy (CAP);
- Cohesion Policy and other EU funds; and
- Roadmap to a Resource Efficient Europe.

The sections below provide a synthesis of the requirements under the policies and initiatives listed above, to discuss how these relate to:

- Notions of 'no net loss', compensation and offsets in EU policy;
- The mitigation hierarchy;
- Mechanisms for requiring offsets/compensation;
- Areas in which compensation is required;

- The role of guidance;
- Methods for assessing offset requirements (including conditions that need to be fulfilled when considering compensation); and
- Financing of offsets.

2.2.1 Notions of 'no net loss', compensation and offset in EU policy

The EU 2020 Biodiversity Strategy is the first EU official document to introduce the notion of 'no net loss of biodiversity and ecosystem services'. The text does not provide a set definition. The Council conclusions of June and December 2011 elaborate a preliminary definition, which is being further elaborated by a working group established by the Commission in 2012.[7]

The impact assessment of the Biodiversity Strategy also described three options to implement the notion, which may be further elaborated. The definitions, and thus the role of compensation and offsets, are not clear in EU documents at this stage. Before the Biodiversity Strategy was launched, different policies referred to compensatory measures (HD and BAP) or remedial measures (ELD) (see below on the use of these two terms). The notion of 'offsets' was also used, in the EIA and SEA Directives and in the 2007 guidance document relating to the Habitats Directive (EC, 2007), in relation to the mitigation hierarchy. However, in this case the term 'offset' was used as a synonym for compensation, rather than as a distinct and more formalised system.

2.2.2 The mitigation hierarchy

The mitigation hierarchy is suggested or clearly mentioned in the texts requiring compensation. The BD only refers to avoiding negative impacts, but for all Natura 2000 areas the HB also applies. The WFD also refers to avoidance of negative impacts as the objective, as well as to preventive and remedial measures. The EIA and SEA Directives seem to introduce a mitigation hierarchy by requiring proponents to *avoid, reduce and, if possible, offset significant adverse effects* (note that small variations in the formulation occur between the EIA and SEA, but also within the documents); however, there is no clear obligation for doing so. The HD clearly requires the mitigation hierarchy to be followed, through Articles 6.2 (avoidance and mitigation), 6.3 and 6.4 (mitigation and compensation). The ELD complements the framework of the HD in terms of compensation for biodiversity and ecosystems, but applies only *ex-post* (after an accident and damage). It has an overarching preventive function through deterring potential offenders, but, since it is a reactive tool, the mitigation hierarchy is not mentioned. The Directive directly focuses on remedial measures (note the change of vocabulary from compensation/offset to remedial measures, due to the reactive nature of the ELD compared to the preventive nature of the HD).

2.2.3 Mechanisms for requiring offsets/compensation

The Habitats Directive is the main mechanism through which compensatory measures are required in the EU. Article 6 applies in Special Areas of Conservation (under the HD) and Special Protection Areas (under the BD) and follows the mitigation hierarchy and describes the different steps to be taken in different circumstances.

Article 6(2) requires avoidance of 'deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated' is required. Article 6(3) is relevant for developments and requires impact assessments of the plans and projects. Approval of the plan or project shall be granted 'only after having ascertained that it will not adversely affect the integrity of the site concerned'. Once potential negative impacts have been assessed by the developer, mitigation measures can be proposed, and included as a condition in the development consent, to reduce these

[7] See the Call for Interest in participating in the Working Group on No Net Loss of Ecosystems and their Services, available from: http://ec.europa.eu/environment/consultations/wgnnl.htm

impacts.[8] Article 6(4) applies in exceptional cases, and as a derogation to the rule under Article 6(3), when the effects of the project are negative and there are no other alternatives, but the project is needed 'for imperative reasons of overriding public interest, including those of a social or economic nature'. In that case, compensation measures are required in all cases, and the compensatory measures must always be communicated to the Commission, as underlined in the 2007 guidance. Only certain reasons can be invoked in case the development affects a site hosting 'a priority natural habitat type and/or a priority species', or approval from the Commission is required. By February 2012, the Commission had released 17 opinions.

In addition, and relative to species protection, Articles 12 and 16 of the HD require strict protection of listed species. A Commission's guidance document (EC, 2007a) refers to the implementation of compensation measures, where the derogation to such protection is granted. The guidance underlines the obligation to ensure that the derogation is needed, the impacts are unavoidable, and the impacts are assessed, because the fact that compensation measures are implemented does not suffice to grant the derogation.

Under the EIA and SEA Directives, developers are required to describe the measures envisaged, and Article 5 suggests follow the mitigation hierarchy when describing measures, although there is no clear obligation to do so. Compensatory measures are mentioned at the latest stage ('remedy significant adverse effects'). In addition, it is less clear to what extent the impacts on biodiversity are concerned and how stringent the rules are. The SEA mentions biodiversity explicitly (EC, 2001), while the EIA mentions fauna and flora (note the Commission's proposition to amend the Directive includes an explicit reference to biodiversity (EC 2012a; EC, 2012b). A recent study also proposed the inclusion of the word 'biodiversity' for strengthening the requirements of the EIA along with introducing conditions linked to avoidance, mitigation and compensation measures to development consents/permits (BIO IS et al. 2012).

At this stage the Directives require a description of the measures foreseen without requiring implementation explicitly and without any controls of the implementation being required (although the SEA requires monitoring of significant effects). In theory therefore, the projects covered by the EIA Directive and the plans and programmes covered by the SEA Directive could trigger the need for biodiversity compensation where significant damages occur that cannot be avoided nor mitigated. Depending on the national implementation of those Directives, the requirements may be further specified. However, evaluation demonstrates that mitigation and compensation requirements are not stringently applied, and a potential option in reviewing the EIA Directive is to strengthen Article 8, including conditions relative to mitigation and compensation measures and monitoring of significant negative effects (where required) to be included in the development consent (not only for biodiversity issues, see BIO IS et al., 2012). The Commission's proposition to amend the Directive includes the requirement to "monitor the significant adverse environmental effects, in order to assess the implementation and the expected effectiveness of mitigation and compensation measures, and to identify any unforeseeable adverse effects. In relation to case law about the EIA Directive, no further information on Article 5 or Annex IV are available relevant to compensation and biodiversity offsets more specifically (EC, 2010a).

Additionally, the EIA Directive only applies to certain types of activities (listed in Annex I, and depending on national decisions in Annex II). A study reviewing the EIA Directive indicates that biodiversity in general may not be efficiently covered by EIA requirements outside Natura 2000 sites, although the information base is thin. One possible policy option proposed by the study is to widen the coverage of activities, including by moving wind farms from Annex I to Annex II, and including deforestation of large areas and offshore hydrocarbon production according to amendments to the Espoo convention, as well as installations working with GMOs, golf courses and other developments (BIO IS et al. 2012). The specification of Annex III criteria is also proposed.

[8] See sectoral guidances available from : http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm#art6

At this stage, at EU level and in most MS, some activities are only subject to screening and do not necessarily undergo an EIA, such as agricultural activities and forestry apart from large installations for the intensive rearing of poultry or pigs in Annex I, and other types of intensive agriculture covered in Annex II for which thresholds and criteria can be decided by each MS. As major users of land, agriculture and forestry have significant impacts on biodiversity, however. These impacts may be both positive and negative and it is important to acknowledge the role that agriculture and forestry could play in providing compensation, but also the negative impacts which may need to be compensated for, where they are significant in each case or significant when accumulated (see below). In this regard the SEA is relevant. The SEA Directive applies to plans and programmes *which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use and which set the framework for future development consent of project listed in the EIA Directive*, excluding national defence or civil emergency and financial or budget plans or programmes.

It is also important to note that within this framework only significant impacts require avoidance, mitigation and compensation. 'Significant' is not defined in the EIA or the SEA Directives. But in both Directives (Annex I of SEA and IV of EIA defining the information to be included in the assessment), a footnote specifies that the 'likely significant effects' should include *secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.* Both Directives, when referring to compensation, only require action 'if possible', which opens a significant loophole in achieving 'no net loss'. Furthermore, cumulative effects are mentioned in the SEA and EIA Annexes as a criterion to decide whether impacts are significant. There is also extensive case law in this regard.

Two other issues arise with the current implementation and wording of the EIA Directive (BIO IS et al., 2012):

- impacts on fauna and flora are mostly interpreted as relating to whether or not developments affect Natura 2000 areas, and are not taken in a broad sense - in particular, species protection provisions tend to be neglected; and,
- the methodologies are insufficient to account adequately for biodiversity in EIA.

The ELD requires remediation/compensation for three types of environmental damages, through three types of remediation. Environmental damages covered relate to protected species and natural habitats[9], water and land. The remediation types include primary, complementary and compensatory remediation. Two forms of liability are defined; a strict liability (operators undertaking an activity listed under Annex III) and fault-based liability (for non-listed activities, but covering only protected species and natural habitats). Where damages are not covered under these forms of liability, net loss may occur.

Remediation measures are required if certain threshold criteria are met, for damages to protected species and natural habitats, waters covered by the WFD and soil pollution. The baseline conditions are defined in Article 2 and the thresholds to define significant damage in Annex I. Operators can be exempted from implementing measures in two specific cases: in the event that the operator acted fully in compliance with an authorisation granted under national laws and regulations, or if the practices used by the operator were not considered likely to cause environmental damage at the time the damage occurred. In addition, if the damage was caused by a third party despite appropriate safety measures being in place, the operator shall not be required to bear the costs of actions taken.

Funding for such measures can be provided through the CAP, Cohesion Policy, the European Agricultural Fund for Rural Development, European Regional Development Fund, European Fisheries Fund, and LIFE+ (all mentioned by the BAP). None of these instruments currently has a specific requirement relating to offsets or compensation.

[9] Protected species and natural habitats are defined in Article 2 of the ELD as species and habitats mentioned in Article 4(2) or Annex I of the BD, or Annexes I, II or IV of the BD, and the breeding and resting places of the species listed in Annex IV of the BD, and where a MS so determines, species or habitats designated by the MS for equivalent purposes.

2.2.4 Areas in which compensation is required

Compensation requirements in the EU apply mostly for areas designated as Natura 2000 sites and where impacts on strictly protected species under the HD occur (under derogation). Wider impacts to biodiversity may be covered by less stringent requirements. Indeed the HD requirements are quite clear and relatively stringent, as are the ELD requirements (covering Natura 2000 sites, in certain Member States and other areas with important biodiversity, waters and land damage). In contrast, the EIA and SEA requirements need to be strengthened to be fully applied and implemented in a more effective way. Additionally, in assessing demand for compensation, different approaches must be used: for requirements under the HD, which follow planned developments, and for those under the ELD, which follow damages (by definition unpredictable events). Planned developments as opposed to probabilistic approaches will thus be needed.

The requirements can be specified for the following types of areas:

Natura 2000 sites

The Nature Directives require that plans or projects (inside or outside Natura 2000) that are *likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, shall undergo an Appropriate Assessment*. The objective is to ensure that developments consider the Natura 2000 network and do not jeopardise the integrity of the sites and the coherence of the network. Any significant effects must be prevented or mitigated, unless the derogation under Article 6(4) is used. Thus, in the absence of alternatives, certain reasons are invoked in which case compensatory measures will apply. Thus support for the concept of 'no net loss' for Natura 2000 sites (including their quality) could be interpreted as being embedded in the requirements of the nature directives, although the language in the directives does not explicitly require 'no net loss'.

Natura 2000 covers 18% of the EU territory.[10] New developments are thus in theory quite likely to affect these areas. However, according to the mitigation hierarchy, steps must be taken to avoid these areas, minimise the impacts of the development and only then to compensate.

Natura 2000 sites hosting priority species and/or habitats

In the more specific case of sites hosting priority species and/or habitats, the second paragraph of Article 6(4) applies, with more stringent measures required for approval of the project, but similar requirements as described for other Natura 2000 sites apply in terms of compensation.

Protected species and natural habitats

Protected species are covered under the HD and BD. Protected species and natural habitats are also covered in the ELD, for both strict and fault-based liability. The Directive does not refer to Natura 2000 sites, but to the relevant Articles and Annexes in the BD and HD and to species and habitats designated by the MS accordingly. The current coverage is broader than the Natura 2000 network, however, as certain Member States have chosen to expand this option when transposing the ELD to national law, to include areas of national importance for nature protection and biodiversity, frequently protected or designated under national laws.

Waters covered by the WFD

The ELD includes in its scope damage to waters covered by the WFD. The WFD requires 'good status' of water to be reached in 2015. If damage occurs, that adversely *affects the ecological, chemical and/or quantitative status and/or ecological potential,*[11] restoration to baseline condition is required. The link between the favourable conservation status of the HD

[10] Natura 2000 barometer as provided in the Natura 2000 Newsletter n°31 of January 2012

[11] The definition of these terms is included in the WFD, see also REMEDE Deliverable n°5.

and the good status of the WFD is not necessarily evident and is explained in guidance.[12] In short, the BD and HD focus on protecting certain species and habitats, while the WFD regards species as status indicators. Water damage is not included in fault-based liability, limiting the requirements to those activities that are listed. In practice, through the 2015 WFD requirements to achieve 'good status', net gains for aquatic habitats should be expected. However, recent evidence shows that achievement of this goal is unlikely to happen in terms of either water quantity or quality (EEA, 2012).

Damage to land

Similar to waters, the ELD covers land damage, thus widening the scope of the requirements under the HD, but referring to contamination/pollution that creates (directly or indirectly) a *significant risk of human health being adversely affected.* This will limit risks to biodiversity, but many impacts that do not affect human health may still negatively impact biodiversity.

Other areas

The EIA and SEA requirements may apply to any location, if significant adverse impacts occur from projects /plans /programmes (see discussion on 'significant' and 'activities' covered above).

2.2.5 The role of guidance

The need for further guidance to implement compensatory measures under the nature directives was recognised early on, with the first guidance document for Natura 2000 sites management and the provisions of Article 6 of the HD being drafted by the Commission in 2000 and several guidance documents for the HD being made available since then. Other documents are foreseen under the ELD.[13]

Such guidance documents are essential in ensuring that compensation and offsets are adequately implemented, and applied similarly in all MS. The study for the European Commission on the ELD (BIO IS, 2009) shows that MS authorities felt rather unprepared for the task of 'valuing' and 'comparing' habitats, something which might also be expected with a potential habitat banking scheme, or more generally to implement offsetting/compensation requirements. Indeed to achieve no net loss, a baseline of what will be lost, and a way to compare it to what is proposed as compensatory measures is needed. Some methodologies are currently available but they are not necessarily widely known or agreed upon. Furthermore, there is no adequate data on baseline conditions for all Member States, and frequently they are not available in usable formats. Steps are being taken by the Commission to map ecosystems and their services in the EU, including the establishment of a working group, which will provide valuable information to establish a baseline in the future.

2.2.6 Methods for assessing requirements for compensation

Habitats Directive

The overall aim of the nature directives is to achieve favourable conservation status of all habitats and species of European importance and adequate populations of naturally occurring wild bird species. The 2009 Composite report on the Conservation status of Habitat types and species (Article 17 reporting, covering the period 2001-2006) shows that only a small proportion of the habitats and species of EU interest have favourable conservation status. Only 17% of the habitats assessments and 17% of the species assessments were favourable (EC, 2009). Target 1 of the EU 2020 Biodiversity Strategy is to show an improved conservation status of 100% more habitat assessments and 50% more species assessments under the Habitats Directive compared to current assessments by

[12] For more information, please see: http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/thematic_documents/biodiversity_water/faq-wfd-bhd_20dec2011/_EN_1.0_&a=d

[13] Note the Commission also compiled a (not necessarily exhaustive) list of national guidance documents on environmental liability : http://ec.europa.eu/environment/legal/liability/eld_guidance.htm

2020 and to show a secure or improved status for 50% more species assessments under the Birds Directive.

The HD does not provide any practical definition or information related to the 'compensatory measures' mentioned. However, guidance from the Commission specifies the requirements to be met. The most recent and specific guidance was drafted in 2007 (EC, 2007b). It describes step by step the considerations and criteria to be applied when implementing Article 6(4). Compensation must be targeted, effective, and the guidance provides information on technical feasibility, extent of compensation, location, timing and long-term implementation of the measures.

Definition - The guidance proposes a definition of 'compensatory measures' based on experience that is not defined in the Directive. It states that "compensatory measures *sensu stricto* are independent of the project (including any associated mitigation measures). They are intended to offset [i.e. compensate for] the negative effects of the plan or project so that the overall ecological coherence of the Natura 2000 Network is maintained'.

Mitigation hierarchy – The guidance underlines that if only compensatory measures are taken, it is not sufficient to allow a project to be approved. Prior to that, the mitigation hierarchy must be followed, using compensatory measures only as a last resort. This is consistent with EU case law.

Reference/baseline conditions – The guidance refers to the conditions 'defined after the characterisation of the biological integrity of the site, [...] linked to the conservation objectives for which the site was designated [...]'. Ecological measures are thus considered necessary, and cannot (only) consist of payments. The area should provide comparable functions to those justifying the designation.

Design of the measures – The measures must be based on best scientific knowledge available to ensure the most effective option is chosen and implemented, so that compensation is feasible and operational. Compensation ratios are set on a case-by-case basis but in general should be above 1:1.

Location – The compensatory measures are expected to be implemented 'within the biogeographic area concerned', or within the same range, migratory route or wintering area and preferably within the Member State concerned. The preferred option is to locate compensatory measures within or near the Natura 2000 site concerned, but if it is not the case, the guidance underlines the need to designate the area used as compensation under Natura 2000 to ensure the Nature directives apply.

Timing and interim losses – Compensatory measures should be in place before the site is irreversibly affected. However, the guidance recognises that this cannot be always be ensured, and requires competent authorities to consider extra compensation for interim losses. The concept of interim losses is not introduced in the HD, but exists in the ELD (see below). The guidance refers to 'no net loss' of the overall coherence of the Natura 2000 network.

Additionality - The guidance further states that 'compensatory measures should be additional to the actions that are normal practice under the Habitats and Birds Directives or obligations laid down in EC law'. For example, it states that implementation of management plans or the designation of a site already inventoried as of Community importance is not considered a compensatory measure. The guidance also states that the designation of a new Natura 2000 site can be part of a compensation package, but that designation as such is insufficient and must be proposed with accompanying measures. Such measures are not described in the guidance, but could for example include measures that improve a substandard habitat or the management of an area so that it becomes favourable to protected species, or the reintroduction of protected species within a newly designated site.

Long-term implementation – the legal and financial basis must be ascertained for long-term implementation and for protection, monitoring and maintenance of the compensatory measures.

Habitat banking - The 2007 guidance mentions habitat banking as being of limited value as compensatory measure under Article 6(4) due to tight criteria for compensation.[14] The document mentions more interest for HB in the framework of Article 6(1), to be integrated in the project before any decision made by the authorities.

Environmental Liability Directive

The ELD provides more guidance on compensation directly in the text of the Directive. Concepts that have been developed since the adoption of the HD and are used in guidance documents are already integrated, notably in Annex II of the Directive.

Definition - Three types of compensation are foreseen: primary, complementary and compensatory remediation measures (see in Annex 3 the description of the ELD). All are aimed at returning the damaged natural resource and/or services to baseline conditions. However, compensatory measures under the HD should apply before the damage occurs, through the planning process, while remediation measures occur as a response to the damage. As pointed out by the REMEDE project (REMEDE, 2006), compensatory measures under the HD and compensatory remediation measures under the ELD are different, and the comparison should rather be made between compensatory measures and complementary remediation measures, since they both aim to ensure no net loss while being located at different sites than where the damage occurred.

Mitigation hierarchy - Since the Directive is reactive rather than preventive, the mitigation hierarchy is not present, contrary to the HD.

Reference/baseline conditions – Baseline conditions are defined in Article 2 of the Directive as the condition at the time of the damage of the natural resources and services that would have existed had the environmental damage not occurred, estimated on the basis of the best information available. The significance of the damages caused is defined in Annex I of the ELD.

Design of the measures – the use of *resource-to-resource or service-to-service equivalence approaches* is preferred according to the ELD, with consideration of those actions that provide the same type, quality and quantity of natural resources and/or services as those damaged first, and then of alternative options.

Timing and location – the ELD states that these aspects are amongst the criteria to be taken into account when choosing the remedial options.

Additionality – referring to the complementary and compensatory measures, the ELD states that these should provide additional natural resources and/or services.

Interim losses – Interim losses are defined in Annex II of the Directive as *losses which result from the fact that the damaged natural resources and/or services are not able to perform their ecological functions or provide services to other natural resources or to the public until the primary or complementary measures have taken effect. It does not consist of financial compensation to members of the public*.

Long-term implementation – long-term issues are not explicitly mentioned in the ELD, such as monitoring or ensuring that the compensatory measures are in place as long as they are needed.

Habitat banking – Habitat banking could be used in the ELD to cover losses from accidental impacts, when located close to the accident and targeting the relevant biodiversity elements. Requirements under the ELD are often considered less stringent than those under the HD, and thus more easily covered by habitat banks. This possibility is foreseen in France in agreements between the Ministry of Environment and the pilot banks.

Table 2.1 provides a summary comparison of requirements for compensation for biodiversity loss under the HD and ELD.

[14] The conclusions of the report from eftec, IEEP et al. (2010) is that the restrictions in the Habitats Directive ' is likely to reduce (but not eliminate) the opportunities for habitat banking for Natura 2000 sites'.

Table 2.1 Comparison of compensatory requirements under the Habitats and Environmental Liability Directives

	Habitats Directive and 2007 Guidance	Environmental Liability Directive
Definition	Compensatory measures	Primary, complementary and compensatory remediation measures
Mitigation hierarchy	Follows the mitigation hierarchy	Only targeting remedial measures
Reference/baseline conditions	In relation to conservation objectives of the sites and favourable conservation status	Clearly defined
Design of measures	Based on best scientific knowledge available Effective measures Ratios higher than 1:1 preferred	Resource-to-resource or service-to-service equivalence preferred
Location	Within biogeographical area Closer is better	To be taken into account
Timing	Measures should be in place before impact	To be taken into account
Additionality	Measures must clearly be additional to normal practice	For complementary and compensatory measures, should be additional
Interim losses	Not mentioned	Clearly defined, must be compensated for
Long term implementation	Considered	Not mentioned
Habitat banking	Said to be probably not very relevant	Not mentioned

2.2.7 Financing of compensation

In the case of compensation under the HD and EIA, developers are expected to fund the required measures in accordance with the 'polluter pays principle'. The 2007 guidance confirms this interpretation for the HD. Compensation may be included in co-financed projects, for example, regarding transport infrastructure under the TEN which may use ERDF financing. Under the ELD, the responsibilities are described in detail, and the polluter pays principle applies.

The CAP, Cohesion Policy and LIFE+ can play a role in funding biodiversity-related activities that help to compensate for losses that are not compensated for elsewhere. In addition, such funds can be used to implement compensatory measures that are requested when funding public infrastructure projects. For example, infrastructure development under the TEN may undergo assessment (under the EIA Directive and/or HD) that results in unavoidable adverse impacts being identified. The authorisation granted by the competent authority will therefore require the implementation of certain compensation measures. In the budget allocated to infrastructure development, funds will be allocated to these compensation measures. Where ERDF financing is for example granted for that infrastructure project, the European Regional Development Fund (ERDF) will play a part in financing the compensatory measures.

The role of EU funds in supporting biodiversity offsets and habitat banking schemes in general is more questionable. For instance, LIFE+ has been used to fund habitat restoration projects, but it is unclear to what extent a habitat banking scheme could be supported by LIFE+ if the purpose is then to sell habitat credits. Farmers are also well placed to deliver biodiversity related compensation areas and/or to maintain restored areas in certain conditions favourable to biodiversity. Currently, support is available through the CAP to implement certain measures to protect biodiversity, such as agri-environmental schemes, and through European Agricultural Fund for Rural Development (EAFRD) to obtain payment for Natura 2000 areas to compensate for reduced yields (caused by the obligations linked to

the area). In the future, other sources of financing environmentally-friendly agricultural practices may include farmers setting up habitat banks, but risks of a failure to achieve additionality and double funding may apply (see below). EU funds such as the CAP and/or cohesion funds can also be used for generally ensuring restoration of biodiversity, without being linked to offset requirements.

This discussion highlights that EU funds can, by financing biodiversity activities, deliver biodiversity gains that may contribute to no net loss at EU level. However, great care is required to ensure that EU funds do not inappropriately fund compensatory measures, because of:

- The risk of breaching the '**polluter pays principle**';
- The risk of **'cost shifting'**, in which governments reduce their funding allocation for biodiversity in response to private companies increasing their funding to implement mitigation (including compensation) measures;
- The requirement for **additionality**, that is, compensation activity should not be activity that would have taken place already; and
- The **risk of double funding**, for example, if farmers are paid by taxpayers to deliver environmental benefits and are then rewarded for provision of offsets, such as by selling credits to developers.

2.2.8 Summary

The EU framework clearly requires compensation *ex-ante* through the HD in Natura 2000 areas, following the mitigation hierarchy. Non-binding guidance from the European Commission is also available to explain how to interpret the terms of the Directive, which does not as such provide any information on practical steps and equivalences to be used. It is left to the relevant authorities to ensure that the hierarchy is followed and negative impacts are avoided in Natura 2000 areas, or that compensation measures are taken and implemented (the Commission is only informed in that case); unless the site concerned hosts a priority natural habitat type and/or a priority species, in which case the Commission must produce an opinion. The ELD clearly requires compensation *ex-post*, which is not limited to Natura 2000 areas, but has until now been implemented to a lesser degree (damages before 30 April 2007 are not concerned).

In other cases, the requirements to compensate are less clear and limited to certain activities (for EIA and SEA) or areas (water bodies in the case of the WFD). They will be very project dependent (and dependent on propositions for avoidance/mitigation/compensation made by the developers).

Public consultation is required in the EIA and SEA Directives and for the River Basin Management Plans required under the WFD (it is not required in the ELD, and is required only 'if appropriate' in the HD). Through the consultation process, avoidance, mitigation and compensation measures can also be identified if the consultation happens early enough in the process.

Table 2.2 summarises the applications of EU legislative instruments with regard to compensation for biodiversity loss.

Table 2.2 Summary of applications and limitations of EU legislative instruments

Instrument	HD and BD	ELD	EIA/SEA	WFD
Applications	During the planning process, if a Natura 2000 site is impacted, a development project can only go ahead under certain conditions, and if	Different types of liabilities apply, depending on the activity and damage. Baseline and interim losses are defined. Refers to a broader scope than Natura 2000 (protected	Required for listed activities. Compensation is required where possible for significant damages.	General framework with a general objective, applied through River Basin Management Plans

	compensation for losses is provided.	species and natural habitats)		
Limitations	Only applies to Natura 2000 sites. The text is subject to interpretations (no definition of compensatory measures, etc.), while guidance documents have been drafted, they are not legally-binding	Some damages are not covered for certain types of activities. Response-type of instrument.	Refers to environment, fauna and flora, not to biodiversity (EIA). This may reduce the scope of compensation requirements, linked to functioning of ecosystems, etc. Only applies to 'significant' damages (without defining the term). Refers to compensation 'if possible'. No monitoring of significant negative effects (EIA). Extent to which compensation is required depends both on the project itself and the permitting authorities.	Does not require compensation explicitly, and would probably not impede a development from going ahead

2.3 The Legislative Framework in the Member States

A review was conducted of the legislative frameworks of selected Member States to examine their potential to support demand for compensation activity (including habitat banking schemes). This included detailed reviews of five Member States, and a less detailed review of the frameworks in a further eight Member States. The Member States reviewed were selected on the basis of their degree of advancement in implementing biodiversity offsets and compensation schemes. The detailed reviews covered the following Member States:

- France
- Germany
- Spain
- Sweden
- United Kingdom

The following eight Member States were covered in less detail:

- Bulgaria
- Czech Republic
- Greece
- Finland
- Italy
- Lithuania

- Netherlands
- Poland

These results are summarised in Table 2.3 which details the key characteristics of the compensation requirements for biodiversity loss and their implementation in the different Member States. More details can be found in Annex 3, which includes the complete assessment for each Member State.

2.3.1 Key Findings

Overall the review found that **all of the MS are broadly implementing the provisions specified under the EU Directives** such as the Habitats Directive (HD), the Environmental Liability Directive (ELD), the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) Directives.

The goal of 'no net loss' is gradually emerging, but has rarely been found explicitly in the MS regulations or policies (German regulations require that the status quo be conserved, i.e. no net loss). However, NNL is stated in some non-binding strategies or other documents (e.g. in Spain no net loss is the goal of the Strategic Plan for natural heritage and biodiversity 2011 – 2017, and the French doctrine requires at least equivalency or net gain) and initiatives are emerging (e.g. a NNL initiative exists in the Netherlands).

Few Member States are going beyond the minimum EU requirements in terms of the requirements for compensating damage to the Natura 2000 network (under the HD) and to unprotected areas outside the Natura 2000 (generally under the ELD and the EIA requirements). Moreover, in many cases areas **guidance is lacking** on how these requirements and provisions should be implemented in practice results which is resulting either in insufficient or inconsistent implementation.

Where these exist, **guidance documents are the main mechanisms which establish how compensation should be achieved**, including at which point of the development compensation is required (*ex-ante*, during or *ex-post*), as well as specifying any methodology for calculating the kind and level of compensation and any monitoring requirements.

Overall, it seems that **demand for compensation outside the Natura 2000 network is generally very low**, **whilst compensation mechanisms for damage occurring within Natura 2000 sites are better developed**. In some cases this appears to be as a result of various problems with the current systems (e.g. a lack of guidance on how to implement the requirements). In most countries compensation is also required when there are impacts on protected species. Such requirements may apply inside or outside Natura 2000 areas. However, species compensation is often not considered sufficiently in advance (notably due to the difficulty of identifying in advance which species might be present and affected) and thus avoidance or mitigation measures may not be implemented, leading to compensation being used instead (e.g. in France). In other countries, financial compensation may be implemented for species, sometimes at specified financial rates (e.g. Lithuania).

Moreover, in a few of the cases examined, it appears that **monetary compensation is often used in lieu of specific physical restoration or recreation of habitats**, which raises questions about the efficacy of the compensation measures and/or requirements of 'like-for-like or better', especially where it is not clear what the funds that are being raised are being used for.

There are three broad categories of Member States, depending on how and to what extent they have implemented compensatory measures and offsets:

- **Well-developed systems**: Those Member States with well-developed systems which cover compensation for damage both within and outside the Natura 2000 network, and where national or regional initiatives are being implemented which attempt to go beyond the basic EU requirements. Implementation of the requirements is generally good such that demand for compensation exists, and national and/or regional guidance is available to clarify the provisions (e.g. the national EHS 'Rules of the game' in the Netherlands).

However, some issues may still remain, for example delays in the implementation of compensatory measures, or the availability/accessibility of land for compensation.

This category includes, for instance: Germany and the Netherlands.

- **Developing systems**: The systems are developed insofar as the requirements of EU legislation are concerned, especially in the case of damage to the Natura 2000 network. However, implementation may be problematic, uneven or inconsistent (for instance due to little or no guidance being available). Moreover, demand for compensation for damage occurring outside the Natura 2000 network is lower and systems to address these impacts are still under development, but some demand for compensation for these impacts does exist. Some national initiatives may be present.

  This category includes, for instance: Sweden, France, the UK and Finland.

- **Limited systems**: Systems are relatively undeveloped. Although EU Directives and associated requirements have been transposed, there is very little experience in implementation and therefore little demand for compensation in practice. In many cases there is no guidance on how compensation should be implemented, nor are there any national initiatives. The focus is on the systems which deal with compensation in the case of damage to the Natura 2000 network (and sometimes nationally protected areas) with no or very little demand for compensation outside the network. Either there is very little evidence or experience of compensation or this is focused on general monetary compensation rather than investment in physical restoration / creation activities that would satisfy the principle of ecological equivalence.

  This category includes, for instance: Bulgaria, Poland, Spain, Greece, Italy and Lithuania.

2.3.2 Implementation of compensation requirements in Member States

In the Member States examined, compensation can be required *ex-ante* (mostly through procedures linked to the HD or EIA) or *ex-post* (largely through procedures linked to the ELD) of the actual damage. Nonetheless, the **legal texts** which implement the EU Directives **rarely specify at which stage of the damage (when) compensation should occur** (due to the reactive nature of the ELD, this aspect is generally clear), although this is sometimes covered in non-binding guidance documents.

The **methodologies** which are used to calculate the kind and level of compensation are **also rarely specified, and are often established on a case by case basis**, for instance during the EIA process, or when the Appropriate Assessment is performed in the framework of the HD. In the case of ELD this takes place as soon as possible after the accident as there is a need to assess and measure the damage caused and design appropriate remediation measures/actions.

S**ome countries** such as the Netherlands, Germany and the UK (and under development in France) **have established national level guidelines on how compensation should be calculated**. Methodologies and metrics to be employed for this purpose are also available through the ELD guidance documents of several Member States.[15]

In a few cases it was possible to identify factors and multipliers used to calculate the level of compensation required. In the Netherlands, for instance, requirements are generally above 1:1 and depend on the duration of the impact and time taken for compensatory actions to deliver biodiversity benefits, whilst in Italy no methodology is specified, but past examples have used ratios that range from 1:1 to 5:1. In Sweden authorities must expressly justify the use of ratios higher than 1:1.

The review also indicated that **monitoring systems are generally lacking or are unspecified** in almost all the Member States. Where they do exist however, they tend to be the responsibility of local authorities with little national oversight.

[15] A (not necessarily exhaustive) list of national guidance documents is available on the Commission's website, see : http://ec.europa.eu/environment/legal/liability/eld_guidance.htm

The review also highlighted that there is a **considerable lack of data** on what compensation activities are being undertaken in Member States, and what impact this may have in terms of conservation of habitats and species, but also how it interlinks with restoration objectives that have been set out in the new EU Biodiversity Strategy or have been set for Natura 2000 sites.

For compensation measures to be implemented, **it is not always necessary for developers to own the land on which activities are carried out**. Increasingly, and due to the issue of land availability, contractual tools are developed so that landowners take measures favourable to biodiversity as compensation for development (this possibility exists for example in France and Germany). The duration of the contracts depends upon the agreement, for example the French national guidance states that the contract should be of a 'sufficient duration'.

In addition, preservation or new practices favourable to biodiversity may be considered relevant compensation measures, where they are additional to existing measures.

The requirements are decided in most MS by **local authorities** in charge of granting permits and/or preserving biodiversity at the local level. This allows a case-by-case decision where local issues are considered, but runs the risk that implementation is not harmonised across the country. This links back to the need for guidance highlighted above.

Table 2.3 Overview of results from the review of legislative frameworks in Member States

Country	Mechanism for compensation for Natura 2000 sites	Mechanism for compensation outside Natura 2000	National initiatives	Timing of compensation	Methodology for calculating compensation requirements	Monitoring arrangements	Availability of data on compensation to date	Any problems / loopholes with the current system
DE	Yes	Yes	Yes - Habitat banking is widespread	Within a 'reasonable period of time'	Yes	Yes - details are left to the permitting authorities	Lack of available data	Limited land availability. Several methods are in place for implementing compensation
FR	Yes	Yes	Yes - Pilot initiative for habitat banking and National Committee working on the mitigation hierarchy (due to publish additional guidelines)	Considered at the time of the assessment, but timing of the measure not stated	Upcoming guidelines	Yes – with requirements often lasting 30 years	Some limited data available for some habitats	The articulations between the frameworks are not clear enough, and national guidance is under development. Determination of compensatory measures is rarely rigorous as there is as yet no standard method to assess impacts
UK	Yes	Yes	Yes - Pilot initiative for offsetting; development by Environment Bank of Habitat Banking scheme; recent Government publication on determining offset requirements	Considered at the time of the assessment, measures usually required during and after	Yes - Proposed common approach. Calculations based on units per hectare and use of multipliers where necessary	Yes – as / if required by condition or planning obligation	Lack of available data	Reform on-going – effects are uncertain. Lack of single guidance document and common assessment approach Lack of a comprehensive monitoring system
SE	Yes	Yes	Basic guidance from SEPA on compensation measures	Before effects of the damage, where possible	No set methodology but projects must have a 'no net loss' objective, and authorities	Yes – determined by local authorities	Lack of available data at the national level. Some project specific information	Case law is still scarce and guidance is still lacking despite some documents being available

Country	Mechanism for compensation for Natura 2000 sites	Mechanism for compensation outside Natura 2000	National initiatives	Timing of compensation	Methodology for calculating compensation requirements	Monitoring arrangements	Availability of data on compensation to date	Any problems / loopholes with the current system
					must justify use of a ratio higher than 1:1			
ES	Yes	No - Compensation is mentioned but not explicitly required	No	Determined in the environmental assessment	Measures decided on a case-by-case basis	Yes - responsibility of the promoter, managed by the Autonomous Communities	Some limited data available but not accessible	Design and implementation of compensatory measures insufficient. Further guidance needed.
BG	Yes	No - legal framework provides for the 'prevention and reduction of environmental damages' but not compensatory measures *per se*.	No	Compensatory measures to be undertaken before the project / investment	Measures decided during the environmental impact assessment, by the entity carrying out the assessment	Not specified	Lack of available data	Available evidence insufficient to evaluate the functioning of the system in practice.
CZ	Yes	Yes	No (although some research efforts on-going to develop methodologies on credit allocation for habitat banking)	Not specified - determined by nature protection authorities	Guidelines on restoration of contaminated sites only – a 'like for like' equivalence is the preferred approach	Not specified	Lack of available data – some evidence of past projects where remediation action was taken.	Remediation practices to date focussed on historically contaminated sites rather than biodiversity loss
FI	Yes	Yes	Yes - requirements linked to damages arising from transport	Payment for future damages ('advance	Restoration of the environment is required to its	Not specified	Lack of available data	Compensation generally seems to occur in the form of monetary compensation,

Country	Mechanism for compensation for Natura 2000 sites	Mechanism for compensation outside Natura 2000	National initiatives	Timing of compensation	Methodology for calculating compensation requirements	Monitoring arrangements	Availability of data on compensation to date	Any problems / loopholes with the current system
				compensation')	previous state, but where costs are reasonable			which raises the issue of what constitutes 'reasonable' cost and what effect compensation is having on physical habitats
GR	Yes	Yes	No	Mostly required after the impact, through the Liability Decree	Not specified – remediation however is defined as restoration to the environment's original state	Some monitoring foreseen under the Draft Biodiversity Law	Lack of available data	Monitoring is lacking so it is unclear what efforts are being made / what effect this is having. Focus to date however seems to be on precautionary measures rather than remediation
IT	Yes	Yes – especially for forests, and generally in terms of payments for compensation. However, ELD requirements not precisely transposed.	Yes - some voluntary compensation measures in place; Green Fund established which is partly helping to ensure no net loss	Not specified, but generally implemented after the damage	Not specified except for fixed monetary compensation. Past experience indicates that factors from 1:1 to 5:1 have been used	Not specified	Lack of available data	Monetary compensation often automatically applied – effects on physical habitats therefore unclear. None of the existing frameworks define environmental compensation, nor operational guidance and criteria
LT	Yes	Yes	Yes - Forests are specifically protected/ compensated for	After the damage	Not specified, except for a methodology on the restoration of sites used for excavation of natural resources	Not specified	Lack of available data – no past examples / case studies could be identified	No compensation for species (only penalties) and focus on compensating loss for damages to forests, protected areas and excavated sites. Compensation not widely used in practice and current guidelines not detailed enough to ensure that the effects on biodiversity are

Country	Mechanism for compensation for Natura 2000 sites	Mechanism for compensation outside Natura 2000	National initiatives	Timing of compensation	Methodology for calculating compensation requirements	Monitoring arrangements	Availability of data on compensation to date	Any problems / loopholes with the current system
								properly assessed.
NL	Yes	Yes	Yes - report on voluntary compensation and recent No Net Loss (NNL) Initiative	With Natura 2000 sites, compensation is required before the impact occurs. Otherwise not specified	Yes - described in 'Spelregels EHS'. Factors applied depend on the development time; requirements are generally above 1:1	Yes - Provincial authorities are responsible	Lack of available data	Compensation is increasingly seen as an obstacle to development and the procedure is insufficiently implemented
PL	Yes	Yes	Unclear – some initiatives (e.g. the National Fund for Environmental Protection and the Biodiversity Technical Assistance Units) may have habitat banking elements but this is uncertain	Compensation is required before the damage for Natura 2000 areas and other protected areas	Determined in the permit for Natura 2000 areas and other protected areas	Yes – responsibility of the managers of the Natura 2000 area, or of Regional Directorate for Environmental Protection can also be the developer's responsibility if required in the permit	Lack of available data	Available evidence not sufficient to evaluate the functioning of the system in practice.

2.4 Potential for EU instruments to support offsets in future

Based on the analysis of the EU and selected national frameworks, it is clear that the goal of 'no net loss' is only gradually emerging for biodiversity protection.

Two main types of policies result in 'no net loss': policies aimed at protecting biodiversity through designating certain protected habitats and species and policies aimed at compensating for negative impacts from development activities (Wissel and Wätzold 2010). The first type of policy is already in place in the EU with the Natura 2000 network, and the requirements of the BD and HD contribute to no net loss in Natura 2000 sites, which is rather well covered if implemented appropriately by the MS. In addition, the EU finances biodiversity conservation activities that are not linked to compensation for biodiversity loss, but which may help to compensate for other losses incurred elsewhere in the EU.

The main issues and gaps identified in the regulations at EU and MS levels include the following:

- lack of clarity as to the nature of compensation to be required for impacts within Natura 2000 areas;
- low requirements for compensation from development or other activities in unprotected areas, and in particular outside Natura 2000 areas, although requirements apply for strictly protected species;
- insufficient coverage of development projects considered to require compensation;
- lack of effective compensation for impacts that are small but cumulatively result in significant biodiversity losses;
- insufficient enforcement and long-term monitoring of the compensation measures; and
- uneven requirements for compensation measures in different MS, and possibly different regions of a MS.

To close these gaps the following possibilities could be considered:

- more clearly requiring that the mitigation hierarchy is followed in the different pieces of legislation;
- providing further guidance, or a toolbox, on methodologies at MS and/or EU level to value biodiversity, while recognising that compensation has to be assessed on a case-by-case basis and all habitats/species cannot be interchangeable;
- requiring that compensation measures, and their monitoring, follow-up, assessment, and if necessary adaptation, are included as a condition in the development consent, in order to facilitate compliance-checking and adaptation of measures;
- strengthening the requirements in the EIA/SEA Directives in order to:
  - ensure implementation of compensation measures proposed in the EIA to address significant negative impacts;
  - enlarge the scope to cover additional types of development by adapting the screening criteria (Annex III of EIA and Annex I of SEA);
  - ensure that the 'significant' impacts that should be offset 'if possible' are interpreted similarly throughout the EU (e.g. obligatory scoping procedure for EIA) and in a manner that contributes towards no net loss, either through modifying the wording, providing a clarification in the Annex (the SEA Directive Annex already partly explains 'significant'), or through a guidance document; and
  - include a (simplified) mechanism to offset the impacts from cumulative low-impact/small-scale developments.
- developing an independent instrument that:

  - covers biodiversity impacts outside Natura 2000 areas;
  - allows dealing with land-use changes and choices of land sharing/land sparing, in particular in relation to agricultural expansion and intensification;
  - includes a (simplified) mechanism to offset the impacts from cumulative low-impact/small-scale developments.

In addition, and in order to move towards no net loss, two different types of initiatives may be investigated. One is strengthening the requirements under the control of the European Commission, that is, the requirements for (co-)funding; and the second is requiring offsets for any remaining uncompensated residual impacts. The following measures could be developed:

- systematic requirement for compensation in case of biodiversity loss from EU (co-) funded developments, such as for infrastructure developments, which often will not result in significant adverse impacts when implemented according to the rules of the EIA Directive (and where relevant the HD) but which still strictly speaking result in net loss of biodiversity; and
- continue financing protection and restoration projects, as a means to compensate unmitigated residual losses. This could be linked to an increase in the financing available for these measures, and/or to a requirement for simple offsets from low-impact/small-scale projects that together have significant cumulative effects on biodiversity.

Lastly, if offsetting of biodiversity loss (e.g. through habitat banking) is to be promoted in the EU, this will require some form of policy framework, to clarify the basis for denominating credits to satisfy the principle of 'like for like or better', to define the geographical scope of compensation service areas and to make the approach attractive to users by incorporating unambiguous and simple approaches to implementation, enforcement and liability (see Section 6).

3 The demand for biodiversity offsets and habitat banking

This section identifies the potential demand for biodiversity offsets in the EU, by assessing the different factors affecting demand, such as the loss of biodiversity to development and other activities, the requirements for compensation (drawing on Section 2), and the metrics used to determine offset requirements.

Together with Section 4, this section meets the requirements specified under Task 2 of the study terms of reference. It also delivers on the second objective of the study, which seeks to identify the potential demand for biodiversity offsets in the EU.

3.1 Introduction

This section provides an assessment of the demand for compensation for biodiversity loss in the EU, considering both the situation under current legislative arrangements, and the potential demand if requirements were increased in order to deliver no net loss of biodiversity.

3.2 Factors affecting demand

The demand for compensation for biodiversity loss depends on:

(1) **The extent of loss of biodiversity and ecosystem services** in the EU as a result of development and other activities;

(2) **The degree to which compensation is required** for this loss of biodiversity and ecosystem services, that is, the regulatory requirements for compensation and/or offsetting; and

(3) **The metrics that could be used to determine offset requirements** arising from biodiversity losses. This includes consideration of equivalence, risk, uncertainty and time preference, which mean that implementing the no net loss principle requires more than one hectare of habitat to be restored or created for each hectare lost or damaged.

The demand for habitat banking as a means of meeting these compensation requirements depends on the regulatory framework in place, as well as the relative advantages, disadvantages and costs of habitat banking compared to other means of meeting compensation requirements.

Biodiversity may be lost through a number of pressures, including:

- Direct losses through habitat conversion;
- Indirect impacts from habitat conversion affecting both habitats and species;
- Indirect impacts through degradation caused by pollution and changes in land management systems; and
- Losses to global biodiversity caused by actions of EU actors (food production, logging, mining, etc); and
- Losses to biodiversity caused by climate change.

Compared to other pressures on biodiversity, direct losses through land use change, pollution, and damage are the easiest impacts to identify and quantify and are an obvious starting point when considering the demand for biodiversity offsets. The extent of potential demand relating to habitat conversion is examined in Section 3.2. The analysis begins by assessing current rates of development and land use change that affect biodiversity in the EU, and hence the potential demand for biodiversity offsets if there was a no net loss requirement.

Section 3.3 then considers the current demand for compensation resulting from EU legislative requirements, while Section 3.4 examines potential demand resulting from

legislative requirements in the Member States. Section 3.5 then compares the current and potential demand for offsets related to habitat conversion, and Section 3.6 considers future demand resulting from projected rates of land use change. Section 3.7 considers other potential drivers of offset demand, including indirect drivers of biodiversity loss and overseas impacts, while Section 3.8 examines voluntary demand for offsets. Finally, a brief review of offsets demand internationally is given in Section 3.9.

The overall level of demand for offsets and habitat banking arrangements will also depend on policy requirements in determining the circumstances in which offsets are required and the level of compensation needed to offset losses. These key design elements are examined in Section 6.2 of the report.

3.3 Loss of biodiversity through habitat conversion

3.3.1 Current rates of biodiversity loss in the EU

This section provides a summary of land use change and biodiversity loss in the EU. A longer analysis is included in Annex 3. The analysis is based primarily upon the CORINE land cover database since this is the only source of land cover data showing changes over time across the EU. There are, however, some issues with the CORINE data including:

- Inconsistencies in approaches and the accuracy of data collected between Member States as the mapping has been undertaken by different organisations using different approaches, albeit using the same protocols and land use categories;
- The CORINE database provides data for 1990, 2000 and 2006, although there are some slight differences in the year used for some Member States, which can result in either over or underestimation of trends in those countries;
- The minimum mapping unit used to inform the CORINE data is 25 hectares (ha), thereby omitting any developments and land-use changes of less than 25 ha, which will result in an underestimation of development rates (particularly relevant to biodiversity losses due to fragmentation);
- There are also issues with the CORINE data in terms of classifying areas under development at the time of analysis, which, if classified as bare land or land under construction, can make it difficult to trace the previous use of the land and thereby underestimate the growth of developed land; and
- There are complications in measuring specific land use changes. For example, the changes from agricultural land towards semi-natural land can be difficult to detect due to the time taken for the changes to become identifiable. The CORINE data does not show large scale abandonment of agricultural land.

In summary, there are issues with CORINE data, and land cover data in general, that are likely to cause over and underestimation of land cover changes. While this raises some concerns over the accuracy of the data, these issues are also likely to offset each other to some extent, and CORINE is considered the most appropriate source of data to show land use change over time across the EU.

3.3.2 EU land cover

The EU has a total land area of approximately 420 million ha across the 27 Member States. CORINE land cover data provides information for 25 of these Member States,[16] covering a total land area of approximately 400 million ha.[17] The data allow an analysis of land use trends up to 2006, while evidence of more recent trends in development and land use is considered in Section 3.6.

[16] Excluding Greece and the UK

[17] CORINE land cover data for 2006, accessed from the European Environment Agency Land Accounts

Table 3.1 shows how this area was distributed between the different types of land cover in 2006. It shows that more than 84 per cent of EU land was either agricultural land or forest and woodland shrub, accounting for a combined 333 million ha. Natural grassland, heathland and sclerophyllous vegetation is the next largest land category, accounting for 5.2% of EU land in 2006. Artificial surfaces, or previously developed land, have grown to represent 4.3 per cent of EU land in 2006. This was followed by water bodies, wetlands and open spaces, which accounted for 2.8 per cent, 2.2 per cent and 1.4 per cent of EU land, respectively.

Table 3.1 EU land cover (2006)

Land cover	2006 area (million ha)	2006 share of overall area
Artificial surfaces	17.1	4.3%
Arable land and permanent crops	110.8	28.0%
Pastures and mixed farmland	71.9	18.2%
Forest and transitional woodland shrub	150.1	37.9%
Natural grassland, healthland, sclerophyllous vegetation	20.5	5.2%
Open spaces with little or no vegetation	5.4	1.4%
Wetlands	8.8	2.2%
Water bodies	11.2	2.8%
Total	**395.8**	**100%**

Source: CORINE land cover data for 2006, from the European Environment Agency Land Accounts

Similar CORINE data also exist for 1990 and 2000,[18] which enables a comparison of growth rates over time, as shown in Table 3.2. The data show fairly consistent trends in the various land cover categories between the two periods from 1990 to 2000, and from 2000 to 2006. The growth in artificial surfaces is particularly consistent at an average of 86-87,000 ha per annum, which equates to growth of just over 0.5 per cent per annum.

The data suggest that the majority of this newly developed land is likely to be land that was previously used for agriculture, with total agricultural land declining by approximately 87,000 ha per annum in the ten years to 2000 and by 78,000 ha per annum between 2000 and 2006. In both cases this represents a 0.04 per cent per annum decline in the stock of EU agricultural land. The losses of agricultural land have been concentrated on non-irrigated arable land, pastures and mixed farmland.

There are also consistencies in the growth trends for wetlands and water bodies. The area of wetlands has declined over time by an average of between 7,000 and 10,000 ha per annum (between -0.1 and -0.2 per cent per annum), while the area of land covered by water bodies has increased by around 9,000 ha per annum over the whole period from 1990 to 2006 (representing growth of between 0.1 and 0.2 per cent per annum). This growth in water bodies has been driven by increasing areas of inland water bodies, including natural and artificial stretches of water.

Forests and transitional woodland shrub experienced slight growth in land coverage of approximately 54,000 ha per annum from 1990 to 2000, and 18,000 ha per annum from 2000 to 2006. Natural grassland, heathland and sclerophyllous vegetation, and open spaces with little vegetation declined fairly consistently by between -0.1 and -0.2 per cent per annum over the whole period.

[18] Although the 1990 data is only available for EU-25 countries, also excluding Bulgaria and Romania

Table 3.2 Trends in EU land cover (1990 to 2006)

Land cover	Average absolute growth per annum (Ha)		Average % growth per annum (% pa)	
	1990-2000	2000-06	1990-2000	2000-06
Artificial surfaces	87,120	86,244	0.53%	0.51%
Arable land and permanent crops	-64,640	-49,080	-0.06%	-0.04%
Pastures and mixed farmland	-22,740	-28,910	-0.03%	-0.04%
Forest and transitional woodland shrub	54,440	18,330	0.05%	-0.10%
Natural grassland and heathland sclerophyllous vegetation	-48,420	-20,400	-0.18%	-0.10%
Open spaces with little or no vegetation	-4,460	-8,619	-0.09%	-0.08%
Wetlands	-10,300	-6,834	-0.22%	-0.08%
Water bodies	9,000	9,270	0.19%	0.08%
Total	**0**	**0**	**0%**	**0%**

Source: CORINE land cover data for 1990, 2000 and 2006

3.3.3 Disaggregated land cover data

CORINE also provides land cover data at a more disaggregated level. For the purposes of this study it is useful to be able to disaggregate some of the semi-natural areas to identify the extent of particular habitat groups. The categories presented in Table 3.3 have disaggregated natural grasslands, sclerophyllous vegetation and moors and heathland. These habitats are relatively similar in terms of size despite each only being prevalent in a small number of Member States. For example, natural grasslands are most common in Austria, Spain and Italy, while moors and heathlands are concentrated in Sweden, Portugal and Austria. Sclerophyllous vegetation is the most concentrated habitat with Spain accounting for almost 75 per cent of all sclerophyllous vegetation in the EU.

The majority of the 'open spaces with little or no vegetation' category (i.e. bare rocks, sparsely vegetated areas, burnt areas and glaciers and perpetual snow) has been included as 'other undeveloped land', while 'beaches, dunes and sand plains' have been added to the maritime wetlands to create a 'coastal habitats' category. The 'other developed land' category accounts for 1.3 per cent of all EU land and is most prevalent in Austria, accounting for 7 per cent of all land, but is non-existent in other countries including Belgium, Luxembourg and the Netherlands. Coastal habitats account for just 0.4 per cent of all EU land and are most common in France, Germany and the Netherlands. Inland marshes and peat bogs comprise a smaller, inland 'wetlands' category, representing almost 2 per cent of total EU land, accounting for large quantities of land in Sweden and Finland, and a particularly strong concentration in Ireland, accounting for almost 16 per cent of all land. The other categories (artificial surfaces, agricultural areas and water bodies) all remain unchanged from before.

Table 3.3 EU land cover by selected categories (2006)

Land category	Main land types	2006 area (million ha)	2006 share of overall area		
			Ave	Min	Max
Artificial surfaces	Continuous/discontinuous urban fabric, industrial or commercial units, road and rail networks and associated land, port areas, airports, mineral extraction sites, dump sites, construction sites, green urban sites, sport and leisure facilities	17.1	4.3%	1.3% (LV)	29.4% (MT)
Agricultural areas	Non-irrigated arable land, permanently irrigated land, rice fields, vineyards, fruit trees and berry plantations, olive groves, pastures, annual crops associated with permanent crops, complex cultivation patterns, agriculture mosaics with significant natural vegetation, agro-forestry areas	182.8	46.2%	8.8% (FI)	74.9% (DK)
Natural grasslands	Natural grasslands	7.8	2.0%	0% (MT & LU)	7.1% (AT)
Moors and heathland	Moors and heathland	5.5	1.4%	0% (CY, HU, LU, LV, MT)	6.1% (SE)
Sclerophyllous vegetation	Sclerophyllous vegetation	7.2	1.8%	0% (AT, BE, BG, CZ, DE, DK, EE, FI, HU, IE, LT, LU, LV, NL, PL, RO, SK)	17.0% (CY)
Forests and transitional woodland shrub	Broad-leaved forest, coniferous forest, mixed forest, transitional woodland-shrub	150.1	37.9%	0.6% (MT)	72.3% (FI)
Coastal habitats	Salt marshes, salines, intertidal flats, beaches, dunes and sand plains	1.4	0.4%	0% (AT, CZ, HU, LU, SK)	6.3% (NL)
Wetlands	Inland marshes, peat bogs	7.6	1.9%	0% (LU, MT)	15.6% (IE)
Other undeveloped land	Bare rocks, sparsely vegetated areas, burnt areas, glaciers and perpetual snow	5.2	1.3%	0% (BE, LU, NL)	7.0% (AT)
Water bodies	Water courses, water bodies, coastal lagoons, estuaries, sea and ocean	11.2	2.8%	0% (MT)	9.3% (FI)
Total		**395.8**	**100%**		

Source: CORINE land cover data for 2006, from the European Environment Agency Land Accounts; The UK and Greece are not included in this data.

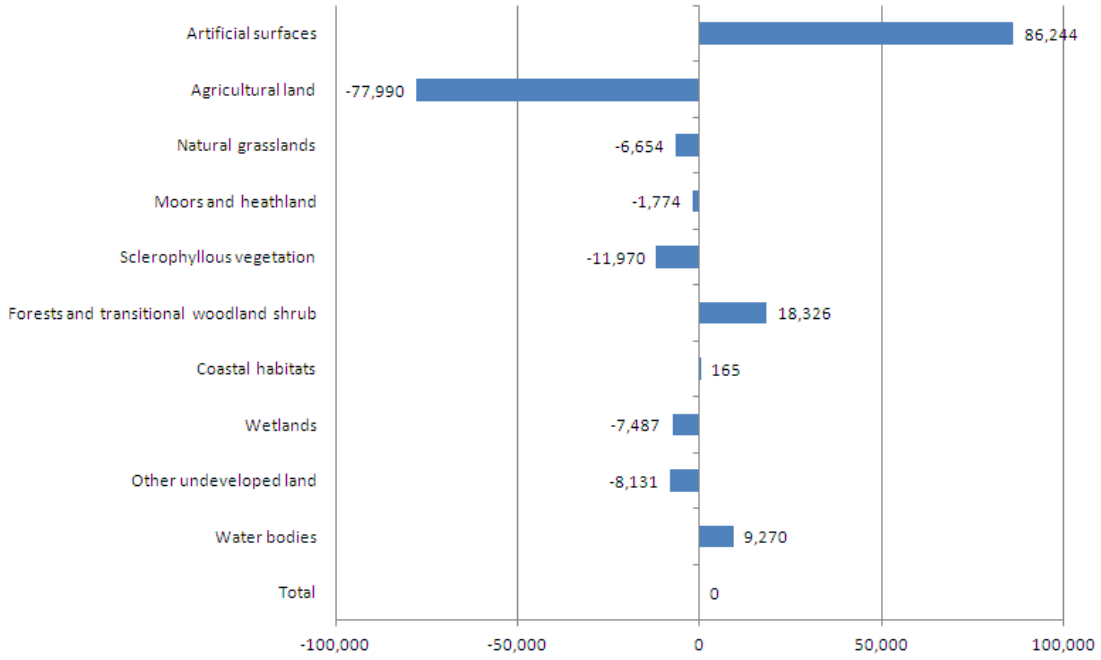
Figure 3.1 shows average annual changes for each individual land category. It shows the total area of EU forests and transitional woodland shrub to have grown by more than 18,000 ha per annum between 2000 and 2006, while the areas of natural grasslands, moors and heathlands and sclerophyllous vegetation have declined by approximately 7,000 ha, 2,000 ha and 12,000 ha per annum respectively during the same period.

There has been very little change in the overall extent of coastal habitats, but inland wetlands declined by approximately 7,500 ha per annum between 2000 and 2006 and other undeveloped land declined at a similar rate of around 8,000 ha per annum.

This evidence suggests that under a 'no net loss' policy, the overall demand for biodiversity offsets for priority habitats would likely be greatest for sclerophyllous vegetation, followed by the inland wetlands of marshes and peat bogs and natural grasslands. There would also be demand for offsets for moors and heathland, albeit on a smaller scale, while demand for offsets for coastal habitats would likely be relatively small. The data show that the greatest potential demand for offsets could be for losses of agricultural land if there was a requirement to offset losses of this land. The large majority of these losses (75,000 ha per annum) relate to non-irrigated arable land, while a further 13,000 ha of pastures and 16,000 ha of mixed farmland were also lost each year between 2000 and 2006. These losses were offset by increases of 21,000 ha per annum in the agricultural land used for permanent crops such as olive groves, vineyards, and fruit and berry plantations.

The data also suggest that much of this agricultural land has been used for the development of artificial areas. All types of artificial areas increased their land coverage between 2000 and 2006, except for dump sites, which declined very slightly over this period. The growth of artificial areas was driven by particular large increases in the land used for construction sites (7.3 per cent per annum), road and rail networks (4 per cent per annum), mineral extraction sites, sport and leisure facilities and industrial and commercial units (all of which increased by 1.1 per cent per annum between 2000 and 2006).

Figure 3.1 Average absolute change in EU land cover, 2000-06



3.3.4 Development trends

It is also possible to use CORINE data to assess the type of land used for new developments (i.e. the creation of new artificial surfaces) between 2000 and 2006 and the previous classification of this land in 2000. The data in Table 3.4 show that approximately 680,000 ha of land were developed to create new artificial surfaces between 2000 and 2006 at an average of 113,600 ha per annum. This represents the gross change in artificial surfaces over the period, resulting from the development of 95,400 ha of previously undeveloped land and 18,200 of brownfield land. In addition, there was a transfer of 9,200 ha of artificial surfaces back to other uses (particularly the transfer of mineral extraction sites, dump sites and construction sites into forests, semi-natural areas, and water bodies) which resulted in a net decline in undeveloped land of 86,200 ha.

Table 3.4 also shows that most of the 113,600 ha of new artificial surfaces (75,400 ha per annum) was previously used as agricultural land, followed by brownfield land (18,200 ha per annum). Forests and transitional woodland shrub accounted for 12,400 ha of the land used for development per annum over this period, followed by the following habitats:

- Sclerophyllous vegetation (3,000 ha per annum);
- Natural grasslands (2,500 ha per annum);
- Other undeveloped land (850 ha per annum); and
- Moors and heathland (700 ha per annum).

The remaining habitats (wetlands, coastal habitats and water bodies) are each estimated to have lost between 160 and 180 ha per annum to developments. These are the relative scales of the different types of habitat that would potentially require offsets under a 'no net loss' policy.

Table 3.4 EU land developed between 2000 and 2006 - Contribution of different land uses

Land cover	Land developed between 2000-06 (ha)	% of all land developed (2000-06)	Average land developed (ha per annum)
Artificial surfaces	108,917	16.0%	18,153
Agricultural land	452,579	66.4%	75,430
Natural grassland	15,234	2.2%	2,539
Moors and heathland	4,115	0.6%	686
Sclerophyllous vegetation	17,749	2.6%	2,958
Forests and transitional woodland shrub	74,563	10.9%	12,427
Coastal habitats	952	0.1%	159
Wetlands	1,090	0.2%	182
Other undeveloped land	5,106	0.7%	851
Water bodies	1,031	0.2%	172
Total	**681,336**	**100%**	**113,556**

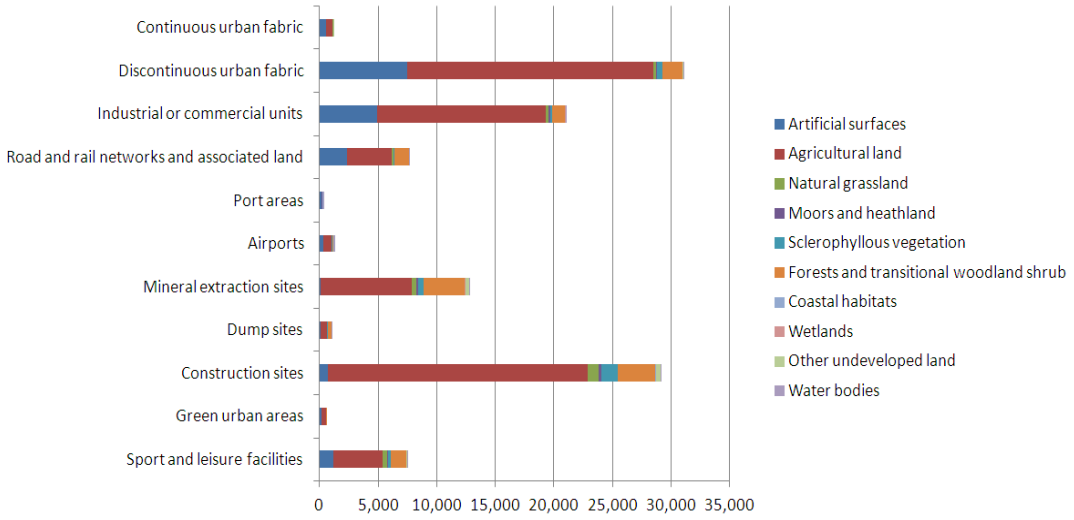
Source: CORINE 'land cover flows' data for 2006, from the European Environment Agency Land Accounts

The different types of development are shown in Figure 3.2 below. Discontinuous urban fabric, construction sites and industrial and commercial sites were the largest types of development in terms of land used each accounting for more than 20,000 ha of land per annum between 2000 and 2006. The other major types of development included mineral extraction sites, road and rail networks and sport and leisure facilities (each having

developed between 7,500 and 13,000 ha of land per annum). These are followed by airports, continuous urban fabric and dump sites (each having developed between 1,000 and 1,500 ha of land per annum) and green urban areas and ports, both of which have smaller demands for land development of between 300 and 600 ha per annum.

This shows that potential demand for offsets may be greatest for the construction and property development sector, but that mineral extraction, transport infrastructure and sports and leisure developments could also have significant requirements for offsets.

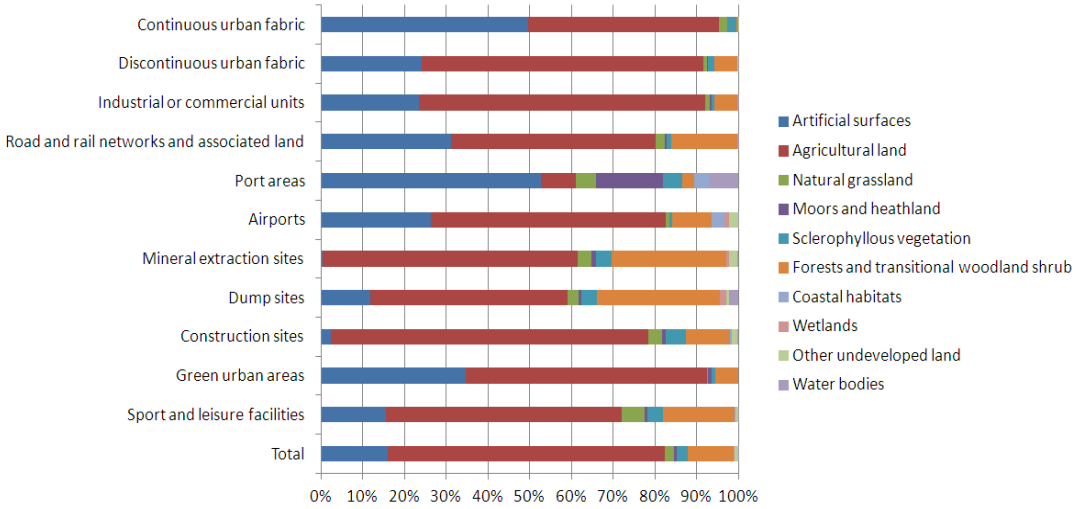
Figure 3.2 Land developed per annum by type of development, 2000-06



It is also interesting to look at the different types of land developed by each use, as presented in Figure 3.3. This shows the high proportion of agricultural land used for most types of development in the EU between 2000 and 2006, but also identifies the types of development that pose the largest threats for other habitats in the EU. For example, although the scale of port development was relatively small at just 320 ha per annum, 16 per cent of this land was previously moors and heathland, while a significant proportion of the land was also developed from water bodies, natural grassland, sclerophyllous vegetation and coastal habitats.

Many of the developments also resulted in large losses of forest and woodland shrub, which accounted for around 30 per cent of all land used to develop mineral extraction and dump sites and around 15-20 per cent of transport networks and sport and leisure facilities.

Figure 3.3 Land developed by type of development, 2000-06

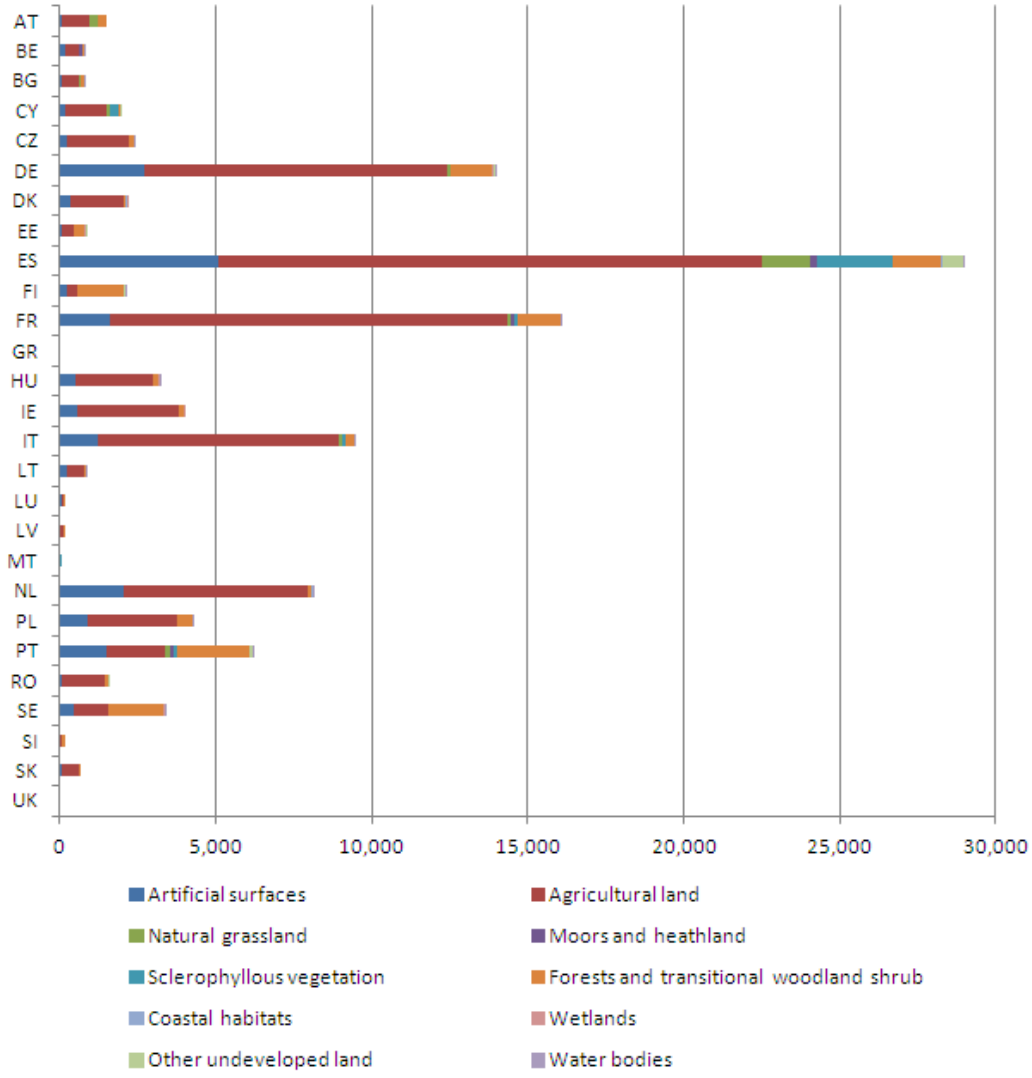


It is also possible to explore development trends across the Member States. Figure 3.4 shows that a large proportion of development took place in the EU15 Member States of Portugal, the Netherlands, Italy, Germany, France and particularly Spain between 2000 and 2006. Development in Spain accounted for around 25 per cent of all EU development between 2000 and 2006, which not only involved large areas of agricultural and brownfield land but also accounted for most of the natural grassland, sclerophyllous vegetation and other undeveloped land lost to development across the EU as a whole. It is also important to note that the data covers the period from 2000 and 2006 and therefore fails to take account of the subsequent increase in development in the new Member States since 2006.

The data also suggest relatively large losses of:

- Agricultural land in Spain, Germany and the Netherlands;
- Natural grasslands in Austria;
- Moors and heathland in France, Portugal and Belgium;
- Sclerophyllous vegetation in Cyprus;
- Forests and woodland shrub in Portugal, Sweden, Spain, Finland, France and Germany;
- Coastal habitats in Spain, Germany, France, and Denmark;
- Wetlands in Estonia, Ireland, Hungary, Sweden and Finland;
- Other undeveloped land in Spain and Portugal; and
- Water bodies in Germany, the Netherlands, Spain and Finland.

Figure 3.4 Type of land developed per annum by Member State, 2000-06



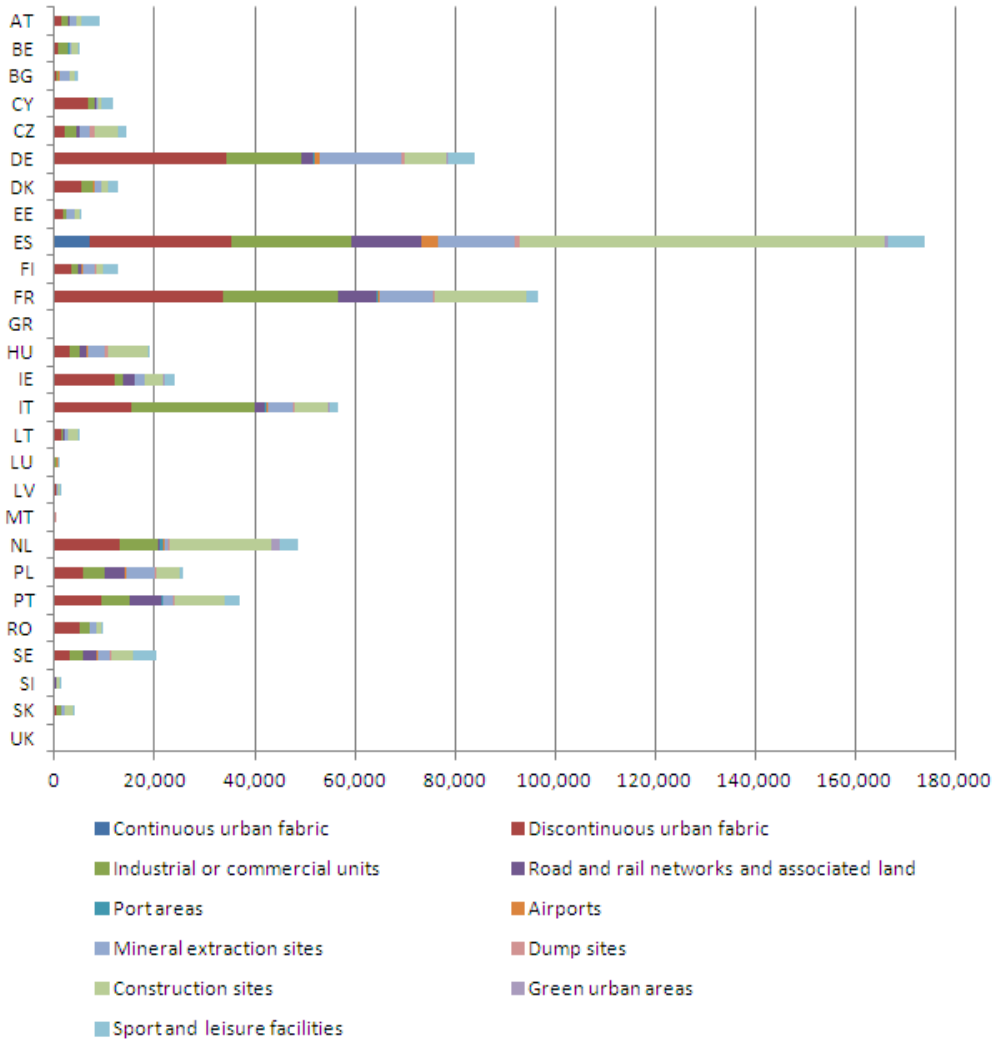
Similar data are presented in Figure 3.5 showing the different types of development undertaken in each Member State between 2000 and 2006. This highlights the significant scale of construction sites in Spain, accounting for 42 per cent of all developments over this period. This scale of construction sites is not unusual in Lithuania, Hungary, the Netherlands. Only Slovakia and Slovenia had a higher proportion of construction sites over the same period. Construction sites were the largest type of development across most of the new Member States. The exceptions are Poland and Romania, where developments were much more concentrated on discontinuous urban fabric, industrial or commercial units and road and rail networks.

The same is true of Belgium, Cyprus, Germany, Denmark, France, Ireland and Italy, where most developments involved the creation of additional 'discontinuous urban fabric' and 'industrial or commercial' developments. Some other more specific trends are described below:

- The extent of road and rail developments in Spain was around two times larger than any other Member State, while road and rail developments accounted for 26 per cent of all developments in Luxembourg (the highest of all Member States);

- Construction of ports was concentrated in Belgium and the Netherlands, with some smaller developments taking place in Germany, France, Spain and Italy;
- Construction of airports was concentrated in Spain and Germany, although airports accounted for a relatively large proportion of developments in Finland and Luxembourg;
- Mineral extraction sites were concentrated in Germany, Spain and France, and accounted for almost half of all developments in Bulgaria;
- Development of green urban areas was highest in the Netherlands, followed by Spain and Germany; and
- Development of sports and leisure facilities was particularly high in Austria, accounting for 42 per cent of all Austrian developments between 2000 and 2006.

Figure 3.5 Type of development by Member State, 2000-06



3.3.5 Trends in development since 2006

In summary, approximately 114,000 ha of land were developed in the EU in each year between 2000 and 2006. As stated above, this represents a gross measure of development experienced in the EU over this period, which also includes the redevelopment of brownfield land and the transfer of previously developed land into other types of land such as forests and semi-natural areas.

Removing the redevelopment of brownfield land and transfer of previously developed land into new uses provides an estimate of the net loss of habitats and other greenfield land to development of 86,000 ha per annum across the EU between 2000 and 2006. If these trends were to continue then this would represent the overall level of development that would require compensatory activity in order to achieve no net loss of biodiversity through habitat conversion. This assumes that offsets are only required for development of habitats, agricultural land and other greenfield land, although brownfield land can also have a biodiversity value and could therefore also give rise to demand for offsets if required.

These land use changes are based on CORINE data up to 2006 and therefore fail to take account of the economic downturn and decline in development activity that has taken place since 2008. The data in Table 3.5 show that GDP growth has fallen significantly since the global recession of 2008, while the pace of recovery has been slow across the EU as a whole. The data suggest that economic growth in the EU in the last six years has averaged just 0.5% per annum, compared to 2.1% per annum between 2000 and 2006.

The construction volume index of production also provides an indicator of the level of development in the EU. It shows that the volume of construction activity peaked in 2007 before declining rapidly to a low point in 2010 (impacted by the financial crisis and decrease in demand for housing). While there is relatively little difference in the averages for the years before and after 2006, the average from 2006 to 2012 is inflated by the strong performance in 2007 and is likely to fall further when 2012 figures are known as construction volumes in 2010 and 2011 were more than 10 per cent lower than in 2006/07.

The steepest declines in construction activity have occurred in Member States where the financial crisis has had the greatest impact - Ireland, Spain and Greece. In contrast, construction activity in Poland and Romania has increased significantly in the last five years, while the Scandinavian countries of Finland and Sweden have also experienced increasing construction activity in recent years.

Table 3.5 Indicators of economic growth and construction activity in the EU-27

	Real GDP growth (%)	Construction volume index of production (2005=100)
2000	3.9%	93.7
2001	2.2%	94.3
2002	1.3%	94.9
2003	1.4%	96.7
2004	2.5%	97.5
2005	2.0%	100.0
2006	3.3%	103.3
2007	3.2%	105.9
2008	0.3%	102.9
2009	-4.3%	95.1
2010	2.0%	91.7
2011	1.5%	92.6
2012 (forecast)	0.0%	-
2000-2006 average	*2.1%*	*97.8*
2006-2012 average	*0.5%*	*97.6*

Source: Eurostat, March 2012

In the UK, the scale of development is reported to have fallen much more significantly than suggested by the construction volume index of production. The Eurostat data suggests that the average construction production index has increased slightly in the UK in the period from 2006-2011, compared to the period from 2000-2006. However, land use change statistics for the UK (CLG, 2011) suggest that the scale of development has fallen by more than 50 per cent from an average of almost 14,000 ha per annum between 2000 and 2006, to just 6,500 ha per annum between 2006 and 2009. Similarly, the federal statistical office, Destatis (2012) suggests that the average volume index of orders in the German construction industry was 8.4 per cent lower between 2006 and 2012, compared to the period from 2000 to 2006 (Destatis, 2012).

These various sources and indicators suggest that the extent of development presented in the CORINE data above is likely to overestimate the 'average' scale of development, as the period from 2000 to 2006 was a period of strong growth with high levels of development. Similarly, the period since 2006 is likely to represent an under-estimate of 'average' development, because it covers a period of considerable economic downturn. However, while the economic downturn is likely to have reduced the rate of development, the rate of habitat creation may have increased. Taking all indicators into account, it is estimated that the average extent of development is likely to be slightly lower than suggested by the CORINE data and within the range of 50,000 to 100,000 ha per annum. This is considered realistic and appropriate for projecting future demand for offsets in order to achieve no net loss of biodiversity. Table 3.6 uses the earlier analysis of CORINE data to distribute the estimated development area between the different land categories to provide an indication of the estimated annual demand for land within each type of habitat and land category. These shares are considered robust given the high level of consistency between the two periods of CORINE data (1990-2000 and 2000-2006) although it should be noted that it is somewhat hypothetical as it is not necessarily the same urban areas that will grow in the future or the same types of land that will be used for future development.

However, assuming that similar development trends occur to 2020, the data in Table 3.6 suggest that 80 per cent of land used for development is likely to be agricultural (65 per cent) or brownfield land (15 per cent). Forests and transitional woodland shrub are expected to provide 12 per cent, while grasslands, heathland and sclerophyllous vegetation are expected to account for a combined 6.5 per cent. Other undeveloped land is expected to provide 1 per cent of land for development, while coastal habitats, wetlands and water bodies are each estimated to provide 0.2 per cent.

Table 3.6 Estimated annual demand for land for development

	Typical demand for land for development (ha/yr)	% of all land developed
Artificial surfaces	7,700 – 15,400	15.4%
Agricultural land	32,300 – 64,600	64.6%
Natural grassland	1,400 – 2,800	2.8%
Moors and heathland	600 – 1,200	1.2%
Sclerophyllous vegetation	1,250 – 2,500	2.5%
Forests and transitional woodland shrub	6,000 – 12,000	12.0%
Coastal habitats	100 – 200	0.2%
Wetlands	100 – 200	0.2%
Other undeveloped land	500 – 1,000	1.0%
Water bodies	100 – 200	0.2%
Total	50,000 – 100,000	**100%**

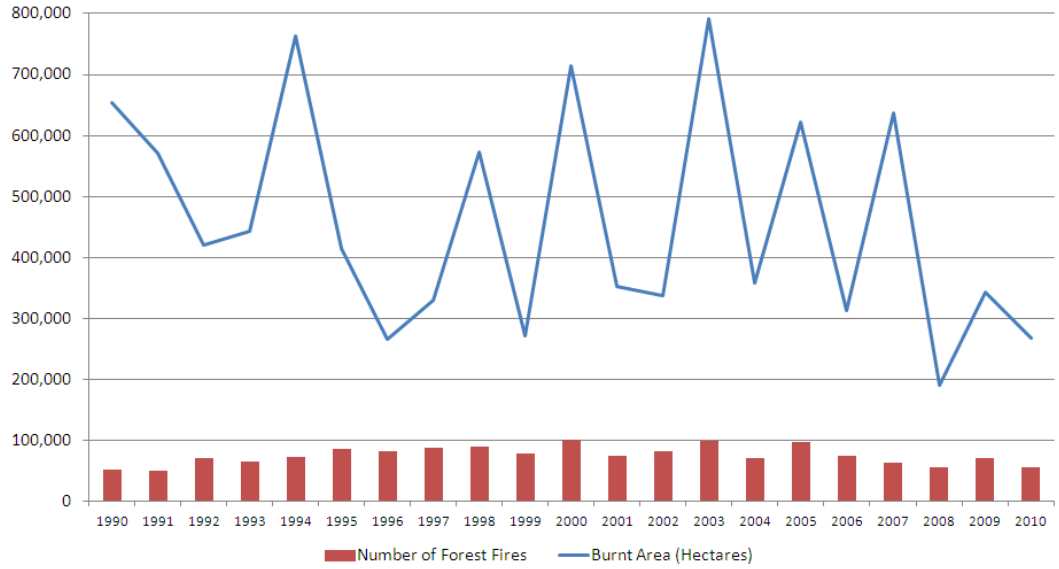
Source: ICF GHK analysis (based on CORINE data), 2012

A similar analysis could be undertaken to distribute demand between individual Member States. However this is likely to raise issues in terms of basing assumptions on the period from 2000-2006, because of disparities in economic trends. For example, the CORINE data identified Spain as the location of 25 per cent of all development in the EU between 2000 and 2006 but Eurostat data suggests that the construction production index in Spain has fallen significantly, by more than 50 per cent, between 2006 and 2011. This decline is considerably larger than in other Member States (although similar to Greece) and is indicative of the economic difficulties and current lack of development in these countries. Comparatively, the construction production index data suggests strong growth in other Member States such as Poland, Romania, Finland and Sweden, which are likely to have increased their share of EU development.

3.3.6 Trends relating to natural disasters

As stated above, undeveloped land can also be lost as a result of natural disasters and particularly forest fires. Data from the European Forest Fire Information System (EFFIS) are presented in Figure 3.6 and show the number of forest fires and the total burnt area for the EU27 (JRC, 2010; JRC, 2011). This shows considerable variance in the number and scale of forest fires over time, ranging from between 50,000 and 100,000 fires, resulting in the loss of between approximately 200,000 and 800,000 ha of forest per annum. On average there have been approximately 75,000 forest fires per annum in the EU27 between 1990 and 2010, causing damage to an average of 460,000 ha of forest per annum. This suggests that each forest fire damages an area of approximately 6 ha.

Figure 3.6 EU forest fires and burnt area, 1990-2010



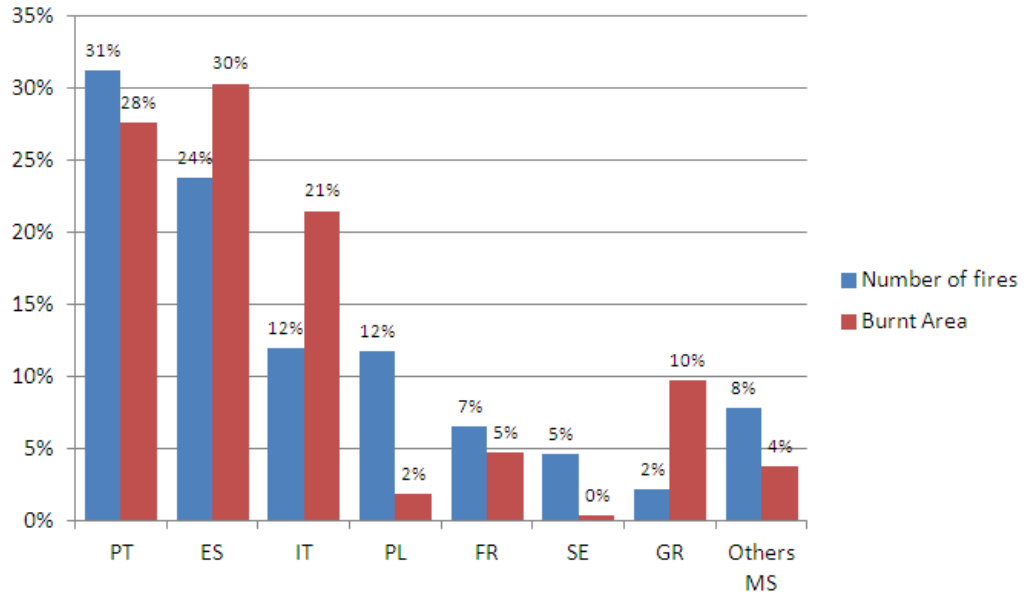
Source: JRC (2010); JRC (2011).

CORINE data suggests that the area covered by forests (excluding woodland shrub) in the EU declined by almost 2 million ha between 2000 and 2006, at a rate of approximately 330,000 ha per annum. These figures are smaller than the losses of forest estimated by the EFFIS data and suggest that the net decline in forests is lower than the damage reported to have been caused by forest fires.

Figure 3.7 shows that the number of fires and the burnt area is concentrated amongst a small number of Member States, with Portugal and Spain accounting for most of the forest fires in the EU and suffering most of the losses in terms of burnt areas. The other Member States with significant forest fires are Italy, Poland, France, Sweden and Greece. The fires in Poland and Sweden have been relatively small in terms of the scale of damage to forests.

However, the fires in Italy and particularly Greece are more likely to cause significant damage to large areas of land.

Figure 3.7 Distribution of fires and burnt area by Member State, 1990-2010



Source: JRC (2010); JRC (2011).

Forest fire losses would also need to be offset where they are a result of human activities or behaviours, in order to achieve no net loss of biodiversity. The latest report on forest fires in Europe also provides data for 11 Member States relating to the identified causes of the fires (JRC, 2010; JRC, 2011). Overall, these data suggest that, amongst these 11 Member States:

- The cause of the fire was unknown in 44 per cent of cases.
- 55 per cent of forest fires in 2010 were caused by human activities (including deliberate actions/arsons as well as accidents or negligence); and;
- 1.3 per cent were caused by natural causes, such as lightning strikes or self-ignition.

Forest fires can be used in some countries for conservation purposes and biodiversity benefit (e.g. Sweden) and so cannot be considered as constituting damage.

Nonetheless, if the unknown cases are excluded, the data suggest that human activities caused the vast majority (98 per cent) of forest fires across these Member States in 2010, where it was possible to determine the cause of the fire. Human activities are therefore assumed to account for between 55 and 98 per cent of all forest fires in the EU. In order for this damage to be offset, it would be necessary to be able to identify the individual person or organisation responsible for causing the fire and establish liability. If it was possible to identify the persons or organisations liable for the 55 per cent of the land lost to forest fires in the EU, and these losses were to be offset, this would amount to an annual average of approximately 250,000 ha across the EU with a potential range of between 110,000 and 440,000 ha per annum of lost biodiversity that might need to be offset. Establishing legal liability for this damage would be key to offsetting these impacts, although insurance schemes are a possible solution where liability cannot be identified.

Flooding also presents a risk to land cover, although temporary flooding is unlikely to have the same significant and lasting impact on land as forest fires. Some effects of rising sea levels and flooding are likely to be reflected in the growth in water bodies, as evidenced by the CORINE data. The loss of intertidal habitats due to rising sea levels also gives rise to compensatory requirements. For example the UK Biodiversity Action Plan has established a

target of no net loss of intertidal habitats, which has required the creation of new intertidal habitats in Eastern England.

3.3.7 Overall potential demand for offsets resulting from habitat conversion

Combining the estimates of undeveloped land lost to development and natural disasters suggests that offsets could potentially be required for losses affecting between 160,000 and 540,000 ha per annum The data suggest that the area of land lost to forest fires is around three times larger than the land lost to development, based on the above analysis.

The analysis above has examined the rate of biodiversity loss resulting from development, natural disasters and land use changes, which would need to be offset to achieve no net loss of biodiversity at EU level. The extent of conservation activities required to offset these losses (and hence achieve no net loss) will depend on a range of factors including the types of action undertaken, the relative quality of what is lost and provided as compensation, the timing of losses and gains, and the risks and uncertainties involved.

It is therefore likely that the compensation requirement will exceed the extent of loss, that is, there will be a need for more than one hectare of new or restored habitat to compensate for each area of lost or damaged habitat. Ratios of more than 1:1 are often applied to determine offset requirements internationally, and assessments of gains and losses may suggest the need for ratios of more than 100:1 in some circumstances. Further discussion of the metrics used to establish offset requirements is given in Section 6.2, and an example from England is given in Box 1.

Box 1 Metrics for Biodiversity offsets in England

In England, GHK and eftec (2011) modelled the combined effects of proposed offset metrics in order to assess the costs of offset requirements. The offset requirement was found to be sensitive to the assumptions employed. If no risk multiplier is employed, offset requirements varied from 0.49 hectares to 4.2 hectares of offset per hectare of land developed. Inclusion of a risk multiplier increases this range from 0.88 hectares to 6.56 hectares of offset per hectare of land developed. The lower ratio is for development affecting low distinctiveness greenfield sites (e.g. arable land, and involving “trading-up” through creation of priority habitats) and the highest ratio is for damage to priority habitats of high distinctiveness.

3.4 Demand for compensation resulting from EU legislation

3.4.1 Habitats Directive and Natura 2000

Table 3.7 presents the latest available data on the size of the Natura 2000 network across all Member States and includes all relevant sites at the end of 2010. The data show that the Natura 2000 network consists of more than 26,000 sites and covers 17.5 per cent of the EU territory. The total area covered by Natura sites is 95 million ha, comprising 75 million ha of terrestrial land and 20 million ha of marine areas. The average size of a Natura 2000 site is therefore around 3,600 hectares.

Table 3.7 Natura 2000 areas, 2010

Member State	Natura 2000 Terrestrial Area (million ha)	Share of total land area	Total number of sites	Total Natura 2000 Area (Terrestrial and marine) (million ha)
AT	1.23	14.7%	220	1.23
BE	0.39	12.7%	458	0.51
BG	3.76	33.9%	332	3.86
CY	0.16	28.4%	61	0.18
CZ	1.11	14.0%	1,125	1.11
DE	5.51	15.4%	5,266	8.07
DK	0.38	8.9%	350	2.24
EE	0.80	17.8%	561	1.47
ES	13.73	27.2%	1,787	14.76
FI	4.88	14.4%	1,833	5.57
FR	6.88	12.5%	1,752	11.01
GR	3.58	27.1%	419	4.30
HU	1.99	21.4%	523	1.99
IE	0.91	13.0%	583	1.59
IT	5.77	19.2%	2,549	6.26
LT	0.79	12.1%	488	0.86
LU	0.05	18.1%	60	0.05
LV	0.73	11.3%	325	0.79
MT	0.004	13.0%	35	0.01
NL	0.57	13.8%	215	1.75
PL	6.08	19.4%	958	6.80
PT	1.92	20.9%	147	2.10
RO	4.27	17.9%	381	4.42
SE	5.71	13.8%	4,074	6.50
SI	0.72	35.5%	286	0.72
SK	1.41	29.0%	420	1.41
UK	1.77	7.2%	898	5.45
EU-27	**75.12**	**17.5%**	**26,106**	**94.99**

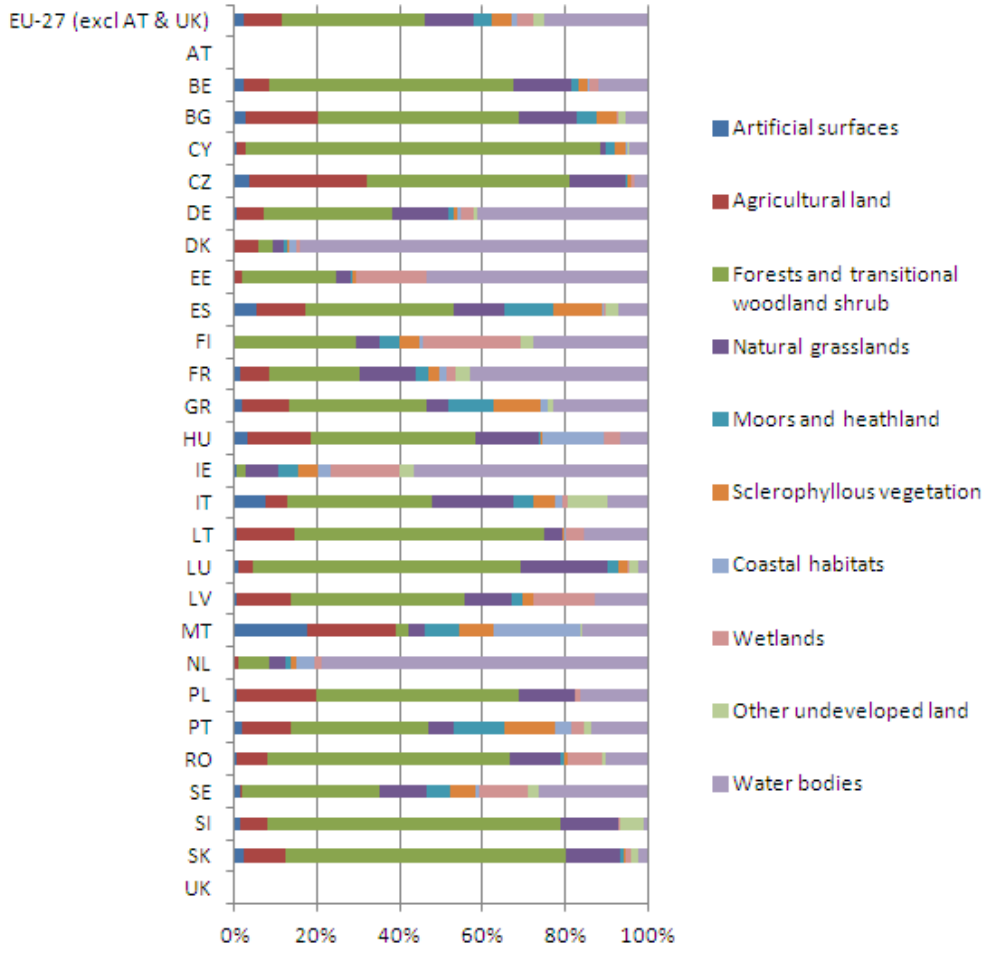
Source: European Environment Agency, available at: http://www.eea.europa.eu/themes/biodiversity/document-library/natura-2000/natura-2000-network-statistics/area-calculations-2007-to-2009/gis-area-of-natura-2000-network-1/

The data also show significant variance in the relative extent of Natura 2000 areas across the Member States. Spain had the largest area at the end of 2010, with almost 15 million ha of Natura 2000 sites, while Malta is the smallest with just over 5,000 ha. These areas as a percentage of the total land area range from a minimum of 7 per cent of land in the UK to 36 per cent of land in Slovenia. This is important as there is a higher probability of development affecting Natura 2000 sites in Member States with a relatively high proportion of land

protected by the Natura 2000 network such as Slovenia, Bulgaria, Slovakia, Cyprus, Spain and Greece.

The Natura 2000 database enables more detailed analysis of the network in terms of its distribution between the different types of habitats in different Member States. The data presented in Figure 3.8 are only indicative since the database excludes data for Austria and the UK and includes some areas of overlap because of the double-counting of sites that are classified as Sites of Community Importance (SCI) as well as Special Protected Areas (SPAs).

Figure 3.8 Natura 2000 sites by land category (2010)



Source: ICF GHK analysis of the Natura 2000 Public Database, last updated March 2011 with 2010 data, available at: http://www.eea.europa.eu/data-and-maps/data/natura-1

The data in Figure 3.8 have been grouped into the same ten land categories as presented above in Table 3.3. This suggests that almost 35 per cent of Natura 2000 sites in the EU consist of forests and transitional woodland shrub. The next largest category is water bodies, which account for 25 per cent of the total area of Natura 2000 sites, followed by natural grasslands (12 per cent), agricultural land (9 per cent), moors and heathland (4.5 per cent), sclerophyllous vegetation (also 4.5 per cent) and wetlands (4.1 per cent). The other categories include: other undeveloped land (2.5 per cent), artificial surfaces (2.3 per cent) and coastal habitats (1.4 per cent).

There are also some significant differences between Member States with relatively high concentrations of the following in Natura 2000 sites:

- Artificial surfaces in Natura 2000 sites in Malta and Italy;

- Artificial surfaces in Malta and Italy;
- Agricultural land in the Czech Republic, Malta, Poland and Bulgaria;
- Forest and transitional woodland shrub in Cyprus, Slovenia, Slovakia, Luxembourg and Lithuania;
- Natural grasslands in Luxembourg, Italy and Hungary;
- Moors and heathland and sclerophyllous vegetation in Portugal, Spain and Greece;
- Coastal habitats in Malta, Hungary, Portugal and the Netherlands;
- Wetlands in Finland, Estonia, Ireland, Latvia and Sweden;
- Other undeveloped land in Italy, Slovenia and France; and
- Water bodies in Denmark, the Netherlands, Ireland, Estonia and Germany, France, Finland and Sweden.

The significant scale of the Natura 2000 network suggests that there is likely to be conflict between these areas and demand for land for new developments in the EU.

However, a survey of Member States, undertaken by the Commission, found that there are only around 20 cases per year where compensation measures are required (EC, 2008). This figure is very low, representing less than 0.1 per cent of Natura 2000 sites and suggests that the Habitats Directive is effective in terms of preventing or mitigating development of Natura 2000 sites before the need for compensatory measures.

Article 6(4) of the Habitats Directive applies when the expected impacts of a project are negative, but the project is needed for due to overriding public interest. Compensatory measures are required in all of these cases and must be communicated to the Commission. In 2008, the Commission requested that Member States provide information on the use of compensatory measures that were taken in 2004, 2005 and 2006 according to Article 6(4), subparagraph 1. A total of 42 cases were reported across seven Member States, while a further eight Member States reported that Article 6(4) had not been applied during that period (EC, 2008b). Unfortunately another ten Member States did not provide any substantial feedback. The Commission concluded that Member States were not following a systematic approach to the application of Article 6(4), subparagraph 1, and information, when submitted was often partial, vague and insufficient.

The report does not provide information about the scale of development or the compensatory measures applied in the 42 identified cases, but does highlight the diverse range of projects and plans that required compensatory measures. These included eleven wind farm proposals as well as transport infrastructure plans for six motorways, four airports and a train line, and five urban developments related to tourist resorts.

Approval from the Commission is required for Natura 2000 sites hosting priority habitats and the Commission had released 17 opinions by March 2012. These opinions provide useful information about the scale of developments and affected areas as well as the compensatory measures, which can be used to provide an estimate the scale of developments, impacts and compensation related to Natura 2000 sites.

A detailed analysis of the 17 opinions is included in Annex 4. These opinions were very concentrated on projects proposed in Germany, which accounted for 11 of the proposals. Two of the other opinions related to projects in Spain, with single projects in Hungary, France, Sweden and the Netherlands. The proposed projects also related to a range of different habitats including forests, grasslands, heathlands, estuaries and other water courses, wetlands and coastal habitats. The key findings of the analysis include:

- Each case relates to 1.5 Natura 2000 sites on average;

- The affected area of habitat in each case averages approximately 410 ha,[19] with a significant variance from just 0.2 ha (relating to proposals to modify an existing motorway) to more than 3,000 ha (relating to development proposals for a large port extension);
- The affected areas represent around 18 per cent of the total area of the associated Natura 2000 sites, ranging from 0.2 per cent (in the case of the construction of a road passing through a Natura 2000 site) to 100 per cent (in the case of a proposed dam and reservoir) of sites; and,
- The scale of proposed compensatory measures was approximately six times larger than the area of affected habitat, with individual examples of compensation ranging from 1.5 times (in the case of a proposed extension to an airport) to more than 20 times larger than the affected area (for the relatively small area affected by plans to modify an existing motorway).

These averages can be used to estimate the scale of the 20 cases per annum where compensatory measures are required. The estimates are only intended to be indicative because they are based on a very small sample. The analysis suggests that the 20 cases may affect 30 Natura 2000 sites per annum[20], causing damage to 8,200 ha of habitats[21], which could give rise to demand for compensation for the loss of up to 50,000 ha per annum[22]. This compensation does not necessarily achieve no-net-loss (and therefore may not strictly qualify as biodiversity offsets *per se*), as there may be a need for better metrics, tools and guidance to determine the level of compensation that should be required. Some caution however is needed when priority habitats are being affected, as these can be especially difficult to restore or replace. Moreover, where key species are affected, it may also be necessary to restore a species population as well, which can be very challenging. The potential for these measures to achieve no net loss may therefore be somewhat limited.

These indicative estimates suggest that development projects are likely to damage around 0.009 per cent of Natura 2000 habitats per annum, while the associated compensatory measures represent 0.05 per cent of the total Natura 2000 network. The estimated 8,200 hectares of damage to Natura 2000 sites per annum represent approximately 10% of the land converted to artificial surfaces in the EU each year.

3.4.2 Environmental Impact Assessment Directive

The recent Impact Assessment of the review of the EIA Directive (EC, 2012b) provides valuable data on the occurrence of EIAs across the EU. Data was collected through a survey of Member States, undertaken by GHK (2010), and was supplemented by a public consultation. Based on this evidence the Impact Assessment estimated the number of EIAs undertaken in the EU to have been between 15,000 and 26,000 per annum for the period 2005 to 2008, and this total is expected to increase over time.

The study team received survey responses from 17 of the EU27 Member States, which showed that there was significant variation in the number of EIAs undertaken by Member States, ranging from approximately 10 EIAs undertaken each year in Malta and Latvia to around 4,000 in France and Poland, as shown in Table 3.8.

The impact assessment also estimates that between 27,400 and 33,800 screening decisions for EIAs are taken each year. Interestingly the survey responses found that the number of screenings varies between zero in France and 4,400 in Poland, the two countries

[19] Average is for the 11 opinions that provided data on the area of habitat affected

[20] Based on an average of 1.5 sites affected by each proposed project (i.e. 20 x 1.5 = 30 sites per annum).

[21] Based on an average of 410 ha of habitats affected by each proposed project (i.e. 20 x 410 ha = 8,200 ha per annum).

[22] Based on an assumption that the proposed compensatory measures are six times larger than the affected area of habitats (i.e. 8,200 ha x 6 = 50,000 ha per annum).

undertaking by far the largest numbers of EIAs each year. The number of positive screenings requiring an EIA was estimated to be between 5 and 10 per cent of all screenings, equating to a total of between 1,370 and 3,380 EIAs per annum.

The GHK study found that the most common types of projects subject to EIAs in the newer Member States tend to be infrastructure projects, such as those related to energy, transport, water and waste management. Most of the major development projects subject to EIAs in the more established (EU15) Member States were related to urban and industrial development concerns such as retail parks and shopping centres. The average EIA duration was reported at around 12 months.

The impact assessment states that average EIA costs for developers will depend on the size of the project and are estimated to be one per cent of the total project cost, or approximately €41.000 per EIA on average. It estimates the overall cost to developers of EIAs in the EU-27 to be between €558 and €846 million per annum. If these costs represent one per cent of total project costs, then the total cost of projects subjected to EIAs can be estimated at between €56 and €85 billion per annum across the EU as a whole.

The total value of the construction industry in the EU-27 is approximately €1,600 billion, approximately €1,050 billion of which is estimated to relate to new buildings and civil engineering projects.[23] This suggests that the development projects subjected to EIAs represent between five and eight of all new building construction projects in the EU each year. The CORINE data suggest that the gross scale of development in the EU averages 114,000 ha per annum. We can therefore estimate that EIAs are likely to be undertaken for developments relating to between five and eight per cent of this area, representing between 5,700 and 9,100 ha per annum.

The GHK study also included a number of case studies of EIAs across Member States. Several of the case studies make reference to the need for measures to compensate for the impact of their activities on the environment. In total, only four of the 16 case study projects (25 per cent) describe the need for compensatory measures and those that provided financial data suggest that the cost of compensatory measures was only around five per cent of the overall cost of the project.

Overall, these data suggest that compensation resulting from EIAs arises for only a small proportion of land affected by development in the EU, and for a tiny proportion of development projects. Further, there is likely to be a high level of overlap with compensatory requirements arising from damage to Natura 2000 sites, as estimated above. Since EIAs are required for projects likely to affect environmentally sensitive areas, it is therefore likely that developments affecting Natura 2000 sites will require an EIA. An analysis of the opinions concerning development of Natura 2000 sites shows that the majority relate to the development of major transport infrastructure or dam construction and are therefore required to undertake an EIA. The remaining three examples relate to coal mining or significant urban developments, which are also highly likely to require EIAs, although the EIA Directive states that the decision can be made by the relevant Member State.

The majority of the estimated 8,200 ha of damage to Natura 2000 sites per annum is likely to be included within the 5,700 to 9,100 ha of developments that are estimated to be subject to EIAs per annum. These figures should therefore not be added together as this would double-count the development area that is currently estimated to give rise to compensatory measures.

[23] Eurostat, April 2012

Table 3.8 EIA activity by Member State

Member State	Average no. of EIAs undertaken per year (2005-2008)	Average number of screenings per year (2005-2008)	Average share (%) of screenings requiring EIAs	Share of EIAs by sector		
				Infrastructure	Development	Other
AT	23	96	17	22	44	34
BE	183	2,337	1	24	49	27
BG	249*	1,031*	n/a	37^	44^	19^
CY	117	58	90	47	33	20
CZ	96	1,610	4	38	25	37
DE	1,000	2,200	10	38^	33^	30^
DK	125	2,500	5	Not estimated		
EE	80	830*	n/a	53^	11^	36^
ES	1,054	2,236*	n/a	21^	43^	36^
FI	38	36	43	67	5	28
FR	3,867	0	n/a	20	42	38
GR	425	1,146*	n/a	80	10	10
HU	152	613	15	48	18	34
IE	197	928*	n/a	Not estimated		
IT	1,548*	2,695*	n/a	21^	43^	36^
LT	142*	895*	n/a	53^	11^	36^
LU	70*	802*	n/a	Not estimated		
LV	11	710	2	53	11	36
MT	10	62	25	39	33	28
NL	123	1,312*	n/a	38^	33^	30^
PL	4,000	4,400	50	37^	44^	19^

PT	323*	1,127*	n/a	53^	22^	25^
RO	596*	1,476*	n/a	37^	44^	19^
SE	288*	1,081*	n/a	38^	33^	30^
SI	108*	851*	n/a	53^	22^	25^
SK	670	476	3	37	44	19
UK	598~	2,745*	n/a	21^	43^	36^
EU-27	**16,093**	**34,253**	**n/a**			

Source: ICF GHK, Collection of information and data to support the Impact Assessment study of the review of the EIA Directive, September 2010, available at: http://ec.europa.eu/environment/eia/pdf/collection_data.pdf

** Estimates based on correlation between population and average annual EIAs/screening numbers*

^ Proxy data obtained from country groupings (based on development paths)

˜ Data for the UK was adjusted after publication of the GHK study, based on new reported figures for EIAs undertaken between 2005 and 2008

3.4.3 Environmental Liability Directive

There is limited data available relating to the cases brought about by the ELD beyond individual examples. The limited availability of data was highlighted by previous studies undertaken by BIO IS in 2008 (BIO IS, 2008a; BIO IS, 2008b) and the subsequent Commission report in 2010 on the effectiveness of the ELD in terms of remediation of environmental damage and on the availability of financial security to cover environmental liability (EC, 2010b).

Member States were surveyed to inform the Commission's report in 2010, with around half providing information on a voluntary basis. The findings suggest that implementation of the Directive had been slow, with a limited number of cases being treated by the competent authorities in the Member States. The collected information identified 16 cases treated under the ELD by the beginning of 2010, and estimated the total number of ELD cases across the EU to total around 50. The report suggests that this low number of ELD cases could reflect limited knowledge amongst operators, and/or the preventative effect of the ELD in terms of minimising environmental damage. Furthermore, the resulting damage may not be regarded as significant, thus the cases may be treated under other legislation (i.e. which deal with water and soil pollution).

The report indicates that there was insufficient information to draw conclusions on the effectiveness of the Directive but does provide some observations about the characteristics of ELD cases based on the limited evidence, which suggest that:

- Most cases relate to water and land damage, but a small number relate to protected species and habitats damage;
- Most cases involved primary remediation measures (in the form of clean-up), which were applied immediately and none of the cases included any information about complementary or compensatory remediation;
- The costs of remedial measures range from between €12,000 and €250,000, while the duration of environmental recovery has ranged from one week to three years; and
- Most activities were covered under the Directive on integrated pollution prevention and control (IPPC), as well as waste management operations, and the manufacture, use and storage of dangerous substances.

This suggests that the current demand for compensation resulting from the Environmental Liability Directive in the EU is very limited. Nevertheless, offset providers and habitat banks may play an important role in providing solutions to operators that may be called to restore biodiversity loss.

3.5 Demand for compensation resulting from MS requirements

The scale of the demand for compensation arising from the regulatory requirements in different Member States largely depends on the type of development and the significance of the impact, as well as the requirements specified in the permits that are issued by local authorities.

However, it does seem that demand for compensation within the Natura 2000 network is higher than for damages occurring to areas outside Natura 2000 sites. Nonetheless, in other Member States, it appears that demand is generally quite low because the mitigation hierarchy is being followed, and that avoidance and mitigation measures are being taken which avoids the need for compensation. Overall however, it seems that demand in Member States for compensation outside the Natura 2000 network is generally limited due to the general lack of supporting legal frameworks. Even where the provisions exist for compensation to be required, such as Sweden, guidance is often lacking on how this should be implemented which means demand is restricted. It seems that even where there are provisions which allow for compensation to be required, authorities do not tend to make full use of these powers (e.g. in the UK). There are some examples of voluntary compensation taking place, but these are relatively limited and small in scale.

Moreover, there are few cases where provisions allow for compensation for a wide range of biodiversity loss; compensation is usually required only once certain thresholds are reached (although these are normally poorly defined) or for biodiversity of higher value.

The Member State review in Section 2.3 also highlighted that there is a considerable lack of data on what compensation measures have actually been taken and to what extent, and in what ways the compensation requirements are being implemented in practice. In many cases therefore it is difficult to judge the strength of the regulatory frameworks and the scale of demand that they are therefore creating in the way of compensation for biodiversity loss.

A qualitative assessment has however been undertaken based on the available evidence to score the regulatory systems and the resulting demand from the different Member States that were considered here. The results are shown in Table 3.9. These results should be treated with some caution however as in several cases the assessment is based on limited evidence given a lack of information on the implementation of the regulatory frameworks in the Member States.

From this assessment it appears that the strongest demand for compensation arises in Germany. Other countries where demand for compensation arises, especially in relation to protected areas under the Natura 2000 network are France, the UK, Sweden and the Netherlands, whilst there is considerably lower demand for compensating for environmental damage in Bulgaria, the Czech Republic, Finland, Greece, Poland, Italy and Lithuania.

Table 3.9 Strength of the regulatory systems and resulting demand in the different Member States

	Within Natura 2000 network		Outside the Natura 2000 Network	
Member State	Strength of the regulatory framework for compensation	Scale of the demand for compensation	Strength of the regulatory framework for compensation	Scale of the demand for compensation
DE	+++	+++	+++	+++
FR	+++	++	++	+
UK	+++	+	+	+
SE	+++	+	++	+
ES	+++	+	+/-	+/-
BG	+	- -	-	-
CZ	+	-	+	+/-
FI	++	+/-	+	+/-
GR	++	+	+	-
IT	-	-	-	-
LT	++	-	+	-
NL	++	++	+	++
PL	++	+	+	+

Key: +++ very strong system / demand, - - - very weak system / demand

3.6 Summary of current and potential demand related to land use change

The main conclusions from the review in sections 3.2 to 3.4 are that:

- Most recent data suggest that the rate of net development of land in the EU in recent years has been of an order of magnitude of 86,000 hectares per year;
- Most recent data suggest that the average area of EU land damaged in recent years by natural disasters caused by human actions has been of an order of magnitude of 250,000 hectares per year;
- The area of land use change which could potentially require offsets is estimated to fall between 50,000 to 100,000 ha per annum, based on this analysis of evidence of the land affected by future rates of development. This area could potentially rise to between 160,000 and 540,000 ha per annum, if the additional 110,000 to 440,000 ha per annum of land lost to natural disasters caused by human actions was also included, although this would depend on the ability to establish legal liability for this damage;
- Achieving 'no net loss' would require some form of offsets to be applied to most of this area, given that most of this land will have some value for biodiversity;
- Current EU legislative requirements require compensation for biodiversity loss for certain developments, although in recent years this has only covered approximately 10% of the area of land used for development;
- The requirements for compensation resulting from national legislation cannot be quantified but are likely to account for only a small proportion of this gap.

It is important to note that the above figures represent best estimates of future demand for offsets given the data available, although they are also dependent on the limitations and potential inaccuracies associated with the data, as described above. The estimates are also based on the assumption that recent trends are likely to continue in the period to 2020, and that other drivers such as food demand, increasing competition for land resources and climate change will not have a significant impact on land use changes during this period. The scale of compensatory measures required to offset the above losses of biodiversity depend on the assessment of biodiversity losses at individual sites, but in area terms are likely to exceed the area of land use change, as the compensation ratios that are used range between 1:1 and 6:1.

The offset requirement will depend to a large extent on the requirement for compensation for biodiversity loss caused by development of agricultural land, as well as loss of priority habitats. Requirements for offsets for previously developed land, some of which has high biodiversity value, are another important consideration.

3.7 Future demand to 2020 resulting from land use change

The trends in land use change, based on historic CORINE data, provide a means of projecting future levels of demand for offsets to 2020. However, a number of models have also been developed to provide projections and scenarios of future land use change in the EU. These models are a useful source of information with which to verify and/or make changes to the above projections of land use change.

A paper was recently submitted by individuals from the Research Institute for Knowledge Systems (RIKS), European Environment Agency (EEA) and the Institute for Environmental Studies (IES) and other organisations as part of the International Congress on Environmental Modelling and Software (iEMSs). The paper presents a comparison of a number of land use studies for Europe that explore land use changes to 2020 or 2030 (Van Delden et al., 2012). It found that most land use models focus on agricultural land use and natural environments and only a few extend to urban developments. The paper identifies three models that generate projections of future agricultural, natural and urban land uses. These comprise:

- The Land-use modelling – Implementation (LUM-Implementation) model: a study commissioned by DG Environment to develop a framework for land use modelling (EC, 2010c);
- The SENSOR model: an EC RTD FP6 project on sustainability impact assessment, tools for environmental, social and economic effects of multifunctional land use in European regions (Helming et al., 2008); and
- The LUMOCAP model: an EC RTD FP6 project on dynamic land use change modelling for CAP impact assessment on the rural landscape.[24]

The comparison of different land use models is complicated since they typically use different land use definitions and spatial units, and report over different time periods (or sometimes only provide information for a single year). The above three models are similar in terms of having a more integrated approach to land use projections, based on a combination of agricultural, natural and urban land uses, although even these do not include urban land uses in as much detail as agriculture or environmental land uses.

However, despite these issues and differences between the models it is possible to make some comparisons at a broad level. The models provide data at a country level for the EU-27, which the iEMSs paper aggregated into the EU-15, NMS-10 (for the Member States that joined the EU in 2004), and the NMS-2 (for the newest Member States of Bulgaria and Romania). The projected growth rates produced by each of the three models are presented in Table 3.10, which shows the average annual growth rates in urban areas under their baseline, or reference case, scenarios.

The data show some variance in the growth projections of the three models. The LUM_Implementation model provides the most conservative projections of very low growth rates for the EU-15 and NMS-10 and no growth for the NMS-2. The LUMOCAP model projects stronger growth of 0.7 per cent per annum across all Member States, while the SENSOR model projects slower growth of 0.3 per cent per annum for the EU-15 and stronger growth for the NMS-2 of 1.2 per cent per annum.

Table 3.10 Projected growth of urban areas in the reference case scenarios of each land use model (per cent per annum)

Model	EU-15	NMS-10	NMS-2
LUM-Implementation	0.3%	0.2%	0%
SENSOR	0.3%	0.7%	1.2%
LUMOCAP	0.7%	0.7%	0.7%

Source: Van Delden et al, Exploring land use trends in Europe: a comparison of forecasting approaches and results, 2012

Table 3.11 uses these growth rates to project future rates of development of urban areas under each model. 2006 CORINE data has been used to calculate the urban (artificial) areas for each of the groups of Member States, before applying the respective growth rates. The results suggest that the three models project urban areas in the EU to increase by between 600,000 ha and 1,750,000 ha by 2020. This represents the net growth in urban areas over this period (i.e. excluding the development of brownfield land) and therefore provides a projection of the net loss of EU habitats and other greenfield land to development of between 43,000 and 125,000 ha per annum between 2006 and 2020.

[24] See http://agrienv.jrc.ec.europa.eu/indexlm.htm

Table 3.11 Projected growth of urban areas in the reference case scenarios of each land use model (per cent per annum)

	CORINE (2006)	LUM-Implementation (2020)	SENSOR (2020)	LUMOCAP (2020)
EU-15	11.9 mha	12.4 mha	12.4 mha	13.1 mha
NMS-10	3.1 mha	3.2 mha	3.4 mha	3.4 mha
NMS-2	2.1 mha	2.1 mha	2.4 mha	2.3 mha
Total	**17.1 mha**	**17.7 mha**	**18.3 mha**	**18.8 mha**
Growth (2006-2010)	-	*0.6 mha*	*1.2 mha*	*1.75 mha*
Growth per annum (2006-2020)	**-**	***43,000 ha***	***86,000 ha***	***125,000 ha***

Sources: ICF GHK analysis, 2012; CORINE land cover data for 2006; and Van Delden et al, Exploring land use trends in Europe: a comparison of forecasting approaches and results, 2012

These figures help to verify the trend-based projections developed using CORINE data, which found artificial areas had increased by 86,000 ha per annum between 2000 and 2006. This is the same as the future growth projected by the SENSOR programme, and very close to the average growth projection of 85,000 ha per annum across all three models. We conclude, therefore, that the projected rate of future development of between 50,000 and 100,000 ha per annum is likely to represent a realistic, yet relatively conservative forecast of future development.

3.8 Other potential drivers of demand

The above discussion focuses on the demand arising from physical land use changes in the EU (i.e. direct losses through habitat conversion). However, there are other drivers which can lead to a demand for offsets / compensation in the case of a no net loss policy. These therefore need to be considered in the context of a more comprehensive framework and are briefly described below. Within the scope of this project it has, however, not been possible to analyse them in further detail; there is potential for these to be assessed in greater depth through further research.

3.8.1 Indirect impacts (biodiversity degradation) induced as a result of habitat conversion

In many situations, the direct, physical footprint of a development is just a small part of the overall ensuing impact on biodiversity. A common example of indirect or induced impacts are raised pressures on biodiversity from greater access to high conservation value areas caused by developments in their neighbourhood. For instance, a new road may bring many more recreational users to a wetland, causing its further degradation. Similarly, a new housing development may leave a nearby mature woodland standing, but predation by household pets, noise and trampling may reduce its functionality considerably. In such cases, habitat is not converted, but biodiversity losses can be large. According to the EIA Directive, indirect and cumulative impacts should be considered in impact assessment. Certainly, if a policy goal is no net loss of biodiversity, such losses need to be addressed. There are metrics for calculating loss and gain that are capable of dealing with functional aspects of biodiversity, but they are not always used, in which case these losses may be masked and undercompensated. Gathering data on indirect impacts of this kind in order to estimate overall demand for offsets in the EU is difficult, but a short study could explore the significance of indirect to direct impacts in several cases and form the basis of an exercise to extrapolate and create plausible scenarios for the level of demand for offsets that take them into consideration.

3.8.2 Indirect impacts (losses) through pollution and changes in land management systems

Another form of impact that is less visible than the direct effects of clearing a forest or building on a field is the impact on biodiversity from non-point source pollution, such as the cumulative effects on freshwater and marine biodiversity from agricultural run-off. In addition, energy intensive developments (such as extractive industry projects) result in considerable carbon emissions, and climate change is a significant cause of loss of biodiversity. A NNL approach would therefore potentially seek to compensate for impacts of this kind as well, perhaps through an approach akin to a scheme for payments for ecosystem services in the first case, and a system of biodiversity-friendly carbon sequestration projects in the second.

3.8.3 No Net Loss of global biodiversity caused by actions of EU actors

The thrust of this report is to consider how to address losses of biodiversity caused within the European Union. Given a goal of achieving NNL, there is also a need to potentially consider what measures might be taken to address the considerable cumulative losses of biodiversity caused by EU entities' operations outside the EU. Public procurement by MS and the Commission, the consumption patterns of EU residents and the international supply chains of companies headquartered within the EU all give rise to biodiversity losses, whether in agricultural commodities (such as oilpalm, sugarcane, soybean, beef, rubber, cocoa, cotton), in extractive activities, chemicals and manufacturing, or in global transport and the related effects of climate change. The EU NNL Initiative could consider a range of initiatives to help MS and companies address their impacts outside the EU.

3.8.4 Level of impacts to be compensated

The foregoing paragraphs explored the scope of the demand for offsets in terms of the nature of activities affecting biodiversity that would require a no net loss outcome. Another aspect to consider when reviewing demand for offsets is the level (or significance) of residual impacts that would trigger the requirement for no net loss. As described in Section 6.2, law, policy and guidance worldwide varies as to whether approaches to NNL should focus on 'significant' impacts only, or use metrics and approaches to impact assessment that would lead to all residual impacts being addressed. The BBOP Standard requires no net loss to be planned for 'significant' residual impacts, but also allows developers to choose to compensate for residual impacts which fall below the 'significant' threshold. In common with most US, Australian and EU compensation rules, BBOP does not define 'significant'. It may seem onerous to require developers whose individual impacts result in residual impacts that are less than 'significant' to offset them. However, the cumulative effect of even fairly insignificant residual impacts mounts up and contributes to the net loss of biodiversity seen in the EU. A number of different responses to this dilemma that are proportionate and fair could be considered. One approach that has been used in Victoria, Australia, is to provide mechanisms for rapid and simple 'over the counter' transactions for offsets of the least significant residual impacts. These can take the form of 'in lieu' payments and use (only in the case of these minor residual impacts) simple tables that correlate offset payments with the scale and type of habitat, rather than field measurement and the use of more sophisticated metrics. Another potential approach is to use a mechanism more akin to a tax (such as the Community Infrastructure Levy in the UK) to capture a contribution for all small development impacts, and invest this in biodiversity.

3.9 Demand for voluntary offsets and compensation more generally

The above sections have considered the demand for compensation resulting from current or potential legal requirements. However, there may also be some demand for offsets on a voluntary basis. Voluntary purchases of biodiversity offsets could be used in an attempt to increase the likelihood of regulatory approval, or be driven by corporate social responsibility, reputational motives, or companies wishing to declare themselves biodiversity neutral.

Voluntary offsets are currently at a low level in the EU. They are unlikely to increase significantly in the near future and are therefore unlikely to make a significant contribution towards an overall EU goal of NN. However, while the development of the market for

biodiversity offsets and habitat banking will need to be driven by regulation, there is also likely to be a potential role for voluntary demand for biodiversity offsets or for compensation more generally. For example, voluntary offsets operated at a much lower level in the carbon offsets market before the introduction of the EU emissions trading scheme for CO_2 emissions (EU ETS), but have since grown to account for between one and three per cent of the global market in carbon emissions (eftec, IEEP et.al., 2010). It would not be unrealistic to assume that potential exists for a similar contribution from voluntary demand for biodiversity offsets. There is, therefore, potential for growth in voluntary demand for biodiversity offsets in future. Moreover, experience with voluntary approaches can inform and shape the nature of a regulated system. Some further discussion of the role of voluntary offsets is given in Section 6.2.

3.10 Evidence from international experience on the demand for offsets

Biodiversity offset programmes exist in various forms around the world. In countries such as the United States, Canada, South Africa and Brazil environmental obligations or offset requirements are delivered principally through environmental legislation. In Australia the planning system is the main mechanism for which environmental obligations and requirements are delivered. Australia represents a good example of integrated legislation whereby requirements under various environmental instruments are reflected and complemented by planning legislation.

Globally, the demand for offsets has increased steadily in recent years as offset schemes have developed and new ones are introduced. A review by Madsen *et al* (2011) found 45 existing compensatory mitigation programmes around the world, and another 27 various stages of development or investigation. Within each active offset program, there are numerous individual offset sites, including over 1,100 mitigation banks worldwide. The global annual market size is estimated at USD 2.4 - 4.0 billion (€2.0-3.3 billion) at minimum, and likely to be much more, as 80% of existing programs are not transparent enough to estimate their market size. The conservation impact of this market includes at least 187,000 hectares of land under some sort of conservation management. North America continues to dominate activity in biodiversity markets, with 15 active programmes and 4 in development.

In the US, programmes have restored or protected around 700,000 cumulative acres (283,280 hectares). The two largest offsetting programs, wetland and species mitigation, offer three mechanisms for achieving compensation: do it yourself, pay into a fund, or buy a third-party credit. Within this third form of offset credit baking there are 615 active and sold-out banks in the country (Marsden et al., 2011). Another 500 banks are either proposed or in the process of being approved.[25] Each bank ranges from one to thousands of acres. The current cumulative value of credits held in these 'banks' is between USD$1.1 and $1.8 billion (€0.9-1.5 billion) (Bovarnick et al., 2010). In the US total payments for wetland mitigation and species banking are between $2.0 billion (€1.6 billion) and $3.4 billion (€2.8 billion) annually. The credit market stems from regulations under the US Clean Water Act and the US Endangered Species Act. US demand for offsets has been influenced by the economic downturn and trends in the housing sector, as urban development provides the greatest demand for environmental offsets (eftec, 2010).

In California, building on the 1973 Endangered Species Act, California Resources Agency (CRA) and the State of California launched a formal species banking process. A free market approach was envisioned by the State of California and this provided land owners of important habitat with the opportunity to derive an income as an alternative to urban development. Species Banking is now present in several states and collectively worth up to around USD$370 million (€282 million) a year and providing protection for around 80,000 acres (about 32,000) hectares) of habitat.

In the Australian State of New South Wales a BioBanking programme has been established. This programme is administered through the State Government and has included the

[25] 1 acre = 0.4 hectares

establishment of a BioBanking Trust Fund. Quarterly reports show that from the period September 2008 to March 2010 the Trust fund did not receive any funds but as at 30 June 2010 a total of AUD$498,880 (€390,000) had been received. This figure increased to AUD $1,761,372 (€1,377,000) in June 2011 suggesting that demand is increasing. In Victoria, the BushBroker scheme has facilitated average annual credit sales worth AUD 6.8 million (€5.8 million) and covering 855 hectares annually since 2007. The Victorian government has committed to create two new large-scale 'reserves' by 2020 to create consolidated banks of credits for expected impact due to planned expansion. Developers in Melbourne's designated urban growth area must source their offsets from these reserves – one of 15,000 hectares (the Western Grasslands Reserve) and one of 1,300 hectares (Madsen *et al*, 2011).

4 The supply of biodiversity offsets and habitat banking

This section discusses the potential supply for biodiversity offsets in the EU, by assessing the factors which may constrain the availability and feasibility of restoring certain habitats. In particular, the potential constraints on supply are discussed, as well as the scope for 'like-for-like' compensation. An assessment is also made of the extent to which habitats in the EU require restoration, given their condition. Finally, the section presents the overall implications in terms of the supply of biodiversity offsets for a habitat banking scheme in the EU.

Together with Section 3, this section meets the requirements specified under Task 2 of the study terms of reference. It also delivers on the second objective of the study, which seeks to identify the potential supply for biodiversity offsets in the EU.

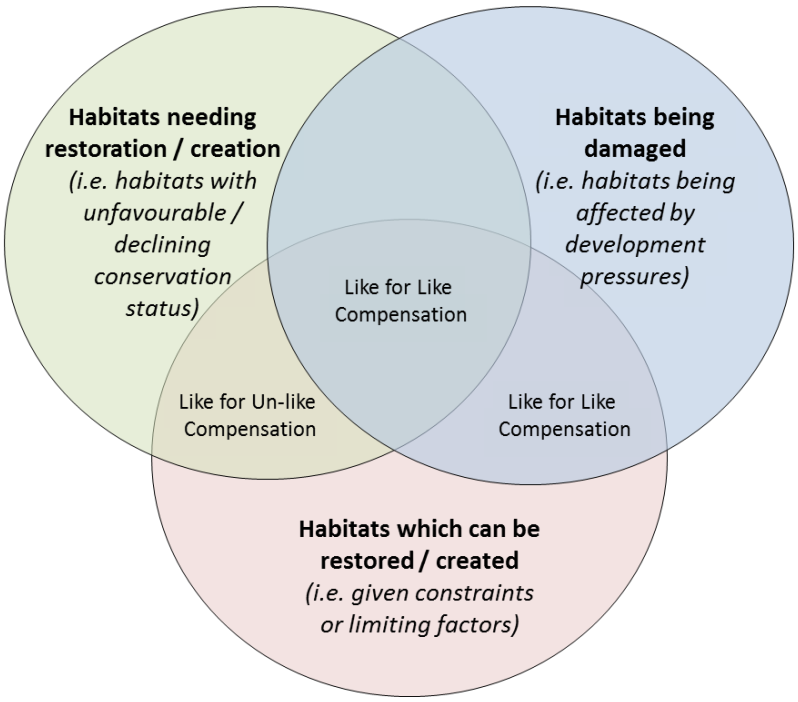
4.1 Introduction

Ensuring no net loss of biodiversity and meeting offset requirements, depends on the ability to design and implement actions to enhance biodiversity on an equivalent scale to the losses incurred.

The ability to do so will depend on the supply of biodiversity offsets which are available to compensate for the impacts of any development or damaging activity. This, in turn, is a function of the kind of activities that are, or will be, required to offset biodiversity losses, and the feasibility of implementing offsets on the scale and of the type required.

There are four separate elements to consider in order to understand how supply may be affected in a habitat banking scheme. The extent to which they interact will also impact on the type, as well as extent, of compensation that can occur. These four aspects are illustrated in the figure below.

Figure 4.1 Factors affecting the supply of habitats for a habitat banking scheme



Source: ICF GHK

The diagram illustrates the fact that supply is affected by:

- **The kinds/types of habitats that are being lost through pressures that may lead to a 'like-for-like or better' requirement for compensation**. Habitats may be lost for a variety of reasons, not all of which may be included within the remit of a habitat banking scheme. Any policy with a 'no net loss' objective could mean that losses due to a wider variety of causes would need to be compensated for.
- **The condition of habitats and the extent to which they are in need of activities to restore them to favourable conservation status**. Priorities need to be set in terms of what habitats need to be improved and this may involve decisions not only at local level, but at a wider spatial scale (regional or even national level). It may be, for instance, that there are habitats of higher value, and which are in greater need of restoration or creation than those which are being damaged due to development. There are, however, likely to be considerable overlaps between habitats being damaged and requiring compensation, and habitats which already are in an unfavourable conservation status (e.g. coastal areas, wetlands).
- **The limitations which constrain the ability to restore or re-create different habitats**. There are several factors which may constrain the potential for a certain habitat to be restored or created.
- The **precision with which the requirement for 'like-for-like or better' compensation is defined**. This may differ according to the physical condition and characteristics of a habitat, the broader context and policy requirements.

There are, for instance, certain types of habitats that have been degraded beyond the point where restoration is feasible, and this could limit the supply of offsets. However, this is only of consequence if there is no alternative option for sourcing appropriate offsets, for instance averted risk offsets (see below) or 'trading up' to a higher conservation priority habitat which presents a 'better' offset option.

It should be noted here that in the discussion on 'like-for-like' and 'like-for-unlike' compensation, 'like-for-unlike' in the case of 'trading down' should not be endorsed. Like-for-unlike compensation should only be allowed in the case of like-for-better, i.e. where habitats are 'traded up'.

4.2 Examining the potential constraints on supply

The ability to offset losses of biodiversity, and therefore to achieve no net loss, depends on the ability to identify and undertake effective actions that deliver biodiversity gains equivalent to the losses incurred.

In practice, the supply of offsets may be constrained by several factors, which include, for instance:

- **The time scale** over which the benefits of biodiversity enhancement schemes are delivered. Habitat creation or restoration actions may take many years to be delivered, and it may take more than 50 years for some habitats to be fully functioning, while others may be created or restored within 10 years;
- The **locational requirements** of the offsets to be provided, and therefore the feasibility of the geographical limits applied to offsetting. Some habitats may be limited to specific locations depending on geographical and climatic conditions, whereas others such as woodlands may be amenable to a wide range of different circumstances. This is important, for instance, given that offsets may have to be provided within a certain radius of the affected site. Conditions which may require offsets to be delivered within a 100km radius will constrain supply less than if there is a requirement for offsets to be within a 20km radius.

These factors will have a significant influence on the restorability of the habitat (or species), and therefore the degree to which the loss of biodiversity can be replaced on a like for like basis (given that some habitats and species are more or less 'replaceable' than others).

Some highly distinctive and/or localised habitats and species may be impossible to replace (frequently encountered in the Natura 2000 network as priority species and habitats). However, the more distinctive a habitat is, the more likely that 'like-for-like' compensation will be required. This effectively means that development should be less likely to affect these habitats as the compensation requirements – if acceptable at all - would either be too costly, or take far too long to be accomplished (which itself would increase costs).

Similarly, because of the distinctiveness of a habitat or species and/or where its restoration is not feasible or possible, there may also be the need to define some types of biodiversity loss as being inappropriate for compensation. In these cases, biodiversity loss should be avoided, restricting development or requiring it to take place in other areas where affected habitats or species could be more easily restored or their loss compensated for.

Considerations such as these generally determine the technical (and, in some cases, the economic) feasibility of restoring / creating habitats. Some other factors (Elliot et al., undated; TEC, 2009; Parker et al., 2004) also constrain the supply of offsets. The following factors are considered here:

- The restorability of habitats over different time scales;
- Geographic and ecological constraints;
- The availability and accessibility of scientific knowledge / technical capacities;
- Financial constraints;
- Land availability and legal constraints; and
- Social and administrative constraints

4.2.1 The restorability of habitats over different time scales

There have been a small number of relatively old studies which have looked at the restorability of certain habitats, and in particular the timescales which would be needed for them to be fully restored (e.g. Crooks et al., 1992; English Nature, 1994; Treweek et al., 1998; Crook et al., 1999; Morris et al., 2007). One more recent study (Sipkova et al., 2009) found that the majority of habitats with an unfavourable conservation status have medium (15 years plus) or long term (150 years plus) regeneration capabilities. None of the habitats had a quick regeneration ability (i.e. could be restored in less than 15 years). Moreover, they found that the potential for functional compensation or regeneration of habitats is largely overestimated in many impact assessments. The broad categories of habitats, and their estimated regeneration abilities, are given in the table below.

Table 4.1 Regeneration ability of habitat groups (On a scale of 1 to 3, where 1 is high (<15 years) and 3 is low or none (>150 years))

Habitat type	Regeneration ability
Coastal (e.g. sandbanks, sea cliffs, sand dunes, mudflats)	2.2
Heathland	2.3
Grassland (e.g. calcacerous grassland, hay meadows)	2.4
Wetlands (e.g. bogs, mires, peat, fens)	2.7
Mountainous (e.g. scree, rocky slopes, caves)	2.75
Open water (e.g. rivers, lakes, ponds)	2.8
Woodland (e.g. oak woods, beech woods, pine woods)	3

Source: adapted from Sipkova et al. (2009)

Another assessment (English Nature, 1994) found that whilst most older habitats (e.g. ancient woodland, grassland, etc.) would take centuries to replace, secondary habitats (e.g. secondary woodland, grassland, heathland, etc.) could take less time, potentially only taking a few decades to replace.

Table 4.2 illustrates the typical timelines over which various habitats could be restored. For instance, some woodland could take hundreds of years, whilst grasslands and heathlands generally tend to fall into the medium timescale for restoration. Nonetheless, the results of one study on heathland restoration found that after 17 years the pH of the soil still remained significantly higher than that of the adjacent, original, heathlands, and that natural colonisation by heathland species was very slow due to seed limitation, and thus resulting in an acid grassland community (Pywell et al., 2011). These results illustrate the difficulties of restoring heathland habitats over a given time period; even after 17 years it was still unclear at what point it would be possible to arrive at functionally similar heathland habitat. Morris et al. (2007) find that heathlands normally take between 50 to 100 years or more to restore.

In the case of grasslands, there are several examples of successful restoration attempts, (Lengyel et al., 2012; Dahms et al., 2010) including large-scale projects. Grassland restoration is one of the most frequent types of terrestrial restoration, with significant opportunities and favourable conditions for large-scale restoration of grassland habitat given, for instance, the large scale abandonment of croplands since the early 1990s in Eastern Europe (generally between 10 and 20% of cropland). However, the restored habitats usually require continual management.

Table 4.2 Possible timescales for habitats to be sustainably restored[26]

Habitat type (with examples)	Examples of timescales
Pioneer plant communities	Years
Open water systems - temporary pools - eutrophic ponds	Years / Decades 1-5 years 1-5 years
Coastal habitats - mudflats - reedbeds - saltmarshes	Years/ Decades / Centuries 1-10 years 10-100 years 10-100 years
Secondary heathland	Decades
Ancient heathland	Decades / Centuries
Secondary woodland	Decades / Centuries
Secondary grassland - oligotrophic grassland	Decades / Centuries 20 – 100 years
Mountainous habitats	Decades / Centuries
Wetlands	Years / Decades / Centuries

Key: 'Years' = 1-10 years; 'Decades' = 11-99 years; 'Centuries' = more than 100 years

Evidence suggests that peat forming systems are found to take centuries to replace, whilst open water systems can take as little as a few years, or in some cases a few decades to restore or create. Wetland systems are the most variable, potentially taking anywhere from a few years to centuries to replace. Nonetheless, the literature and evidence from practical experience suggests that the restoration of wetlands can be relatively straightforward. For instance, one academic study found that after less than 6 years, there were no significant differences between the intact wetland sites and the experimentally restored sites in terms of insect-plant interactions (Watts et al., 2006). However, wetland restoration is faced with other constraints, such as socio-economic considerations; for example most wetland restoration projects are highly local and usually under 1 ha in size (Lengyel et al., 2012).

CORINE land cover data can also be used as another potential indication of the restorability of different habitats, in that the data illustrate the extent to which different habitats have been created or lost. For instance, the CORINE data indicate that water bodies, semi-natural

[26] By the principles of sustainable development and intergenerational equity, if a habitat is not replaceable within 25 years, then it should be considered 'irreplaceable' (EN, 1994)

areas, forests and transitional woodland shrub are potentially restorable, given that their land coverage has been increasing. On the other hand, areas of natural grasslands, moors and heathlands and sclerophyllous vegetation have declined. However, these land use data do not present information on the quality of the habitats that exist within each land class, neither do they consider the quality of the habitats that are formed compared to those which have been lost. If there was a way to acquire this additional information and for it to be considered, it is possible that the information on habitat changes and formation would be lower for certain habitats.

The studies that have been identified (Sipkova et al., 2009; Morris et al., 2007; Crooks et al., 1992), all seem to support the conclusion that coastal habitats are potentially easier to restore than terrestrial habitats in that restoration in coastal areas offers a higher success rate than for terrestrial systems. Morris et al. (2007) for instance, concludes that 'compensatory habitat creation can probably be used in some wetlands and inter-tidal environments, but the prospects for success in many terrestrial situations are far less certain'. This is an important finding given the sensitivity of many coastal areas to infrastructure developments. However, CORINE land data indicates that coastal habitats account for only a very small area of EU land cover (0.4%), although they are important habitats in France, the UK, Germany and the Netherlands.

Moreover, there is increasing evidence (e.g. from the UK) to suggest that although some elements of coastal habitats are relatively easy to restore, others are much more difficult and it may be that restoring or recreating the full functionality of such habitats is not possible, or as easily done as previously thought.

On the whole, however, the evidence suggests that most (if not all) habitats are restorable, *if given sufficient time* (see Table 4.2 above). The critical question however, is whether these time-scales are acceptable. The time-scales required to restore some habitats, may be so considerable as to make them essentially irreplaceable (e.g. ancient woodland, raised lowland mires, limestone pavement).

This has important implications for the supply of biodiversity offsets and habitat banking. Where offset requirements apply metrics to take account of time preference, this will make very long term projects (e.g. creation of semi-natural woodland) unattractive. Similarly, long term projects will be unattractive to habitat banking schemes because of the long timescales required to provide like-for-like compensation and/or the limited credits that are likely to be awarded to early stage schemes.

4.2.2 Ecological and geographical constraints to offsetting

In the case of some habitats, the options for restoration may be limited not by the timescales necessary for ecological restoration, but by the geographical distribution of necessary features and characteristics. Some habitats are inherently restricted in their distribution, by, for instance, the presence or absence of particular soils or geological features (e.g. calcareous grassland) (eftec *et al*., 2010).

Individual sites therefore have varying potential for restoration depending on their physical characteristics, functions and ecological character. For instance, the restoration of many habitats is reliant on the availability of propagules, the right soil structure and/or the right nutrient input (e.g. salt-marshes, grasslands, heathlands). These kinds of ecological constraints are a significant reason why the re-creation of some habitats is so difficult and costly, and why it is preferable to restore habitats than re-create them. However, some habitats which cannot be re-created can however be restored (e.g. grey dunes and dune slacks) (Morris et al., 2007).

Some species (as with habitats) have such specific requirements that suitable conditions for their successful restoration are inherently rare, thereby limiting practical opportunities for offsetting. Examples of habitats which are particularly ecologically constrained and are therefore essentially not possible to re-create are blanket and raised bogs, vegetated shingle and limestone pavement (Morris et al., 2007). Table 4.3 gives examples of the technical difficulty associated with recreating and restoring different habitats.

Table 4.3 Examples of the difficulty associated with recreating and restoring different habitats

Difficulty	Re-creation	Restoration
Low	Arable Field Margins, Coastal and Floodplain Grazing Marsh	Coastal and Floodplain Grazing Marsh
Medium	Coastal saltmarsh	Aquifer Fed Naturally Fluctuating Water Bodies, Calaminarian Grasslands, Coastal saltmarsh, Coastal Sand Dunes
High	Calaminarian Grasslands, Coastal Vegetated Shingle	Blanket Bog, Coastal Vegetated Shingle.
Very high / impossible	Aquifer Fed Naturally Fluctuating Water Bodies, Blanket Bog, Coastal Sand Dunes	

Source: Defra (2012)

Overall the complexity of habitats, and their specific requirements, means there is considerable risk and uncertainty in attempting to restore habitat functions after the original habitat has been lost. Evidence suggests that replacing or restoring a habitat to its exact earlier state is virtually impossible.

These considerations are why existing habitat restoration guidelines usually recommend that sites are created as near as possible to the original habitat which has been affected (Defra, 2009). However, this requirement limits possibilities and may have other side effects. For example in the Netherlands, this requirement has sometimes resulted in small compensation sites which make restoration difficult to achieve.

In some cases therefore, restoring habitats to their previous location or close to it may not be possible if the more recent management of the land has permanently changed its ecological characteristics. Moreover, these constraints may be further exacerbated where the physical requirement of the habitat coincides with other high-value land uses. These changes over time to the ecological character of a site may also mean that maintaining a restored habitat in its preferred condition may require additional management. The extent to which a restored habitat needs to be managed also has cost implications, which can significantly affect the financial viability of habitat restoration.

The sites being considered for restoration, and the requirements stipulated by the relevant authority, therefore need to take into consideration the characteristics of the area in question and how these may have changed over time. For instance, the fact that restoration is needed means that generally some form of environmental degradation has taken place which may have affected or modified the original set of environmental conditions in some way. If the level of degradation is severe, the site may no longer be suitable for the species that once were found there. For example, soils in some parts of Los Angeles have experienced such high levels of heavy metal deposition from automobile exhaust that restoring native plants there is no longer an option. Simenstad *et al*. (2005) also note the case of restoring urbanised estuaries, where historical alterations in both ecosystem structure and the underlying processes that sustain the structure and related functions significantly limit the opportunities and long-term prospects for rehabilitation, much less restoration.

These issues mean that, in some cases, rehabilitation may have to act as an acceptable substitute for restoration, where it is not possible to fully restore a habitat.

Whilst the above discussion makes it clear that exact replication is inherently difficult, elements of a habitat may be restored. The extent to which habitat restoration can therefore be considered ‘successful’ depends to a large degree on the goal being considered; sometimes a fully comparable habitat may not be required, for instance when a habitat is being mainly restored to support a certain species (Parker et al., 2004; Ehrenfeld, 2000). For example, temporary and eutrophic pools can be rapidly restored (1-5 years), and are quickly colonised by water beetles whilst some fauna may never be supported (Morris et al., 2007). In the case of ancient woodlands, restoration may be possible for some plant assemblages but is more questionable for rarer invertebrates.

Where 'like-for-like' compensation is required, significant constraints on the restoration of some habitats might mean that, in practice, certain habitats are not developed (e.g. ancient woodlands, sand dunes). This would mean that offset requirements could redirect development to less distinctive or more easily restorable habitats.

4.2.3 Accessibility and availability of reliable information

Given the significant number of the various factors on which successful habitats depend, and the complexity of the interactions between all the necessary elements, it is clear that offsetting development impacts through the restoration of habitats would be inappropriate in cases where an understanding of the ecological requirements is poor or if there are no tried and tested techniques, as the chance of successful restoration would be significantly reduced. For instance, a general lack of understanding of the first principles of wetland science is thought to be a potentially key factor in the relatively high number of failures to restore wetlands (Crooks *et al*., 1999). Moreover, in a number of the Member State reviews completed for this study, insufficient ecological knowledge and expertise was found to play a key role in the insufficient implementation requirements for compensating the effects of environmental damage.

However, the argument is also made that the lack of, or insufficient, knowledge should not be used as an excuse for inaction, given that it may be 'better to try and do something than risk doing nothing'. This was, for instance, a key point that was made at a recent conference on environmental compensation in Sweden (EES, 2011).[27] There, the situation has developed where the lack of knowledge and practical experience is making it difficult for the Environment Agency to develop detailed guidelines for local authorities to require and implement compensation, whilst the lack of detailed guidance is making it difficult for knowledge to be developed and experience to be gathered. Insufficient knowledge, therefore, has created an unfortunate vicious cycle of sorts, which is now a barrier to increasing the use of compensation.

4.2.4 Financial constraints

Given the potential complexity and the relatively long time scales, it is not surprising that habitat restoration can also be relatively expensive and therefore a key constraint may be the availability of the necessary funds.

The inherent uncertainties and risk of failure also make it difficult in some cases to secure funding or investment in certain projects, especially where these are voluntary and not a result of any regulatory driver. For instance, Simenstad *et al.* (2005) note the difficulties in finding the necessary resources to implement voluntary restoration projects of urbanized estuaries, especially given the difficulties and the risks of the project being a success in comparison to projects which are aimed at other, less disturbed, estuaries.

The level of the challenge, and the extent to which finances might be a constraint, however, is a function of the type of habitat that is being restored. Miller et al. (2007) for instance, highlight that the value of restored habitat rarely increases linearly with the amount spent on the restoration. In some cases, restoring a high proportion of the desired habitat value may be achieved relatively cheaply, but at some point even small improvements become disproportionately expensive. For instance, this may be the case if most of the critical biodiversity is provided by a few key plant species, which are relatively easy to re-establish, and where additional species may be more difficult to restore. On the other hand, in some cases relatively few benefits arise without considerable expenditure (e.g. earthworks or soil remediation).

Lastly, biodiversity value may increase in a stepwise fashion in response to the need for expenditure to overcome successive biotic or abiotic thresholds. Miller et al. (2007) notes that this might be the most realistic case in most restoration projects, where a series of relatively discrete management actions are required to achieve the restoration of different

[27] For more information, see: http://www.eesweden.com/whatsnew_ekolkomp_stkhlm.html

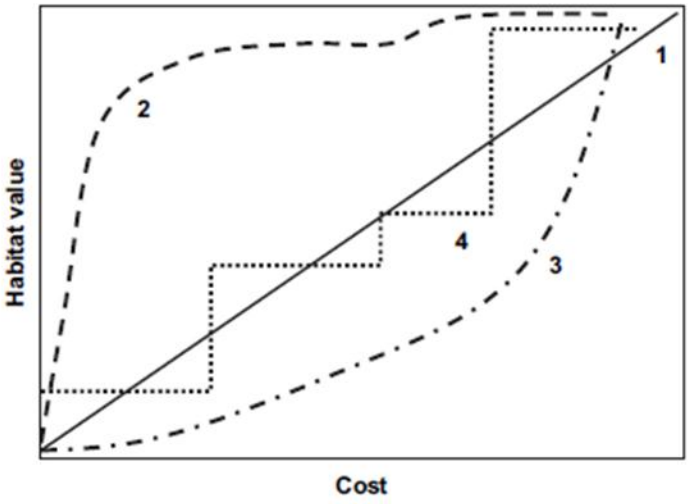
habitat elements (e.g., fencing out domestic stock, soil conditioning, replanting key species). These various scenarios are illustrated in Figure 4.2 below.

The extent to which funding might be a constraint therefore depends on the goal of the project, and the type of habitat that is being restored and the types of activities that are required to restore or create the necessary ecological conditions. In the UK, for instance, experience has shown that costs are generally found to be higher where land needs to be purchased, for re-creation compared to restoration, and for coastal compared to upland habitats.

In the case of compensation for damages, it is important to note that the high costs associated with restoring certain habitats may prevent the damage from taking place because compensation cannot be provided cost effectively.

Figure 4.2 Biodiversity value mapped against the financial input into the restoration project.

(1) Biodiversity value increases linearly with the amount spent; (2) Restoring a high proportion of the desired habitat is achieved relatively cheaply, but achieving further value becomes increasingly expensive; (3) Relatively little value is restored until considerable expenditure is invested; (4) Biodiversity value increases in a stepwise fashion in response to the need for expenditure to overcome particular thresholds



Source: Miller et al. (2007)

4.2.5 Land availability and legal constraints

Related to the above discussion with regard to financial constraints are the legal constraints that are also associated with habitat restoration, particularly the availability and accessibility to suitable land.

In many countries, a shortage of suitable land for habitat restoration is a key barrier to habitat restoration projects. This was highlighted as a key issue across the different Member States in which interviews were undertaken. In some cases, it may be that the land (either as a whole or for particular habitats) is in short supply and therefore opportunities for restoration are limited. In other cases, suitable land may be abundant, but ownership and rights are barriers and it is difficult to obtain the land (either through purchasing or long-term leasing) in order to use it to restore the necessary habitat.

The latter case, for instance, is a common problem in Sweden, where there is an abundance of available and suitable land for restoration but where it is very difficult to legally gain access to the land in order to use it for restoration purposes. In one case of compensation, planning conditions required that additional land be included within the Natura 2000 network to compensate for a construction project which would damage an area within an existing Natura 2000 site. In this case, the landowners were then legally required to enter their land

into the network in order for it to be restored. This approach therefore was able to ensure that the land was made available.

This is an extreme example of what legal measures can be taken to overcome certain supply constraints for habitat restoration. In most cases it is possible to enter into a management arrangement or agreement with the land owner whereby the land is either leased or bought from the owner. Furthermore, switches between lands and even expropriation have been considered in some cases and countries (Greece and Italy).

In France, however, there are more formal mechanisms available to secure land for compensation. There, land can be acquired by Agencies for Land Development and Rural Establishment (Sociétés d'Aménagement Foncier et d'Etablissement Rural: SAFER agencies), given they have pre-emptive rights on land for the protection of the environment and landscape (and for other objectives). However, this situation seems to have arisen due to a need for land to be purchased for it to be used for compensation. Changes have recently been made which allow developers to contract land owners or other land-users to lease the land or manage the activity in their stead.

The problems with the availability of suitable land were also highlighted by Simenstad et al. (2007), especially in urban environments, where public property is often restricted to established parks and recreational facilities. In the case of estuaries for instance, commercial shoreline property is highly valued, such that derelict properties comprise the only site opportunities which are often occupied by abandoned structures and are frequently contaminated with chemicals. As a consequence, many available sites are not suited to restoration efforts, or the related costs are prohibitive.

The lack of an adequate legal framework can limit the opportunities for compensation to be used. For instance, Verschuuren (2010) notes that whilst restoration is a central objective of the Natura 2000 network, the current legal provisions fall short of meeting this requirement. Whilst this does not necessarily hinder government authorities that want to take action, it does mean that this action tends to be voluntary. In the case of Sweden, for instance, national requirements provide for, but do not require, environmental compensation. Combined with the lack of awareness and an inadequate understanding of compensation and offsetting more specifically, this means that compensation is rarely required, although some municipalities are taking voluntary action.

4.2.6 Social and administrative constraints

Miller et al. (2007) highlight that whilst ecological constraints define what is possible and/or feasible, and financial constraints determine what is realistic, there are also potential social constraints which determine whether a given habitat restoration project is acceptable.

Social and financial constraints are, however, inter-related. Available funding may depend on public acceptance of a project, whilst the degree of public acceptance is likely to be affected by the perceived costs and benefits of the project. Habitat restoration efforts may be seriously hindered by an unanticipated public backlash, whilst public acceptance and engagement can make a difficult restoration project successful, especially where there is local stewardship of the project on an ongoing basis.

There are also administrative constraints to consider, which create very lengthy procedures which can therefore constrain the opportunities for habitat restoration. The necessary procedures for restoring the Thames River environment in the UK provide an example of this (Box 2).

Box 2 Administrative constraints on restoring the Thames River

Any habitat creation or improvement efforts that relate to the foreshore of the Thames River in London will require planning permission and/or advice to be given by both The Port of London Authority and the Environment Agency. Most habitat creation will also require access from the riverbank, and will therefore potentially involve a wide range of landowners, who must also give permission, as well as Local Authorities, which could include one or more of the London Borough Councils. Other complicating factors may also emerge such as sections of the river walls which may have historical value, or potential aesthetic implications may arise. A River Works Licence will also likely be required, which may require information to be provided by outside agencies. All these considerations highlight the lengthy procedure that needs to be followed to conduct even the smallest habitat re-creation or improvement, and illustrate the barriers that may exist to attempting to perform any restoration or improvement at a landscape scale.

Source: Francis et al. (2008)

4.3 Drawing on the demand assessment to determine the scope for 'like-for-like' compensation

The analysis presented in the preceding section on the demand assessment (using CORINE land cover data) indicates that demand for offsetting is likely to be greatest for sclerophyllous vegetation, followed by the inland wetlands of marshes and peat bogs, as well as natural grasslands. There would also be demand for offsets for moors and heathland, albeit on a smaller scale, while demand for offsets for coastal habitats would be likely to be relatively small. The data show that the greatest potential demand for offsets could arise from losses to agricultural land, if there was a requirement to offset losses within this land use.

The loss of agricultural land creates opportunities for the restoration of other, higher value, habitats, in that 'like-for-better' compensation is potentially of greater benefit than restoring or recreating low distinctiveness habitats as is often the case with agricultural habitats (although it should be recognised that some agricultural habitats are of high value and are needed to sustain bird and other animal populations). The relatively extensive loss of agricultural habitats therefore provides considerable scope for trading up in the form of 'like-for-unlike' restoration of habitats of higher value which are in greater need of restoration or improvement.

The section above on constraints to restoring certain habitats indicates that it may be relatively straightforward to restore losses to wetlands and natural grasslands, which means that 'like-for-like' compensation for these losses is likely to be feasible. Losses to coastal habitats, although small, may also be subject to fewer constraints and should provide opportunities for 'like-for-like' compensation. However, in this case the availability of suitable sites may be a constraint given they are likely to be in shorter supply than some other habitats. Moreover, some evidence suggests that certain elements of coastal habitats are very difficult to restore or re-create.

With regard to moors and heathlands, these are likely to be more difficult to restore, let alone re-create. However, the discussion does indicate that in most cases this should be possible, but only over medium to long term timescales. Like-for-like compensation in these cases is going to be constrained therefore by whether these timescales are acceptable, and whether the necessary ecological conditions and sites are in available to restore the habitat elsewhere. Nonetheless, given that the loss of moors and heathlands due to development is rather small, these constraints may not be of significant concern.

In all cases however, the restorability of the habitat will depend on certain conditions and on the nature of habitat that is lost (Section 4.2.2).

Often those habitats which are significantly constrained, or which are unlikely to be successfully restored are not the habitats that are at high risk of being damaged or lost due to development pressures (e.g. dunes, rocky habitats and caves). Where these habitats are distinctive and difficult to replace, there is a strong case for avoiding impacts and offsets are

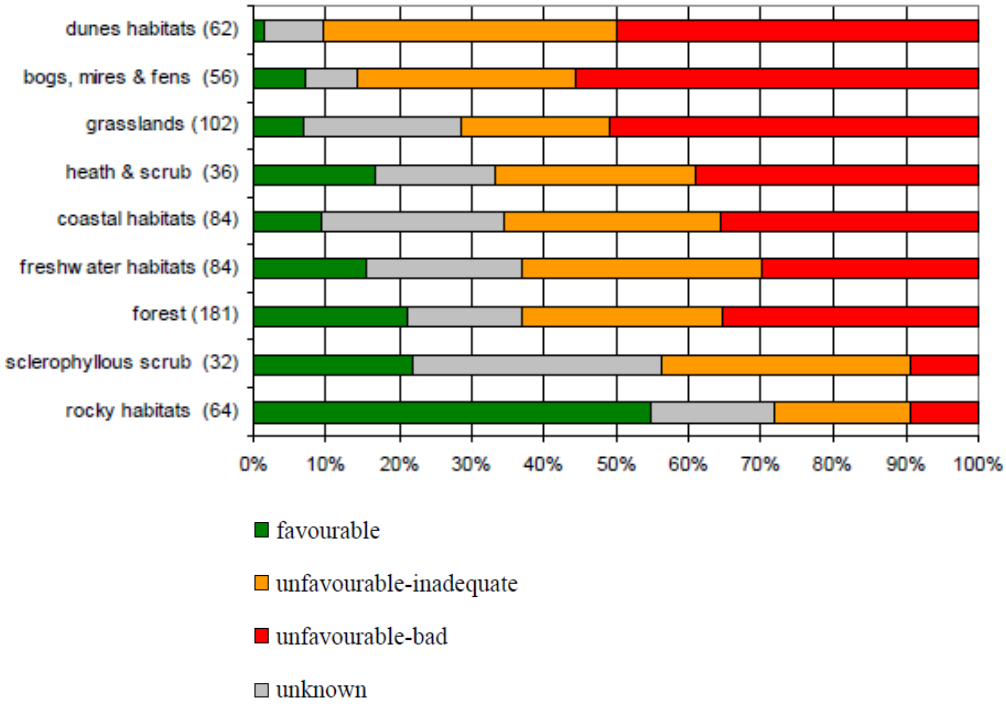
less likely to be acceptable. Moreover, if 'like-for-like' compensation is required, constraints on the supply of certain habitats might mean that in practice acceptable compensation measures cannot be formulated (e.g. for ancient woodlands where restoration could take hundreds of years, or sand dunes where restoration is very difficult to achieve). This means that development should be redirected to less distinctive or more easily restorable habitats.

4.4 Habitat condition and the need for restoration

4.4.1 Conservation status of EU habitats

Recent reports from the European Commission make it clear that only a small proportion of habitats and species of interest are in a favourable conservation status, with grassland, wetland and coastal habitat types tending to be in particularly poor condition. All of these habitats are specifically subject to threats from development (e.g. urban sprawl, tourism developments).Habitat assessments from Member States also highlight that almost all dunes are in unfavourable condition. They therefore present a significant need for restoration activity.

Figure 4.3 Assessment of conservation status of habitats by habitat group (the number in brackets refers to the number of assessments carried out for each group)



Source: EC (2009)

The reports highlight that assessments of rocky habitats and sclerophyllus shrubs (e.g. different types of screes) tend to be more positive than for other habitat groups (with the exception of 'permanent glaciers' which are under threat due to climate change).

With regard to forest habitat types, the situation is quite varied and general trends are less evident. The State of the European Environment Report (2010) highlights that, despite their land area increasing, forests are heavily exploited, with only 5% being considered undisturbed. The loss of old-growth forest, in particular, combined with increasing fragmentation of remaining stands, has had a detrimental effect on their conservation status.

Forests in some biogeographical regions are performing better than forests in other biogeographical regions (ETC/BD, 2008). Forests of the Boreal, Pannonian and Continental regions are in the worst condition, whilst forests in the Alpine and Mediterranean region tend to be in better condition. In fact, the habitat assessments show a distinctive regional pattern,

across all habitat types; whilst none of the habitat assessments from the Atlantic region were favourable, 20 to 30% of habitat assessments are favourable in the Mediterranean and Alpine regions.

This suggests that there may be scope for habitat banking scheme to work across countries (in light of an EU-wide no net loss policy), in order to focus on areas or biogeographic regions where the need for conservation activity is greatest.

As expected, there is a considerable degree of overlap between those habitats that are being lost due to development, and those habitats that are of poor conservation status. Nonetheless, there are some differences. For instance, whilst development is leading to the loss of a relatively large amount of sclerophyllous vegetation, the conservation status of sclerophyllous shrub habitats tend to be more favourable than that of most other habitats. There are also habitats that are under significant pressure from threats other than development and which therefore have a poor conservation status, as a consequence of other types of factors such as land abandonment, changing management techniques, climate change, or eutrophication.

4.4.2 Scope for averted risk offsets

Aside from their restoration and re-creation, the continued loss and degradation of habitats also provides the opportunity for *averted risk offsets*, which involve the protection of habitats which would otherwise be seriously under threat (instead of restoring, enhancing or re-creating a habitat that has already been damaged or degraded). Averted risk offsets have the potential for significant biodiversity gain by arresting ongoing degradation and losses.

Protection may take the form of agreements (e.g. contracts / covenants) which remove the right to convert the habitat in the future in return for payment or other benefits. The habitat can also be incorporated into an existing protected area network.

These kinds of offsets are most applicable where there is robust evidence of imminent or projected loss of biodiversity. Moreover, eftec (2010) also note that 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);
- Currently 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).

This indicates that averted risk offsets may be somewhat limited given that, for instance, a large proportion of European habitats whose further degradation is worth arresting are already protected at some scale. This is a topic that merits some discussion in the EU.

4.5 Overall implications for the supply of habitats for a habitat banking scheme

The discussion in the preceding three sections are summarised in the table below. This gives an overall view of the scope that there is for restoration, drawing on the following elements:

- The extent of the habitat (its area);
- Geographical constraints;
- Habitat condition (i.e. the extent to which there is a need to improve its conservation status);
- Habitat loss due to development; and,
- The feasibility of restoring the habitat in question (given the necessary timescales and ecological constraints)

It should be noted here that it has only been possible to conduct this assessment on a very general level, and the implications and considerations will inevitably vary if each habitat group is disaggregated and looked at in more detail; some specific habitats may be exceptions to the generalisations that are made for the habitat group as a whole. Member States will also have particular circumstances which may further limit or facilitate offsetting (e.g. considering issues such as the availability of land, political support, the existence of the necessary regulatory frameworks and associated guidance, etc.)

However, on the basis of the available information, an overall assessment can be made of the extent to which there is a supply of, and scope for, offsetting activities across different habitat types.

The results indicate that:

- The supply of grassland and wetland habitats for restoration / enhancement / re-creation is least constrained;
- The supply of coastal, freshwater, forest, sclerophyllous and heathland habitats for restoration / enhancement / re-creation is slightly more limited in scope; and,
- The supply of dune and rocky habitats for restoration / enhancement / re-creation is most limited.

It was noted by several interviewees that restoration and enhancement is preferable to re-creation, in that it is generally more efficient and more effective to restore habitats that already exist rather than trying to re-create habitats, where there are inherently greater risks of failure. Nonetheless, some habitats, such as wetlands, are relatively easy to re-create, such that re-creation is a feasible option with few additional risks. Re-creation can, therefore, be useful where enhancement / restoration opportunities are limited. In some cases there may also be scope for averted risk offsets to be used where restoration / enhancement / re-creation is not feasible or preferable.

Overall, interviews with different Member States suggest the following:

- The factor which currently constrains supply the most is actually **the availability and / or accessibility of suitable land** for compensation to take place. Land suitable for the restoration or creation of required habitats may be short in supply locally because it is in demand for other purposes, because there is no clear market for providers to sell into, due to little awareness of this as a business opportunity, or because other land uses generate higher incomes for providers.
- In some cases, the **timescales** required to restore, enhance or re-create some habitats **can also constrain supply.**
- On the whole, however, it seems that **few Member States seem concerned with limits to the feasibility with which certain habitats can be restored, enhanced or re-created** either because:
  - those habitats that are inherently very difficult to restore are not the same ones being affected by development;
  - applying the mitigation hierarchy should limit losses of more distinctive and hard to replace habitats; and/or
  - constraints may sometimes be overcome by like-for-unlike (i.e. like-for-better) compensation.

Development is less likely to occur on habitats which are difficult to enhance / restore / re-create, if the mitigation hierarchy is followed diligently, if the value of these habitats is appropriately reflected in the chosen metrics and if 'like-for-like or better' compensation is required.

Habitats which are relatively straightforward to enhance, restore or re-create should present fewer challenges to find 'like-for-like compensation, and indeed might also provide widespread opportunities for 'like-for-like or better' compensation (where 'trading up' is

acceptable and where like-for-like compensation is difficult), and where this takes the form of trading up (i.e. 'like-for-better').

For certain habitats where creation or restoration may be feasible and where there are widespread opportunities, but which take a very long time to start yielding benefits or can only be implemented at high cost, a 'like-for-like' requirement may discourage damage of that habitat as offsets may be deemed unacceptable, or may be excessively expensive or take too long to achieve.

Where the scope for restoration and/or re-creation is severely constrained and where like-for-like compensation is required, development on these habitats may be discouraged and shifted onto other habitats which are easier to restore / re-create and where it would, therefore, be more feasible and cost effective to offset the damage. Alternatively, it could mean that other mechanisms are sought to deliver 'like-for-like or better' additionality (e.g. through averted risk offsets rather than restoration).

Given that, in general, habitats which are more distinctive and of higher value tend to be more difficult to enhance / restore / re-create, it may be therefore that a 'like-for-like or better' requirement could therefore mean that development on these types of habitats could be limited.

Similarly, stipulating 'no go' areas where a habitat is highly distinctive and/or the restoration of a habitat is not feasible, may also restrict development on these kinds of areas and limit development to areas where affected habitats could be more easily restored or their loss compensated for.

The metrics that are applied when calculating the offset requirements should reflect these factors. For instance, metrics that reflect the temporal scale within which no net loss can be achieved can also help distinguish between situations where the conservation gains required for no net loss are achieved rapidly, and those where many decades or even centuries are needed . Time discounting would mean, for instance, that projects whose offsets take a long time to deliver no net loss become unattractive because of the scale of offset required and the fact that credits would only accrue over a long time horizon.

There also potential benefits to a system which allows some flexibility in the precision of the exchange rules set to define 'like-for-like or better' compensation and a broader area for offset delivery, but there may also be potential drawbacks.

Some countries are beginning to be more flexible with the kind of compensation that is acceptable. In the Netherlands, for instance, like-for-like compensation near the site of damage used to be required, but the regulation has recently been changed so that the system was more amenable to a habitat banking system.

Allowing 'like-for-unlike' or 'like-for-better' offsets can ease some supply constraints (provided this is based on a sound scientific method for defining what constitutes trading up to 'better' in a manner that does not endanger the biodiversity components affected). Similarly, allowing a broader geographical frame of reference within which offsets can be provided (i.e. a larger 'service area') can also increase flexibility and be used to deliver more strategic, joined up and connected conservation projects that are planned at the regional or landscape scale. This has been a key issue for the biodiversity offset pilots in the UK, for instance. Moreover, financial compensation may also have a role to play in some cases where development is considered essential and no net loss is not possible.

However, despite some obvious conservation and administrative benefits of greater flexibility, this must be balanced with a potential lack of political and public acceptance for more coarsely drawn exchange rules and larger service areas. In Sweden, for instance, it was noted that there is a strong presumption in favour for compensation to benefit the same communities which are affected by the damage. Whilst this does not constrain the supply of offsets because there is considerable scope for 'like-for-unlike' compensation, to the extent that damage to biodiversity can, and has been, compensated for with investment in recreational and cultural values, this does however, mean that the actual biodiversity benefits that are delivered can be limited.

One way to bridge the gap between the larger spatial scales at which offset planning can make the greatest contribution to conservation priorities and the need to satisfy those affected locally, is to plan 'composite offsets' spread across more than one location, in which the amenity and livelihood values affected by the project are compensated nearby, while the more intrinsic conservation values (e.g. populations of threatened species, priority habitats) are compensated at a broader spatial scale taking on board considerations for connectivity and resilience to climate change.

Overall then, there seems to be a balance to be struck between:

- The service area: the extent to which compensation can, or should, occur in another different area from where the damage has occurred (e.g. in order to allow for a more strategic approach to compensation);
- The exchange rules: the extent to which like-for-unlike / like-for-like / like-for-better compensation is acceptable, especially where the biodiversity which is lost is of particularly high value;
- The goals: the importance of the scale and type of biodiversity benefits that are delivered (e.g. considering goals such as no net loss or net gain).

These key design elements are discussed further in Section 6.2 and together will affect the extent to which supply is constrained, and how these constraints may be overcome.

Table 4.4 Factors affecting the supply of habitats for habitat banking, and the resulting overall scope for restoration / re-creation

Habitat Group under Annex 1	% of total habitat area (km^2)	Geographical constraints	Habitat condition	Habitat loss due to development	Ease of restoration	Implications for supply – Scope for restoration / re-creation
Coastal habitats	16.5% (54,957)	Found in almost all biogeographic regions. Mostly in the Atlantic, Boreal and Continental regions. Not found in the alpine and Pannonian regions (except for inland salt meadows). Some habitats particular to specific regions.	Considerable number of habitats with an unfavourable-bad status and unfavourable-inadequate status. A small number with a favourable status (e.g. vegetated sea cliffs)	Coastal habitats are estimated to have lost only 160 ha per annum to development (0.1% of all developed land). However, habitat assessments indicate that habitats are under significant and increasing pressure from coastal development	**Years/ Decades / Centuries**. Evidence from the literature suggests that coastal habitats are easier to restore than terrestrial habitats, with a higher success rate for coastal restoration projects. Mudflats, for instance, can be restored in 1-10 years depending on the position in the tidal frame. Nonetheless, evidence suggests that not all functions can be easily restored.	**MEDIUM** There seems to be some scope for restoration / re-creation of coastal habitats, given their poor condition (and hence need for improvement), as well as the relative ease with which they can be restored. They are also under increasing risk of being lost due to development pressures so could offer scope for like-for-like compensation. Nonetheless some elements are difficult to restore, and available coastal land may be very limited in some MS
Dunes (coastal and inland)	1.6% (5,230)	Largely constrained to the Atlantic, Boreal and Continental regions, with some found in the Mediterranean.	Virtually all habitats have an unfavourable-bad or unfavourable-inadequate conservation status	No corresponding classification under the CORRINE land use accounts data, however habitat assessments indicate that dunes are under severe pressure from coastal and tourism developments.	**Decades / Centuries.** E.g. yellow dunes would take 50-100+ years to restore, and are more likely to be restored than re-created. Grey dunes and dune slacks are even more difficult to restore, and would take 100 - 500 years. Again they're potentially restorable but are unlikely to be re-created. Vegetated shingle habitats are, for instance, essentially not possible to re-create shingle given that shingle is a	**LOW** There is very limited scope for restoration of dune habitats, given their geographical and ecological constraints, and the considerable timescales that would be required to restore them. Recreation would not be feasible. However, habitat conditions are very poor. Protection is likely to be a much more viable and effective option than restoration or re-creation

Habitat Group under Annex 1	% of total habitat area (km^2)	Geographical constraints	Habitat condition	Habitat loss due to development	Ease of restoration	Implications for supply – Scope for restoration / re-creation
					restricted coastal sediment type.	
Freshwater habitats	6.8% (22,674)	Found across all biogeographic regions, but limited in the Macaronesia region.	Largely equal number of unfavourable-bad, unfavourable-inadequate and favourable statuses. Habitats in the alpine region tend to be of favourable conservation status, whilst those in the Atlantic and Continental regions are largely unfavourable-bad.	Water bodies are estimated to have lost only 170 ha per annum to development (0.2% of all developed land).	**Years / Decades / Centuries**. Open water systems can take as little as a few years to restore or recreate. For instance, eutrophic ponds can be easily created in 1 - 5 years' time.	**MEDIUM** Freshwater habitats provide some scope for compensation – they are relatively abundant, not geographically constrained, easy to restore / recreate and there is scope to improve their condition. However, compensation is likely to be like-for-unlike given little of the habitat is lost to development
Temperate heath and scrub	12.6% (41,954)	Found across different regions but limited in the Macaronesia region. Some habitats are particular to specific regions	Largely equal number of unfavourable-bad, unfavourable-inadequate and favourable statuses. Wet and dry heaths have the worst conservation status, whilst Alpine and Boreal heaths are in better conditions	Moors and heathlands are estimated to have lost 700 ha per annum to development (0.6% of all developed land)	**Decades / Centuries.** Some heathlands can be restored over medium time scales (15+ years), however, heathlands normally take between 50 - 100 years to restore. It tends to be easier to restore than recreate these habitats.	**MEDIUM** There is some scope for compensation of heathland habitats, given the need to improve habitat condition. However, there are some constraints to their restoration / re-creation, and the loss due to development is relatively low.
Sclerophyllous scrub	4.4% (14,693)	Largely limited to the Mediterranean region, although some particular habitats also found in the Alpine, Atlantic and Continental	There are a greater number of favourable assessments than most other habitat groups. Although some are of unfavourable-inadequate status and there are a large number of habitats have inadequate information available for assessment.	Sclerophyllous vegetation are estimated to have lost 3,000 ha per annum to development (2.6% of all developed land).	Restoration is technically feasible, and there is scope for re-creation.	**MEDIUM** There seems to be some scope for restoring / recreating sclerophyllus given the scale of habitat lost to development. However, the habitat is relatively geographically limited, and most habitats are still of favourable conservation status indicating less of a need for improvement.

Habitat Group under Annex 1	% of total habitat area (km^2)	Geographical constraints	Habitat condition	Habitat loss due to development	Ease of restoration	Implications for supply – Scope for restoration / re-creation
		regions.				However, the habitat seems a good candidate for like-for-like compensation, .
Natural and semi-natural grasslands	12.7% (42,422)	Found across different biogeographic regions, although some habitats limited to particular regions. Very limited in the Macaronesia region.	Most habitats of unfavourable-bad status, with the remainder of unfavourable-inadequate status. However, a small number of habitats are of favourable status	Natural grasslands are estimated to have lost 2,500 ha per annum to development (2.2% of all developed land)	**Decades / Centuries**. Although secondary grassland is relatively easy to restore, other types of grassland may be more difficult and could take centuries. There are several examples of successful attempts at restoring grasslands, and it is one of the most frequent types of terrestrial restoration, despite requiring continual management	**HIGH** There seems to be considerable scope for compensation through grassland habitats, given their generally poor conservation status and need for improvement, as well as their relatively large loss due to development and the relative ease with which they can generally be restored / recreated.
Wetlands (bogs and mires and fens)	8.6% (28,630)	Found across almost all regions, although more limited in the Mediterranean and the Pannonian region	Almost all habitats have an unfavourable-bad status, with some of unfavourable-inadequate and a small number with favourable status	Wetlands are estimated to have lost only 180 ha per annum to development (0.2%). However, habitat assessments from Member States indicate that wetlands are significant pressure to be converted for other types of land use.	**Years / Decades / Centuries**. Wetlands vary significantly in the ease with which they can be restored. However, literature and other evidence suggests that restoration of wetlands can be relatively straightforward and is already well established in practice. For instance, reedbeds can be readily developed with the appropriate water conditions in 10+ years. Blanket and raised bogs however are very	**HIGH** There appears to be considerable scope for compensation, given their generally poor conservation status and need for improvement, as well as their relatively large loss due to development and the relative ease with which they can generally be restored. This is also one of the habitats with the most scope for re-creation.

Habitat Group under Annex 1	% of total habitat area (km^2)	Geographical constraints	Habitat condition	Habitat loss due to development	Ease of restoration	Implications for supply – Scope for restoration / re-creation
					difficult to restore given ecological constraints.	
Rocky habitats and caves	4.5% (15,016)	Found across all regions, although more limited in the Macronesia region. Less common in the Boreal and the Pannonian region as well.	Almost all habitats have a favourable conservation status, with a small number of habitats with a unfavourable-inadequate or unfavourable-bad status (mostly in the Atlantic region)	No corresponding classification under the CORRINE land use accounts data. However, 'other undeveloped land' is estimated to have lost 850 ha per annum to development (0.7% of all developed land)	Decades / Centuries. Limestone pavements, for instance, are impossible to recreate, and would take more than 10,000 years to regenerate if lost, depending largely on glaciation.	**LOW** There seems to be limited scope for compensation of rocky habitats and caves, given the significant difficulties in restoring the habitat (re-creation is not feasible), their limited extent, and the fact that very little of the habitat is lost due to development. There also seems to be little need to improve the habitat s as their conservation status is generally favourable.
Forests	32.3% (107,558)	Some habitats very limited to particular regions	Largely equal number of unfavourable-bad, unfavourable-inadequate and favourable statuses. Habitats of the boreal, Pannonian and continental regions are in the worst condition, whilst forests in the alpine and Mediterranean region tend to be in better condition	Forests and transitional woodland shrub are estimated to have lost 12,400 ha per annum to development (10.9% of all developed land).	**Decades / Centuries.** There is a huge variation in the ease with which forests can be restored. Whilst secondary woodland may only take decades, ancient woodland would take centuries and is essentially considered impossible to recreate.	**MEDIUM** There is some scope for compensation, although this will depend on the type of habitat (the ease of restoration / re-creation varies significantly). The need for habitats to be improved also varies considerably. However, significant areas of forests are being lost to development, so the need for compensation is high. In some cases (e.g. old growth), protection may be the only viable activity.

Source: ICF GHK analysis drawing on, inter alia*, ETC/BD (2008); Evans (2006); EEA (2009); EEA (2010) (see reference list for full details)*

5 The costs and benefits of biodiversity offsets and habitat banking

This section of the report discusses the different types of costs and benefits associated with offsetting and habitat banking, presenting a brief overview of the evidence. The potential or perceived risks from biodiversity offsets are also briefly discussed.

It delivers part of the second objective of the study, which seeks to "identify the potential associated costs and benefits" of biodiversity offsets in the EU.

5.1 Types of costs

Biodiversity offsets and habitat banking schemes result in a variety of different costs for developers and regulatory authorities. These include:

- **Habitat management costs** - the costs of habitat creation, restoration and long term management activities designed to deliver a gain in biodiversity equivalent to the losses incurred;
- **Land costs** - the costs of acquiring the land on which this conservation activity is to take place, or entering into a management agreement to secure a change in land management over long periods;
- **Financial costs -** the costs of financing biodiversity offsets, and of providing financial guarantees and assurances. Financing costs may be significant for habitat banking schemes, which require up-front capital investments, sometimes many years in advance of revenues from sales of credits. Offset providers and habitat banks will normally be required to set aside funding for long term management, and to secure sufficient funds or other financial assurances to cover contingency actions in the event of default or failure;
- **Management and transaction costs** incurred by the developer in meeting the requirements of the policy, by the provider in managing the provision of offsets and habitat banks, and by providers and brokers in organising transactions. These include the time, fees and expenses relating to applications, project management, management planning, certification, administration, monitoring and reporting; and
- **Administrative costs** - The costs incurred by the authorities in administering and regulating the offsets system, which may be reclaimed through fees paid by developers and/or providers. These may include the costs of receiving, assessing and granting applications, advising on requirements, conducting site visits, undertaking scientific assessments, issuing permits, dealing with disputes or complaints, maintaining records and inventories, enforcing any requirements, and undertaking on-going monitoring and evaluation. While most national offset systems require some up-front investment by governments, it is possible to run offset systems on a 'cost recovery basis.'

The various costs of providing offsets should be reflected in the prices paid by developers for credits, which also include any profits made by the offset provider on the provision and sale of credits. At least two possibilities exist for the commercial basis of offset provision. Some offset providers (e.g. individual farmers or conservation banking companies) will wish not only to cover their costs but to make a profit through the business of offset provision. However, other offset providers, particularly conservation NGOs or individual landowners wishing to conserve biodiversity for philanthropic reasons, may not require a profit margin, but might be satisfied by ensuring that all their costs are covered in the price they obtain for the sale of offset credits.

A large proportion of the overall costs involved – especially habitat management and land costs – will be common to any habitat creation or restoration scheme. However, other costs will vary according to the type of delivery model. Habitat banking schemes will incur different types of costs than one-off offsets. For example, habitat banking will tend to have significant financing costs (because it tends to involve conservation work in advance of offset requirements being identified), but should yield economies of scale which will help to reduce

management and transaction costs for providers. Habitat banking may also reduce administrative costs by enabling the authorities to deal with known, certified providers with established systems and practices. On the other hand, less formalised and voluntary schemes that are not driven by regulatory drivers tend be more uncertain with a higher risk of failure, increasing the costs and making access to finance more difficult (see, for instance, Section 4.2.4).

5.2 Evidence of costs

While detailed breakdowns of costs are rarely available, evidence suggests that the initial costs of habitat management works may often be a small proportion of the overall costs of habitat banking and offset schemes. The costs of purchasing or securing rights to land, the administrative and transaction costs of determining offset requirements and entering legal agreements, and the allocation of funding to long term management and monitoring all add significantly to the overall costs involved.

A wide range of cost estimates are available for different countries, reflecting variations in local requirements, land prices and cost structures. For example:

- In England, a study estimated that the total costs of implementing offsets nationally could range from €63 to €500 million per annum, depending on the metrics used to assess offset requirements. These figures were derived by estimating annual losses caused by development nationally, applying metrics to estimate offset requirements, and applying appropriate unit costs to estimate the annual cost of offset provision. The estimates include the costs of land purchase, habitat creation/restoration, on-going management costs and administrative and transaction costs. Average (capitalised) costs of offset provided would range from €30,000 to €60,000 per hectare, with the lowest costs being for upland habitats and the highest ones for wetlands. The estimates were conservative, being based on costs estimated for the UK Biodiversity Action Plan, applying conservative assumptions about administrative and transactions costs, and excluding profits. For example, based on their experience, one provider has estimated that offsets are likely to cost between €37,000 and €100,000 per hectare, which includes an allowance for profits.
- In the Netherlands, the costs of habitat restoration projects are estimated to average €20,000 per hectare, but the costs of acquiring land can be very high, at up to €200,000 per hectare. Costs for nature compensation normally amount to about 1% (or lower) of the total costs of a project (mainly road and rail projects). However, the Rotterdam harbour extension involved much higher costs than this.
- In Sweden, a 500 hectare wetland creation and restoration project in the Umeälven delta, cost €25,000 per hectare, including the costs of land, planning, habitat restoration and management, and creation of a fund for long time management and monitoring;
- In Spain, examples of the cost of compensatory measures of projects (e.g. the development of the Madrid-Barajas airport or projects for the development of the rail network) indicate that compensatory measures represented between 1.8% and 4.5% of the total cost of the project;
- In New South Wales, trained consultant ecologists are required to undertake assessments of offset requirements, operating the BioMetrics calculator. The cost of this alone has been estimated at €20,000 per project. Early experience in BioBanking has shown that high upfront costs of AUD $50,000 - $60,000 (€42,000 - €50,000) may dampen speculative offset development by landowners (Madsen et al, 2010).
- In the US, contingency funds of an additional 15-25% of project costs are typically set aside to enable improvements and to meet monitoring criteria (Jones, 2011).

Examples of the prices of credits include the following:

- In France, the (per hectare) prices of credits for habitat banking are €38,000 in the pilot experiment in Saint-Martin-de-Crau, and between €30,000 and €80,000 for experiments selected in the 2011 call for projects;

- In Victoria, Australia, the price of credits under the BushBroker scheme averaged between €31,000 and €134,000 per habitat hectare across different bioregions in 2006-2009;
- In Brazil, the Compensação Ambiental law requires compensatory payments of around 0.5% - 2.0% of the cost of proposed industrial developments, with the proceeds paid into an Environmental Conservation Fund, which is used to finance protected areas;
- In the US, the prices of Conservation Banking credits vary widely by species and by site, averaging €63,000 per hectare. Variations in prices are influenced by local land values, credit scarcity and demand;
- Wetland banking credit prices in the US also vary widely, with different transactions involving costs of anything between €6,000 and more than €1.2 million per hectare. State agencies can set in lieu prices that can be paid if mitigation opportunities are not available, with a sample of these fees ranging from €48,000 to €1.3 million per hectare, with most transactions in the range €80,000 to €300,000 per hectare.
- Globally, Madsen *et al* (2011) estimate the annual market for biodiversity offsets to be at least $2.4 -$4.0 billion, and possibly much larger, since 80% of existing programmes are not transparent enough to estimate their market size.

Examples of the administrative and transactions costs of offsets and habitat banking are available from Victoria, Australia, where the BushBroker scheme applies a tariff of fees set in accordance with the Victorian Government's Cost Recovery Guidelines and Competitive Neutrality Policy. These fees range from AUS$250 for an Expression of Interest by a landowner to AUS$7,000 for an assessment of a site of more than 500 hectares (Table 5.1).

Table 5.1: Services and Fees for BushBroker, Victoria, Australia, 2011/12

Service	Fee (AUS$)	Fee (€)
Landowner expression of Interest	250	209
Offset Search Request and offset matching	900	753
Extended Search for unlisted Credits	1500	1256
Over the Counter transactions		
< 200 plants	200	167
> 200 plants	400	335
Credit Agreement	1000	837
Site assessment		
< 50 hectares	5000	4185
> 50 hectares	7000	5859
Landowner Agreement		
(standard) < 50 hectares	5000	4185
(large) > 50 hectares	7000	5859
Permit holder or landowner initiated site assessment		
< 50 hectares	5000	4185
> 50 hectares	7000	5859

Source: Department of Sustainability and Environment, Victoria (2011)

While no comparative data could be found, it is widely commented that habitat banking should lead to cost efficiencies over time compared to individually arranged offsets, through economies of scale and the ability to plan and implement compensatory strategies in a strategic and cost effective way.

5.3 Benefits

The benefits of offsets and habitat banking schemes can be measured in terms of their effectiveness in conserving biodiversity and ecosystem services. It is clear that established schemes in the US and Australia have provided many thousands of hectares of habitats to compensate for losses to development. Indeed, Madsen *et al* (2011) estimate that the global impact of the offset market has been to bring at least 187,000 hectares of land under some sort of conservation management or permanent legal protection per year. Most of this area is in North America and only a small proportion is in the EU. While the methods employed to assess offset requirements do not always guarantee that no-net-loss is achieved, enhanced understanding and improvements in standards should help to enhance benefits over time.

There is little evidence of the monetary value of the benefits of offsets and habitat banking schemes, and arguably monetary valuation may not be a high priority where policies are driven by clear sustainability criteria (i.e. the 'no-net-loss' objective, delivered through biodiversity-based metrics that establish 'like for like or better', and quantified changes in condition of biodiversity in particular areas).

Treweek *et al* (2009) identify a range of other potential benefits of offsets, which could include:

- Helping to deliver Biodiversity Action Plan targets, especially through trading up – i.e. where offsets compensate for damage to non-priority habitats by restoring or creating priority habitats;
- Helping to build ecological networks, especially where the location and design of offset actions can be set in a strategic framework;
- Streamlining planning processes, including through strategic planning of offset provision;
- Providing additional funding for conservation.

In England, an impact assessment of potential future offsets policies used per hectare monetary values to estimate that the annual benefit of investing in offsets on 5,000 hectares should be worth approximately €185 million, comparable to the estimated costs of the policy (Defra, 2011). Since 50% of the estimated costs per hectare related to the transfer of land rather than the costs of delivering the offset itself, it was found that the benefits of the policy were more than twice as high as the net costs. In practice, the government decided against a mandatory national scheme, and introduced voluntary offset pilots which are now focusing on the potential benefits of offsets in enhancing the effectiveness of existing compensatory actions (including through more strategic, larger scale and better connected projects), and in streamlining processes for development approval (including by enhancing the certainty and transparency of compensatory requirements), rather than increasing overall levels of compensation required.

Eftec *et al* (2010) identified a range of potential economic benefits from habitat banking compared to biodiversity offsets, relating to economies of scale, reduced transaction costs (both of regulation and of pairing up buyers and sellers) and the introduction of a market incentive for biodiversity conservation on private land. There are also potential major ecological benefits (or ecological returns to scale) from habitat banking, relating to:

- More effective, and in some cases *ex-ante* (and therefore more reliable), delivery of existing biodiversity policy objectives and of compensation requirements;
- Greater impacts and increased long-term viability of large-scale measures (also potentially from pooled offsets);
- Reduced habitat fragmentation from strategic and selective placement of compensation measures (e.g. to link up, increase the size of, or buffer Natura 2000 sites);
- The option to trade up measures to address higher conservation priorities, and
- The opportunity to efficiently address cumulative impacts from small-scale or low impact developments for which there is no legal requirement for compensation.

UNDP and PWC (2010) identify a range of benefits of habitat banking to a variety of actors – government regulators, developers, landowners, habitat bankers and the environment and public good. In addition to those mentioned above, these can include consolidated monitoring of mitigation sites; professional environmental restoration experts managing mitigation projects; a transfer of liability to private professional companies with a vested interest in success of mitigation; enhancing the value of land with previously limited uses; and the opportunity to develop best practice and performance standards.

5.4 Incidence of costs and benefits

Biodiversity offsets and habitat banking should provide benefits to society as a whole, by supporting biodiversity policy through enhancing the conservation of biodiversity and the associated provision of ecosystem services. There may also be benefits to landowners and offset providers through new opportunities to generate income, while even developers may see benefits through streamlining of planning processes.

Most of the costs of biodiversity offsets and habitat banking will be met by developers, either through provision of offsets themselves or by purchasing credits from providers. However, some of these costs are likely to be passed on to landowners, through reduced prices paid for development land that gives rise to offset requirements. On the other hand, land that has potential to provide offsets will be in increasing demand and can be expected to rise in value, particularly in areas where it is in relatively short supply. Providers and brokers will expect to recoup any costs they incur from developers, and to make a profit on offsets transactions.

The authorities will incur significant costs in the administration and regulation of offset schemes, some or all of which may be recouped from developers and providers through fees and charges, as in the example given above from Victoria, Australia.

5.5 Risks

Treweek *et al* (2009) identified a range of potential or perceived risks from biodiversity offsets, from the perspective of the public, regulators and developers. For example, the public may perceive that offsets are used to justify otherwise 'unacceptable' adverse environmental impacts, or to give developers the opportunity to buy themselves out of planning policies and restrictions.

From the perspective of regulators, there are risks that offsets may over-ride the protection of valuable environmental assets, divert resources from other successful conservation initiatives, or, unless well regulated, fail to deliver real conservation benefits.

From the perspective of the developer, biodiversity offsets could be seen to further complicate existing obligations to safeguard biodiversity and to represent an additional tax, particularly for smaller scale developments.

Eftec *et al* (2010) identified the following risks:

- ***Licence to trash*** – if offsets result in relaxation of mitigation hierarchy;
- ***Lack of additionality*** – offsets displace existing conservation activity – credits are sold for activities that would be undertaken anyway;
- ***Offsets crowd out opportunities for biodiversity gain*** – as land suitable for habitat restoration or creation is in short supply, there is a risk that projects to compensate for losses consume land that would otherwise be taken to deliver net gains in biodiversity;
- ***Offsets incentivise damage to biodiversity*** – e.g. developers damage sites to reduce offset requirements, or providers reduce the condition of the offset site to increase opportunities to deliver gain;
- ***Acceptability of offsets*** - Offsets can be unpopular and meet resistance from developers as often they are seen as additional costs.

These risks can lead to opposition to, or scepticism about, offset schemes. However, while offsets will never be risk free, most of the potential risks can be minimised or reduced through careful design of offsets and habitat banking initiatives. The next section considers key elements in the design of offsets and habitat banking schemes, including some of the most important aspects of risk management such as enforcement of the mitigation hierarchy, ensuring additionality, specification of appropriate metrics to balance gains and losses, and regulation of offset provision.

6 The design of potential biodiversity offsets and habitat banking schemes

This section identifies and reviews the key design elements of a potential biodiversity offsets and habitat banking system in the EU, both in terms of the offset requirements and the implementing arrangements.

It delivers on the third objective of the study, which seeks to 'identify and compare alternatives for key design elements for the development and implementation of offsetting schemes'. The section also meets the requirements specified under Task 3 of the study terms of reference.

6.1 Introduction

Based on analysis and experience of the implementation of biodiversity offsets and habitat banking in EU Member States and internationally, a number of different design elements need to be considered in developing and implementing these schemes.

These issues can broadly be divided into two groups:

- **The design of offset requirements** – including in what circumstances offsets are required, the metrics used to assess offset requirements, the criteria for assessing additionality, and requirements relating to the location and timing of habitat banking delivery. These issues effectively determine the scale and type of **demand** for offsets and habitat banking schemes.
- **Arrangements for implementing offsets and habitat banking** – including the overall institutional arrangements for delivery of schemes, the instruments and delivery models used, the arrangements for regulating offsets provision, the certification and accreditation of supply, the use of standards and performance criteria, and the long term monitoring, reporting and enforcement of offsets. These issues determine arrangements for the **supply** of offsets and habitat banking, and how these arrangements are regulated.

Biodiversity offsets and habitat banking schemes can potentially be applied at different levels (local, regional, national, EU and international) and through different mechanisms (mandatory or voluntary). A number of principles and design elements are common to schemes at all of these levels, although there may be differences in emphasis and approach according to the circumstances, priorities and objectives of different schemes.

This section explores these design elements in turn, drawing on EU and international experience.

6.2 The design of offset requirements

6.2.1 Overall objectives and guiding principles of offset schemes

BBOP (2012) stresses 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'.* BBOP notes that there is a spectrum of biodiversity compensation activities, and that only those activities which deliver no-net loss or a gain in biodiversity, in full compliance with the BBOP Standard, should be termed biodiversity offsets.

As one means of delivering biodiversity offsets, habitat banking schemes aim to meet biodiversity offset requirements in a cost effective and ecologically effective way.

In practice, biodiversity offsets and in particular habitat banking schemes may have a variety of aims and objectives (McKenney and Kiesecker, 2010). While some schemes such as the US wetlands mitigation programme, have the objective of no net loss, others go beyond this requirement and seek to achieve net gains in biodiversity, which is a stated requirement of offset schemes in some Australian states such as Victoria and Western Australia. In Canada,

offsets under the Fisheries Act aim to achieve net gain in the productive capacity of Canada's fish habitats and increase fisheries (eftec, 2010). Net gain is also required for impacts on critical habitat under IFC Performance Standard 6.

Other schemes are designed to provide compensation for biodiversity loss more generally and do not directly specify the achievement of net gain or no net loss – examples include the US conservation banking, the Brazilian industrial offsets (SNUC) and South African offsets programmes.

Similar differences in objectives can be found in the EU. In Germany, offsets and habitat banking are applied in order to contribute to the delivery of a national no net loss requirement established by the national Impact Mitigation Regulation.

However, in England, the government is piloting the delivery of biodiversity offsets without introducing a formal no net loss requirement. Offsets are being trialled as a means of improving the delivery of compensation requirements for biodiversity loss under the planning system. It is hoped that offsets will enhance the effectiveness of compensation for biodiversity loss and streamline processes for the delivery of compensation requirements. While the scheme aims to deliver no net loss or net gain with respect to individual developments to which offsets are applied, and the Natural Environment White Paper mentions no net loss as an aspiration, there is no overall no net loss requirement at national level.

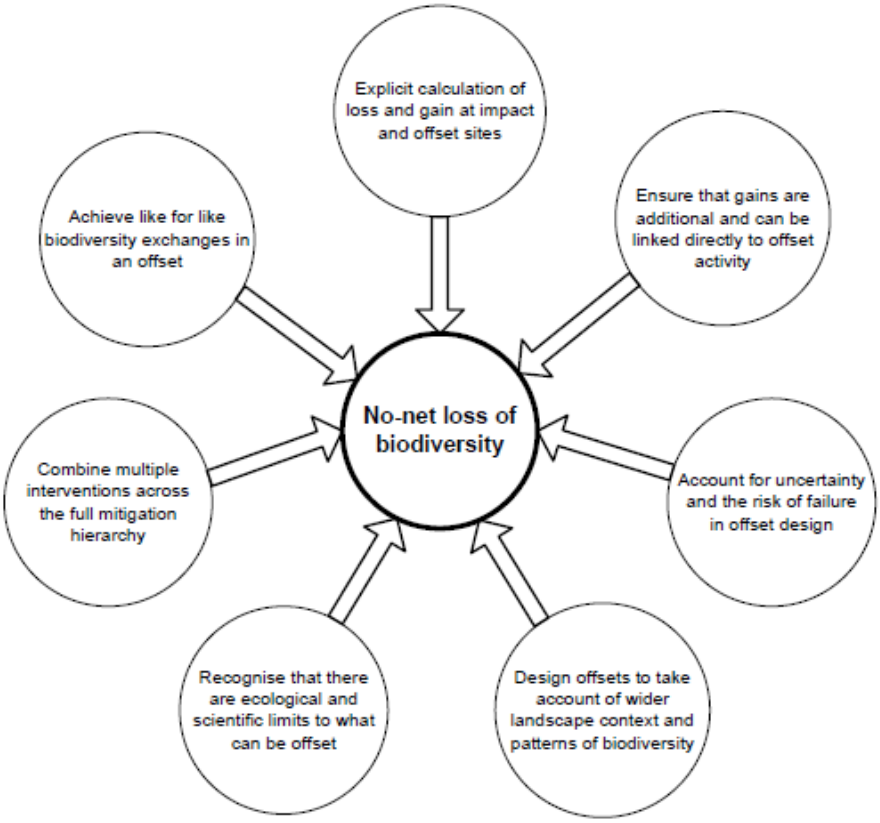
In Sweden, the Environment Code places a strong emphasis on compensating the local population affected by a development. While priority is given to compensating for biodiversity losses on a 'like-for-like basis' wherever possible, where this is difficult to achieve locally, other options may be considered, which can even include investments in cultural or recreational assets. According to the Swedish Environmental Code and the EIA-regulations, the developer is responsible for implementing compensation measures. The possibility of transferring compensation between environmental and recreational or cultural values appears to be unique to Sweden.

In the Netherlands, for areas belonging to the Dutch National Ecological Network (EHS), the principle of no net loss is frequently applied, but financial compensation may also be allowed. Finances generated by the Dutch National Ecological Network legal scheme are deposited in a green fund, the '*Groenfonds*'.

More specifically, many schemes (such as wetland mitigation in the US and native vegetation offsets in Australia) focus on achieving no net loss of habitats or ecosystems, while some (such as the US Conservation Banking scheme) are targeted at species. There is also increasing interest in the idea of offsets for ecosystem services, though this presents greater challenges, not least in relation to data and measurement issues (Natural Capital Initiative, 2010).

The principle of no net loss guides a number of different design elements of offsets and habitat banking schemes, as illustrated in Figure 6.1, which is taken from BBOP technical guidance on biodiversity offsets. Implementing the mitigation hierarchy, placing limits on what can be offset, requiring additionality of gains, designing metrics to account for losses and gains and to deal with risk and uncertainty and requirements for like-for-like offsets are all important elements linked to the objective of no net loss.

Figure 6.1 No net loss as central target underpinning biodiversity offsets



Source: Business and Biodiversity Offsets Programme (BBOP). 2012

These considerations have led to the widespread international acceptance of a number of principles guiding the design of biodiversity offsets (Box 3).

While these general principles are widely accepted internationally, they are reflected in different ways in the design of offset and habitat banking schemes. McKenney and Kiesecker (2010) reviewed design elements that affect the requirement for offsets in North America, Australia, Brazil and the EU. Table 6.1 presents a summary of some of the key design elements under offset policies in each region.

Box 3 Ten Principles for Biodiversity Offsets

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

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

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

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

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

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

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

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

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

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

Source: BBOP (2012b)

Table 6.1 How offset (and compensation) policies in the United States, European Union, Australia and Brazil address key implementation issues

Key Issues	US Wetland Mitigation	US conservation banking	EU Natura 2000	Australian native vegetation offsets	Brazilian industrial offsets	Brazilian forest offsets
Equivalence	Most environmentally preferable option, in-kind for difficult-to-replace resources	In-kind for species; must support conservation needs of the species	Comparable proportions and functions	‘‘Commensurate’’ or in-kind (especially for losses of high significance)	No preference	Same ecosystem type
Location	Same watershed	Same service area (US FWS); provides best long-term benefit to species	Same biogeographic region in the same Member State; same bird migratory path	Adequate geographic link between losses and offsets; closer to on-site when losses are high significance	No preference, but if impacts are to a protected area, offset must benefit that protected area	Same watershed
Additionality and types of offsets	Must be additional; prefer restoration; allow establishment, enhancement, and preservation	Must be additional; no specific constraint on type of offset	Must be additional; recreating habitat, or in exceptional cases proposing a new site	Must be additional; full range of offset types allowed	No requirement; supports funding of Brazil’s protected areas system	Must be additional to required conservation area on any private landholding
Timing	Before first credit is sold/ debited, need to have secured site, approved mitigation plan, and assurances	Offset must be operable at time first credit is sold	Compensation must be operable at time when project damage is effective	Flexible; timing is factored into scoring	Offset payment required prior to environmental permitting	Offset is retroactive, addresses land clearing that has already occurred
Duration	Self-sustaining; preservation must be permanent	Perpetuity only	Perpetuity preferred	Perpetuity preferred; in place as long as on-site impacts	Perpetuity preferred	Perpetuity preferred
Currency and offset ratios	Based on lost aquatic resources; at least 1 to 1 ratio by acreage or linear foot	Based on species and habitat values, at least 1 to 1 ratio for area supporting nest site or family group	Based on impacts to species, habitat, and functions	Based on assessment methodology in NSW; ‘‘Habitat hectares’’ framework in Victoria	Commensurate with impacts (minimum payment of 0.5% of total capital costs of project)	Defined ratio of 1 to 1

Source: Mckenney and Kiesecker (2010)

6.2.2 Implementing the mitigation hierarchy

The idea of biodiversity offsets is controversial to some in the conservation community; the fear is that that the use of offsets could encourage regulators to allow projects with severe impacts on biodiversity to go ahead as long as they offered offsets to compensate, and allow companies to leave significant impacts in areas affected by projects as long as they undertook conservation work elsewhere (BBOP website).

It is therefore widely accepted that biodiversity offsets and habitat banking schemes should follow the mitigation hierarchy - compensatory measures should only be used to offset adverse residual effects arising from an activity once other avoidance and mitigation measures have been taken.

A significant concern expressed in relation to offsets and habitat banking schemes is that, in seeking to deliver effective compensation for biodiversity loss, they may serve to legitimise development proposals that have adverse impacts on biodiversity, creating a so-called 'license to trash', in conflict with the mitigation hierarchy. A common critique has been that while offset schemes emphasise the importance of the mitigation hierarchy seeking to avoid and minimise impacts before considering offsets, there is often insufficient guidance to assist decision makers on how this critical sequence should be applied.

McKenney and Kiesecker (2010) found strong support for the mitigation hierarchy across policy frameworks for offsets in the US, Australia and Europe, but noted a shortage of quantitative guidelines to ensure its application in decision-making. They argued that a key challenge for future application of offsets will be establishing a clear and defensible process for determining when offsets are an appropriate tool in conformance with the mitigation hierarchy, and when offsets should be rejected in favour of more intensive efforts at steps higher up in the mitigation hierarchy (avoidance and minimisation of impact). They suggested that conservation planning could guide this process, ensuring that proposed developments are consistent with maintaining the viability of biodiversity and achieving biological targets. In New South Wales, Australia, the BioBanking scheme takes such an approach, applying irreplaceability and vulnerability criteria to support conformance with the mitigation hierarchy and identifying ''red flag'' areas where biodiversity conservation values are high and impacts should be avoided.

In the Western Cape, South Africa, the application of offsets is determined by the significance of the negative impact on biodiversity:

- When residual impacts on biodiversity are of 'very high' significance, offsets are inappropriate as they could not compensate for the loss of biodiversity;
- When residual impacts on biodiversity are of 'medium' to 'high' significance, offsets for biodiversity loss should be explored; and
- When residual impacts on biodiversity are of 'low' significance, there is no need for biodiversity offsets.

Similarly, guidance for offset schemes in Canada and the US also mention avoiding impacts for 'difficult to replace' or 'high significance' habitats but the scope for discretion of decision-makers about when to avoid, minimise and offset is wide. In Australia, concerns have been expressed that wider use of offsets and a lack of clarity about the implementation of the mitigation hierarchy could lead to a perception of offsets as a 'licence to trash' – i.e. a culture among developers that anything can be offset.

Similarly, Treweek *et al* (2009) argue that there should be an upper as well as a lower threshold for the application of offsets, and that they are not appropriate for losses of critical or non-substitutable biodiversity.

The regulatory authorities play an essential role in ensuring adherence to the mitigation hierarchy. In California, for example, where the use of offsets and habitat banking is highly advanced, interviewees emphasised the role of the regulatory authority to act as the 'check' in the process to ensure that guidance and standards are followed. In practice what this means is early and sustained engagement between the developer and the relevant

authorities to devise offsets that are acceptable after full consideration of avoidance and mitigation options. However, it was also noted that there is a perception that conservation planning ought not to be positioned as a barrier to development and that the use of communication, negotiation and flexibility to find suitable development and conservation outcomes may not always be consistent with the strict application of the mitigation hierarchy.

Similarly, authorities in the Western Cape of South Africa and Victoria, Australia, both require developers to submit evidence that they have taken all reasonable steps to avoid and minimise impacts on biodiversity, prior to considering offsets for residual impacts (Treweek *et al,* 2009).

The importance of adherence to the mitigation hierarchy is also stressed in offsets and habitat banking schemes in the EU. Interviewees in Germany, the Netherlands and Sweden commented that effective implementation of the hierarchy limits the actual demand for compensation. In the Netherlands, the demand for biodiversity offsets was estimated by interviewees to be as low as about 100 hectares annually, and this was attributed to the effectiveness of efforts to avoid and mitigate impacts.

In Sweden, the Environmental Code stresses that compensation should only be used after the mitigation hierarchy has been followed. For example, in Swedish road planning and building, avoidance and minimising impacts are routine steps in the planning procedure; these are mainly determined by EIA-related regulations in the Environmental Code, or in sectoral regulations. The final step in the hierarchy (compensation) is rarely used. However, stakeholders remain concerned that compensation may be used as a "licence to trash", and this may be a barrier to the wider use of offsets. It was suggested that practical guidelines about the application of compensation within the mitigation hierarchy could help to address this issue. Similar concerns about potential conflicts with the mitigation hierarchy have been expressed by stakeholders in France.

In England, guiding principles for biodiversity offsets published by Defra (2011a) state that offsets should not change existing levels of protection for biodiversity and be at the bottom of the mitigation hierarchy, requiring avoidance and mitigation of impacts to take place first. As an example, if habitats or species are subject to statutory protection under national or EU legislation, decisions on development and any subsequent compensation will remain subject to the requirements of that legislation and current processes. Development decisions will continue to be taken by planning authorities in line with planning guidance, which refers to the mitigation hierarchy.

The BBOP Standard on Biodiversity Offsets (BBOP, 2012c) stresses the importance of following the mitigation hierarchy and that developers should specify in a Biodiversity Offsets Management Plan their approach to avoidance, minimisation and rehabilitation/restoration prior to addressing residual impacts.

6.2.3 Conditions and thresholds for the application of offsets

A key design element involves the thresholds or conditions that are applied in deciding whether offsets are required and the definition of the types of biodiversity loss that need to be offset. While the last section makes clear that offsets should be applied only in certain circumstances and that there are upper limits to what can be offset, rules also need to be specified as to the thresholds of losses over which offsets are applied.

For example, offsets could be required for all development activity, or only for projects above a certain size threshold, or affecting certain types of land. Key issues include whether and how offsets are required for activities affecting the biodiversity in agricultural land and previously developed sites, some of which have high biodiversity value. For example, in the UK , Open Mosaic Habitats on Previously Developed Land are now a priority habitat under the Biodiversity Action Plan, in recognition that natural regeneration of some previously developed sites has resulted in the emergence of important plant and invertebrate communities. In the cost assessment by GHK and eftec (2011), it was estimated that 25% of previously developed land is of sufficient value to require biodiversity offsets if redeveloped.

Internationally, most schemes require offsets where a significant residual impact is deemed to occur. Treweek et al (2009) note that whether there is a significant residual adverse effect on biodiversity which might require an offset depends both on the importance and resilience of biodiversity affected, on the magnitude and significance of impacts and on the likely effectiveness of planned mitigation. In the context of the Western Cape, offsets are considered when residual negative impacts on biodiversity (confirmed through EIA) are found to be of 'medium' to 'high' significance, based on criteria provided in the guidance.

In Canada, Madsen et al (2011) report that 95% of referrals to the National Fish Habitat Compensation program do not require compensation, either because they are deemed to have no impact or because they negate impacts through relocation, redesign or mitigation measures.

BBOP (2012b) supports the idea that offsets might only be appropriate for significant impacts, noting that 'the design of a biodiversity offset involves a considerable level of thought and planning, so it may not be an appropriate approach for project where impacts on biodiversity will be comparatively trivial (e.g. building a house on a previously developed but vacant lot in a city centre)'.

EU Member States use a wide range of criteria for determining the circumstances in which compensation are required:

- In Germany, biodiversity offsets are applied widely to biodiversity losses overall and not only in protected areas or for protected species.
- In France, application of compensation for biodiversity losses has so far been relatively limited, rarely including impacts on agricultural and forestry areas. However, since 1 June 2012, for projects submitted to an EIA and for facilities classified for environmental protection, the scope of impacts to be taken into account has been widened. The Environmental Code states now that compensatory measures apply to impacts on fauna and flora, natural habitats, sites and landscapes, material goods, ecological continuity, biological balances, climatic factors, soil, water, air, noise, natural areas, agricultural areas, forestry areas, marine areas, leisure areas, as well as interactions between these elements.
- In England, the compensation is required if 'significant harm' resulting from a development cannot be avoided or adequately mitigated (Department for Communities and Local Government, 2012). Defra guidance to local authorities stresses that the decision about whether a development needs to provide compensation for biodiversity loss is for the planning authority to take, in line with planning policy. There is no definition of significance. However, the term relates to the magnitude of impacts, either alone or in combination, including those which may be temporary during construction, rather than the size of the development under consideration. Small developments can have significant impacts on biodiversity. In assessing significance, local authorities are advised to consider issues such as the sensitivity, relative abundance and importance of biodiversity interests affected, the loss of habitats and/or species and the proportion that these losses constitute of the international/national and/or local resource, changes to natural processes, loss of the integrity of a site or viability of a population, and contribution that particular interests make to the wider value of ecological networks.
- In Sweden, while the Environmental Code does in theory allow the authorities when granting an environmental permit or exemption to require compensation in a wide range of cases where a development causes damage to public interests, in practice it tends to be demanded relatively rarely and mainly for damage to sites or species of higher nature value.

6.2.4 Mandatory and voluntary approaches

Offsets and habitat banking schemes may involve a mandatory requirement to provide compensation for biodiversity loss, or be voluntary in nature. Both approaches may be designed to achieve no net loss of biodiversity. However, only mandatory approaches can provide offsets in a sufficient proportion of cases or places where residual impacts occur to make a significant contribution to achieving no net loss.

Mandatory schemes are in place in an increasing number of countries internationally, including the US, Australia, Brazil, Canada and South Africa. Compensation for damage to Natura 2000 sites is also a mandatory requirement under Article 6 of the Habitats Directive, while some EU Member States have introduced additional mandatory requirements for compensation for wider biodiversity losses, with these being most comprehensive in Germany.

Voluntary schemes can fill gaps where mandatory requirements are lacking, and tend to be more prominent in countries with weaker legislative frameworks.

England is trialling the introduction of biodiversity offsets on a voluntary basis in six pilot areas. Developers are given the option to use offsets to meet existing responsibilities under the planning system to deliver compensation for biodiversity loss. It is hoped that this will streamline the planning process and enhance certainty and transparency about compensation requirements. However, there are concerns that the voluntary nature of the English pilots will not result in the scale, rigour and certainty of requirements needed to stimulate supply and demand and hence deliver the benefits envisaged, or a workable scheme on a scale that can be evaluated. Nine respondents to a Defra consultation, mostly representing environmental NGO, consultancy and offsetting professional sectors, commented that a voluntary approach to biodiversity offsetting would not make a significant contribution to halting biodiversity loss. They felt that mandatory offsetting would be necessary for it to contribute to stopping biodiversity loss, and to stimulate the market in offset providers sufficiently to become efficient. Linked to this, some respondents commented that an opt-in approach could result in variations in use and approaches to offsetting across England, which could lead to confusion and variable conditions for development (Defra, 2011b).

In the Netherlands, national legislation does not require compensation for all cases of biodiversity loss, stimulating interest in opportunities to develop voluntary offsets. Various initiatives started from 2008 to test mechanisms for voluntary compensation. In 2009, the idea of establishing a nature compensation bank was analysed. Furthermore, the Taskforce Biodiversity and Natural Resources (B&NR) collaborated with the international Business & Biodiversity Offset Program (BBOP) in order to support the development of voluntary compensation by companies and institutions. The Taskforce has developed the No Net loss Initiative with the aim to develop a programme of action for private sector companies. This initiative is still in an experimental phase.

Companies and other organisations may wish to consider voluntary offsets for a variety of activities and projects, such as those resulting in biodiversity loss:

- Outside protected areas;
- Outside the Netherlands;
- As a result of drivers other than land use change, such as emissions to air or noise which have impacts on biodiversity;
- As a result of supply chain impacts; and/or
- Through past activities.

There is increasing awareness and interest in voluntary offsets in the Netherlands, though initiatives are very new and under development, and actual demand is still limited. Whereas a number of companies were invited to join the No Net Loss initiative, only two pilot projects were in place by 2010. The No Net Loss initiative developed a methodological approach to assess the biodiversity footprint of a company and to determine biodiversity offsets.

In France, the habitat banking experiments currently being implemented can sell credits to developers, to meet the demand for compensation arising from a range of legal requirements, or to any stakeholder that wishes to support conservation action on a voluntary basis.

Internationally, a number of companies have introduced their own initiatives to offset their impacts on biodiversity. Many of these projects have been implemented by multi-national companies active in natural resource based sectors such as the minerals and extractive industries. Examples documented by BBOP include:

- The Ambatovy Project - a nickel extraction project in Madagascar – which seeks to achieve no net loss through a composite restoration and averted risk offset (BBOP, 2009g);
- PPRust - involving expansion of a platinum mine in Limpopo Province, South Africa with offset options including the creation and rehabilitation of a 5,398 hectare Bushveld reserve (BBOP, 2009h); and
- Akyem Gold Mining Project – in Eastern Region, Ghana involving offsetting the impacts of a gold mine through a proposed offset plan including 80 habitat hectares of net gain through species and habitat conservation within a 250-hectare offset site located within the Mamang River Forest Reserve (BBOP, 2009i).

Voluntary schemes of this nature may be motivated by a variety of factors, including:

- Concerns about corporate social responsibility and potential reputational benefits;
- Core business strategies, including the license to operate and access to markets; and
- Access to finance and lender requirements.

A summary of the business case for biodiversity offsets – as set out by BBOP – is given in Box 4.

Box 4 Biodiversity Offsets – the Business Case

Why should businesses voluntarily 'go the extra mile' and take on biodiversity offets? What's in it for them?

Many businesses are recognizing that their biodiversity impacts can lead to significant regulatory, financial and reputational risks as governments, financial institutions, and civil society increasingly expect developers to take full responsibility for such impacts. Benefits of voluntarily undertaking a biodiversity offset for a company include improved license to operate (through a better reputation with regulators, local communities and civil society as a whole), improved competitiveness and access to finance.

Project developers' access to finance will increasingly depend upon no net loss approaches to their biodiversity impacts. Revised Performance Standards issued by the International Finance Corporation (IFC) (the private sector arm of the World Bank) came into effect on 1 January 2012. Revised Performance Standard 6 concerns biodiversity conservation. Clients with an impact on 'Natural Habitat' are required, where feasible, to demonstrate 'no net loss' of biodiversity, and those affecting 'Critical Habitat' are obliged to demonstrate 'net gains' in biodiversity. The significance of the IFC Performance Standards is considerably amplified by the fact that the 73 financial institution members of the Equator Principles Association, together responsible for some 70% of project finance in developing countries, have committed to following the revised IFC Performance Standards.

Source: BBOP website - http://bbop.forest-trends.org/pages/business_case

6.2.5 Requirements for 'like-for-like or better' compensation

Offsets and habitat banking schemes vary in the extent to which they require like for like compensation of biodiversity losses, and the rules and guidelines used to apply like for like requirements.

McKenney and Kiesecker (2010) make the distinction between 'in-kind' offsets, involving similar habitats, functions, values or other attributes to those affected by the project, and 'out-of-kind' offsets which allow for different forms of compensation. In reviewing programmes in the US, Australia, Brazil and the EU, they found a general preference for in-kind offsets, as required, for example, for Natura 2000 sites and by Western Australia's Environmental Protection Agency. In Victoria, like for like compensation is only required where vegetation losses are of 'higher significance', and more flexibility and discretion can be applied by local planning authorities for losses of lower significance. A similar approach is adopted in US wetlands mitigation policy. Guidance for US conservation banking stresses that compensation for species must benefit the same species affected by the development, but not necessarily exactly the same habitats.

The BBOP (2012b) Offsets Design Handbook argues that an '**in-kind**' offset is generally preferable, but that '**out-of-kind**' offsets are appropriate in some circumstances. For example, the biodiversity to be impacted by the project may be neither a national nor a local priority, and other areas may offer potential biodiversity gains through 'trading up'; i.e. where the offset targets biodiversity of higher priority than that affected by the development project.

As well as the mitigation hierarchy, guidance for compensation for loss of fish habitats in Canada provides a '***Hierarchy of Compensation Options***,' with the following order of preference:

1. Create or increase the productive capacity of like-for-like habitat in the same ecological unit;
2. Create or increase the productive capacity of unlike habitat in the same ecological unit;
3. Create or increase the productive capacity of habitat in a different ecological unit;
4. As a last resort, use artificial production techniques to maintain a stock of fish, deferred compensation, or restoration of chemically contaminated sites (DFO, 2007).

Interviews conducted for this project suggest that, in general, wetland mitigation in the US has tended to involve a more flexible approach than schemes in Australia in determining whether 'like-for-like' compensation is required. Practitioners in the US consider that flexibility in assessment approaches is a core strength of the US framework and enable appropriate, site and context specific outcomes to be determined, with negotiation and adaptability seen as key to the success of conservation outcomes. This contrasts with the Australian preference for structured planning techniques, albeit within a market-led system that is generally supportive of development.

McKenney and Kiesecker found little or no support in offset schemes for 'very out-of-kind' forms of compensation, such as funding for conservation training and education. US federal guidance on the use of in-lieu-fee arrangements for wetlands specifically rejects such approaches, stating that any funds collected should be used to replace wetland functions and values. An exception is the Brazilian industrial offsets programme, where offset payments may fund conservation expenditures not linked to the environmental impacts caused. However, they also noted a trend away from strict requirements for in-kind offsets located as close to impact sites as possible, in favour of identifying the most environmentally preferable offset options within the watershed or landscape. While these changes in policy could improve conservation outcomes, they argued that further guidance is needed, for example in determining whether out-of-kind offsets require a ''trade up'' in conservation benefits compared to in-kind options, the criteria and standards needed for watershed/landscape planning, and the approaches for offsetting ecosystem service impacts, given that service benefits tend to be tied closely to location and that people benefiting from such services will benefit less from offsets located far from the impact site.

Examples from the EU also demonstrate that, while 'like-for-like' compensation is normally preferred, sometimes a flexible approach can help to deliver enhanced conservation outcomes.

In the Netherlands, there was until recently a requirement to compensate 'like-for-like' the loss of habitat or species (with another habitat or species or with qualitative improvement of the remaining biodiversity) and in an area as close as possible as the lost habitat. A working group was established in 2010 to discuss possible improvements to the nature compensation framework and see if habitat banking could play a role, and this led to modification of regulations under the Nature Conservation Act to facilitate the wider use of offsets and habitat banking. For the project to extend the port of Rotterdam, a new habitat, similar to the one which was destroyed, was created 20 km away, involving qualitative compensation, for loss of protected nature values.

In Sweden, there is a presumption in favour of 'like-for-like' compensation wherever possible, and the Environmental Code places 'like-for-like' compensation above 'like-for-unlike' compensation in the mitigation hierarchy. However, the onus on compensating the local population affected by the development can result in a wide range of compensatory options being considered, particularly in urban areas where opportunities for biodiversity compensation may be limited. This can result in highly 'like-for-unlike' compensatory measures in some cases, such as habitat protection (rather than restoration or recreation) schemes, and even investments in cultural or recreational assets.

In England, guidance states that 'like-for-like' offsets (involving creating or restoring the same type of habitat) will usually need to be applied for impacts on habitats of high distinctiveness (Defra, 2012c). Habitats are categorised by the Integrated Habitat System (IHS) and have been assigned to three distinctiveness categories using criteria defined by Treweek Environmental Consultants, which include parameters such as species richness, diversity, rarity (at local, regional, national and international scales) and the degree to which a habitat supports species rarely found in other habitats.

6.2.6 Metrics to assess offset requirements

An important element in any offset scheme is the method used to determine the extent of conservation activity required to offset biodiversity losses. Key elements of metrics are:

- Biodiversity counts and measures (what is being exchanged, or lost and gained);
- A currency constructed from these data (how much of what is being exchanged);
- An accounting model defining offset specifications (how much of what is needed); and, separately from the metrics themselves,
- Spatial information to identify potential offset locations (where).

Different approaches to selecting and using metrics have been applied internationally, ranging from using area with a simple multiplier (or ratio) as the metric for compensation actions, to the use of fairly subjective professional judgements by experts, or more sophisticated metrics based on particular assessment methods.

Current good practice is to use a simple approach that reflects not only the area affected but changes in condition or quality of the biodiversity lost or gained. There are many 'area x condition' metrics in use around the world, which are really variations on a theme. A well-known approach is 'habitat hectares' in Victoria, Australia, where the unit combines area and condition or quality of the habitat.

As more sophisticated modelling methods are developed and more data on species' abundance, condition and persistence become available, it may be possible to develop metrics based on combined data for changes in many species' populations in the same area. For now, simpler approaches based on area and condition of habitats supplemented with information on particular species of concern are more feasible.

On top of the basic metric, it is common to apply multipliers to take into consideration a number of factors such as:

- uncertainty in offset success;
- particular national or regional conservation targets and rare / threatened biodiversity components;
- time discounting and time preference; and
- dealing with out-of-kind offsets.

McKenney and Kiesecker (2010) note that the currency used may incorporate values associated with ecological functions, quality, and integrity, rather than being based simply on land area. With a currency established, ratios can be determined for the number of credit units that must be provided through an offset to compensate one unit of loss at the project site (e.g. 3 to 1 ratio). US offset guidance calls for the incorporation of ecological values as far as possible, but allows also for offset transactions based on land area alone. For example, US conservation banking calls for credit units that reflect ''a species' or habitat's conservation values'', with these values based on biological criteria, habitat types, and management activities, but allows that ''in its simplest form, one credit will equal one acre of habitat or the area supporting one nest site or family group''. Likewise, US wetlands mitigation regulations require compensatory mitigation to be sufficient, to the extent practicable, to replace lost aquatic resource functions, based on a functional, condition, or other suitable assessment method, but requiring a minimum one-to-one area or linear compensation ratio where this is not possible.

While areas of habitat most often provide the most appropriate currency for determining offset requirements, species based offsets may be based on numbers of the species itself (Box 5).

Box 5 Species-based currency for offsets in Wyoming

A recent study undertaken in Wyoming sought to determine a currency for offsetting energy development impacts, specifically in relation to Greater Sage-Grouse a focal species of high conservation concern. The study found that, in this instance birds, rather than habitat should be used a common and biologically-based currency for estimating sufficiency of offsets.

The authors contend that with birds as currency it can be implemented immediately and allows industry to add biodiversity costs to their balance sheets through off-site mitigation. This offsite mitigation then enables other risks to be mitigated. The authors suggested that one such measure could be buying back oil and gas development rights and juniper encroachment treatments. They note that the monetary costs of protective conservation measures can be high and that cumulative easement costs were estimated at $47-$90 million with average costs ranging from $600 - $1000 per acre to mitigate the impact on sage-grouse of a multistate transmission corridor in Idaho and Montana.

Source: Doherty et al 2010

Within the US wetland mitigation programme, there is no standard method for calculating credits, and different states use a wide range of different metrics and approaches. Credit requirements may be assessed for different types of ecosystems and conservation measures, and may be based on acreage, a functional assessment method, or a combination of the two. The lack of common methodologies or standard units makes it difficult to compare credit requirements or prices between states (Madsen *et al*, 2010).

Several states have simply defined wetlands mitigation ratios based on the type of compensatory action. These can vary widely from state to state. For example, Ohio's ratio is 1:1 for wetlands restoration and creation and 2:1 for enhancement and preservation actions, whereas New Jersey's ratio is 2:1 for restoration actions and Michigan's ratio is 10:1 for preservation (McKenney and Kiesecker, 2010).

Similarly, in Canada, an audit by the Auditor General in 2009 reported that the policy on fish habitat compensation provides little guidance to regulators as to how to calculate impact and compensation; there is no national guidance on compensation ratios. As a result, fish habitat compensation has regional differences in calculations and compensation ratios which makes accurate compensation difficult if not impossible (Madsen *et al*, 2010).

In Australia, the ‘‘habitat hectares’’ method is widely used. This effectively involves multiplying the area of a site by a measure of habitat quality to give a score based on habitat hectare units. Habitat quality is measured through assessments of site condition and wider landscape context, which use a wide range of attributes (related to structure, composition and function) to compare remnant native vegetation to a benchmark for the same vegetation existing in a mature and long-undisturbed state. In general, Australia’s methodology has received positive comments, especially for its transparency and relative simplicity, but it is also widely acknowledged that there are areas requiring improvement particularly in classification of vegetation benchmarks (Bekessy *et al.*, 2010; McCarthy *et al.*, 2004)

In the Western Cape, South Africa, the approach is to consider any environmental offset on a case by case basis. The proposed offset system is based on area-based compensation noting that in some instances monetary compensation may be appropriate. Monetary compensation may comprise contributions to an accredited biodiversity conservation trust for the purpose of acquiring and managing priority habitat for biodiversity, and/or providing funds to expand or manage public protected areas.

McKenney and Kiesecker (2010) argue that all three approaches that are used to determine compensation ratios are problematic:

- Pre-defined ratios may simplify the offsets implementation process but may result in under-compensation or over-compensation depending on individual circumstances;
- The use of single assessment methods to determine ratios is likely to be inadequate for addressing the wide range of possible impacts and offset opportunities, as well as restricting innovation; and,
- Subjectively determined ratios based on professional judgement (of regulators and others) may be *ad hoc* and opaque, making it difficult to ascertain the degree to which decisions are science-based and unbiased. The lack of a structured and transparent framework may lead to a loss of time- and cost efficiencies.

They argue for a more structured, transparent, and defensible accounting framework that focuses on additionality, probability of success and time-lag to conservation maturity.

Within the EU, Natural England has developed a set of metrics for biodiversity offsetting designed to assess the equivalence of gains and losses and hence to calculate compensatory requirements (Defra, 2012c, see Box 6). These metrics are being trialled in six pilot areas of England. Critics of the English metrics argue that the use of habitat scores is subjective and may not ensure no net loss.

Box 6 Metrics for biodiversity offsets in England

The English metrics are based on areas of habitat and apply ratios to take account of:

- **Habitat value** – taking account of the relative distinctiveness of the habitats lost and gained as well as their condition. Each hectare of habitat is given a score based on distinctiveness x condition (Table 1);
- **Risk and uncertainty** – taking account of the fact that we can know what biodiversity is being lost as a result of development but that creating or restoring habitat is always subject to risks that the offset will fail to deliver habitat of the expected quality. Ratios are therefore applied to calculate offset requirements based on levels of risk (low = 1, medium = 1.5, high = 3, very high= 10). Additional multipliers are applied to account for locational risk;
- **Time preference** – taking account of the fact that we would prefer to have a given amount of biodiversity now rather than at some point in future. While the loss of habitat due to development is immediate, creation or restoration of habitats may take many years. The metrics

take account of time preference by calculating ratios to be applied to future benefits, based on a 3.5% discount rate. Offset schemes which take 20 years to reach target condition are subject to a multiplier of 2.8, while a maximum multiplier of 3.0 is applied to schemes that take 32 years or more to reach target condition.

Table 6.2 Matrix showing how condition and distinctiveness scores are combined to give the habitat score for a potential offset

		Biodiversity Distinctiveness		
		Low (2)	Medium (4)	High (6)
Condition	Optimum (4)	8	16	24
	Good (3)	6	12	18
	Moderate (2)	4	8	12
	Poor (1)	2	4	6

Impacts on habitats of high distinctiveness will normally require 'like for like' offsets (i.e. restoration or creation of the same habitat type). For habitat of medium distinctiveness, the offset should largely be made up of habitat from the same distinctiveness band or higher (i.e. habitat from the medium or high distinctiveness band). Where the habitat lost was low distinctiveness, the offset project should involve a 'trade up' in distinctiveness (i.e. be largely made up of habitat from the medium or high distinctiveness band). This approach reflects the guiding principle that offsetting should result in an improvement in the extent or condition of the ecological network.

Overall, offset requirements will be greatest where habitats of high distinctiveness and quality are lost through development, where restoration or re-creation takes a long period of time, and where there is significant risk and uncertainty regarding the conservation outcome of the offset.

Metrics are also applied to hedgerows, which, are important in England and which, as a linear feature, are not amenable to area based metrics. Hedgerows lost to development need to be replaced on a 1:1, 2:1 or 3:1 basis depending on whether they are of poor, medium or high quality respectively.

Similar criticisms to those of McKenney and Kiesecker have been levelled at other methods of assessing offset requirements in the EU. For example, in **France** equivalency is often calculated in terms of surface, often with reference to the requirements of previous projects, and without taking into account functionalities and effects on ecosystem services. There is concern that wider application of habitat banking, if based on simple units of exchange, could exacerbate these problems. However, improved understanding of compensatory requirements has led to different consultants developing new methodologies (e.g. for the calculation of equivalency, for ecological evaluation, for ecological measures) – this has led to a wide variety of approaches with a lack of knowledge sharing and standardisation. One interviewee called for the elaboration of standardised methodologies and shared technical guidance to address this issue.

In **Sweden**, there are no official methods to assess offset requirements. Some local authorities (Stockholm, Gothenburg, Helsingborg, Örebro and others), however, have developed their own guidelines, with varying degrees of sophistication. These municipalities have set up interdisciplinary working groups, drafted theoretical studies and developed evaluation methods (which in most cases are similar to German approaches).

The municipalities of Malmö, Lund and Helsingborg have developed a factor based method for determining the value of offset needed. Various biotope types have been assigned values/factors from 0.01 (sealed soil) up to 0.9 (deciduous forest with certain tree species). Scrubs, bushes and/or herbs raise the woodland biotope types by 0.1. The same points will be given to a biotope type if a species worthy of protection exists at the site. The maximum

value/factor is 1.0. In order to calculate the offset amount, the area of the affected sites in m^2 is multiplied by the site's specific biotope factor. Ten per cent of the value is then added on top to account for the maintenance responsibility of the developer. This method of calculation can be reversed to calculate the gain when creating offset biotopes. Other damaged environmental values and functions, as well as landscape and cultural heritage values, are analysed separately. In the case of damage to Natura 2000, more strict metrics tend to be used. For example, in one case 40 ha of wetlands had to be created for each hectare of wetland lost.

In most cases, uncertainties are acknowledged by using a greater than 1:1 compensation factor. It is also worth noting that in some examples, municipalities use higher compensation factors for developments in urban areas than those in suburban areas. Usually, developers propose a method of compensation and then this is assessed by the authorities. Details therefore, of the nature and type of compensation, are generally determined on a case by case basis. One of the interviewees noted a concern that this ad-hoc approach is not very scientific or rigorous and can lead to suboptimal compensation. Compensation requirements tend to be less rigorous outside protected areas and, where negotiated, may reflect the bargaining positions of the authorities and the developer, and the value of the development, as well as the biodiversity value of the land affected. This flexible approach may create uncertainties for the developer and affect the robustness of compensatory requirements.

Guidelines are typically produced by the relevant national authority, in this case the Swedish Environmental Agency. However, the EPA has been reluctant to develop these guidelines due to a perceived lack of demand / practical experience on which to base the guidelines, and also due to a concern that compensation may be used as a 'licence to trash'.

The Netherlands also lacks a uniform methodology for estimating biodiversity offset requirements. Regional government bodies are responsible for determining how biodiversity offsets should take place. Each regional government body uses its own set of criteria within the broad criteria set by the respective legislative schemes. The recent decentralisation process has given provinces more responsibilities for implementing compensation. Interviewees commented that a more standardised system (such as Germany's eco-points) would enhance transparency and encourage offsets provision. It was argued that this should include improved methodologies for evaluating the baseline, as well as determining the need for compensation, based on damage to nature, and could help to harmonise the methods used by mandatory and voluntary offset schemes.

Overall, therefore, we can conclude that there is still much to be learnt in the development and application of metrics. There is a significant challenge in developing metrics that are both scientifically robust (and hence able to deliver no net loss) while also being practically workable, cost-effective and transparent.

6.2.7 Criteria for assessing additionality

In order to achieve no net loss of biodiversity, offsets must be designed to ensure that they result in additional conservation outcomes to what was expected in their absence. The criteria applied to assess the additionality of offsets are therefore an important design element of the policy.

These criteria may relate to:

- Allowable conservation actions – such as habitat restoration, re-creation and averted risk. In some countries mere protection of biodiversity may not qualify as an activity that can be included in offset schemes, while in others it may be eligible subject to certain criteria (e.g. that it protects sites otherwise at significant risk and does not contribute to the fulfilment of existing regulatory requirements);
- The funding of conservation activities – with publicly funded activities often excluded from offsets and habitat banking schemes.

McKenney and Kiesecker (2010) found that additionality is a widely held principle of the frameworks they reviewed. For example, US conservation banking guidance states unambiguously that land used to establish conservation banks must not be previously

designated for conservation purposes. Offset regulations in New South Wales, Australia call for offsets to be additional to actions or works carried out using public funds or to fulfil regulatory obligations.

Additionality may be achieved through a wide range of conservation actions, providing these deliver conservation benefits that would not be achieved in the absence of offsets. For example:

- Native vegetation programmes in Australia may include re-vegetation, regeneration, restoration, enhancement, removal of threats, improved management (e.g., control of weeds), avoidance of further permitted impacts (e.g. stock grazing), and protection.
- US conservation banking relies on a ''range of strategies'' including ''preservation, management, restoration of degraded habitat, connecting separated habitats, buffering of already protected areas, creation of habitat, and other appropriate actions''.
- US wetlands mitigation favours restoration over other compensation options, on the grounds that it offers a greater likelihood of success compared to establishment, and greater potential gains in terms of aquatic resource functions compared to enhancement and preservation.' If restoration is not possible, wetland establishment, enhancement (e.g., water quality improvement), and preservation may be acceptable forms of compensation. Wetland preservation, however, is only an allowable option when the wetland resources proposed for preservation provide physical, chemical, or biological functions important for the sustainability of the watershed, the resources are under threat of destruction or adverse modifications, and the site will be permanently protected (McKenney and Kiesecker, 2010).

In Germany, habitat banking must be financed by private funds, and restoration projects funded by public funds cannot become habitat banks. Private institutions providing habitat banking may include private companies, foundations (e.g. Foundation for Nature Conservation in Schleswig-Holstein) and NGOs. Biodiversity offsets can consist in creation or restoration but not in conservation, which does not achieve no net loss of biodiversity.

In the Netherlands, additionality of gains is a legislative condition for mandatory compensation under the Dutch Nature Conservation Act (de Bie and van Dessel, 2011).

In England, Defra's principles state that offsets should be used to:

- Expand and restore habitats, not merely protect the extent and condition of what is already there;
- Contribute to enhancing England's ecological network by creating more, bigger, better and joined areas for biodiversity; and
- Provide additionality; not being used to deliver something that would have happened anyway.

In Sweden, conservation measures demanded by law or listed in management plans for protected areas are the responsibility of the authorities. This means that such measures should not be counted as additional when assessing the requirements of offsetting. However, one grey area relates to future planned restoration projects identified by local authorities, whose actual implementation may be uncertain (e.g. given funding constraints, political changes and therefore changes to priorities). There is some argument that these activities should be considered, especially where it may mean that funds are freed to invest in other environmental improvements. Moreover, the projects that have been identified, considered and prioritised by the local authority are likely to be projects which would deliver significant benefits compared to more *ad hoc* activities, having undergone a relatively rigorous assessment to be included in the list of priority actions.

One of the difficulties in assessing additionality is that the provision of offsets or development of habitat banks may take place prior to them being offered as compensation for a particular development project. Where existing projects are offered as compensation, there is a need for some means of regulating them to verify that they are genuinely additional and designed to achieve appropriate compensation for biodiversity losses. Such a means of verification is

important for offset providers, who need to be certain that their projects will be deemed to be additional in order to justify their investment. The lack of such an arrangement at present has been identified as a barrier to the development of offset providers and habitat banks in the Netherlands.

In the English pilot areas, offset providers who are starting work on a project in advance of knowing who will use the units, and hoping to supply units from it at a later date, are required to develop a Biodiversity Offset Management Plan which must be approved by Natural England before the conservation work is started. This will make it possible to demonstrate what additional biodiversity benefits have been achieved.

Similarly, in France, the Ministry of Sustainable Development has formally recognised the additionality of the habitat banking experiments that were launched in early 2012 and the pilot habitat banking experiment in Saint-Martin-de-Crau.

In England, given that offsets may be delivered by organisations such as Wildlife Trusts that undertook habitat restoration and creation projects prior to offsets being introduced, it is not entirely clear how additionality can be guaranteed (i.e. it may be difficult to prove that a particular project would not have taken place in the absence of the offset requirement). However, it could be argued that the availability of financial resources is one of the main constraints on conservation activity, and that offsets, by securing additional resources from developers, should therefore deliver additional conservation activity.

BBOP (2012a) stresses the importance of identifying baselines and trends in assessing additionality. It is important to check that the conservation gains planned through the activities at the offset site(s) would not have happened anyway, in the absence of the offset. By comparing how the biodiversity components are predicted to change under the status quo scenario with how they would change under the offset scenario, offset planners can calculate the expected conservation gain. This can enable them to compare the relative value of the potential offset site(s) and the level of potential conservation gains that could be achieved at each.

6.2.8 Locational requirements

Offset schemes normally place geographical restrictions on the provision of compensation, which must be provided, for example, as close as possible to the impact site, or within a specific local area (often known in conservation banking terminology as the ‘service area’). The ‘service area’ may be set geographically, often with reference to the watershed or within an ecologically defined region, or it may be set by default by defining biodiversity credits with such precision that the same credit types will most likely only be found within a particular region. Local offsets are normally preferred, in terms of confidence in ecological equivalence given the uncertainties inherent in quantifying no net loss, and in terms of fairness so that those affected by the project benefit from the offset.

While offset frameworks are in broad consensus that compensation should take place within the affected areas, guidance differs on how proximate offsets need to be to an impacted site (McKenney and Kiesecker, 2010). For example:

- US wetlands mitigation policy has changed from requiring compensatory actions adjacent to the impact site to within the same watershed – this is less restrictive and allows larger scale and better planned projects with better consideration for the watershed context.
- US conservation banking guidance supports off-site banks where they are environmentally preferable or where on-site measures are not practicable. Banks are sited within a ‘‘service area’’ defined by the US Fish and Wildlife Service based on physical and ecological attributes such as watersheds, soil types, species recovery units, and/or species and population distribution.
- In Victoria, Australia the need for on-site mitigation for native vegetation impacts varies based on the quality of the vegetation proposed for clearance – the programme calls for ‘‘an adequate geographic link between losses and offsets,’’ but only requires offsets to be ‘‘as close as possible’’ when ‘‘higher significance’’ vegetation is affected.

- Compensation for damage to Natura 2000 sites must be within the same biogeographical region in the same Member State.
- Brazil's forest offset system calls for offsets to be within the same watershed, while its industrial offsets place no geographic boundary on the expenditure of offset funds, unless the industrial development impacts a protected area, in which case the protected area becomes the beneficiary.

In some areas, levels of development pressure and shortages of land make local compensation difficult, leading to pressure to extend the geographical limits for offset provision. This can raise both ecological and social concerns (Box 7).

Box 7 Housing Pressure in Sydney

In Sydney, in the State of New South Wales (NSW), current rates of development are exerting significant pressures on the biodiversity offsets system. The Sydney basin is experiencing a shortage of housing and increasing demand for land. This has led the NSW government to prepare planning proposals for urban growth areas. Two areas as part of the urban growth corridors have been planned under the Biocertification Programme where development is projected at a landscape scale and offsets needed assessed at an aggregate level; thus removing the need for project-by-project processing. It is anticipated that around 1,800 hectares of habitat will be lost and projects worth AUD 340 million (€286 million) in 2009-10 values will be delivered over a 30 – 40 year period to implement offset requirements – raised through infrastructure contribution levies (Madsen *et al.*, 2011).

Demand for offsets is outstripping supply with a reported shortage of 22,000 ecosystem credits and 5,000 endangered species credits (Ibid). Further, within the Sydney basin the most valuable ecosystem (Cumberland Plain woodland) is highly endangered and extensively cleared so remaining small and isolated patches are in competition for both offset and development, limiting market liquidity.

Due to the housing shortage and demand for land there is significant political pressure to look for offsets outside the basin, potentially generating contention over the conservation outcomes of the BioBanking scheme. Planning proposals in urban Sydney suggest that 'net gain' in vegetation can be achieved through sacrificing most vegetation within the urban growth corridor so long as vegetation is protected and restored elsewhere in the State of New South Wales. However, this assumes unrealistically that equivalent vegetation can be found elsewhere, and has further implications in terms of the connectivity of the landscape and the metapopulation dynamics and genetic diversity of species. Furthermore, there is concern that this approach will lead to an increasing separation between people and nature and a reduction in the provision of local ecosystem services to local communities (Bekessy *et al*., 2010).

In the Western Cape of South Africa appropriate 'receiving areas' for offsets have been defined which reflect conservation priority, based on a comprehensive process of spatial biodiversity mapping and threat assessment (Treweek *et al*, 2009).

Different approaches to the location of compensation are also evident within the EU. In Sweden, most compensation resulting from urban planning is implemented close to the development site and under the management of local authorities. There is a strong preference for compensation to benefit the same people who are affected by developments, which may limit the exchangeability of compensatory measures, as well as sometimes making it difficult to implement like for like compensation.

In England, the six offset pilots are operating at the county level or in metropolitan areas, through partnerships of local authorities. They are seeking to maximise the effectiveness of the delivery of biodiversity compensation through strategic targeting of offsets provision, designed for example to enhance the scale and connectivity of natural areas, rather than necessarily to provide compensation as close as possible to the impacted site.

There appear to be few examples of offset schemes working across national boundaries (i.e. involving damage incurred in one country being compensated for in another). However, this could be achieved voluntarily by companies taking action to offset their impacts. Eftec *et al*. (2010) envisaged that habitat banking could involve transactions between Member States of the EU, provided certain ecological, socio-economic and institutional criteria were met.

However, it is perhaps doubtful whether EU citizens would damage caused by development being compensated for through conservation actions located in a different Member State.

Offsets for impacts on species raise further interesting issues, particularly where compensatory measures may be more effective some distance from the impacted site. This may apply particularly in the case of migratory species with widely dispersed breeding and wintering grounds, for which offsets across national boundaries may be appropriate.

Locational requirements have clear implications for the viability of habitat banking. In general, very restrictive requirements are likely to be a barrier to the development of habitat banking schemes, since the demand for credits at a very local level may be limited and uncertain, while more flexibility regarding the distances over which credits can be traded will increase the liquidity of habitat banking markets.

6.2.9 Timing issues

The timing of provision of compensation is also a significant consideration in the design of biodiversity offsets and habitat banking schemes.

While project impacts cause immediate and certain losses, the conservation gains of an offset are often uncertain and may require many years to achieve. Indeed some habitat features and systems take decades or more to develop and mature, with the risk that they may never provide an equivalent conservation value as what was lost (McKenney and Kiesecker, 2010). Even where compensation measures are successful, the time taken may result in significant interim losses (Moilanen *et al.*, 2008).

These concerns may be addressed through:

- Habitat banking schemes, which allow for the initiation of offsets prior to project impacts, thus allowing some time for restoration and creation schemes to demonstrate progress and effectiveness and hence to prove that appropriate compensation is being delivered;
- Time discounting of conservation benefits when calculating offset ratios. Since a unit of conservation benefit is worth less in future than it is today, application of appropriate discount rates allows ratios to be calculated to determine the equivalence of current losses and future gains.

In theory habitat banking arrangements may allow offsets to mature and hence demonstrate conservation gains prior to impacts taking place, hence reducing risk and uncertainty. In practice, however, commercial realities mean that habitat banks will look to release credits as early as possible, and many trades are still therefore likely to involve significant risks and uncertainties, which will need to be factored into calculations of the numbers of credits required.

Indeed, habitat banking faces significant barriers and challenges, including:

- The difficulty of anticipating future compensation requirements;
- The up-front costs of establishing banks, which may not be reimbursed for many years; and
- The financial risks and uncertainties involved.

Given the time taken to establish effective habitat banking arrangements, a requirement for compensation to be fully operational prior to a project taking place is often unduly restrictive, especially in the case of new offset policies for which there may not be an established supply of offsets or habitat banking arrangements. The time taken to supply effective compensation may also call for flexibility in requirements – for example allowing trading up through unlike-for-like compensation in the absence of established like-for-like offsets.

For these reasons, offset policies for Australian native vegetation and US wetland mitigation tend to take a flexible approach to the timing of project impacts and offset benefits. For example, in Victoria, Australia temporal issues are factored into scoring, depending on when offsets are initiated. Under the BioBanking scheme in New South Wales, biodiversity credits are issued and can be sold on the open market once a BioBanking agreement has been

approved. US wetland mitigation allows for credit releases in accordance with the achievement of specific milestones. Before an initial allocation of credits can be sold, a wetland bank or offset project must have a secured site, an approved mitigation plan, and other assurances need to be in place. Additional credits can be transacted as the bank/offset achieves ecological and performance-based milestones set out in its credit release schedule. This schedule should reserve a significant share of the total credits for release only after full achievement of ecological performance standards. Advance credit release is very common for US wetland mitigation banking, and it has been estimated that about 90% of US wetland banks sell some credits before achieving any performance standards (McKenney and Kiesecker, 2010).

In the EU, compensation for damage to Natura 2000 sites normally has to be operational at the time when the damage takes place, unless it can be proved that this simultaneity is not necessary to ensure the contribution of this site to the Natura 2000 network.

In England, the current biodiversity offsets pilot deals with timing issues through the metrics used to assess the equivalence between gains and losses. Ratios to gain future benefits and current losses are calculated using a 3.5% discount rate. This means that a project that takes 10 years to deliver target condition will have a time multiplier of 1.4, a 20 year project will have a multiplier of 2.0, with a maximum multiplier of 3.0 assigned to a project taking 32 years or more. In other words, an offset that delivers a similar gain in habitat quality per hectare in 40 years' time as that lost through the development project will require 3 hectares of offset to each hectare lost. These time multipliers are combined with metrics for changes in habitat quality, risk and uncertainty to assess overall offset requirements (see Box 6 above).

In the Netherlands, there has been discussion about the need to offset historical losses of biodiversity. Full provision of compensation for historical biodiversity loss is judged not realistic, because of the difficulty to determine who should take responsibility for historical losses (de Bie and van Dessel, 2011).

6.3 Arrangements for Implementation

The implementation of biodiversity offsetting and habitat banking schemes carries some risks and uncertainties (see, for example, Section 5.5). These can be significantly reduced by having appropriate arrangements for implementation, and by ensuring there are appropriate safeguards in place.

This includes, for instance:

- A strong regulatory and legal framework;
- Having clear roles and responsibilities between different actors and agencies;
- Using well-designed and effective standards and performance criteria;
- Using certification and/or accreditation systems;
- Ensuring that appropriate and effective systems are in place for monitoring, reporting and evaluation;
- Ensuring that there are effective options for enforcement in the case of non-compliance; and,
- Having contingencies in place in case of failure and ensuring that management takes a long-term view.

All these elements not only reduce risks and uncertainty, but also increase the effectiveness of habitat banking / offsetting schemes. These elements, as well as others, are discussed in more detail below.

6.3.1 Institutional arrangements

The overall institutional arrangements need to be effective and based on clearly assigned responsibilities, in order to successfully implement an offsetting or habitat banking scheme. This includes, for instance, regulation, monitoring and enforcement; certification of suppliers; provision of offsets and habitat banking services; and oversight of market transactions for offsets or credits.

Treweek (2009) finds that experience worldwide reinforces the fact that successful implementation of biodiversity offsets depends crucially on arrangements that provide stakeholders with clearly defined rules and objectives, and are legally, institutionally and financially secure. Eftec *et al.* (2010) also note the importance of strong governance arrangements, stating that the establishment of an effective and robust institutional framework with well-defined roles and responsibilities is essential for offsetting to work, and is even more important if a habitat banking scheme is to be implemented. In situations where roles and responsibilities are not clearly defined or where there is duplication, the effectiveness of implementation can be reduced.

The importance of adequate institutional arrangements was highlighted by stakeholders with regard to the experience in South Africa. One interviewee noted that it is much more likely that the design and implementation of offsets, particularly at a provincial level, is hindered by the lack of effective and inefficient administration and management, rather than because of any technical issues (e.g. on the metrics or calculation of requirements).

Given the range of potential stakeholders involved in delivering an offset or habitat banking scheme, arrangements can take many different forms, as there are a variety of approaches and institutional roles. Stakeholders include not only government (at national, regional and local levels) and the developer, but may include entities which as act as separate providers (e.g. NGOs) or brokers (who bring together developers and providers), as well as, for instance, local community groups and donors.

Different actors may be responsible for different elements across the management, operational and monitoring stages of a scheme. In its Biodiversity Offset Implementation Handbook (2009d), BBOP provides a detailed analysis of the advantages and disadvantages of involving different types of actors in the different stages of implementation. As stated in the BBOP guidelines, national conditions and the specific nature and location of the biodiversity offset will play a significant part in determining which stakeholders should be involved in the offset design process.

Offsets can be provided by a range of actors, including developers themselves, other landowners, NGOs, conservation organisations, government bodies or dedicated providers. Evidence from the EU suggests that developers tend to act as providers and play an active role in the compensation. Developers are, for instance, typically responsible for financing the measures as well (e.g. as in Spain) as well as usually being responsible for designing, implementing and managing the activity. This may be a result of the fact that systems are still largely voluntary and ad-hoc.

This is, for instance, the case in Sweden, although here there are rare occasions where the public authority will administer and manage the activity, funded by the developer. It should be noted, therefore, that public authorities and agencies can also play an important role not just as regulators, but also can also potentially act as a provider of offsets (subject to additionality), as a broker, buyer or seller, and can also design and implement offsets.

In Germany (as in South Africa), most pooled offsets are delivered and managed by local government administrations given their strong existing capacity for biodiversity management and policy planning, but some are delivered by private companies or third sector organisations. More options are available to a developer in the US, including incorporating all necessary offsets within their own development parcel or land, going through a mitigation or habitat bank, or paying into a fund (in lieu fees) to provide off development site offsets. Madsen *et al* (2011) explain that nationally in the US most mitigation is still sourced from permittee mitigation (67%), followed by mitigation banks (26%) and then in lieu funds (7%).

It was noted by one interviewee that implementing a more formalised habitat banking system, where the developer is no longer as actively involved in the provision of the offset, may limit the sense of responsibility of developers and may increase the sense that compensation is essentially a 'licence to trash'. Because of these concerns, France has made it clear in non-binding national guidance that the developer remains responsible for the compensatory measures in terms of their conception, implementation and effectiveness, even this is entrusted to a provider (including habitat banks).

In some cases government may be the only stakeholder who has any contact with the developer, for instance where compensation is related to the protected area network or where the developer also acts as the landowner and is responsible for the active implementation and management of the activity. However, findings from this study indicate that currently in the EU, most compensation involves three key parties: government, the developer and a landowner. Providers, as a separate stakeholder group, are still relatively rare.

The evidence suggests, however, that where it exists, offsetting activity in the EU is still quite basic (where a developer undertakes conservation actions to offset the impacts of its own project) compared to a more sophisticated system whereby offset credits are banked and or traded (Treweek, 2009). This can be challenging and expensive for the developer, although does mean greater control over the process and its cost.

Aside from government, developers, and landowners, the evidence suggests that other key stakeholders who are typically involved in some offsetting activities include consultants and experts (whose help is often sought to determine the amount of compensation required) and local community groups. Consultants and experts are, for instance, often used in Sweden where there is no standard methodology and compensation is determined on a case-by-case basis.

Brokers can also play an important role, by, for instance, helping to minimise conflicts of interest that potentially arise when landowners, developers and local planning authorities come together to negotiate compensation for environmental impacts. In the UK, for instance, the Environment Bank Ltd (EBL) works with local planning authorities, developers and conservation groups, farmers and landowners. EBL provides a mechanism for creating, managing and enhancing habitats and landscapes by engaging with developers and landowners. It works with offset providers such as farmers, landowners, wildlife trusts and public agencies (e.g. the Forestry Commission and Environment Agency), matching them with developers. The online Environmental Markets Exchange (EME) allows conservation groups, farmers and landowners to register their wildlife sites so as to provide 'Conservation Credits'. Credit sales are backed by legal agreements. EBL also helps developers to calculate their impacts and offset requirements, whilst also monitoring and ensuring the long term delivery of management plans.

Local level engagement, through for instance, community involvement can also be very important. Specifically, it can help to increase ownership and support of an offsetting project. For instance, a lack of adequate consultation with local community and stakeholders groups can create difficulties for projects if the necessary public support for the process and activity is lacking. This was noted by interviewees, for instance, as being a key issue in Germany, where a lack of public acceptance can hinder the completion of a project.

There can be a tension between the principle of stakeholder participation in determining impacts and mitigation (including offsets) and the principle of securing no net loss. On some occasions, this has led to compensation activity offering little biodiversity benefit, despite being located close to the site of development. In Sweden for instance, damage to biodiversity can be compensated for by investment in cultural or recreational values instead given the presumption in favour of compensation close to the affected site. Moreover, in other cases the inclusion of too many stakeholders can result in an inefficient and unmanageable implementation of the project (BBOP, 2009f). BBOP's Principles, Standard and Handbooks point to ways to resolve this dilemma, through the use of composite offsets and metrics which first provide for 'no net loss on the basis of like for like or better' and supplement this with any compensation needed to put communities affected by projects or

offsets in at least as favourable a situation with respect to use and enjoyment of biodiversity as they were before (BBOP, 2012a-d; BBOP, 2012b; BBOP, 2009b, 2009c, 2009f).

Although NGOs have the potential to play a significant role in the process, in most EU Member States they are not currently very active in the design, implementation or monitoring of offsets.

6.3.2 Regulators

The role of regulators and public authorities is especially crucial for an offsetting or habitat banking scheme to be successful, without which, for instance, implementation of the mitigation hierarchy may be weak, compensation actions may be inappropriate, ineffective or completely lacking, or there may be limited additionality.

There should, therefore, be specific arrangements for the regulation of offsets, to ensure that requirements are properly met and the necessary conditions are adhered to. This includes, for instance, receiving and checking applications, advising on requirements, granting approvals, monitoring adherence to conditions, and taking appropriate action in the case of non-compliance. Specifically with regard to habitat banking, this will require approval of providers and regulation of the purchase and sale of credits.

Government therefore has, arguably, the most important role to play to ensure the success of biodiversity offsets (BBOP, 2009a, 2009d, 2009f; Crowe and ten Kate, 2010), by defining clear environmental targets and performance indicators, establishing an enabling framework of incentives and/or property rights to stimulate demand for and supply of environmental services, and ensuring fair and transparent monitoring and enforcement of the rules (Treweek, 2009).

Potential regulators at the EU level have a particularly important role to play in establishing a clear and consistent framework for offsetting. National regulators would also have a significant part to play in translating an EU level framework into the national context. They could also usefully establish an enabling framework of incentives and/or property rights to stimulate demand and supply. Nonetheless, local/regional authorities also have a significant role in translating and implementing requirements to suit the local context and conditions, and could be especially important in monitoring, evaluating (and potentially enforcing) requirements. In countries with a strong federal element (e.g. Germany), regional/local authorities will be particularly significant.

Statutory functions can 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. In the US, for instance, the administration of the federal legislation (including the preparation of guidance and policy) falls across multiple agencies, including the US Army Corps of Engineers, the US Environmental Protection Agency and the US Fish and Wildlife Service. Moreover, application of the requirements vary between different States depending on the nature of development and are developed in a case by case basis using the available federal guidance but also the requirement for engagement with government departments throughout the duration of the development process.

In Australia, the Minister for Sustainability, Environment, Water, Population and Communities and their department are responsible for the administration of the national legislative framework, which has also been integrated into legislation at the state level. The integration of national requirements with state legislation provides a robust framework where roles and responsibilities are also clearly defined. However, as noted by Eftec *et al* (2010) there is sometimes variation in the offsets applied by the different federal states. The Australian government has acknowledged this and through the current review and reform process is working to integrate legislative requirements further as well as ensure consistency of application.

In several EU Member States, interviews highlighted the lack of clear guidance, political direction and support as being key factors which are currently hindering the success of

offsetting. Clear guidance is particularly important when offsetting is voluntary, which relates to most impacts outside protected areas in the EU. The importance of adequate and appropriate guidance is also borne out by the experience of the US, Australia, Canada and Brazil, especially in the following areas:

- Conformance with the mitigation hierarchy;
- Identifying the most environmentally preferable offsets within a landscape context; and
- Determining appropriate mitigation ratios.

From the evidence gathered from different Member States for this study, different public authorities in EU countries are involved in different roles, and are responsible for different aspects depending on the scale, type and location of the impact and compensation activity. For instance, although eftec *et al* (2010) note that a public nature conservation or environmental authority typically plays the main regulatory role, this is often limited to providing overall guidance and support, although such an authority may take a lead role if the case relates to compensation in a protected area. In Germany, the nature conservation agency plays an important role in ensuring that quality standards are adequately applied in each case. Nonetheless, on the whole across the EU, the most significant role tends to be played by local and regional authorities.

For instance in the Netherlands, the responsibility for compensation lies largely with regional government bodies, although increasing decentralisation has meant that provinces are becoming more involved in requiring and implementing compensation. Similarly, in Sweden compensation is regulated mostly at a local level, although some regional authorities can also play an important role. Use of the available provision under the Environment Code, which allows for compensation to be required, varies widely. At the local level, however, there are some examples of municipalities voluntarily requiring compensation under planning laws (despite them containing no explicit mention of compensation). A similar situation also exists in Germany, where each federal state is able to apply its own rules with regard to offsetting and compensation. In Spain, local Autonomous Communities are responsible for ensuring that compensatory measures are adequately implemented.

In the UK, responsibility for requiring and organising compensation (outside of protected areas) also lies largely with local authorities. Whilst some have robust policies and apply them rigorously, others appear not to and permit development in circumstances where consent should normally be withheld or be subject to requirements for compensation. At the national level, Defra produces guidance to support compensation (and offsetting more specifically) in England, while Natural England provides more detailed, local advice.

In California, the regulatory authority acts as the ‘check’ in the process to ensure that guidance and standards are followed. This tends to involve early and sustained engagement between the proponent and the relevant authorities to devise offsets that are acceptable to regulatory authority which has the ultimate responsibility to authorise the proposals. This system also means that more prescriptive guidance is not necessarily needed, as the regulatory authority is able to ensure the appropriateness of offset proposals and accordance with issued guidance.

Regulators may also appoint independent agencies to oversee the licensing of habitat banks and their operations. In the Schleswig-Holstein region of Germany, an agency was created to act as an intermediary between developers, authorities and nature conservation organisations. The Compensation Agency not only coordinates the development of habitat banks from the Foundation for Nature and other owners, who provide compensation areas and compensation measures, but also provides advice to the project developers in the search for suitable compensation areas, coordinates with relevant authorities and organises contracts.

Although most EU Member States have existing institutions able to oversee and manage a system for offsetting, eftec *et al* (2010) raise concerns that capacity constraints may limit their effectiveness. They highlight, for instance, that many conservation agencies are struggling to implement even existing conservation legislation (such as the designation and management of Natura 2000 sites) and other initiatives such as biodiversity action plans.

Staff capacity and capabilities in planning authorities were also raised by stakeholders interviewed in the UK.

In the US, weak government capacity has also been identified as a significant barrier to the successful implementation of mitigation arrangements. Treweek (2009) notes that the main bottlenecks and complaints about mitigation banking can often be traced to gaps in the regulatory regime, including inconsistent rules and treatment, and weak capacity on the part of regulators. This indicates that firm regulatory procedures are needed to ensure that compensation is provided and is of suitable quality. Efforts would therefore be required to raise the capacity, skills and resources of institutions in the EU to successfully implement and manage a habitat banking scheme.

There was broad consensus amongst stakeholders consulted for this study that a mandatory framework is needed in order for offsetting / compensation to occur at scale across the EU. Whilst compensation can be delivered voluntarily, it will not be sufficient to deliver NNL. Mandatory requirements enforced through regulation would create a more level playing field, be more manageable and fairer, and would create more consistent and transparent rules. All these factors will help to drive the development of a market in offsets. A regulatory approach may also provide the mechanisms for ensuring that the benefits are secured into the future (preferably in perpetuity). Currently there are few safeguards available to ensure that benefits from compensation are maintained and protected into the future.

6.3.3 Instruments and models

It is clear that many different mechanisms can be used to facilitate the delivery of offsets. These may range from individual negotiated agreements to habitat banking schemes in which offset requirements are met through the purchase of credits.

Experience in the EU is largely limited to individual agreements or conditions, rather than a more comprehensive habitat banking system. It seems the most common approach used by authorities is to include requirements for compensation as conditions attached to a planning permit, which are then legally binding. These conditions can also include requirements for monitoring and reporting, although this is not always the case. Eftec *et al* (2010) comment that these planning agreements (where they relate to compensation outside Natura 2000 sites) tend to be quite weak, and are not always fully enforced.

There are some cases where separate, legally binding, agreements can also be made. In Australia, for instance, developers are required to enter into an offset agreement, which acts as a formal agreement between the State as a regulator and the developer. Third parties can also sign the agreement, for instance, in their role as provider. Alternatively, a separate agreement can be entered into directly with the developer. The agreement itself covers a range of aspects, including for instance:

- a description of the impact that would be offset;
- the offset being provided to meet the offset requirement;
- timeframes and milestones for providing the offset;
- when the environmental impact would commence;
- the duration of the offset requirement;
- the offset management plan;
- the monitoring and reporting plan including environmental indicators to be monitored and regular reporting periods;
- any payments and contributions allocated for the offset, management plan and monitoring and reporting plan;
- reference to the mechanism for legally securing the offset; and,
- when and how the proponent's responsibility for the offset would be extinguished.

There are also examples of legal agreements being used in the EU. In the UK for instance, Section 106 agreements have sometimes been used. These can then involve not just the developer, but also third parties such as providers or separate landowners. Although these agreements can take much longer to negotiate and agree than is the case with planning conditions, they provide greater scope for formally involving a greater number of stakeholders (in the UK, planning conditions only legally bind the developer, and are not applicable to third parties) and have the potential to include a wider variety of terms, conditions and requirements.

In the EU, however, such formal legal agreements are rare. On the whole, it seems that using the planning system, and the conditions that can be attached to a planning permit, seems to be the easiest and preferred route in most cases. With regard to habitat banking, eftec *et al* (2010) note that comprehensive habitat banking agreements would have to be developed by authorities. These should cover all the necessary components, such as, the duration, management actions, rights and responsibilities of each party, monitoring, reporting and auditing requirements, contingency plans, performance standards etc. BBOP (2009) also recommend a similar type of agreement, sometimes referred to as a memorandum of understanding, which formalises the roles and responsibilities and lays down the general parameters for implementation.

Management plans can also be developed which specify, for instance, the measures to be taken during the offset to deliver biodiversity benefits. These sometimes sit alongside a legal agreement which ensures that the land will be used for conservation and that the management plan will be followed (as in Australia, above). BBOP (2012) states that it is good practice to require one or more plans to address the range of issues involved in designing and implementing compensation measures, and lists the recommended contents for a Biodiversity Offsets Management Plan (BOMP), including the performance, criteria and indicators linked to each aspect (Box 8).

Management plans are also used in the UK. Providers in the English biodiversity offset pilot areas will need to produce a BOMP to explain what they will do, to provide the evidence required by Natural England assessors and the relevant local authorities to examine the delivery of the proposed biodiversity outcomes. The plans will be assessed by Natural England and recommendations made to the relevant local authority, who will need to be convinced that the project is capable of delivering the proposed biodiversity offsets in a suitable location, before agreeing their use in delivering planning obligations for specific developments.

Box 8 BBOP (2012) - Suggested Contents of a Biodiversity Offset Management Plan

According to Indicator 4-1-4 in BBOP's Standard on Biodiversity Offsets, 'the Biodiversity Offset Management Plan (BOMP) describes the offset design and its intended conservation outcomes, and includes the evidence and assumptions used to predict that these outcomes will result from the offset activities described'. In fact, this document may have another name, and the issues may be covered in more than one document (including the Environmental Impact Assessment, Environmental Action Plan, Biodiversity Action Plan, and Offset Plan). Whatever approach is most suitable for the given project, one or more plans are needed that satisfy the assessor that all the requirements the Standard describes for the 'BOMP' have been met. Where there is more than one plan, they should be clearly cross-referenced and made available to the assessor together. As the layout of plans may vary, the following table offers an indicative outline only of the contents of the BOMP, and the specific criteria and indicators from the BBOP Standard that refer to it.

INDICATIVE POSSIBLE OUTLINE OF THE BOMP	RELATED INDICATORS IN THE BBOP STANDARD
Table of contents **Executive Summary (two pages)**	
Introduction ■ One or two-page summary about the project (location, sector, nature of activities, operator). ■ Developer's commitment to no net loss*, and rationale for this commitment (explanation of business case) ■ Intended conservation outcomes. ■ (* provided the project's impacts are capable of being offset)	4-1-4: documentation of the offset design and how offset will achieve no net loss 1-1-1: assessment of project's predicted residual impacts 1-1-2: application of mitigation hierarchy documented 4-1-1: publicly stated commitment to no net loss; 2-1-1: assessment of whether impacts can be offset
Description of project impacts: ■ Describe the key biodiversity components affected. ■ Describe the project's impacts on biodiversity (including direct, indirect, and cumulative impacts, as appropriate) including on the key biodiversity components identified. Include consideration of the intrinsic, socioeconomic and cultural values of biodiversity.	4-1-2: pre-project baseline characterised 4-2-1: key biodiversity components identified 1-1-1: the predicted residual impacts from the project on all affected biodiversity, including key biodiversity components, assessed and documented
Description of measures for avoidance, minimisation, rehabilitation/restoration: ■ Describe the measures for avoidance of impacts, including those taken to avoid impacts and risks to highly irreplaceable and/or vulnerable biodiversity ■ Describe the measures for minimisation of impacts ■ Describe the measures for rehabilitation/restoration	1-1-2: application of mitigation hierarchy documents avoidance, minimisation, and rehabilitation / restoration measures 2-1-1: assessment of risk that impacts cannot be offset (highly irreplaceable or vulnerable biodiversity)
Description of residual impacts: ■ Describe the residual impacts on biodiversity, after avoidance, minimisation, rehabilitation/restoration.	1-1-1: assessment of project's predicted residual impacts 4-1-2: quantification of residual losses relative to pre-project baseline

■ Describe the level of risk that any of these residual impacts are not capable of being offset.	2-1-1: assessment of risk that impacts cannot be offset 2-1-2: the risk assessment demonstrates how the impacts can be offset, accounting for uncertainties
Description of offset design: ■ Describe how stakeholders were identified and involved in offset design, and the results of their involvement ■ Describe the metrics selected and the rationale for doing so ■ Describe the offset site(s) selected and the rationale for doing so ■ Describe the offset activities selected and the rationale for doing so	6-1-1: relevant stakeholders identified and informed 6-1-2: stakeholder consultation and participation in design and implementation 6-1-3: roles of stakeholders defined 7-1-1: agreements established with relevant stakeholders 2-2-2: selection of methods and appropriate metrics documented, and rationale explained; 4-1-4: describe and document offset design (including location) and provide rationale for design 3-1-1: identification of offset sites in context of landscape level analysis 4-1-3: offset gains quantified relative to biodiversity baseline at offset site(s) 4-1-4: offset design described and rationale provided 4-2-5: loss-gain used in design and demonstrates no net loss 5-1-1: offset gains are additional 2-1-2: risk assessment demonstrates how residual impacts can and will be offset 9-1-2: implement a mechanism for independent review of offset design and implementation
Description of offset implementation: ■ Describe the roles and responsibilities of the different stakeholders involved in the implementation of the offset ■ Describe the institutional and legal arrangements for the implementation of the offset ■ Describe the financial arrangements for the implementation of the offset ■ Describe the milestones for implementation ■ Describe the measures for monitoring, evaluation and adaptive management of offset implementation ■ Describe the grievance procedure	6-1-3: roles of stakeholders in implementing offset 8-1-1: evidence for management and technical capacity of those implementing the offset 8-1-2: legal mechanisms in place 8-1-2: financial mechanisms in place 4-3-1: sources of uncertainty and risk, and measures to manage risk are identified 4-3-2: milestones for delivery of offset gains established and monitored 8-2-1: risk management measures are implemented, monitored, and risk is adaptively managed 8-2-2: outcomes are independently audited 8-2-3: a system for monitoring, evaluating, and reporting on success 6-2-1: system for handling grievances implemented
Reporting: ■ Describe the provisions for reporting on the implementation of the measures defined in this plan	4-1-1: public commitment to no net loss 4-1-4-: documentation of offset design and implementation 4-3-2: development of implementation milestones and tracking progress 8-2-2: outcomes independently audited 8-2-3: a system for monitoring and reporting on success 9-1-1: communication on baseline findings 9-1-2: mechanism for independent review and reporting

Offsets may also be guided by higher level strategies which set out the overall approach to offsetting in an area, providing a sense of direction and prioritisation. In England, for instance, local authorities involved in the biodiversity offsets pilots must develop an overall strategy which sets out the types of habitats the local authorities would like to see created through offsetting, and target areas for offset projects (e.g. linking together valuable wildlife sites, buffering watercourses). This information will be used by offset providers, to make sure they are proposing projects that the local authority is likely to accept as compensation. Strategies such as these, therefore, can help make sure offsets make the greatest possible contribution to improving and enhancing the ecological network.

Overall, eftec *et al* (2010) describe four main kinds of approaches for implementing biodiversity offsets (Table 6.2). In the EU, most compensation tends to be based on a principles-based approach, usually without any accompanying guidance. There are very few examples of the use of market mechanisms in the EU. However, one is in development in the UK through the Environment Bank, whilst experimentation with habitat banking in France is being implemented through the CDC Biodiversité project. A more developed system is evident in Germany, where compensation takes place in the form of 'compensation pools', which developed as an innovative solution in response to amendments in the Federal Building Code in 1998 (with the aim of optimising the enforcement and implementation of compensation measures in urban development planning) and the Federal Nature Conservation Act in 2002 (which resulted in a relaxed spatial and functional connection between impact and compensation). Compensation pools have also led to the need for, and development of, professional public and private providers of compensation services ('compensation agencies'). Full habitat banking schemes are operational in both the US and Australia.

In a principles-based approach, the provision of detailed guidance on the methodology and monitoring offsets is essential. This was highlighted as a key issue by interviewees in several Member States, including the Netherlands, the UK and Sweden. In Sweden, for instance, the lack of guidance is seen as a main factor preventing the widespread use of compensation. Guidance is particularly important on technical aspects, as well as the implementation of the mitigation hierarchy.

However, interviewees in some countries (e.g. Netherlands, US) also commented that, whilst guidance is necessary and useful, it also needs to be flexible enough to allow for changes to be made on a case-by-case basis. This was highlighted as being one of the main success factors in the US, where practitioners stated that flexibility in the assessment approach is a core strength of the framework and enables appropriate, site and context specific outcomes to be determined.

Table 6.3 Different approaches to implementing biodiversity offsets

Approach	Examples
Principles based approach with or without legal requirements and/or guidance	Several states in Australia Provincial Government of the Western Cape of South Africa Some EU Member States, e.g. Sweden, France, UK, Netherlands
Market mechanisms including systems of tradable credits or auction based approaches	State of Victoria, Australia: Bushbroker is a system of tradable credits Germany
Mitigation and conservation banks	In the US since 1970s, including wetland mitigation banks and conservation banks. Some examples in other countries but lower levels of implementation
Guidance on good practice	BBOP (2009) for businesses undertaking voluntary offsets and for other parties wishing to design or implement offsets

Source: eftec (2010)

6.3.4 Securing land for offsets

A significant factor affecting the delivery of the offset will be the laws associated with land ownership, as these determine who owns which land, security of that ownership and 'in perpetuity' considerations (BBOP, 2009b, 2009d). This will also affect whether an offset is best to be privately managed, managed by communities, or be delivered through a public-private agreement. The issue of how land can be secured for offsetting was consistently identified as a key area of concern by interviewees in Member States (e.g. Netherlands, Sweden, Germany, France).

One interviewee noted that problems can arise, for instance, if arrangements for delivering the offset are only decided after the conditions are set down in the permit. The conditions that were decided may, for instance, not have taken into account any difficulties or constraints that may arise in terms of the availability or accessibility of suitable land. It would be preferable, therefore, to include considerations of how the offset will be delivered in the actual instruments that are used to set the conditions of the compensation.

There are a range of options available for securing land for compensation. This may, for instance, involve purchasing the site on which the compensation is to be carried out, leasing the land, or other models based on management arrangements with the landowner. BBOP (2009) also mention the use of covenants, easements or other rights that can be attached to land in perpetuity, to ensure land use is consistent with certain objectives (e.g. conservation) in the long term.

BBOP (2009d) note that biodiversity offsets can also operate through agreements with community members, delivering benefits to them in exchange for improvements in conservation practices and land management. Third parties, such as conservation organisations for instance, could be 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 (eftec *et al*, 2010).

Land can also be more forcibly acquired by requiring that it be included in the protected area network. By doing so, existing laws on the status of protected areas may determine how the offset will be managed and can help guarantee long term management (BBOP, 2009b, 2009d). This has, for instance, been necessary in one case in Sweden in order to ensure that land was available for the offsetting activity. This approach did, however, lead to conflicts with the landowner.

Very few countries seem to have specific mechanisms in place which would provide for land to be acquired for offsetting. However, France has a system whereby land can be acquired by Agencies for Land Development and Rural Establishment (SAFER agencies). SAFER agencies are not-for-profit organisations that are allocated missions of public interest by the Ministry of Agriculture and the Ministry of Finances. They are responsible for implementing aspects of public policies related to rural and peri-urban areas. Therefore, they have pre-emptive rights on land related to three main objectives, including the protection of the environment and landscape. As a consequence, SAFER agencies have recently become regularly involved in biodiversity offsets in order to offer expertise and organise transactions of land. SAFER agencies are also able to pre-emptively secure land for environmental protection interests. These areas can then be sold to developers needing areas for compensation. Moreover, SAFER agencies have also created a not for profit endowment fund of land for compensatory measures, which has been recognised by the French Ministry of Sustainable Development. One issue, however, is that there are no rules on prioritising the use of the land across SAFER agencies' three objectives (which include farming, forestry and local development). Given the potential conflict between different land uses and objectives, the agencies tend to look for win-win situations, but if that is not possible, the decision becomes more of a negotiation, which is decided on a case-by-case basis.

This system seems to have developed as a result of the need for land to be bought for compensation activities to take place. However, it is now possible for developers to contract land owners or other land-users to lease the land or manage the activity in their stead. This may ease some of the pressures.

6.3.5 Standards and performance criteria

The terms and conditions of the offset can include standards and performance criteria to determine whether the compensation delivers the necessary benefits. These are, therefore, especially important for building confidence in the offsetting activity, and for ensuring effective implementation.

For instance, in the US, a review of the effectiveness of the wetland mitigation banking system showed that wetland mitigation projects had not always satisfied the basic goal of restoring and maintaining the quality and quantity of the country's wetlands. Following this review the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers developed new standards to promote no net loss of wetlands and strengthened wetland restoration and protection policies (Treweek, 2009).

BBOP has developed a Standard on Biodiversity Offsets ('the Standard') to help auditors, developers, conservation groups, communities, governments and financial institutions to assess the design and implementation of a biodiversity offset against the BBOP Principles, Criteria and Indicators. It is similar in some ways to the approach used for other standards such as the Forest Stewardship Council, the Marine Stewardship Council, the Roundtable for Sustainable Palm Oil, and the Round Table on Responsible Soy.

Of particular relevance is the fact that the International Finance Corporation (IFC) has recently revised its Performance Standard 6 (PS6) on biodiversity conservation and sustainable management, which is a requirement for anyone seeking project finance from the IFC. PS6 took effect on 1 January 2012. It is a requirement of clients seeking project finance not only from the IFC, but from 2012[28] also from over seventy banks that have adopted the Equator Principles, and thus apply the IFC's Performance Standards (BBOP, 2012c). PS6 defines a set of circumstances in which companies will, in order to obtain project finance, need to achieve no net loss or even a net gain of biodiversity, using biodiversity offsets, where necessary as the last step in the mitigation hierarchy (no net loss is required, where feasible, for impacts on 'natural habitat', and a net gain is required for impacts on 'critical habitat').

Currently in the EU, however, the use of standards and performance criteria is relatively rare. In France, for instance, no standards are yet in place for determining the level and quality of offset activities. As a result, decisions on offsets vary from project to project, and can be very subjective. This also creates a disincentive for rigorous offsets to be implemented with a high level of commitment as there is no way of safeguarding against offsets which are, for instance, ineffective.

Interviews in the Member States indicate that performance criteria are typically decided on a case-by-case basis, and can vary widely in the extent to which they are used. In Sweden, for instance, one project in the Umeälven delta used 'geese-days' as a criterion by which to judge whether the project was delivering the required benefits for wetland birds. For affected virgin forests, standards were chosen which related to the area and amount of dead wood debris.

Germany, however, has a much more developed system, whereby high quality standards have been developed based on past experience. Under this system, a compensation pool

[28] The Equator Principles Association Steering Committee has agreed that the newly revised IFC Performance Standards will take effect for EP Association Members on 1 January 2012, just as they do for the IFC. Accordingly Exhibit III of the Equator Principles (which refers to the 2006 IFC Performance Standards) will be updated on 1 January 2012 to reflect their implementation by EP Association members under the current EP framework. The existing EPs (specifically Exhibit III) will refer to the revised IFC Performance Standards from 1 January 2012. The revised IFC Performance Standards should be applied by EP Association Members (as per the EPs) to all new and current project finance transactions when the borrower has commissioned an Environmental and Social Impact Assessment (ESIA) on or after 1 January 2012. The 2006 IFC Performance Standards can be applied to current project finance transactions when the borrower has commissioned an ESIA before 1 January 2012 on the proviso that it is completed by 30 June 2012. All new transactions after 30 June 2012 should apply the revised IFC Performance Standards. See: http://www.equator-principles.com/index.php/all-ep-association-news/ep-association-news-by-year/83-ep-association-news-2011/254-revised-ps

(i.e. compensation instruments which collectively provide 'compensation areas') should, *inter alia*:

- Achieve the technical legislative objectives, including implementation of the mitigation hierarchy;
- Define of clear responsibilities;
- Ensure appropriate land acquisition;
- Control property prices;
- Avoid competition with agricultural land use; and,
- Ensure wider acceptance of the measure being taken.

Further standardisation is also likely, especially with regard to the content, character and scope of compensation measures, removal of imperviousness, reconnection of habitats, management and maintenance, and the level and calculation of compensation payments.

In South Africa, proposals are being developed for a wetland habitat banking system, which reference the use of standards. The proposals mention the potential use a set of success criteria to evaluate the status of a habitat bank's performance, which should include multiple parameters that are geared to the diverse physical and functional attributes of wetlands, be determined by the bank sponsor using monitoring techniques that have been agreed to and documented in the banking instrument, and include performance 'thresholds' that can be explicitly linked by the authorising agency to certification of credits (SANBI, as quoted in eftec *et al* , 2010). The US has only relatively recently developed national guidelines for developing ecological performance standards. These came into force in 2008, which now ensures that approved performance standards are included in the mitigation plan. These can vary depending on the bank, but generally include:

- Administrative standards, e.g. securing financial assurances and submitting monitoring reports.
- Ecological performance standards, e.g. biotic (measures of plant density, cover by native or non-native invasive species, aquatic invertebrate density, and composition of fish assemblages) and abiotic (measures of soil conditions, hydrologic criteria, and nutrient thresholds) measures.

It has been recommended that these ecological performance standards be linked to monitoring periods, credit release schedules, and relief from legal and financial assurances (eftec *et al*, 2010). However, agencies tend to allow a percentage of a bank's anticipated credits to be debited before the bank meets all of its performance standards, although credits are, generally, thereafter released in phases as banks meet the performance standards.

6.3.6 Certification and accreditation

Certification systems help to build confidence in offset provision, particularly for providers intending to engage in a multitude of transactions, for example through habitat banking. Engaging in a transaction with a certified supplier therefore enhances confidence that offset requirements are being adequately met. There are also benefits to the developer and/or provider, in terms of its license to operate and/or reputational advantages (BBOP, 2009b, 2009d). A trustworthy, independent arbiter can therefore be important to verify the outcomes of a specific project, or to certify that a developer/provider is able to, or has in the past evidenced that it can, deliver on its promises. Certification is particularly useful where developers are undertaking offsets voluntarily or to access project finance, and not in compliance with detailed national regulatory frameworks. Certification is used in some settings and is beginning to be explored more broadly as an option.

To date, there are very few examples in the EU where systems have been developed for developers or providers to be certified. The most obvious example is in Germany, where certain regional agencies have set standards for habitat banks that have to be followed. Applicants therefore have to demonstrate compliance with a number of specifications in

order to obtain approval by the nature conservation agency for the offset. In 2006, the Federal Association of Compensation Agencies developed five core criteria, including:

- Ensuring enhancement from a nature conservation perspective;
- Safeguarding areas and measures over the long term;
- Monitoring and follow up of the development of the pool areas;
- Integration of offsets into other strategies and instruments; and
- Compliance with high performance standards.

Formal certification also exists in certain Länder. In order to ensure that credits are recognised (i.e. that the habitat restoration will be considered additional to existing nature), habitat banks must be validated by the authorities. In Brandenburg, for instance, the following criteria are used for certifying compensation pools:

- The pool-area encompasses at least 30 hectares in total, of which 10 hectares are legally safeguarded and usable at once.
- At least 30 hectares of the pool-area have a functional and spatial connection and at least 10 hectares consist of coherent sites.
- A nature conservation concept containing development goals is developed for at least 30 hectares of the pool-area. Landscape and preparatory land use plans have been considered. Explanation of the special nature conservation value of the developed measures based on bundling them in a compensation pool.
- The need for nature conservation action is represented.
- The potential of enhancement for all possible subjects of protection (flora, fauna, soil, water, air/climate, landscape) is demonstrated; and as many different types of nature conservation measures as possible or one key project (renaturalisation of a degraded river) are realisable.
- The pool operator commits to safeguard the sites by land registry charge, including the sites which may continue to be used, in a manner compatible with the biodiversity objectives, by third parties (e.g. farmers who maintain the sites).
- The compensation measures are accepted by the local nature conservation authority and the Brandenburg state office for the environment.
- The initial state is documented.
- The pool operator commits to long term safeguard of the compensation sites, maintenance and monitoring.
- The pool operator commits to inform the Brandenburg state office for the environment on request and to report data to the State impact and compensation site information system (EKIS).

In France, one report has highlighted the importance and usefulness of a certification and accreditation process. The report details the minimum specifications for the competencies of a specialised ecologist who are involved as consultants in EIAs, as a first step which might indicate the potential to move to a more formal certification and accreditation process.

The inclusion of accreditation and certification is being formally explored as a potential amendment to the EIA Directive, specifically to Article 5(1) (EC, 2012a). The proposal specifies that competent authorities and developers must ensure that environmental reports are prepared by accredited experts in order to guarantee the completeness and quality of the documents. The details of the arrangements for use and selection of accredited experts, however, are to be determined by Member States. The suggested amendments therefore seem to recognise the benefits and usefulness of having formal accreditation systems in place to improve the effectiveness and merit of the EIA process.

In the UK there are no plans to formally certify or accredit offset provision in England. Nonetheless, Defra has noted that if offsetting were used nationally in the future, there would

probably need to be an independent body setting standards, and potentially certifying offset providers. In the meantime, the providers for the biodiversity offset pilots are being assessed by Natural England, and their Management Plans quality-assured.

There is some evidence of certification being used in international examples. In Australia (NSW Biobanking Scheme), assessors (consultants) have to be accredited in order to apply the standard methodology which calculates the appropriate number of credits to be used (eftec *et al*, 2010).

In South Africa, there is a voluntary (soon to be mandatory) certification system for offset environmental assessment practitioners. There is, however, no certification system for offset planning or implementation. Nonetheless, proposals that are being developed for a wetland habitat banking system do mention the need for habitat banks to be audited by third parties, as well as the fact that, were these proposals were to be implemented, consultants (e.g. wetland ecologists / managers) should be accredited in the use of the necessary tools and techniques to determine the impacts and to develop compensation activity (SANBI, as quoted in eftec *et al.*, 2010). However, no system has yet been formally developed or implemented; proposals are only being developed. Currently in South Africa, any consultant in a natural scientific profession must be certified or professionally registered by law (Natural Scientific Professions Act). This is only a general requirement and not one specifically related to offsets/ habitat banking. This would, however, provide some level of quality assurance in the case of offset design if checks were used to confirm that consultants involved in offsetting were registered.

In terms of certification, there is, therefore, the option to certify the habitat bank (e.g. Germany) and/or the consultants involved in designing and implementing the offset (e.g. Australia).

6.3.7 Monitoring and reporting

Since no net loss of biodiversity is dependent on sympathetic management of habitats over time, offsets are usually subject to conditions regarding long term maintenance. Arrangements for long term monitoring of offset sites and reporting of trends in site condition are therefore important.

Effective monitoring is essential to ensure compliance and that biodiversity benefits are being delivered. It is also important to enable management to be adapted if circumstances change, and to contribute to the evidence base. Moreover, the need for long term outcomes and transparency in the design, implementation and communication of offsets are two key principles of offsetting according to the BBOP Standard on Biodiversity Offsets. Monitoring and evaluation are crucial elements that can ensure that these principles are translated into practice.

In order for monitoring to be effective, eftec *et al* (2010) state that a monitoring strategy should be developed, which would for instance, define the timetable and methods to be used, set out responsibilities and establish procedures in case management has to be adapted. According to BBOP (2009), monitoring should cover both implementation performance (i.e. the process, covering inputs, activities and outputs) as well as the impact performance (i.e. on the ecological and biodiversity impacts). This should include key biodiversity indicators, which can be developed through BBOP's Key Biodiversity Components Matrix and the selection of metrics, which can guide the choice of impact performance indicators. BBOP's Biodiversity Offset Design Handbook describes how to develop metrics for quantifying loss and gain of biodiversity. One approach is to use a benchmark of attributes for condition of biodiversity, and these attributes can form part of the offset's monitoring system.

BBOP notes that implementation and impact performance should be linked, to ensure that a project's implementation performance has the intended effect on impact performance. Moreover, the results should be used to determine whether appropriate changes need to be made through adaptive management to ensure offset goals are being achieved.

Monitoring is a key element of systems in other countries (e.g. in Queensland, Australia, monitoring and reporting plans are required which include environmental indicators; in the US, 2008 federal guidelines includes ecological performance standards and monitoring requirements), although in Canada compliance and consistent monitoring and evaluation of offsets is often lacking.

In the US, requirements are included in the mitigation plan to include, inter alia, baseline information, monitoring requirements, a long-term management plan and an adaptive management plan. Moreover, any conservation bank that is established is required to undertake annual evaluation of the site and report its findings. It is the responsibility of the developer/owner of the offset site or conserved site to undertake the necessary monitoring and data collection and submit the findings annually. This information is then available, in the case of California, online to the public. However, there does seem to be a growing need for a State agency to take a more active role in monitoring and evaluation processes particularly where plans overlap, are near, or generally begin to converge. Offsets that are independently monitored, verified and audited will be regarded as more trust-worthy than those that are monitored and verified by the developer itself.

In the EU, monitoring requirements seem to be implemented on a more ad-hoc basis. In the UK, for instance, mitigation measures continue to be largely ineffective as a result of inadequate monitoring and a lack of enforcement by planning authorities and statutory agencies (eftec *et al*, 2010).

In other countries, however, systems seem to be working relatively well. In Sweden, for instance, progress is monitored both by the developer (through a basic reporting responsibility, which generally takes place every 2 to 3 years) and by the responsible public authority. Monitoring is generally carried out as long as the permit is valid, although the exact terms are decided on a case by case basis. For example, in the case of the compensation in the Umeälven delta, compliance with the following two conditions had to be demonstrated by the developer by 2015:

- the offset must be proven functional; and,
- that there must be no disturbance on the night roosting site for the bean geese.

Monitoring provides scope for different stakeholders to be involved besides public authorities, developers and land owners. For instance, there is considerable scope for independent consultants to play a significant role. This practice has been in evidence in some Member States, including Sweden. NGOs and local communities can also play a significant role, providing a source of third party scrutiny. However, if this function is not financed, the capacity of NGOs may be severely limited. NGOs should therefore not be relied upon unless there is a system whereby they are remunerated. For example, participation by NGOs could be funded through an administrative charge to developers (eftec *et al*, 2010).

The issue of who should bear the cost of monitoring has also been discussed in the UK; developers generally held the view that offset money should be spent directly on conservation outcomes rather than administration or monitoring, while other groups felt the provider or developer should pay for monitoring rather than the local authority or statutory conservation organisations.

The evidence indicates that, whilst monitoring in itself is important, it is also crucial that these results be shared to develop the knowledge and evidence base associated with offsets. Experience with compensation and habitat banking is still relatively limited, so information should be shared as widely as possible, not just within countries (e.g. between local, regional and national levels and between stakeholders), but also between countries (e.g. between the EU and the US / Australia) where existing experience can be used to inform developing practice. Monitoring, and the sharing of experience, are therefore key for iterative learning to take place.

6.3.8 Compliance and enforcement

Whilst monitoring is necessary to identify cases of non-compliance or where activities have been ineffective, enforcement is required to ensure that actions are appropriately and effectively carried out, particularly where they are a condition of planning approval, permits or project finance. The ability for relevant bodies to discharge their enforcement obligations is linked to the efficacy of legislation and the financial and resourcing capacity of regulating bodies.

For instance, the experience in Canada demonstrates that compliance with conditions is problematic; only 17 of 124 projects have met their condition requirements. Experience from the EU also seems to indicate that mechanisms for enforcement are lacking, and there are rarely penalties for non-compliance. Few of the case studies were able to identify what enforcement mechanisms were in place if developers were found to be in breach of the conditions of the activity.

In other countries, this element of the system works relatively well, in that developers are held accountable for the outcomes of the offsets. For instance, in Sweden, there is scope for developers to be prosecuted if it is determined that conditions of the compensation are not being met. In Australia and the US, enforcement of conditions is also more prevalent. In Australia, for instance, all tiers of government allocate resources for compliance and enforcement activities. Moreover, financial penalties and criminal convictions can be imposed on breaches of environmental legislation which includes the legislative framework for offsets and habitat banking. Development which proceeds without approval can attract both criminal penalties (up to 7 years imprisonment) and financial penalties up to €4.6 million. The US also imposes administrative, civil and criminal penalties with administrative penalties that can reach almost €130,000 and civil penalties imposed in a judicial proceeding can reach €26,500 per violation per day.

Compliance can also be ensured through iterative stages whereby funds are released in phases (Box 9).

Overall, it is clear that offsets and compensation will only be effective if they are adequately and correctly enforced. When offsets were first developed in the US, for instance, three options were available to developers: voluntary action, in lieu fees or conservation banking. Only the latter option delivered effective results, largely due to the fact that the others were not linked to any strict performance standards or monitoring requirements.

Box 9 BioBanking: Monitoring and enforcement in Australia

BioBanking, as operated in New South Wales, Australia, typically involves auditing and enforcement on a 3 year-basis for selected proposals (based on risk assessment) and every 6 years for every transaction. The costs for this are covered within fees payable by the offset provider of AUS$ 1100 per site per annum. Payments are generally phased and tied to 'delivery' or the achievement of defined targets. Money is paid to the register by the developer and held by the Secretary for the benefit of the landowner, subject to an agreement. Offset providers may be required to report annually on their performance in delivering against agreed targets or objectives.

A landowner's obligations are to maintain the offset (credits) in perpetuity (an obligation which is registered on the land title), but the management agreement stipulates particular actions the landowner will take in the first 10 years, and then maintenance activities to be undertaken in perpetuity thereafter. The payment for the credits is staggered over the initial 10 years (an example is shown below). The provision of the credits is monitored by the Department of Sustainability and the Environment in years 1, 2, 5 and 10 for every site.

A typical payment schedule under BushBroker for payment by the Secretary to the provider of credits might be as follows:

- Initial Payment on Commencement of the Agreement (Initial Payment) 25% of the Total
- At the end of the first year 5% of the Total
- No later than the end of the second year – ('Establishment') 10% of the Total

- No later than the end of the third year – ('Survival 1') 10% of the Total
- At the end of the fourth year 5% of the Total
- No later than the end of the fifth year – ('Survival 2') 15% of the Total
- At the end of the sixth year 5% of the Total
- At the end of the seventh year 5% of the Total
- At the end of the eighth year 5% of the Total
- At the end of the ninth year 5% of the Total
- At the end of the tenth year – ('Completion') 10% of the Total

Source: Treweek, 2009

6.3.9 Long term management and contingencies for failure

A key issue linked to the issue of monitoring and enforcement is that of ensuring long term sustainability of the offset. Long term management and contingencies for failure are important to ensure that the measurable conservation outcomes needed for offsets are actually delivered and that they endure over the long term and preferably in perpetuity. European Commission guidance (EC, 2007) makes it clear that compensatory measures for impacts on Natura 2000 sites require long-term implementation, protection, monitoring and maintenance. Although 'long term' is not defined, the need for 'in perpetuity' provision is implied.

Long term management can be facilitated, for instance, through endowment funds for ongoing management, mandatory renewal of credits subject to inspection, easements or other legal restrictions on land use. Land may also be transferred to government or, where an offset provider retains ownership, a covenant can be required that runs with the land and binds any successors in title. In Australia, for instance, this is entered into the land title deeds and recorded in the Land Registry (Treweek, 2009), whilst in the US, 'easements' are granted over land and reflected in land titling documents which protects the conservation site into perpetuity.

Germany has taken some relevant measures, such as to require commitments to be included in the land title deeds and to be entered into the Land Registry. However, these kinds of safeguards are largely lacking in other EU countries, partly because they rely on general requirements for compensation rather than a more formalised system for offsetting.

For instance, under the CDC Biodiversité project in France, permanence of outcomes is only ensured for a 30 year period, although there is a commitment to guarantee an appropriate solution for long-term conservation after that period. Options could be an integration of the site to the Crau Nature Reserve or a retrocession to another operator of environment protection (NGO/association, Conservatoire du Littoral etc.) or to confer a conservation status to the site (reserve, park etc.). Nonetheless, a change in land tenure could mean that the land and the associated (current and potential) benefits could be lost as long term safeguards are not secured.

In England, Defra guidance stresses that offsets need to last at least as long as the development project's impacts, and preferably in perpetuity. Providers therefore either need to own the land, or be in a position to put a long-term agreement in place, and to put arrangements in place to manage the resources needed to be able to deliver a long-term commitment. Plans will need to include managing finances to maintain the offset in the long term, and pricing must adequately reflect the uncertainties of habitat creation and long-term management and monitoring.

In Spain, there is a general requirement that a project's budget must be ensured throughout the project's lifetime. The responsibility for ensuring that a long term perspective is maintained and implemented in the case of compensatory measures lies with the Autonomous Communities.

Another related issue is the management of risk and uncertainty in the case of failure. Contingency plans, which would come into play if the project fails, are rarely incorporated into the agreement or planning conditions in the EU. This contrasts with experience in the US where a 15 - 25% contingency fund is normally set aside in case additional work needs to be done to meet monitoring criteria in case a project fails to deliver. However, bankruptcy provisions are typically not included, although there is guidance available on how to avoid financial failure. For wetland mitigation banking, for instance, federal guidance states that the banking sponsor is responsible for establishing remedial funds and long-term management funds. Remedial funds should reflect the risk of the bank failing to meet its performance standards and the amount of credits released before ecological performance standards have been met. The 2008 federal guidelines also require financial assurances to be included in the mitigation plan associated with any offset. The sale of credits is conditional on the approval of the mitigation plan which also includes appropriate real estate assurances.

In Australia, on the other hand, under NSW's BioBanking scheme there is no mechanism or process to address offsets that fail to achieve the intended outcome, although it is noted that it is unacceptable for the public to bear the risk of failure. Similarly in France there are currently no provisions in the event that a conservation bank goes bankrupt, although the 'Grenelle' bill plans to commit developers who have not realised their compensatory measure to pay a corresponding amount of money, which could provide a legal precedence to developing safeguards for habitat banks.

7 Conclusions and recommendations

This section summarises the key findings from the research and presents the overall conclusions. It also identifies some gaps in the evidence base and provides suggestions for further research.

It delivers on the final objective of the study, which seeks to 'identify and address gaps in knowledge and information available that can hinder the design and potential implementation of an EU wide off-setting scheme'.

7.1 Conclusions

The EU Biodiversity Strategy includes a policy to achieve no net loss of biodiversity and ecosystem services. Biodiversity offsets have an important potential role to play in delivering this commitment, by requiring measurable compensation for residual losses of biodiversity, following avoidance, minimisation and restoration or rehabilitation. Habitat banking has the potential to facilitate the delivery of offsets in an ecologically-effective and cost-effective way.

The demand for offsets and habitat banking is largely driven by requirements to compensate for losses of biodiversity. These are currently variable; there is currently no consistent or comprehensive framework in the EU to drive the need for offsetting or habitat banking. An EU-wide NNL framework would, however, serve to significantly stimulate biodiversity offset schemes, and potentially encourage the development of habitat banking schemes as a means of delivering offset requirements.

It is clear that the current legislative framework in the EU and its Member States is inadequate to deliver no net loss of biodiversity. While compensation is required for damage to Natura 2000 sites, it is not known whether this results in gains equivalent to the losses sustained in these sites. Outside the Natura 2000 network, requirements for compensation for biodiversity losses are limited in most Member States, and only Germany has a well-developed compensation policy.In most EU Member States, current demand for biodiversity offsets arises from the requirement under the Birds and Habitats Directives for compensation for impacts on Natura 2000 sites, while national policies also create some additional demand in certain countries such as Germany, the Netherlands, France, Sweden and the UK. Whilst current demand is difficult to quantify, it is well short of what would be needed to offset the estimated biodiversity losses in the EU each year (for instance, the annual development and sealing of 50-100,000 hectares of greenfield sites). Further biodiversity losses occur as a result of indirect and cumulative impacts on biodiversity, human caused forest fires, loss of habitat quality and function caused by pollution, climate change, habitat fragmentation and other pressures, and the effects of agricultural and forest management.

While biodiversity offsets have the potential to compensate for many of these losses, a number of technical, ecological, geographical and economic constraints mean that offsets are not possible or appropriate in all circumstances. Where the components of biodiversity affected are particularly vulnerable and/or irreplaceable, it may not be possible to achieve no net loss, and in these circumstances, questions arise as to whether the development should go ahead (perhaps because there are overriding reasons of public interest) or be dropped. Where no net loss is possible but the biodiversity is still fairly vulnerable and/or irreplaceable, 'like for like' offsets are advisable. By contrast, where the biodiversity affected is not particularly vulnerable or irreplaceable, 'trading up' to conserve higher conservation priority biodiversity may be the best outcome.

On the whole, the lack of sufficient demand (i.e. because of weak regulatory requirements which fail to stimulate compensation activities) appears to be a more pressing issue than that of supply.

Concerning supply, stakeholders consistently highlighted the availability and / or the accessibility of suitable land for compensation as the most significant limiting factor, rather than any ecological, geographical or technical constraints. However, such concerns are sometimes voiced before mechanisms and incentives for supply are clear. For instance, people can wrongly assume that land would have to be purchased outright, whereas

contractual arrangements for long-term delivery of conservation improvements on private land are a possibility. Another potential constraint on supply is the need to satisfy offset requirements for additional conservation outcomes, whether through restoration, or through the aversion of risks. While limits to the feasibility of restoring different habitats does not (yet) seem to be a significant constraint in terms of offset supply, there is a possibility that, in the future, it might prove challenging to find a suitable offsets for a project with impacts on a particular type of system that is difficult to restore. However, this need not necessarily be the case, if there are other ways to generate conservation gains (e.g. averted risk offsets), and if offsets are hard to find, this is often a good signal that the future of the project itself and its design should be reconsidered.

A flexible system (i.e. which allows 'trading up' to conserve higher conservation priority biodiversity than what was affected by the project and which allows offsets within a fairly broad bioregion) has some advantages, including easing of some potential supply constraints and allowing a more strategic, joined up approach to be adopted. Such flexibility does not necessarily have to mean compromising on the conservation outcomes that are delivered (e.g. best practice is to require 'like-for-like or better'), and indeed could allow habitats which are in the greatest need of attention to be prioritised as offset investments. There are, however, issues of political and public acceptance to be considered, including ensuring that offsets are designed and implemented in an equitable manner. One way in which to bridge the gap between the larger spatial scales at which offset planning can make the greatest contribution to conservation priorities and the need to satisfy those affected locally is to plan 'composite offsets' spread across more than one location, in which the amenity and livelihood values affected by the project are compensated nearby, while the more intrinsic conservation values (e.g. populations of threatened species) are compensated at a broader spatial scale for connectivity and resilience to climate change.

Biodiversity offsets and habitat banking schemes give rise to a range of costs, including land, habitat management, financial, administrative and transaction costs. Most estimates suggest that offsets will cost between €30,000 and €100,000 per hectare to provide in the EU. However, international experience suggests that actual costs by widely by location and may be significantly higher in some circumstances. Habitat banking schemes may be expected to reduce the costs of delivering offsets, particularly by reaping economies of scale.

The main benefits of offset schemes can be assessed in terms of their impacts on biodiversity and contribution to no net loss goals. Habitat banking may deliver additional conservation benefits by allowing larger scale and more strategic conservation initiatives than would be achieved by individually arranged offsets.

Biodiversity offsets present a number of potential and perceived risks, most of which can be addressed through careful scheme design, monitoring and enforcement.

The design of biodiversity offsets and habitat banking schemes is guided by a number of internationally agreed principles, which are widely shared by different schemes throughout the world. However, applying some of these principles can present significant practical challenges. The specification of metrics to balance gains and losses is a key design element that determines the effectiveness of offsets and habitat banks in delivering no net loss. Balancing the scientific robustness with practicality and cost-effectiveness is a challenge and gives rise to significant debate amongst practitioners internationally.

In order for habitat banking, and offsetting more generally, to be successful there is a need for a strong regulatory framework to create demand, establish basic standards, and drive the process forward. The framework needs to define roles and responsibilities clearly, including robust mechanisms for monitoring, enforcement, compliance and safeguarding against potential risks and uncertainties to ensure that benefits are sustained in the long term (i.e. contingencies for failure).

It is crucial that a knowledge base is developed which takes into account the wide range of experience which is growing both internationally and, increasingly, within the EU. European experience with compensation and habitat banking is still relatively limited, so information should be shared as widely as possible particularly with countries that are well advanced in their systems, such as Australia and the US, in order to help improve, inform and develop

systems through iterative learning. Building networks between countries (both in terms of those already have experience as well as those who are interested in offsets as a potential tool to address biodiversity loss) could therefore prove very useful.

Several design elements associated with offsetting and habitat banking have been discussed. Carroll et al. (2008) include several of these in a list of key features for a conservation banking system (Box 10).

Box 10 Key Features of a Conservation Banking System

Key features of a conservation banking system are as follows:

- **Asset/Product:** For conservation banking to take place, the product or asset being traded must be defined clearly. This is generally a parcel of habitat together with agreed, measurable conservation action, restoration/preservation/management.
- **Legal Agreement**: A binding agreement is needed that recognizes the offset and authorizes the bank to sell credits.
- **Management Plan**: The Conservation Bank is obliged under the agreements to carry out a management plan of conservation activities that include restoration, maintenance & ecological monitoring.
- **Endowment Fund**: The conservation bank relies upon an endowment fund with sufficient assets to fund the agreed management activities in perpetuity (a non-wasting fund)
- **Service Area**: This is the area within which impacts are still ecologically relevant and from which credits could be sold to offset impacts. This is generally set within watersheds or other areas that are ecologically equivalent so the credits will match the impacts.
- **Strategic Site Selection**: When establishing a conservation bank, it is important that it is located appropriately in the landscape so it will endure over time (and not be swamped by surrounding developments to the detriment of the conservation outcomes), and is big enough to ensure ecological functionality. If it is possible for the bank to benefit connectivity and buffering of existing conservation areas, that is an advantage.

Sources: Carroll et al. (2008); UNDP/PWC (2010)

7.2 Evidence gaps and further research needs

Key evidence gaps and research needs apparent from the analysis include:

- **Defining the policy framework and the role for offsets and habitat banking**: Within the context of the EU's No Net Loss Initiative, there is a need to identify and appraise potential options at the EU and MS level capable of ensuring implementation of the mitigation hierarchy including through offsets and habitat banking. A key issue is the extent to which policies are defined at EU and at MS level. Another important element is defining the role for offsets and habitat banking in compensating for biodiversity which occurs outside the Natura 2000 areas (i.e. for which compensation is not yet required under EU policies). Research could identify potential policy options for both MS and the Commission, and analyse the pros and cons of each, using a range of criteria such as ecological effectiveness, political acceptability, legal feasibility, economic efficiency and coherence with existing policies.
- **Developing a common understanding of terms**: given the different ways in which aspects of offsetting and habitat banking have developed across Member States, there may be value in additional research to understand how terms have evolved and what they may mean in different contexts and to different stakeholders in order to establish a baseline or frame of reference for further work and future policy developments. For instance, it is clear that some stakeholders have different interpretations of words such as 'compensation' and 'quality hectares', as well as of what qualifies as a 'habitat bank' and 'market mechanism'. Efforts to address this issue are already being made as part of the NNL Working Group.

- **Assessing and mapping biodiversity condition:** there is a need to better understand the type and quality of biodiversity in the EU, especially outside protected areas, as well as current rates of biodiversity loss and the drivers and pressures causing these losses. Many Member State assessments of habitats and species indicate a lack of data and/or knowledge on the state of biodiversity, which makes it difficult to understand the baseline against which a no net loss initiative, and specifically a habitat banking scheme, could work. This could tie in with Action 5 of the Biodiversity Strategy which aims to improve knowledge of ecosystems and their services within the EU.
- **Understanding the level of demand resulting from indirect damage to habitats following developments:** Gathering data on indirect impacts in order to estimate overall demand for offsets in the EU is difficult, but a short study could explore the significance of indirect and direct impacts in several cases and form the basis for an exercise to extrapolate and create plausible scenarios for the level of demand for offsets.
- **Further analysis of design elements for biodiversity offsets and habitat banking:** While this report has identified a number of key design elements that need to be considered in implementing biodiversity offsets and habitat banking schemes, a number of key issues merit further research (e.g. to develop a comprehensive guidance document or toolkit). In particular, it would be helpful to explore in more detail issues such as:
  - The design of metrics (i.e. methods to evaluate biodiversity losses and gains) to ensure no net loss in the EU context and balancing requirements for scientific robustness, practicality and cost effectiveness. Further research could examine best practice in Australia, the US, the EU and elsewhere, and assess its applicability in addressing biodiversity losses in Europe.
  - The scope for offsets and habitat banking schemes to operate across Member State borders, and the key political and regulatory barriers that might need to be addressed.
  - Potential barriers that might inhibit the growth of offset provision and the development of habitat banks in the EU, and how these might be addressed in order to facilitate the supply of offsets and habitat banks in an ecologically- and cost-effective way.
  - The scope for EU schemes to facilitate effective delivery of offsets and habitat banking arrangements, for example through common guidance, standards and performance criteria.
  - Potential initiatives to promote voluntary offset schemes to address the impacts of EU businesses on biodiversity outside the EU.
  - Potential options for land to be acquired, accessed and/or secured into the future for compensation purposes, and the ways in which habitat banking could affect both land availability and prices.
  - Mechanisms which are available to secure long term benefits and possible safeguards against risks and uncertainties (drawing on, for instance, experience in the financial and insurance sectors with regard to bankruptcy and financial assurances). A better understanding of what mechanisms are available, and how these may be limited in different Member States (e.g. the use of easements, endowment funds, performance bonds, etc.) could be useful.
- **Understanding the supply constraints of habitats and how these may vary across Member States**: this study was not able to go into detail with regard to the constraints on, and condition of, the different habitats within different Member States. Instead, only a very general, aggregated assessment was possible. There is potential value in undertaking a more detailed assessment in order to understand how supply constraints may vary across different habitats and across Member States in order to develop a clearer and more detailed picture of the extent to which habitat banking may be constrained in different areas and contexts. One discrete area worthy of study is whether

and in what circumstances averted risk offsets (i.e. offsets which prevent future risks of harm to biodiversity from occurring) are applicable and appropriate in an EU context.

- **Understanding the costs and benefits of biodiversity offsets and habitat banking:** The review undertaken for this study found that evidence on the costs and benefits of offsets is patchy. Gaps in the evidence base make it difficult to assess the potential costs of introducing offset requirements at EU level, or to identify the most cost effective options for the design of offsets and habitat banking schemes. More detailed analysis would help to inform further policy design and impact assessment work.
- **Understanding and developing the necessary capacity and institutional structures:** Given the limited experience with biodiversity offsets and habitat banking schemes in many parts of the EU, it is likely that their development could be hampered by a shortage of knowledge, skills and experience, and by limitations in capacity and institutional arrangements. Research to understand the key elements for the effective implementation of offset initiatives would therefore be beneficial. Pilot projects in some Member States – such as France and the UK – are improving understanding of the practicalities of implementing offsets and habitat banking schemes in these countries, and could helpfully be extended to other parts of the EU.

References

Aubry, A., Elliott, M., 2006. The use of environmental integrative indicators to assess seabed disturbance in estuaries and coasts: Application to the Humber Estuary, UK. Marine Pollution Bulletin 53, 175–185.

Bekessy S., Wintle B., Lindenmayer D., McCarthy M., Colyvan M., Burgman M., Possingham H. (2010) The biodiversity bank cannot be a lending bank. *Conservation Letters*, 3: 151-158.

BIO Intelligence Service (2008a) Study on the Implementation Effectiveness of the Environmental Liability Directive and Related Financial Security Issues, available at: http://ec.europa.eu/environment/legal/liability/pdf/ELD%20Study%20November%202009.pdf

BIO Intelligence Service (2008b), Financial Security in Environmental Liability Directive, available at: http://ec.europa.eu/environment/legal/liability/pdf/eld_report.pdf

BIO Intelligence Service (BIO IS) (2009) Implementation efficiency of the Environmental Liability Directive (ELD) and related financial security issues and BIO Intelligence Service (2008) An analysis of the current situation in Europe regarding financial security to cover environmental liability, available from http://ec.europa.eu/environment/enveco/others/pdf/implementation_efficiency.pdf and http://ec.europa.eu/environment/legal/liability/pdf/eld_report.pdf

BIO Intelligence Service (BIO IS), IEEP and VITO (2012) Impact assessment study regarding the review of the EIA Directive, Final report prepared for European Commission DG Environment

Bovarnick A, Knight C & Stephenson J. (2010) Habitat Banking in Latin America and Caribbean: A *Feasibility Assessment*. United Nations Development Programme.

BBOP (Business and Biodiversity Offsets Programme) (2009a). Business, Biodiversity Offsets and BBOP: An Overview. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/overview.pdf ISBN 978-1-932928-29-7 (paperback) ISBN 978-1-932928-30-3 (PDF)

BBOP (Business and Biodiversity Offsets Programme) (2009b). Biodiversity Offset Design Handbook: Appendices. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh-appendices.pdf.. ISBN 978-1-932928-32-7 (PDF)

BBOP (Business and Biodiversity Offsets Programme) (2009c). Biodiversity Offset Cost-Benefit Handbook. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf.

BBOP (Business and Biodiversity Offsets Programme) (2009d). Biodiversity Offset Implementation Handbook. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/oih.pdf. ISBN 978-1-932928-34-1 (PDF)

BBOP (Business and Biodiversity Offsets Programme) (2009e). The Relationship between Biodiversity Offsets and Impact Assessment: A BBOP Resource Paper. BBOP, Washington, D.C. www.forest-trends.org/ biodiversityoffsetprogram/guidelines/eia.pdf. ISBN 978-1-932928-36-5 (PDF)

BBOP (Business and Biodiversity Offsets Programme) (2009f). Biodiversity Offsets and Stakeholder Participation: A BBOP Resource Paper. BBOP, Washington, D.C. www.forest-trends.org/biodiversityoffsetprogram/guidelines/participation.pdf ISBN 978-1-932928-35-8 (PDF)

BBOP (Business and Biodiversity Offsets Programme) (2009g) BBOP Pilot Project Case Study - The Ambatovy Project. http://www.forest-trends.org/documents/files/doc_3118.pdf

BBOP (Business and Biodiversity Offsets Programme) (2009h) BBOP Pilot Project Case Study -Potgietersrust Platinums Limited (PPRust) http://www.forest-trends.org/documents/files/doc_3121.pdf

BBOP (Business and Biodiversity Offsets Programme) (2009i) BBOP Pilot Project Case Study - Akyem Gold Mining Project, Eastern Region, Ghana. http://www.forest-trends.org/documents/files/doc_3122.pdf

BBOP (Business and Biodiversity Offsets Programme) (2010). BBOP Factsheet. http://bbop.forest-trends.org/documents/2010%2003%2025_BBOP_Factsheet_2pg_A4.pdf

BBOP (Business and Biodiversity Offsets Programme) Glossary http://bbop.forest-trends.org/guidelines/glossary.pdf. Also (2012).2009 Glossary with updates. BBOP, Washington, D.C. Available from http://bbop.forest-trends.org/guidelines/Updated_Glossary

BBOP (Business and Biodiversity Offsets Programme) (2012a). Guidance Notes to the Standard on Biodiversity Offsets. Available from http://bbop.forest-trends.org/guidelines/Standard_Guidance_Notes.pdf.

BBOP (Business and Biodiversity Offsets Programme) (2012b). Biodiversity Offset Design Handbook-Updated. BBOP, Washington, D.C.http://bbop.forest-trends.org/guidelines/Updated_ODH.pdf

BBOP (Business and Biodiversity Offsets Programme) (2012c). Standard on Biodiversity Offsets. ISBN (paperback) 978-1-932928-45-7; ISBN (pdf) 978-1-932928-44-0. Available from http://bbop.forest-trends.org/guidelines/Standard.pdf

BBOP (Business and Biodiversity Offsets Programme) (2012d). Guidance Notes to the Standard on Biodiversity Offsets. ISBN (paperback) 978-1-932928-46-1; ISBN (pdf) 978-1-932928-47-1. Available from http://bbop.forest-trends.org/guidelines/Standard_Guidance_Notes.pdf.

BBOP (Business and Biodiversity Offsets Programme) (2012e). Resource Paper: Limits to What Can Be Offset. ISBN (pdf) 978-1-932928-48-8. Available from http://bbop.forest-trends.org/guidelines/Resource_Paper_Limits.pdf.

BBOP (Business and Biodiversity Offsets Programme) (2012f). Resource Paper: No Net Loss and Loss-Gain Calculations in Biodiversity Offsets. ISBN 978-1-932928-49-5 (pdf). Available from: http://bbop.forest-trends.org/guidelines/Resource_Paper_NNL.pdf

Carroll N., Fox J. and Bayon R. (2008). Conservation and Biodiversity Banking: A Guide to Setting Up and Running Biodiversity Credit Trading Systems. London: Earthscan

CLG (2011), Land Use Change Statistics: July. Available from: http://www.communities.gov.uk/documents/planningandbuilding/xls/1955510.xls

Crooks S, Turner RK. (1999). Coastal zone management: sustaining estuarine natural resources. Advances in Ecological Research 29:241-291

Crooks S. (1999). Formation of over consolidated horizons within estuarine alluvium: implications for the interpretation of Holocene sea-level curves. p.197-215. In: Flood plains: interdisciplinary approaches. Marriot S., J. Alexander and R. Hey (Eds). Geological Society, London, Special Publication 163.

Crowe, Michael and ten Kate, Kerry (2010) Biodiversity Offsets: Policy options for governments. Forest Trends. October http://www.forest-trends.org/publication_details.php?publicationID=3079

Dahms et al. (2010). Restoration of Seminatural Grasslands: What is the Impact on Ants. Restoration Ecology Vol. 18 Issue 3, p330-337

DEA&DP (2011) Information Document on Biodiversity Offsets, EIA Guideline and Information. Document Series. Western Cape Department of Environmental Affairs & Development Planning, (DEA&DP), October 2011

Defra (2010) Biodiversity offsetting - Discussion material. http://archive.defra.gov.uk/environment/biodiversity/offsetting/documents/110714offsetting-discussion.pdf

Defra (2011a) Biodiversity offsetting - Guiding principles for biodiversity offsetting. http://archive.defra.gov.uk/environment/biodiversity/offsetting/documents/110714offsetting-guiding-principles.pdf

Defra (2011b) Biodiversity offsetting - Summary of responses to discussion material on biodiversity offsetting. http://archive.defra.gov.uk/environment/biodiversity/offsetting/documents/110714offsetting-discuss-response.pdf

Defra (2011c) Biodiversity offsetting - Planning policy and biodiversity offsetting research summary. http://archive.defra.gov.uk/environment/biodiversity/offsetting/documents/110714offsetting-research-summary.pdf

Defra (2012a) Biodiversity Offsetting Pilots - Guidance for offset providers. March 2012. http://www.defra.gov.uk/publications/files/pb13742-bio-guide-offset-providers.pdf

Defra (2012b) Biodiversity Offsetting Pilots - Guidance for developers. March 2012. http://www.defra.gov.uk/publications/files/pb13743-bio-guide-developers.pdf

Defra (2012c) Biodiversity Offsetting Pilots - Technical Paper: the metric for the biodiversity offsetting pilot in England. March 2012. http://www.defra.gov.uk/publications/files/pb13745-bio-technical-paper.pdf

Defra (2012d) Biodiversity Offsetting Pilots - Information note for Local Authorities. March 2012. http://www.defra.gov.uk/publications/files/pb13744-bio-local-authority-info-note.pdf

Department of Sustainability and Environment (2011) BushBroker fees and services Information sheet No. 22. http://www.dse.vic.gov.au/__data/assets/pdf_file/0003/97275/BB-Info-Sheet-22-Fees-and-services.pdf

Destatis (2012). Construction Industry Statistics; November. Available from: https://www.destatis.de/EN/FactsFigures/Indicators/ShortTermIndicators/ConstructionIndustry/pgw610.html

DFO (2007) Practitioners Guide to Habitat Compensation for DFO Habitat Management Staff – Version 1.1. available at http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/policiespolitique/operating-operation/compensation/index_e.asp

Doherty KE, Naugle DE, Evans JS (2010) A Currency for Offsetting Energy Development Impacts: Horse-Trading Sage-Grouse on the Open Market. PLoS ONE 5(4): e10339. doi:10.1371/journal.pone.0010339

Duke, G., Dickie, I., Juniper, T., ten Kate, K., Pieterse, M., Rafiq, M., Rayment, M., Smith, S and Voulvoulis, N. (2012). Opportunities for UK Business that Value and/or Protect Nature's Services. Final Report to the Ecosystem Markets Taskforce and Valuing Nature Network. ICF GHK, London. http://www.defra.gov.uk/ecosystem-markets/2012/06/27/vnn-report-published270612/

EC (2001) Implementation of Directive 2001/42 on the assessment of the effects of certain plans and programmes on the environment – Guidance from the European Commission available from: http://ec.europa.eu/environment/eia/pdf/030923_sea_guidance.pdf

EC (2007a) Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC. Available from http://ec.europa.eu/environment/nature/conservation/species/guidance/index_en.htm

EC (2007b) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC from the European Commission *Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the Commission,* January 2007, available from: http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/guidance_art6_4_en.pdf

EC (2008a). "Natura 2000 an Opportunity for or an Obstacle to Development" - Speech by EU Commissioner Dimas, April. Available from: http://www.eu-un.europa.eu/articles/en/article_7828_en.htm

EC (2008b) Implementation of Article 6(4), first subparagraph, of Council Directive 92/43/EEC during the period 2004-2006. Summary Report. Available from: http://ec.europa.eu/environment/nature/knowledge/rep_habitats/docs/art_6_4.pdf

EC (2009). Composite Report on the Conservation Status of Habitat Types and Species as required under Article 17 of the Habitats Directive

EC (2010a). Environmental Impact Assessment of projects. Rulings of the court of justice. Available from: http://ec.europa.eu/environment/eia/pdf/eia_case_law.pdf

EC (2010b). Article 14(2) of Directive 2004/35/CE on the environmental liability with regard to the prevention and remedying of environmental damage. COM(2010) 581 final. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0581:FIN:EN:PDF

EC (2010c). Land use modelling — Implementation. Preserving and enhancing the environmental benefits of "land-use services. Available from: http://ec.europa.eu/environment/enveco/studies_modelling/pdf/report_land_use.pdf

EC (2011). Our life insurance, our natural capital: an EU biodiversity strategy to 2020. COM(2011)244 final. Available from: http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/2020/1_EN_ACT_part1_v7%5B1%5D.pdf

EC (2012a). Proposal for a Directive Of The European Parliament And Of The Council amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (COM(2012)628 final). Available from: http://ec.europa.eu/environment/eia/pdf/COM-2012-628.pdf

EC (2012b), Commission Staff Working Paper – Impact Assessment accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

EEA (2009). Progress towards the European 2010 biodiversity target

EEA (2010). The European Environment State and Outlook 2010 Synthesis

EEA (2012). European waters — current status and future challenges: Synthesis. EEA Report No 9/2012.

EES (2011). Environmental Compensation – the road forward. Conference in Stockholmd on the 18th of October. Available from: http://www.eesweden.com/pdf/InbjudanEkologiskKompensationOct2011_en.pdf

eftec, IEEP et.al (2010) The use of market-based instruments for biodiversity protection – The case of habitat banking – Technical Report. Available at http://ec.europa.eu/environment/enveco/index.htm

Ehrenfeld (2000). Defining the limits of restoration: The need for realistic goals. Available from: http://archives.evergreen.edu/webpages/curricular/2004-2005/ftts/downloads/ehrenfeld2000.pdf

English Nature (1994). Planning for environmental sustainability. In: Sustainability in Practice, Issue 1, June, English Nature, Peterborough

Environmental Impact Assessment of projects - rulings of the Court of Justice, 2010, available from: http://ec.europa.eu/environment/eia/pdf/eia_case_law.pdf

ETC/BD (2008). Habitats Directive Article 17 Report (2001 – 2006): Overview Of Biogeographical Assessments.

Evans (2006). The habitats of the European Union Habitats Directive. Biology and environment: proceedings of the Royal Irish Academy, vol. 106b, No. 3,167- 173;

Ezemvelo KZN Wildlife (2010), Concise Guidelines for Biodiversity Offsets, KwaZulu Natal Province.

Francis et al (2008). Meeting the challenges of urban river habitat restoration: developing a methodology for the River Thames through central London. Area; Dec2008, Vol. 40 Issue 4, p435-445

GHK (2010), Collection of information and data to support the Impact Assessment study of the review of the EIA Directive – Final Report.

GHK and eftec (2011). A detailed technical report on costing potential actions to offset the impact of development on biodiversity, referred to in the impact assessment. Available from: http://www.defra.gov.uk/environment/natural/biodiversity/uk/offsetting/

Gibbons, P, Briggs S.V, Ayers D, Seddon J, Doyle S, Cosier P, McElhinny, C, Pelly V, Roberts, K. (2009) An operational method to assess impacts on land clearing on terrestrial biodiversity. Ecological Indicators 9, 26-40.

Gibbons, P, Lindenmayer D.B. (2007) Offsets for land clearing: no net loss or the tail wagging the dog? *Ecol Manage Restore* **8**, 26–31.

Gibbons, P., Ayers, D., Seddon, J., Doyle, S. and Briggs, S (2008) A Terrestrial Biodiversity Assessment Tool for the NSW Native Vegetation Assessment Tool

Global Forest Resources Assessment (2010) Food and Agriculture Organisation of the United Nations.

Gordon, A., Langford, W., Todd, J. White, M., Mullerworth, D., Bekessy, S. (2011) Assessing the impacts of biodiversity offset policies, Environmental Modelling & Software, Volume 26, Issue 12, December 2011, Pages 1481-1488.

Helming, K., Perez-Soba, M., Tabbush, P. (2008) Sustainability Impact Assessment of Land Use Changes. Available from: http://www.springerlink.com/content/q15300/front-matter.pdf?MUD=MP

HM Government (2011) Options Stage Impact Assessment: Offsetting the impact of development on biodiversity. http://www.archive.defra.gov.uk/environment/natural/documents/newp-ia-offsets-110607.pdf

Hruby, T. (1999). Assessment of wetland functions: what they are and what they are not. Environmental Management 23(1), p.75-85.

Hruby, T. (2009). Developing rapid methods for analysing upland riparian functions and values. Environmental Management 43(6), p.1219–1243.

Jones A (2011) Presentation to 2nd Ecological Compensation conference, Stockholm, Oct 2011. http://www.enetjarnnatur.se/static/sv/291/images/7%20Scaling_Jones.pdf

Kiesecker, J., Copeland, H, Pocewicz, A., Nibbelink, N., McKenney, B., Dahlke,J., Holloran, M., Stroud, D. (2009). A Framework for Implementing Biodiversity Offsets: Selecting Sites and Determining Scale, BioScience 59(1):77-84.

Lawton, J., Brotherton, P., Brown, V., Elphick, C., Fitter, A., Forshaw, J., Haddow, R., Hilborne, S., Leafe, R., Mace, G., Southgate, M., Sutherland, W., Tew, T., Varley, J., & Wynne, G. (2010) Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra.

Lengyel et al. (2012). Grassland restoration to conserve landscape-level biodiversity: a synthesis of early results from a large-scale project. Applied Vegetation Science Vol. 15 Issue 2, p264-276

Lerda, D & Zwick, S (2009) A Brief Tour of Brazilian Payments for Ecosystem Services. Available at http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=6524&section=home&eod=1

Madsen, B.; Carroll, N.; Moore Brands, K.; (2010). State of Biodiversity Markets Report: Offset and Compensation Programs Worldwide. Available at: http://www.ecosystemmarketplace. com/documents/acrobat/sbdmr.pdf

Madsen, Becca, Carroll, N. Kandy, D. and Bennett, G. (2011) Update: State of Biodiversity Markets. Washington, DC: Forest Trends (2011). Available at: http://www. ecosystemmarketplace.com/reports/2011_update_sbdm

McCarthy, et al. (2004). The habitat hectares approach to vegetation assessment: an evaluation and suggestions for improvement Ecological Management and Restoration 5, 24-27.

Mckenney, B. and Kiesecker, J. (2010) Policy Development for Biodiversity Offsets: A Review of Offset Frameworks, Environmental Management (2010) 45:165 – 176

Miller, J. R. and Hobbs, R. J. (2007), Habitat Restoration—Do We Know What We're Doing? Restoration Ecology, 15: 382–390.

Moilanen, A., van Teeffelen A.J., Ben-Haim Y., Ferrier S. (2008) How much compensation is enough? A framework for incorporating uncertainty and time discounting when calculating offset ratios for impacted habitat. *Restoration Ecology* **17**, 470–478.

Morris, R. K. A., and P. Barham (2007) The Habitats Directive as a driver for sustainable development in the coastal zone: the example fo the Humber estuary in B. A. Larson, editor. Sustaianble development research advances. Nova Publishers. National Academy Press, Washington, D.C.

Olsen, N., Bishop, J. and Anstee, S. (2011). Exploring ecosystem valuation to move towards net positive impact on biodiversity in the mining sector. Gland, Switzerland: IUCN. vii + 41pp.

Parker et al. (2004) Suitability Criteria for Habitat Creation – Report I: Reviews of present practices and scientific literature relevant to site selection criteria. Defra R&D Technical Report FD1917TR1.

Parkes, D., Newell, G., Cheal, D. (2003). Assessing the quality of native vegetation: The 'habitat hectares' approach. Ecological Management and Restoration 4, S29-S38.

Pywell et al. (2011). Long-term heathland restoration on former grassland: The results of a 17-year experiment. Biological Conservation; May 2011, Vol. 144 Issue 5, p1602-1609

Quétier, F. & Lavorel, S. (2011). Assessing ecological equivalence in biodiversity offset schemes: Key issues and solutions. Biological Conservation 144(12), p.2991–2999

REMEDE (2006). Resource Equivalency Methods for assessing Environmental Damage in the EU - Deliverable n°5 Legal analysis, 30 November 2006, project under the 6th Framework Programme

Robertson M., BenDor, T., Lave, R., Riggsbee, A., Ruhl, J.B., and Doyle M. in press. Stacking ecosystem services. Frontiers in Ecology and Environment, in press.

Robertson, M. (2004). The neoliberalization of ecosystem services: wetland mitigation banking and problems in environmental governance. Geoforum, 35(3), p.361-373.

SANBI (2007) Wetland Mitigation Banking: Assessing the appropriateness of wetland mitigation banking as a mechanism for Securing aquatic biodiversity in the grassland biome of South Africa. Unpublished Report OE226. Contact Anthea Stephens stephens@sanbi.org

SANBI (2008) Literature and legislative review. The coal mining component of the grasslands biodiversity programme. Unpublished Report OE226. Contact Anthea Stephens stephens@sanbi.org

SANBI (2009) Five year implementation plan: Coal mining – Wetland Mitigation banking. Unpublished Report OE226. Contact Anthea Stephens stephens@sanbi.org

Sifneos, J.C., Herlihy, A.T., Jacobs, A.D. & Kentula, M.E. (2010). Calibration of the Delaware Rapid Assessment Protocol to a Comprehensive Measure of Wetland Condition Wetlands 30, p. 1011–1022

Simenstad et al. (2005) Challenges of Habitat Restoration in a Heavily Urbanized Estuary: Evaluating the Investment. Journal of Coastal Research, Special Issue.

Sipkova et al. (2009). Assessing the conservation status of european union habitats – results of the community report with a case study of the german national report. Annali di Botanica Ann. Bot. (roma), 2010

ten Kate, K.., Bishop, J., and Bayon, R. (2004). Biodiversity offsets: Views, experience, and the business case. IUCN, Gland, Switzerland and Cambridge, UK and Insight Investment, London, UK. ISBN: 2-8317-0854-0
http://www.insightinvestment.com/Documents/responsibility/Biodiversity_Offsets_Report.pdf; http:www//biodiversityeconomics.org/offsets

ten Kate, Kerry. (2009). Can biodiversity offsets and conservation banking help the British countryside? Future Countryside, August 2009.
http://www.futurecountryside.com/articles.php/resourcesandregulations/20/can-biodiversity-offsets-and-conservation-banking-help-the-british-countryside

The Natural Capital Initiative (2010) Towards no net loss and beyond: Designing a system to offset for the residual impacts of terrestrial development on ecosystem service provision Summary report of a one day inter-disciplinary workshop, London, 7th December 2010.
http://www.naturalcapitalinitiative.org.uk/sites/default/files/docs/101207/Workshop_3_report_FINAL_230211.pdf

Treweek J (2009) Scoping study for the design and use of biodiversity offsets in an English Context.
http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/BiodiversityOffsets12May2009.pdf

Treweek J, ten Kate K, Butcher B, Venn O, Garland L, Wells M, Moran D and Thompson S (2009) Scoping study for the design and use of biodiversity offsets in an English Context. Report to Defra. www.defra.gov.uk

UNDP and PWC (2010) Habitat Banking in Latin America and Caribbean: A Feasibility Assessment. http://www.pwcwebcast.co.uk/UNDP_pwc_habitat_banking_LAC_report.pdf

Van Delden et al (2012). Exploring land use trends in Europe: a comparison of forecasting approaches and results

Verschuuren, J. (2010). Climate Change: Rethinking Restoration in the European Union's Birds and Habitats Directives. Ecological Restoration, Vol. 28, No. 4, pp. 431-439, 2010

Watts et al. (2006). Rapid recovery of an insect–plant interaction following habitat loss and experimental wetland restoration. Oecologia Vol. 148 Issue 1, p61-69

Wissel, S. & Wätzold, F., (2010). A Conceptual Analysis of the Application of Tradable Permits to Biodiversity Conservation. Conservation Biology, 24(2), p.404-411.

Wotherspoon, D & Burgin, S (2009), The consultant ecologist's role in the New South Wales (Australia) approach to biodiversity offsets: "BioBanking". *Local Environment* Vol. 14, No 1. January 2009, 61 – 71.