Appendix – Case Studies

The views expressed in these background case studies are entirely those of the authors and do not, in any respect, represent those of the European Commission.

1. France

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1.1 Introduction

The Law for the Protection of Nature (1976) introduced in France the obligation for developers to perform an Environmental Impact Assessment. Through this assessment, developers evaluate the impacts of their project on the site. The Assessment includes the analysis of the initial state of the site, analysis of the impacts generated and propose measures "to avoid, reduce and, if possible, remedy significant adverse effects" of the project"[2] in this hierarchical order.

The European Directive on Environmental Liability (Directive 2004/35/EC), integrated into national law[3], a clearer definition of offset measures. Preventing measures help avoiding impacts on biodiversity by modifying the initial project design. When it cannot be avoided, project developers will seek to minimise the impact so that the restored site recovers as much as possible to its initial state. If not, developers should then compensate the residual impacts. Offset measures shall be implemented to provide the same level of natural resources or services than what should have been provided by the restored site and can be implemented in-situ (preferably) or ex-situ.

Besides these general principles, there are some specific rules existing for compensation:

- The Forest Code (art. L.311-4) plans specific rules for forest clearing: the administrative authority may oblige the developer to plant or replant an area from 1 to 5 times the size of the cleared surface, depending on its ecological and social importance;
- Rules specific to Natura 2000[4] sites;
- Specific rules relative to the exemption from the prohibition to the destruction of protected fauna and flora species (art. L411-2 Environmental Code) – e.g. for imperative reasons of major public interest, including those of a social or economic

[1] CDC Biodiversité is a private simplified joint stock company and a subsidiary of the French financial institution "Caisse des Dépôts et Consignations" (CDC), created in February 2008. It acts as an provides the necessary intelligence for biodiversity-related project design and monitoring, including the implementation of offset measures (i.e. compensatory actions) on behalf of project developers. It is currently testing a habitat banking approach, the focus of this case study.
[2] It has now been integrated and consolidated in the Environmental Code, Article L 122.
[3] law 2008-757 of the 1st of August 2008 integrated in articles L160 to L165 of the Environmental Code
[4] Article 6 of the Habitat Directives, transposed into articles L414-1 to L414-7 and R414-19 to R414-24 of the Environmental Code

nature. The exemption demand should provide the offset measures and the positive impact expected on the affected species. Exemptions are granted on the condition that there is no other satisfactory solution and that the exemption does not adversely affect the maintenance in a favourable state of conservation of the populations of species concerned in their natural area of distribution.

Despite this legal basis, offset schemes have not been fully implemented in France. There are various underlying reasons:

- a lack of control and follow-up,
- technical and land obstacles,
- scope being limited to protected biodiversity, and
- weaknesses from the national legislation, stemming from the difficulty of making clear methodological guidelines where case-specific assessments (on how to quantify impacts and assess ecological equivalency, on allowed distance from impact, and the financial commitments of the developers) may be required.

The Law for the Protection of Nature stipulates that offsets should be implemented "if possible", implying this action is an empowerment but not an obligation. No national guidelines have ever been released by the French administration to clarify what compensation is and how it should be implemented. However, a number of thematic guidelines do exist (e.g. for road infrastructure, energy infrastructure, mineral extractions, etc.) and some guidelines are also being developed at the regional level. Furthermore, the overlaps of various conservation laws make it difficult for different stakeholders to clearly understand what biodiversity offsets are about. As a result of this lack of common guidelines, local and national administrations have different visions on how offsets should be implemented.

Eventually, a lack of operators specialised in the implementation of offsets has left developers with minimal support to plan, implement and secure long-term management of rehabilitation actions. Until recently this has resulted in insufficient compensatory actions. In this context, a number of initiatives have recently begun. In particular, the EIA regulation will be modified to reinforce the control capacities of the State and to oblige developers to offset more effectively (a range of sanctions is foreseen). The ministry for ecology, together with its local agencies, is also committed to issue some general guidelines on compensation.

After decades of being overlooked, compensation measures are again attracting interest as a potential and innovative economic incentive to tackle the rapid decline of biodiversity. Habitat Banking approaches are being tested at a national level[5], the first pilot compensation banking project has been launched in May 2009, aiming at evaluating the potential use of such a system in France

[5] Ministère de l'écologie, de l'énergie, du développement durable et de la mer, pers comm.

1.2 Context

1.2.1 The two approaches regarding compensation

Compensation measures can be realised by the project developer directly or by an operator. In this second case, we can distinguish two types of approaches. The first one is called the "on demand" approach. At their request, an operator can implement required offset measures on behalf of project developers. Project developers must develop an EIA through specialised consultants, which will evaluate the impacts as well as propose offset measures. The project developer then submits the completed EIA to local agencies for advice, including proposals for avoiding, reducing and offsetting the impacts. Once the administrative authority has given its authorisation to proceed with the project and defined the final offset measures to be implemented, project developers can decide to contract with an operator to realise those offset measures.

The second approach is called the "supply approach". It seeks to anticipate potential demand through financing positive actions for biodiversity, which will be used for compensation at a later stage. The pilot project currently being developed by CDC Biodiversité is the first conservation banking experience in France. This project is designed notably on the basis of established law for offsetting (Environmental Code article 122.1 and European Directive 2004/35/EC on Environmental Liability) and will provide valuable experience and lessons learned.

1.2.2 The activities of CDC Biodiversité

Most of CDC Biodiversité's activity is currently based on the offset demand from project's developers Its involvement can include every step of the offset measure, including:

- Searching and securing land (if purchase of land is necessary)
- Developing management plans;
- Implementing the measure;
- Ensuring management and follow-up as long as necessary; and
- Reporting to both the control authority and the project developer.

Overall, CDC Biodiversité steers the process, contracts with local experts (consultants, work companies, associations, managers of parks or protected areas, etc.) and guarantees the coherence and effectiveness of the offset measure. However, the French law does not allow the transfer of penal responsibility and the project developer remains therefore the legally responsible for delivering the offset.

CDC Biodiversité is currently working on about ten "on demand" projects, including offsets against highway constructions, maintenance and development of the national road network, creation of wind farms and development of business parks. The contracts signed between

CDC Biodiversité and project developers vary from about €100,000 to €1,000,000s and with commitment periods of up to 55 years.

1.2.3 The "supply" approach: experimentation of the Habitat Banking principle.

To assess the potential of habitat banking in France, CDC Biodiversité, the French Ministry of the Environment and regional government agencies launched a pilot experiment in 2008. It has been officially inaugurated on May 2009 by the French Secretary of State for Ecology.

The habitat banking approach seeks to anticipate potential demand through financing positive actions for biodiversity before the damage from development occurs, which will be used for compensation at a later stage. The pilot project developed by CDC Biodiversité is the first experience of habitat banking in France. Therefore, it is worthwhile to note that a habitat banking system as such does not yet exist in France. This project has no specific legal foundation and builds on established law for offsetting.

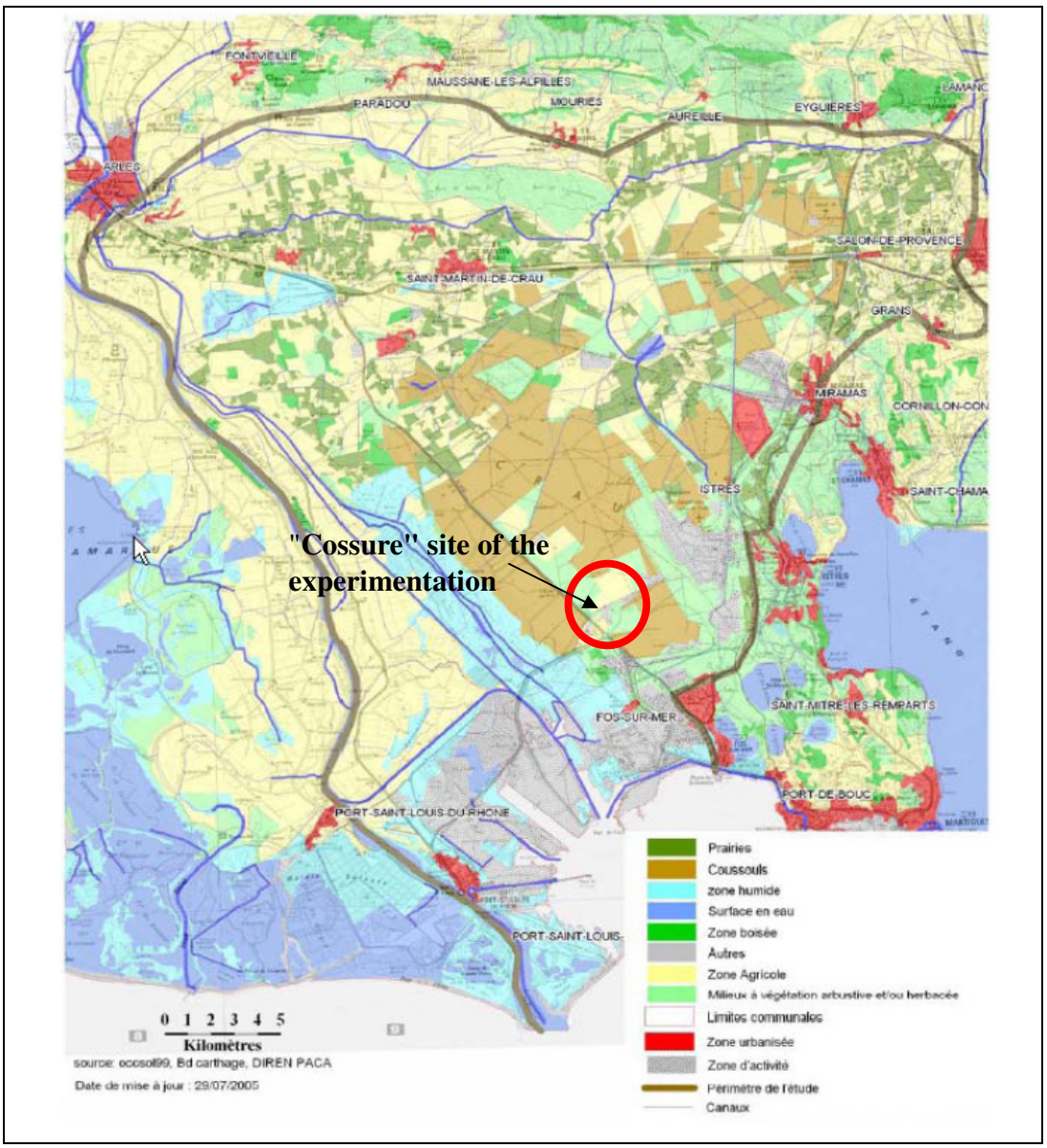
The pilot site is located in the Plaine de Crau, in the Provence-Alpes-Cotes d'Azur (PACA) region in the Western part of Marseille (see Map 1). It is the last semi-arid steppe in Western Europe and contains several rare and threatened species of bird (Pin-tailed Sandgrouse, Little Bustard, Lesser Kestrel etc.), insects (endemic specie of grasshopper) and plants. These steppes used to cover 40,000ha (98,842 acres) in the 17th century and only 11,500ha (28,417 acres) were remaining in 1990, which are partially fragmented due to human activities. Multiples factors are driving the degradation of this habitat, including:

- The Plaine de Crau lies at the crossroads of major circulation axis in the South of France (Rhône Valley, Mediterranean and Languedoc regions), which results in intensive development of roads, railways, maritime and fluvial transport as well as pipe-lines;
- The development of new activities linked to the port of Marseille (industry, logistic, wind power plant, etc), which creates new needs in terms of transport, lodging and energy;
- Farming and the development of greenhouses and arboriculture since the 80's; and
- Pollution from a municipal dump as well as from military land included in the site area.

Different conservation tools have been put in place to protect and manage the specific habitats of the Plaine de Crau. In particular, the Plaine de Crau is included in the Natura 2000 network. Most of the remaining steppe (7,411 ha) is classified as a National Nature Reserve[6] (Nature Reserve of Crau). In addition, the *Conservatoire du Littoral et des Rivages Lacustres*[7] has purchased part of the littoral zone to implement conservation actions.

[6] Decree n°2001-943 of October 8th 2001 creating the Nature Reserve of the Coussouls de Crau (Bouches-du-Rhône).
[7] Public administrative body with the responsibility of conducting appropriate land-use policies for the protection of threatened natural areas. Its remit and domain of competence are defined in the Rural Code (articles L243 and R.243).

The traditional land-use of the Plaine de Crau was dedicated to extensive pastoral activities and represented an area of transhumance with ewe herds. Extensive livestock production and seasonal grazing has played an essential role in the creation of the original habitat. Such practices have diminished in recent decades, to be replaced by industrial orchards, which have contributed to damage thousands of hectares of the steppes. Sale of land used for arboriculture represents an opportunity for environmental rehabilitation of the Plaine de Crau and the possibility of reintroducing extensive pasture activities, which support the balanced use and management of the steppes.



Map 1: Location and territory occupation
Source: DIREN PACA

CDC Biodiversité bought a 357 ha plot in September 2008, in accordance with local and national environmental agency, to serve as the first *in situ* experiment of habitat banking in France. Through this project, CDC Biodiversité commits to provide biodiversity offset before impacts from development occurs, convert abandoned orchards into grazing pastures and ensure the durability of the offset measures on the long term. In addition, it plans to aggregate offsets from several developers and thus allow a more coherent approach to compensation and better conservation outcomes.

1.3 Analysis

1.3.1 Methodological issues

i. Objectives

The habitat banking experimentation in the Plaine de Crau aims to primarily convert arboriculture land into sustainable grazing areas for ewe herds as well as suitable habitats for the many endangered bird species found in the area. To do so, a 357 ha piece of land (882 acres) has been identified next to the National Nature Reserve in the steppe part of the Plaine de Crau. Previously an arboriculture domain (the "Cossure" domain), it fell into bankruptcy two years ago and exploitation stopped. CDC Biodiversité has been able to secure this land in Plaine de Crau by purchasing it and acquiring property rights for 30 years. It has been bought through the SAFER, society entitle to pre-empt land on sale to make it available for sustainable development projects in rural areas (e.g. support local economy, installation of young farmers or natural resources conservation).

In order to rehabilitate the site, the project will first remove the old orchard and windbreaks, irrigation equipment and other agricultural residue, and then recreate as far as possible the pre-existing topography, soil and vegetation. An unusual feature of this experiment is the role of agriculture in ecological restoration. As part of the pilot project, traditional grazing methods will be reintroduced as a key element of the site management plan. Although these pastures are currently being planted with non-native species, this is creating favourable conditions for the return of native vegetation in the future. Indeed, a return to the original steppe flora can only be carried out through a long-term approach (a couple of millenniums probably!). Dry grassland is providing a favourable environment to both the local threatened fauna and extensive ovine pasture. The pasture will, in turn, help maintain short grassland as well as avoid overgrown vegetation and proliferation of invasive plant species. Grazing will mainly take place in spring and the farmers will be contracted on a pluri-annual basis to carry out pasture planting and maintenance according to enacted specifications.

An active Orchard

Rehabilitation of the site: removing old orchard and windbreaks, irrigation equipment and other agricultural residue

Rehabilitation of the site: recreate the pre-existing topography, soil and vegetation

Expected result after rehabilitation

The rehabilitation and conservation of the site's biodiversity will be evaluated and optimized through a management plan. The outcome of the project will be to offset development impacts on biodiversity only, with a focus on protected habitats and species. These biodiversity offsets are designed to achieve the neutrality of development project impacts on biodiversity ("no net loss" of biodiversity). They are intended for residual impacts after avoidance, reduction and restoration has been carried out by project developers in accordance with the current legal framework. As the site experiment is adjacent to the National Nature Reserve, the banking experiment is expected to locally increase the ecological coherence. It is also expected to improve biodiversity connectivity between the Crau and the Camargue, linking currently disconnected different parts of the Crau Nature Reserve.

The CDC Biodiversité experiment is based on the hypothesis that different development projects will require offset actions that could be provided by the Cossure project. No advanced market analysis has been performed, but the regional environmental agency (DIREN) has indicated to CDC Biodiversité that development projects are currently being planned around the pilot site. The PACA region, located on the shore of the Mediterranean Sea, is one of the French regions predicted to experience some of the highest growth of population and activity in the near future.

ii. System description

As stated above, offsets are required under article L122.1 of the Environmental Code, which since 1976 has set out the obligation for developers to perform an Environment Impact Assessment and to detail what measures are required ""to avoid, reduce and, if possible, remedy significant adverse effects" of the project. In practice, a project developer will have to submit the project proposal and the Environmental Impact Assessment to the competent State administrative authority (Préfet) responsible for authorising or approving these projects. After consulting the stakeholders and the local administration bodies, the Préfet decides if the project can be implemented and which accompanying offset measures are necessary. Finally, the DIREN is in charge of controlling the offset action.

In national guidelines, compensation for ecological issues are defined as measures to obtain habitats with the same ecological level or more than the residual loss and in the direct surroundings of the impact when possible. Those measures have to be implemented as soon as possible and before the impact occur. However, there is no legal definition of which activities and outcomes qualify as part of the generation of conservation credits. This part is left at the discretion of the regional administrative authority and therefore discrepancies might occur among regions. CDC Biodiversité defines compensation as "to realise an action generating a biodiversity gain at least equivalent to the residual loss". Other actions, such as training, research or capacity building, are relevant as additional measures but are not targeted as priority actions under the banking experiment. Similarly, the law does not define where biodiversity credits and conservation banks should be located or what the criteria for site selection are. Preferably, offsets are expected to occur near or adjacent to the impact site (in-situ offsets), but practice indicates that this is not always the case. It depends on

many factors, including land availability. In the case of the banking experiment, the location of the site is very important as it is of high ecological importance with fragile and rare habitats. And it is located in a region where dynamic and significant economic development is forecasted and offsetting is mandatory for every development project undertaken in the area. Therefore, it is reasonably expected that demand will arise for a "banking offset", despite potential competition with other compensation measures (see section 2.2.2).

Usually offset actions take place once the damage has occurred. Increasingly, however, regional government agencies are asking for the offset to already be in place before the impact occurs, to avoid risks linked to land availability, lack of implementation, monitoring and control. The banking experiment in the Plaine de Crau is delivering an ecological gain before the damage for which it would compensate has occurred.

The CDC Biodiversité has committed to guarantee the banking credit system for a period of 30 years. This duration should be long enough for the project to provide with credible biodiversity offset but not too long to dissuade developers to invest in this project, as they are not familiar yet with these timeframes. However, no official duration is imposed by law for offset actions either for "on demand" offsets or for banking offsets. In practice, the duration of conservation outcomes is highly variable and depends on the decision taken by the regional administrative authority, usually from 0 to 5 years. There is a trend, however, for increasingly higher levels of commitment: recently a 150 km highway was authorised and its developer committed to secure 1,400 ha of land (3,460 acres) and pay for 55 years of its ecological management. However, the duration of the offset measure should be defined in accordance to the ecological characteristics of the site and the time needed for rehabilitation. In this particular pilot project, the native vegetation of the steppe is quite difficult to reintroduce and the habitat and the ecosystem is not expected to be fully recovered after several centuries. To date, CDC Biodiversité has a 30 year lease on the site and one of its objectives is therefore to propose a secured management plan beyond this period.

CDC Biodiversité has contracted with the co-manager of the Crau Nature Reserve (the CEEP association) and the University of Avignon to compile initial state, fauna and flora inventories of the site, as well as develop monitoring and evaluation indicators, in order to assess the success of the operation. The local Chamber of agriculture and the CEEP are also in charge for the site rehabilitation and the ecological restoration (seedbed).

The additionality issue remains a question with no clear answer in France, though carbon trading schemes are regarded as a relevant comparison. The PACA Region developed its own guidance regarding offsets where additionality is one of the 4 fundamental principles along with the "No net loss", long term conservation outcomes and feasibility of the measure. The habitat banking experiment will require that bank credits demonstrate conservation outcomes that would not have happened without the offset.

CDC Biodiversité and the Ministry of Ecology will work together to determine the value of the project in term of offsetting: define the biodiversity unit produce by the project, exchange criteria, equivalence or compensation ratios. In France, ecological assessment of development impacts is generally based on a "Type /Quantity /Quality" approach. “Type” refers to identifying the impacted resource. Current practice consists of identifying what habitat and what species are potentially impacted, with attention mostly paid to protected taxa. The “Quantity” of the offset is generally measured in hectares of the area impacted, or the number of individuals (this can be appropriate for plant species). Eventually, the “Quality” is designed to express the conservation state of the impacted resource, generally expressed through a "bad to good" gradient. This qualification is based on experts’ opinions (“dire d'experts”), which can be criticized as subjective. CDC Biodiversité is currently exploring the use of others assessment criteria such as ecological services.

The ecological equivalence for the pilot project is not determined beforehand. How to quantify the impact of a development project and equate that to purchasing credits generated by the banking project will be established on a case-by-case basis. On one hand, the loss of biodiversity resulting from projects is determined through the Environment Impact Assessment. On the other hand, conservation gains resulting from offset action, including the “Cossure” project, are evaluated with different methods. As a consequence, it remains difficult to assess whether the quality of the compensatory outcomes is equivalent to the loss of biodiversity. Additionally, the site is actually being turned into a grazing steppe but is still far from being recovered to its original state and as such, projects located outside the Plaine de Crau, but with a similar ecology, could potentially be eligible: for example, projects impacting dried plains and sheltering common bird populations that range in larger territories than the Plaine de Crau.

As there are no legal standards for biodiversity compensation in France, offsets might be required for strict ecological equivalence in some cases or "trading up" may be allowed in other cases. CDC Biodiversité is aiming for “like for like” equivalence though it might test trading up in the banking experiment. As stated previously, complete rehabilitation of the Cossure site will take over 1000 years in order for the vegetation to come back and for the ecosystem to provide its initial ecological functions. However, when purchasing a biodiversity offset through the Cossure restoration project, a project developer will contribute for the first 30 years of the land rehabilitation. During this period, the restoration actions undertaken will first set the Cossure site in the appropriate ecological dynamics. Moreover, the primary ecological objectives aim towards the reintroduction of threatened animal species, not vegetation. So the offset units traded will be units of habitats for birds and insect species.

In order to reflect the inevitable scientific and implementation uncertainties when designing a biodiversity offset, compensation ratios are commonly used and will be used in the banking experiment. Usually, ratios used go from 1:2 to 1:10 (number of biodiversity credits needed to be withdrawn from the bank to provide compensation for 1 ha of land impacted). Higher ratios are used when protected habitats or species are impacted though there is no accepted

methodology to define the appropriate compensation ratio. However, the Marseille Harbour recently conducted some innovative work in the nearby harbour area that could give some insight. As a result, a matrix of offset measures has been produced, which classifies zones according to their ecological importance and propose offset measures (specific compensation ratios, land tenure secure) for each type of zone. The specific compensation ratios that will be used in the habitat banking experiment still need to be defined. CDC Biodiversité will finance a post-doctoral research position on the issue of equivalence for offsets. This study will notably focus on developing a methodology for ecological equivalence, which could be easily used by the administration or the experts realising environmental impact assessments in order to quantify impacts, offsets and their equivalence.

In short, the decision concerning the level and quality of offset (activities, location, timing, duration, etc.) relies on local governmental agencies and, to date, there are no standards to refer to. As a consequence, the decision on when and how offsets are required remains highly subjective and may vary from one project to another.

iii. Links to other policies and issues

There are many biodiversity conservation tools in place, responding to national legislation (e.g. natural reserve, regional or national parks, etc.), European legislation (e.g. Natura 2000) or to international conventions (e.g. Ramsar Convention). Offset compliance is one these tools, developed to follow the "polluter pays principle". The implementation of multiple biodiversity conservation policies can certainly affect the level of offset and/or biodiversity credits needed. If a project is intended to be developed in a protected area for instance, this will be reflected by the Environmental Impact Assessment and will increase the intensity of damages and therefore the level of offsets necessary to produce. Similarly, the biodiversity credits generated in ecologically sensitive places should be more valuable than credit created elsewhere.

The crossover of various pieces of conservation legislations may induce additional constraints for project developers. For instance, if impacts occur on a Natura 2000 site, project developers will need to undertake extra procedures at the European level, which will add administrative and transaction costs as well as several months delay in the implementation of the project.

1.3.2 Implementation issues

i. Institutional roles and responsibilities

The mitigation hierarchy is defined and enforced to avoid emphasis on offsets or conservation banking at the expense of avoidance, minimisation and restoration. It relies on the involvement of government agencies and NGO's during the Environmental Impact Assessment. To avoid any conflict of interest, CDC Biodiversité does not interfere during the Environmental Impact Assessment, the discussions on the mitigation hierarchy and in the authorization process.

No legislation, policy or institutional infrastructure defining offset banks are in place yet. CDC Biodiversité advocates that bankers must demonstrate different types of standards before being authorised to start a bank. In the event that a conservation bank goes bankrupt, there is no provision planned so far. Nevertheless, the "Grenelle" bill plans to commit developers who have not realised their compensatory measure to deposit the corresponding amount of money. This is a new regulatory development and could provide a legal precedence to develop a safeguard system for habitat banks.

If a developer responsible for an offset transfers its title to a project to a successor in title, the obligation to support the offset passes to the successor in title. However, French regulations do not allow responsibility being transferred from a developer to a habitat bank. This curbs the potential rise of credit prices that could result from the transfer of the associated risk.

Currently, the permanence of outcomes is ensured for a 30 year period by CDC Biodiversité, after which, it is committed to guarantee an appropriate solution for long-term conservation. 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 confer a conservation status to the site (reserve, park etc.). However, it should be noted that a change in land tenure might create a risk for the permanence of biodiversity offsets generated under this project.

In regards to local stakeholder consultation, because no structure exists to date it is too early to evaluate how consultation needs to be integrated. Nonetheless, CDC Biodiversité is involved with different stakeholders in the pilot site, for instance with the DIREN, which proposed the pilot site. A governance structure has been put in place, at the local and national levels, to follow the pilot project.

ii. The 'economic incentives'

Considering the costs of implementation, one of the justifications for habitat banks is that they are more cost-effective than ad-hoc offsets. However, this has not yet been demonstrated in France because of the absence of overarching standards for offset implementation. Today, the price for credits through the habitat banking experiment is estimated at €35,000/ha. This price includes land purchase, restoration/rehabilitation and management over 30 years. However, developers may find it cheaper to offset their impacts on their own, through shorter-term projects validated by the administration (usually 5-10 years). In general, habitat banking in France suffers from a lack of national standards, especially regarding the duration of offset actions, which could make it more competitive compared to other offset projects.

Because offset and banking projects could under certain conditions be implemented elsewhere than where the impact occurred, the socio-economic benefits associated with the environment might be transferred from locations and populations impacted by development.

However, as offset actions are not well developed or proven efficient so far, this issue of distributing the benefits or of taking into account the differences between locally realised and population-wide benefits has not yet been raised.

iii. Legal issues and responsibilities

The responsibilities for managing and monitoring credit sites as well as the coherence of the overall banking system are still issues that need to be legally defined at the national level. CDC Biodiversité is currently working on a definition of a biodiversity credit and its legal standing. In terms of implementation, the administration will be accountable for putting into practice biodiversity credits and banking offsets.

The local authority will be in charge of keeping track of the transactions of credits and debits of the pilot project. CDC Biodiversité is also exploring the possibility of developing a registry in order to keep track of owners of banks and biodiversity credit trades. It will ensure that biodiversity credits can be tracked from issuance to withdrawal and will guarantee against double selling. Most likely, it will be done by building on the experience gained by CDC (the parent company) in creating the Seringas software, which is the registry of CO_2 quotas used by France and several others European countries.

At the level of the project, the pilot project in Crau is financed and managed by CDC Biodiversité. CDC Biodiversité is supported by several national and local agencies, notably the Ministry of Ecology, the Regional Environment Agency (DIREN), the management of the Crau Nature Reserve and the local Chamber of agriculture, with additional technical support provided by scientists at the universities of Marseille and Avignon. As part of the banking experiment, a PhD study will be financed on vegetal/ecological engineering and restoration of Cossure.

CDC Biodiversité will receive the authorisation from the administration to sell credits and it will sign a contract with all developers buying credits to ensure their commitment for 30 years. CDC has developed an ecological management plan within which specific ecological objectives indicators are defined. It will also realise annual reporting on the project activities and results. Additionally, project performance will be overseen by a third party, most likely the DIREN. Beside the role of the DIREN as the control entity for the project, additional public agencies are sitting on the steering committee.

In terms of performance and evaluation, it is too early to assess if the banking experience complies with the principles of efficient regulation or how it deals with likely tradeoffs between limiting regulatory burdens and ensuring high environmental standards. However, a registry for credits would provide environmental and financial guarantees to stakeholders, in particular buyers, in term of the quality of the credits (real, verified, additional, unique, etc.) and will be an essential element to monitor a banking scheme at the national level. In addition, there is no entity in place yet that could perform control and evaluation of biodiversity offset actions. More and more scientists and associations, including CDC Biodiversité, are claiming for the creation of such a control agency dedicated to biodiversity.

To date, the National Council for the Protection of Nature (Conseil National de la Protection de la Nature – CNPN) is the only national body which examines cases of impacts on protected species as well as the related offset measures that are required. This way, the CNPN will evaluate if a project impacting protected species can be offset through the banking pilot project in Cossure.

The conditions for the development of conservation banking still need to be created in France. Indeed, habitat banking is still being experimented while no juridical or legal definitions, no responsibilities and no infrastructures have yet been established. In addition, the current framework for offset actions does not provide project developers with the right economic incentives for them to invest in long term and robust offset actions, as the pilot banking project intends to do. The current experimentation, with the pilot project in the south of France, will show whether such a system can be successfully implemented or not. Particular attention will have to be paid to the respect of the mitigation hierarchy (given the potential "pressure" created by the available credits) and to the equivalence between credits and debits.

1.3.3 Future Work

The pilot project in Crau, lead by CDC Biodiversité, is offering new perspectives to offset impacts on biodiversity in France. If it is successful, this pilot project will be able to demonstrate the features of the banking mechanism: offset measures before the impact on biodiversity occurs, secured finance and land tenure through long term contract with the project developers, aggregating several offsets to have more coherent actions and larger-scale conservation outcomes and build field knowledge and experience. Beyond the field project, it will be an opportunity to think or develop an offset scheme with biodiversity offset banks at national level and develop partnership with project developers to invest in habitat banking.

Though CDC Biodiversité and its partners still need to respond to several challenges that still need to be solved, including the long-term use and governance of the site, how rapidly the native vegetation and other species will recover, how many "biodiversity credits" will be generated by the experiment and how much damage to other sites may be offset as a result. In addition, the concept of biodiversity or habitat banking is unfamiliar to the general public, and among developers. The Cossure operation is the first pilot of a habitat banking experiment in France. As part of the experiment, a total of 5 pilots operations will be conducted by CDC Biodiversity with the Ministry of Ecology. So far, another pilot is about to start in Poitou-Charentes region, near to a Natura 2000 site.

1.4 Summary

The experience of offsets and banking is still at an early stage of development in France. Habitat banking is currently being test, with one pilot project launched. The results of the

experiment will determined whether it is relevant and possible to foresee the development of habitat banking in France.

To date, there is no habitat banking system in France. There are various underlying reasons for this: a lack of control and follow-up, technical and land obstacles, a scope limited to protected biodiversity, and the lack of clear guidelines from the French administration to clarify what compensation is and how it should be implemented. As a result, no impacts or offset actions can be verified against: standards defining the eligible offset activities; the approach to quantify impacts and assess ecological equivalency; the distance from impact; additionality; or the financial commitments of the developers. The decision on when and how offsets are required is at the discretion of the local administrative authority (Préfet), with support of the local environment agency (DIREN). The absence of standards limits the coherence in the decision-making process which is highly subjective and may vary from one project to another.

In this context, a number of initiatives have recently been initiated. In particular, the EIA regulation will be modified so as to reinforce the control capacities of the State and to oblige developers to offset more effectively. The ministry for ecology, together with its local agencies, is also dedicated to issue some specific guidelines on compensation.

To date, there is no habitat banking system in France. In order to assess the potential use of habitat banking, one pilot project has been launched in May 2009 by CDC Biodiversité, a private company, in the South of France. The development of conservation banks could respond to the demand from local agencies to have offset gains already in place when the impact occurs on a site. In order to assess the potential of habitat banking, CDC Biodiversité, with the Ministry of Ecology, will conduct a total of 5 pilot operations in various types of habitats. The first pilot project has been launched in the South of France.

This site experiment ("Cossure", in the Plaine de Crau) is a site of high ecological interest with unique, but threatened, habitats and endemic species (insects and birds). It includes 357 ha of semi-arid step (the only one in Western Europe), which has been degraded and fragmented by human activities over the last few centuries. The experiment is based on the hypothesis that different development projects will require offset actions that could be provided by the pilot project. The region, located on the shore of the Mediterranean Sea, is one of the French regions predicted to support some of the highest growth of population and activity in the coming years. So far, the site is being rehabilitated in order to generate biodiversity credits, which could at a later stage be sold to project developers to offset their impacts. The project intends to financially commit project developers for 30 years. CDC Biodiversité is also exploring the possibility of creating a registry to ensure that biodiversity credit can be tracked from issuance to withdrawal and guarantee against double selling. The ecological equivalence between the credits generated by the "Cossure" project and impacts of projects will be determined on a case-by-case basis.

The main constraint in France for habitat banking approach is, as for offsets in general, the absence of standards at the national level. The reinforcement of standards at the national level is necessary, is a condition for coherent design of offset projects in terms of duration, location, additionality and so on. The current situation gives a competitive advantage to offset actions, which are realised with lower level of commitment for the project developer (cheaper and realised over a shorter period of time, usually 0-5 years). Moreover, the crossover of various pieces of conservation legislation (conservation tools resulting from national, European and/or international legislations and conventions) is likely to introduce additional constraints for project developers. For instance, if impacts occurred on a Natura 2000 site, project developers will need to undertake extra procedures at the European level, which will add administrative and transaction costs as well as several months delay in the implementation of the project.

The legal terms related to habitat banking, such as the definition of responsibility for managing and monitoring credit sites or the coherence of the overall banking system, are still issues that remain to be defined. However, the progress of offsets and banking is not necessarily slowed by this as the administration will be accountable for implementing biodiversity credits and conservation banking. Additionally, as there is no evaluation and control body in place, more and more scientists and associations, including CDC Biodiversité, are calling for the creation of such a control agency dedicated to biodiversity.

CDC Biodiversité and its partners still need to respond to several challenges including the long-term use and governance of the site, how rapidly the native vegetation and other species will recover, how many "biodiversity credits" will be generated by the experiment and how much damage to other sites may be offset as a result.

If successful, this pilot project will demonstrate the benefits from the banking mechanism: effective offset measures before the impact on biodiversity occurs, secured finance and land tenure through long term contract with the project developers, aggregate several offsets to have more coherent actions and larger-scale conservation outcomes and build field knowledge and experience. Moreover, it will also be an opportunity to think or develop an offset scheme with biodiversity offset banks at national level and develop partnership with project developers to invest in habitat banking.

2. Australia

2.1 Introduction

Most States in Australia have introduced some form of biodiversity banking or biodiversity offsets, with approaches varying between States. In the State of Victoria, 'native vegetation offsets' are required under planning law. Following avoidance and minimisation, the Victorian system requires developers to offset impacts on native vegetation as a condition for planning approval, according to the Native Vegetation Regulations under the Planning and Environment Act. One option available to developers is to purchase biodiversity credits produced by private landowners and sold through a government regulated trading system ('Bushbroker'). The NSW Government has introduced specific regulations allowing mitigation 'banking' ('BioBanking') and has also published principles for biodiversity offsets. Other States rely more on policy and guidance notes, with biodiversity offset policies introduced in West and South Australia and the Queensland Government having recently issued a Draft Policy on Biodiversity Offsets.

Consideration of biodiversity offsets at federal level has followed their implementation at state level. Biodiversity offsets are a subset of the various types of offsets that may be used under the Environmental Protection and Biodiversity Conservation Act (EPBC Act) 1999. A draft Policy Statement and Discussion Paper in relation to the imposition of bio-offsets under the EPBC Act was released in 2007. The aim of the policy is to achieve a consistent, transparent and equitable application of bio-offsets under the EPBC Act by reference to a clear set of guiding principles. There is therefore no consistent approach to implementing the federal Act, but offsets have been negotiated on a case-by-case basis for approvals required under it (ten Kate, pers.com).

The Australian Government sometimes applies offsets in different States under the EPBC Act. Federal and State Governments are beginning to work together to coordinate offset requirements. Where possible, offsets packages are developed to meet offsets requirements under the Australian Government's EPBC Act, and any State-specific offsets that are triggered by a development proposal.

The expectation is that all existing State/ Territory biodiversity offsets policies and schemes would also be capable of satisfying the Commonwealth Draft Policy in relation to biodiversity offsets under the EPBC Act. Guidance is likely to be issued to help developers to tailor biodiversity offsets so that they can meet both State and Federal requirements, particularly for development projects likely to have impacts at both State and Federal levels. There is still some uncertainty at present as to how the systems will integrate in practice.

2.2 Analysis

2.2.1 Objectives

In all Australian biodiversity offset schemes, the main underlying objective is to halt or reverse loss of native vegetation, which has accelerated in recent years, whether as a result of land clearance for agriculture or urban development. In the State of Victoria the key driver was the Native Vegetation Regulations under the Planning and Environment Act and the main underlying objective is to halt loss of native vegetation in the State, contributing to a state policy of 'no net loss'. The NSW Government's Biodiversity Banking and Offsets Scheme is intended to help address loss of biodiversity values, including threatened species, with an 'improve or maintain' goal. In West Australia the aim is to achieve no environmental difference (i.e. no net loss) and, aspirationally, a net benefit or 'net environmental benefit' outcome following successful application of offset activities.

The Queensland Government's Draft Policy on Biodiversity Offsets has the following objectives:

- To ensure an equivalent or better biodiversity outcome on a State-wide basis where biodiversity values are lost to impacts from development or other activities.
- To improve the long-term protection and viability of the State's biodiversity.
- To increase the area of habitat restored and enhanced.
- To ensure development in Queensland is ecologically sustainable.

Additional objectives referred to in these schemes include provision of opportunity to landowners to benefit from offset activities and the enabling of markets in sale of credits. One of the stated objectives of the NSW 'biobanking' scheme, for example, is to:
"[create] *a market that values biodiversity conservation. The scheme will send a strong price signal that maintaining and rehabilitating bushland can produce a valuable asset, rather than producing a potential future liability*." (2nd Reading Speech, NSW Legislative Council, 24 October 2006).

Descriptions of main systems

Federal Policy
At present, 'trade-offs' or bio-offset-like conditions are sometimes imposed as part of the EPBC Act decision making process at both the 'controlled action' stage (when the Minister decides whether the referred action or development proposal requires approval under the Act) and in the form of conditions to approvals. Such offsets are informal in the sense that the EPBC Act does not provide for a structured 'credit/debit' assessment methodology to be applied in relation to the measurement of impacts and offsets, and offsets may be required in the form of a package of various different types of actions.

At the controlled action decision stage, the Minister may decide that the referred action is not a controlled action requiring approval, providing particular offset activities are carried out in a "particular manner", for example:

- impacts of a retirement village development in Queensland were required to be partially offset by protecting and revegetating other environmentally important land, including 5 ha of koala habitat (EPBC 2006/2663); and
- impacts of a residential development in Victoria were required to be offset by transferring a portion of the development land to the local council to form a nature reserve to protect the Golden Sun Moth (EPBC 2006/2932).

This is potentially controversial in relation to the stage of the mitigation hierarchy at which offsets are invoked.

Offsets are also imposed as conditions to approvals. These have included, for example, requirements to:

- implement a plan to enhance the biodiversity of a grassland by revegetation with indigenous species, and measures to protect certain species, in respect of an approval to extend a quarry (EPBC 2002/862); and
- implement a suite of offset measures to mitigate on and off-site impacts to a threatened species including engaging in feeding and research programs (EPBC 2005/2389).

The proposed policy for bio-offsets under the EPBC Act

A draft Policy Statement and Discussion Paper in relation to the imposition of 'bio-offsets' under the EPBC Act was released in 2008. The aim of the policy is to achieve a consistent, transparent and equitable application of bio-offsets under the EPBC Act by reference to a clear set of guiding principles, replacing the current more informal approach.

The draft policy defines bio-offsets as "actions taken outside a development site that compensate for the impacts of that development – including direct, indirect or consequential impacts".

Similar to the New South Wales Biobanking Scheme, the use of bio-offsets under the EPBC Act is intended to be on a compensatory basis only, rather than as a substitute for avoidance or taking appropriate on-site mitigation measures. The proposed policy is that bio-offset proposals will not be considered unless they also set out avoidance and/or mitigation measures.

However, consideration will be given to the potential combination of offsets and mitigation measures in achieving an acceptable conservation outcome, or whether a better outcome may be achieved through the use of bio-offsets rather than mitigation measures.

Direct or indirect characterisation of offsets

The draft policy proposes that offsets be characterised as direct or indirect:

- Direct offsets concern practical maintenance and improvement of habitat or landscape values, including conservation reservations and covenant arrangements, restoration or rehabilitation of degraded habitat and re-establishing habitat.
- Indirect offsets comprise a range of other actions geared towards improving knowledge, understanding and management, including the implementation of recovery plans, contributions to research programs and removal of threatening processes.

"Maintain or enhance" basis for bio-offsets

Bio-offsets under the EPBC Act are intended to be used only to "maintain or enhance" the health, diversity and productivity of the environment as it relates to "protected matters" that is, matters of national environmental significance or actions involving the Commonwealth. The appropriateness and availability of bio-offsets will be determined on a case by case basis with regard to the scale and intensity of the impact of the development. Bio-offsets are not intended for development resulting in minor impacts that could otherwise be mitigated.

Principles for the use of bio-offsets

The draft policy suggests use of the following eight principles to guide the assessment of bio-offset proposals:

- Bio-offsets should specifically target the matter protected by the EPBC Act that is being impacted upon, that is, a matter of national environmental significance or an action involving the Commonwealth.
- The design and use of bio-offsets should be sufficiently flexible to enable long-term and certain conservation outcomes that are also cost effective for proponents.
- Bio-offsets should deliver a real conservation outcome – that is, an outcome that otherwise would not have occurred, for example, purchasing an existing unprotected habitat and ensuring it is actively managed and protected in perpetuity.
- Bio-offsets should be considered in terms of a package of actions, which may include both direct and indirect offsets. Although direct offsets are preferable, there may be cases where a mix of direct and indirect actions would provide a better chance of achieving a sustainable outcome, for instance as risk of failure is diluted and the scope of conservation outcomes is broadened.
- Bio-offsets should be at least commensurate with the extent of the impacts of the development and ideally deliver "like for like" outcomes. The threshold for use of bio-offsets is whether they will achieve a "maintain or enhance" outcome of the matter protected by the EPBC Act. Consideration will be given to the following matters:
    - the scale and intensity of impacts of the development;
    - achieving the best long-term conservation gains;
    - precedents set by previous offsets in similar circumstances;
    - the possibility of building on or complementing the approach of the relevant State or Territory; and
    - the degree of certainty that the offset will result in a conservation gain.

- To guard against degradation of an area of importance to a protected matter, wherever possible, bio-offsets should be located within the same general area, that is, the same bioregion or subregion as the development activity.
- Delivery of bio-offsets should be timely and long lasting. As a guide, offsets should function for the same period of time as the impact occurs, with consideration given to the security and long-term management of offset sites.
- Bio-offsets should be enforceable, monitored and audited. Proponents will be required to report on the progress of bio-offsets against benchmarks and the government will seek feedback from affected and/or interested parties.

State of Victoria

Under the Native Vegetation Act, developers in the State of Victoria are required to seek ways to avoid and minimise impacts on native vegetation, and if this is not possible, to offset residual impacts, to achieve No Net Loss.

There are three principal government-intermediated mechanisms to achieve no net loss of native vegetation in the context of development:

- Native vegetation offsets: these are required under planning law. Offsets for relatively minor projects are regulated by local authorities using a very basic area/ratio calculation. Offsets for more significant projects are referred to the Department of Sustainability and the Environment (DSE), which calculates loss/gain using a 'Habitat Hectares' method (see Annex to this Appendix), although there are alternative, simpler metrics for offsets for scattered and large old trees.
- BushBroker (see box 1): a market-based and computerised system for matching credits to specific offsetting requirements, following which the buying and selling of native vegetation credits is undertaken by the owners and buyers of credits or their agents. BushBroker also registers expressions of interest by landowners in supplying credits. Presently, it oversees the registration, listing, extinguishing, and quality control of native vegetation credits agents, but this function will, in future, be transferred to:
- The Native Vegetation Credit Register; a computer-based function for the registration, listing, extinguishing, and quality control of native vegetation credits, registering the contact details of buyers and sellers, credits registered, and sales made.

Box 1 Summary of the Bushbroker Scheme

Bushbroker is a system to establish, register and trade native vegetation credits (where a native vegetation credit is a gain in the quality or extent of native vegetation) because clearing of native vegetation that requires planning approval must be offset by a gain elsewhere.

Landowners register their interest in delivering credits with Bushbroker. A field officer for the Department of Sustainability and the Environment (DSE) works with the landowner to prepare a draft management agreement as the basis for the establishment of native vegetation credits and also calculates the number of credits potentially available, based on the habitat gains achievable through the management plan. Potential buyers of credits can search the BushBroker database for native vegetation credits that could match their specific requirements. BushBroker provides relevant information to the buyer, who can then progress a trade. Trading of credits (i.e. negotiations over price) is between the buyer and seller. BushBroker is not involved other than to record trading information such as new ownership details of the credits. A web-based system is proposed.

Policy/ legal trigger
The clearing of native vegetation in Victoria is regulated by the Planning and Environment Act 1987. In most cases permitted clearing of native vegetation must be accompanied by the identification of an appropriate offset vegetation offset.

Regulator:
Department of Sustainability and Environment (DSE). Responsible for agreeing the number and type of credits that can be registered and determining the number of credits required for the offset.

Offset rules
- 'Like for like' requirement in terms of habitat type. There are some 700 combinations of bioregion and ecological vegetation classes, each generating a different class of credit (although a much smaller number of credit types has been traded in practice so far). This precision in the definition of credits supports a fairly stringent 'like for like' approach.
- A credit can only be used for an offset once.

Benefit for biodiversity:
Helps to avoid the problems of managing several scattered, small areas of native vegetation which are unlikely to be sustainable in the longer term.

Benefit for developers:
Provides a simple and secure process for locating third party offsets (subject to approval from the responsible authority).

Benefit for landowners:
Represents an opportunity to improve biodiversity on their property, as well as generate a potentially new income stream from their native vegetation.

Costs/benefits
- Benefits local government through reduced administrative costs.
- Reduces overall transaction costs by facilitating the process of finding suitable offsets.
The price of native vegetation credits is determined by supply and demand. Because some vegetation types are scarcer than others, prices for credits vary.

How permanence is assured
Offset agreements under Bushbroker are subject to secure and permanent agreements registered on land title.
http://www.dse.vic.gov.au

New South Wales
There are two main approaches to offsets: through the original 'threatened species 'assessment of significance'' process, which falls under the Environment Planning and Assessment Act (1997) or through a voluntary 'Biobanking' Scheme. Developers can choose either approach.

The original approach to offsets in NSW involved the integration of 'threatened species impact assessment' with the process of environmental impact assessment. S. 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act), requires assessment of significance for potential impacts on threatened species, populations and ecological communities, and their habitats. The Threatened Species Conservation Amendment Act 2002 revised the factors that need to be considered when assessing whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats, previously known as the '8-part test.' The changes affect s. 5A EP&A Act, s. 94 Threatened Species Conservation Act 1995 (TSC Act) and s. 220ZZ Fisheries Management Act 1994 (FM Act).

The assessment of significance is the first step in considering potential impacts. When a significant effect is likely, further consideration is required and this is usually carried out through a more detailed 'species impact statement'. Where adverse effects on a threatened species population cannot be avoided, compensation is required, generally negotiated on a case-by-case basis. An example is purchase of land by the RTA (Road Transport Association) for inclusion in a State Nature Reserve, for which the land title was transferred to the Department for the Environment and Conservation (DEC). As well as measures to minimise and mitigate biodiversity impacts caused by a road bypass scheme, 89 ha were added to Karuah Nature Reserve to offset 47 ha of lost habitat. The added area created a larger contiguous block of habitat.

Biobanking

Biobanking is a market-based scheme established in New South Wales and anticipating its first trade in the coming months. It is a voluntary alternative to the 'threatened species assessment of significance' process, and is intended to provide an opportunity for rural landowners to generate income by managing their land for conservation as well as allowing developers to buy credits to offset the adverse ecological impacts of their development.

'Biodiversity credits' are generated by landowners who commit to enhance and protect biodiversity values on their land through a biobanking agreement. The credits can then be sold, generating funds which are used for management of the site. Credits are 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 others seeking to invest in conservation outcomes, including philanthropic organisations and government.

Landowners can decide which areas of their land they will include as the biobank site, allowing different economic activities (such as primary production) to continue on other parts of their land. Landowners can also decide who they will sell their credits to, the price of their credits, and the timing of the sale. All biobanking agreements are registered on the land title. The obligation to protect and manage the land is binding on both current and future owners of the site.

In summary, the biobanking scheme has the following key features:

- Establishment of 'biobank' sites by a voluntary "biobanking agreement" entered into between a landowner and the Minister for the Environment. Landowners apply for their land to be officially registered and then carry out conservation management as instructed.
- Trading of credits: biodiversity credits are created once a biobanking agreement is registered. Once registered, the credits may then be "traded", or used to offset a biodiversity impact on another site.
- Issue of "biobanking statements" to developers for their proposed development which essentially allows them to purchase biodiversity credits to offset any impact of their development on biodiversity values.

Developers applying for a biobanking statement need to provide:

- A description of the proposed development;
- Details of any on-site measures proposed to minimise biodiversity impact;
- An assessment of likely biodiversity impact, prepared in accordance with the biobanking assessment methodology; and
- Details of the number and class of biodiversity credits proposed to be retired to off-set the impact.

They must use an accredited assessor to undertake a calculation of required gains/credits using a formal assessment methodology and must demonstrate that the mitigation hierarchy has been appropriately applied with respect to their proposal.

BioBanking can provide the development industry with a number of advantages. These include:

1. Greater certainty when applying the methodology before purchasing land to identify any potential threatened species constraints (for example, areas identified as having high biodiversity conservation values). This allows developers to forecast the cost of the potential offsets and include them in the financial feasibility analysis for a proposed development.
2. Greater certainty in the cost and time associated with biodiversity assessments and offset calculations as credit requirements can be estimated and purchased at any phase of the project proposal.
3. The ability to run different development scenarios and assess the likely costs to offset any biodiversity impacts by using the BioBanking Credit Calculator (the electronic software version of the methodology).
4. Greater certainty and confidence that most of the issues regarding threatened species have been dealt with. This is because where a biobanking statement has been obtained, the consent authority is not required to consider the likely impacts of a development on threatened species in relation to s. 79C of the EP&A Act.
5. Establishes a market for biodiversity offsets (credits) and provides significant flexibility for credit purchasing.
6. No ongoing responsibility for managing offsets when biodiversity credits are obtained and retired in line with a biobanking statement. Offsets are managed by landowners who have already established a biobank site and are committed to managing the land for conservation.

Western and South Australia

West and South Australia also have biodiversity offset (or environmental offset) policies. In West Australia the aim is to achieve no environmental difference (i.e. no net loss) and aspirationally, a net benefit. That is, the successful integration and application of offset activities should aim to produce a 'net environmental benefit' outcome. Both 'direct' (off site ecosystem restoration, off site ecosystem rehabilitation, land acquisition for conservation) and 'contributing' (materially add to environmental knowledge, research, ongoing management and protection, covenanting) offsets can be included in an offsets package. Priority would be given to formulating a package that will deliver the maximum long-term environmental benefit with a high level of certainty that it can be successfully implemented in the context of 'like for like or better' (referring to similar or better environmental values and attributes – species compositions, vegetation complex, landscape functions).

Queensland Government Draft Policy on Biodiversity Offsets

The proposed Policy on Biodiversity Offsets is a 'specific–issue offsets policy' under the framework of the Queensland Government Environmental Offset Policy (QGEOP) which commenced on 1 July 2008.

It applies to the use of offsets to address impacts to biodiversity values resulting from development or activities (including national park revocations) where a State Government agency is the decision-maker or a concurrence agency under the Integrated Planning Act 1997 (see also below).

The policy states that all reasonable attempts should be made to first avoid and then minimise any negative biodiversity impacts before considering the use of offsets to address remaining biodiversity impacts. Offsets are not considered appropriate where there is a high risk of failure i.e. the proposed offsetting actions are unlikely to deliver the biodiversity outcomes sought. The proponent of a development activity is responsible for proposing offsets and showing how the proposed offsets meet the requirements of the policy.

The policy would apply to areas or features that are considered to be important to the State for their 'biodiversity values'. These are set out in the draft policy and include for example parts of the Protected Area Estate, wetlands or threatened species. In the case of the latter, proponents are required to demonstrate that their proposed offset activities address the viability of the species population and its habitat. If more than one biodiversity value is affected then the offset must address all of these.

In terms of what kinds of activity would qualify as an offset, the policy suggests that offsets should be largely 'direct' rather than 'indirect', where:

- Direct offsets provide biodiversity values
- Indirect offsets support the intended biodiversity outcome.

A direct offset would usually be an area of land with its biodiversity values managed, improved (if necessary) and permanently protected. Examples of acceptable direct offsets include:

- Acquiring additional land to be included in the protected area estate.
- Rehabilitating and protecting regrowth vegetation.

Indirect offsets can only form part of an offset package in combination with direct offsets and must also be 'allowable' under the policy, e.g:

- Removing threats to biodiversity values
- Providing a wildlife crossing
- Implementing action(s) in a Recovery Plan, Biodiversity Action Plan or Management Plan.

Funding of research would not be permitted as an indirect or direct offset under this policy.

To be acceptable as offset activities, proposed actions would be required to demonstrate that they meet the principle of 'additionality'. This means that a biodiversity offset would be above and beyond any other measures that are already required under federal or state law.

The EPA has defined 'offset rules' which set out what the EPA would consider to be appropriate to offset lost biodiversity values. These take into account:

- the biodiversity values that are impacted (including their extent, resilience, etc.)
- the environmental outcome sought
- the current status of the environment in Queensland
- potential opportunities and constraints of identifying and securing offsets
- the risk and uncertainty involved in relying upon an offset to provide biodiversity values over the long-term.

To achieve the required positive outcomes, biodiversity offsets would be required to be larger than the extent of impact. The offset rules table included with the draft policy expresses the amount of offset required as a ratio between the impact and offset. The ratios used are chosen to reflect each value's importance (e.g. larger offset required for endangered than for vulnerable species; largest ratios for national parks) and the EPA's expectation of the ability of the offset to achieve the intended outcome (larger offset required for less desirable options). The approach requires quantification of the area of an impact and identification of all the different biodiversity values that will be affected. There are different offset options available depending on the biodiversity value affected. The offset requirement would be calculated by applying a ratio to the amount of each affected biodiversity value (usually in terms of area, i.e. the number of hectares impacted: number of hectares required). If a development activity will impact on more than one biodiversity value covered by this policy, then the offset package must satisfy offset requirements for each of the impacted values. Single location offsets are preferred but multiple location offsets are allowed.

Voluntary offsets would be permitted if a proponent wished to provide an offset as a sign of good environmental responsibility, but to be formally accepted as an offset any voluntary offset would have to meet the requirements of the policy and also be registered with the EPA.

Proposed delivery options are as follows:

- Proponent directly provides and manages the offset;
- Proponent engages a third-party to provide and/or manage the offset on their behalf;
- Proponent arranges to use a registered, advance offset

Proponents would be encouraged to implement offsets in advance of impacts taking place, but they would not necessarily be required to do so. The policy would require implementation to take place with a minimal time-lag between the impacts and delivery of

the offset (in accordance with QGEOP, principle 5). This is because permanent biodiversity impacts should not be allowed to occur due to delays in implementing the offsetting actions (e.g. a displaced population of a species might have no alternative habitat available to colonise and could be lost permanently from an area). A bond (or bank guarantee) would be required if a proponent wanted to commence an activity prior to legally securing an offset, following development approval. The bond would be sacrificed if delivery did not take place within the required period.

In some circumstances, financial contribution to a fund would be permitted under the policy.

Proponents undertaking an offset would be required to enter into an offset agreement, which would be a formal agreement between the State as regulator and the proponent. The agreement would be signed by all parties to the agreement. If a third-party was chosen to supply the offset, then the supplier would either sign the offset agreement or alternatively, sign a separate agreement with the proponent.

The agreement would include:

- 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 + 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;
- when and how the proponent's responsibility for the offset would be extinguished.

Under this policy, all costs of monitoring, reporting and evaluation activities would be met by the proponent.

Equivalence

The State of Victoria has been classified and mapped into 28 bio-geographic areas which capture the patterns of ecological characteristics in the landscape. There is a 'Like for like' requirement in terms of habitat type. There are some 700 combinations of bioregion and ecological vegetation classes, each generating a different class of credit (although a much smaller number of credit types has been traded in practice so far). This precision in the definition of credits supports a fairly stringent 'like for like' approach.

In NSW, developers who opt to take the BioBanking route must hire an accredited assessor to calculate the number of biodiversity offsets they should provide using the BioBanking Assessment Methodology. These might be ecosystem credits, species credits or both. There are over 1000 types of credits.

The QG **Draft** Policy on Biodiversity Offsets clearly states that "Biodiversity offsets must achieve an equivalent or better environmental outcome for the biodiversity values impacted". The policy uses a table to indicate the "rules" for biodiversity offsets that are appropriate in size and scope to meet the stated environmental outcome sought for each biodiversity value which is going to be impacted. This is consistent with the QGEOP which suggests that an appropriate metric should be used to measure 'loss and gain'. The offset rules table allows considerable flexibility by listing a prioritised range of options for offsets for each biodiversity value. The offset rules outline the amount, location and other characteristics that the EPA considers appropriate for offsets to meet the required environmental outcome for each biodiversity value.

Links to other issues and policies

At federal level, bio-offsets are seen as one of a suite of measures addressing the state of the environment.

The QG Draft Policy on Biodiversity Offsets applies to biodiversity offsets required or negotiated by State government agencies under relevant legislation to address remaining biodiversity impacts. The Draft Policy on Biodiversity Offsets is seen as a specific form of offset under the Queensland Government's Environmental Offset Policy. This wider offset policy also applies to carbon and other forms of environmental offset. Similarly in the State of Victoria, landowners have the option of providing credits through 'Ecotender' which allow them to offer a wider range of environmental values on their land, beyond biodiversity per se.

Institutional roles and responsibilities

In most cases there is a government or state regulator. In the State of Victoria, this is the Department of Sustainability and the Environment (DSE). The NSW Biobanking Scheme is regulated by the Department of Environment and Conservation ("DEC"). Under the Queensland Government Draft Policy on Biodiversity Offsets, the proponent of a development activity would be responsible for proposing offsets and showing how the proposed offsets would meet the requirements of the policy. The Regulator would be the State Government department administering the legislation which triggers the requirement for an environmental offset. This would vary according to the specific category of offset. For example, the Environmental Protection Agency would be the regulator for a koala habitat offset secured to meet the requirements of the Nature Conservation Act 1992. The Department of Natural Resources and Water would be the regulator for a vegetation management offset secured to meet the performance requirements of a Regional Vegetation Management Code under the Vegetation Management Act 1999. The Department of Primary

Industries and Fisheries would be the regulator for a fish habitat offset secured to meet the requirements of the Fisheries Act 1994.

In the State of Victoria, the regulator has a key role, both in determining the required number of biodiversity credits to be delivered through an offset and also in determining whether impacts should be exempt from an offset, or are sufficiently serious that permission for native vegetation clearance should not be granted. Increasingly a regional approach to planning offsets is intended and an upcoming review of the State's biodiversity strategy could mean wider use of offsets (for fauna and ecosystem services as well as for vegetation). These changes could have implications for the regulatory system and its cost. At present, however, the DSE is moving towards more cost recovery in implementation of biodiversity offsets. Although the regulator plays a key role in the Victorian system, it is a relatively open-ended and contestable system (as opposed to being comprehensively regulated): policy guidance issued by the executive accompanies basic regulation and this means that implementation systems can be relatively flexible.

The NSW Biobanking Scheme requires input from accredited assessors (consultants) who apply a standard methodology to determine the appropriate number of credits.

The 'economic incentives'

It is difficult to obtain transferable information about this. Most information is highly context-specific, e.g the government regulatory workload (and the cost of this) is proportional to the number of offsets required (and the number of enquiries).More information is required about the overall costs of the different systems and how transaction costs compare between them.

2.2.2 Legal issues and responsibilities

Legal framework for bio-offsets under the EPBC Act [8]

The draft Policy Statement indicates that the use of biodiversity offsets under the EPBC Act is relevant to the concept of inter-generational equity. This is the concept that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced, for the benefit of future generations. Inter-generational equity is a principle of ecologically sustainable development (ESD), which is a mandatory consideration for the Minister to take into account in determining whether or not to approve an action, and on what conditions, under the EPBC Act. The EPBC Act specifies the scope of the Minister's power to attach conditions to an approval. Any bio-offset requirement sought to be imposed as a condition of approval must be necessary or convenient to protect, repair or mitigate damage to a protected matter.

[8] http://www.blakedawson.com April 2008

Amendments to the EPBC Act which commenced on 19 February 2007 enable conditions to be imposed requiring specified activities to be undertaken in order to protect, repair or mitigate damage to a protected matter, or a specified financial contribution to be made in support of such activities. The effect of the amendments is to allow activities not related to the taking of action, as may be the case with certain bio-offsets, to be required as conditions of approval. However, conditions not reasonably related to the taking of the action may not be imposed without the applicant's consent.

NSW Biobanking

The Threatened Species Conservation Amendment (Biodiversity Banking) Bill 2006 was passed by the New South Wales Parliament on 22 November 2006 and inserts a new Part 7A into the Threatened Species Conservation Act 1997. This provides the basis for the 'biobanking' scheme.

The scheme applies to:

- developments under Part 4 and activities under Part 5 of the Environmental Planning and Assessment Act 1979 that are required to undertake the threatened species assessment of significance
- development projects under Part 3A of the Environmental Planning and Assessment Act 1979 (the Minister for Planning may require that Part 3A developments offset impacts in accordance with the biobanking assessment methodology)
- the establishment of biobank sites on both private and public land including land to which the Native Vegetation Act 2003 applies.

The Queensland Government Draft Policy on Biodiversity Offsets

This policy applies to the use of offsets to address impacts on biodiversity values resulting from development or activities (including national park revocations) where a State Government agency is the decision-maker or a concurrence agency under the Integrated Planning Act 1997.

Legally binding mechanisms are required to formalise the status of land included in offsets in some cases to provide protection for the life of an offset, for example:

- dedication as a protected area under the Nature Conservation Act 1992 (e.g. nature refuge, national park)
- declaration of an area under the Vegetation Management Act 1999
- use of a covenant under the Land Act 1994, Land Title Act 1994 and Integrated Planning Act 1997

Offset conditions can be enforced by regulators under the relevant legislation, for example the Environmental Protection Act (1999).

2.3 Summary

A key guiding principle in all these schemes, is that offsets are only applicable when impacts cannot be avoided or minimised, and if all other Government environmental standards have been met. Offsets are considered to differ from other existing forms of mitigation in that they address impacts remaining after attempts to reduce (or mitigate) the impact have been undertaken. However they are also intended to complement existing arrangements for environmental assessment and mitigation, not to replace them. At federal level, it seems that bio-offsets may be used as a form of avoidance measure under the EPBC Act where this would be more effective than other forms of mitigation, but the situation is a little unclear.

Some of the key factors that appear to have been instrumental in the emergence of biodiversity offsets in Australia include:

- Recognition that biodiversity loss is continuing despite existing mechanisms.
- A legal requirement or trigger (e.g. Threatened Species Act, Native Vegetation Act).
- Policy setting out clear goals/objectives and desired outcomes (no net loss or a net gain).
- Principles to help guide what constitutes an acceptable offset (e.g. South Australia, West Australia and New South Wales).
- Clear regulatory framework with institutional roles and responsibilities identified (NSW Biobanking).
- State or government involvement in regulation and monitoring.
- The desire to enable markets in biodiversity credits (Bushtender etc) and to provide opportunities for private landowners to generate biodiversity credits on their land.

Experience suggests that it is necessary to achieve a balance between over-simplification of loss/gain calculations and over-regulation.

Definition of equivalence has been greatly facilitated by comprehensive regional planning, with state-wide conservation and prioritization exercises having been carried out which help define the nature, scale and location of offsets needed.

The need to articulate baseline conservation requirements on land for private individuals and government bodies hoping to host biodiversity offsets has emerged as an important need, to ensure that 'additionality' can be demonstrated where there are already other commitments or duties of care in place.

Annex: Habitat Hectares Scoring Method

The method involves assessment of a number of site-based habitat and landscape components against a pre-determined 'benchmark' relevant to the vegetation type being assessed.
Assessors must first determine the bioregion(s) in which a habitat hectares assessment is to be conducted. Bioregions are landscape units based on a range of environmental attributes such as climate, geomorphology, lithology or vegetation. A statewide bioregion map (and bioregion layer within the DSE Geospatial Data Library) identifies 28 bioregions within Victoria and shows their distribution.

The habitat hectares approach requires the condition of native vegetation at a site to be assessed in comparison to a 'benchmark' that represents the average characteristics of a mature and apparently long-undisturbed state for the same vegetation type (Parkes *et al*. 2003). Habitat hectare assessments are conducted with reference to a bioregional benchmark for the vegetation type in question. Bioregional benchmarks for Victoria are available from the DSE website. They might specify the number of species that should be present, typical dominant or 'character' species, average canopy height and percentage cover for different life forms… Benchmarks apply to particular 'Ecological Vegetation Classes' (EVCs) within a particular bioregion.

EVCs are aggregations of botanical communities that are defined by a combination of species composition, life form, position in the landscape and an inferred fidelity to particular environments. The habitat hectares approach is constrained to a single EVC of similar 'quality'. There is guidance to explain how quality should be assessed. Each unique EVC/ quality combination is referred to as a 'habitat zone'. A patch of native vegetation may contain one or more 'habitat zones' due to localised variation in 'quality'. The number and size of habitat zones depends on a number of factors including the size of the area being assessed, the variability of the vegetation and the context of the assessment.

The habitat hectares assessment approach involves assigning a habitat score to a habitat zone, to indicate the quality of the vegetation relative to the EVC benchmark. A total score of 1.0 is built up from constituent scores for a series of separate attributes, for example 'absence of weeds', '%cover of high native herb diversity'. The final habitat hectare value is a measure of both the quality (habitat score) and quantity (hectares) of the vegetation, and therefore requires consideration of the total number of hectares present. It is determined by multiplying the habitat score (as a decimal) of the habitat zone by the number of hectares in the habitat zone.

When applied to offset calculations, the habitat hectares method can be used to determine the type and number of habitat hectares likely to be lost due to a development proposal and therefore the type and number required to be provided.

3. South Africa

3.1 Introduction

3.1.1 South Africa's legal basis for biodiversity conservation

The conservation of biodiversity in South Africa is enshrined in the Constitution (Section 24 of the Bill of Rights) and in a number of international legal instruments, to which South Africa is a party, notably Agenda 21 and the Convention on Biological Diversity (Rio de Janeiro 1992). The rights set out in the Constitution and South Africa's international legal commitments are implemented through a series of national and provincial statues.

The most relevant aspects of National law are:

- The National Environmental Management Act (No.107 of 1998 - NEMA)
- The National Environmental Management: Biodiversity Act (No.10 of 2004).
- The National Environmental Management: Protected Areas Act (No.57 of 2003).
- The National Water Act (No.36 of 1998 - NWA).
- The Conservation of Agricultural Resources Act (No.43 of 1983 - CARA).

3.1.2 South Africa's existing offset systems

South Africa has a highly diverse, endemic, globally important and threatened biodiversity but also a well-developed institutional and scientific capacity to design and implement the appropriate tools for its conservation and sustainable use. State governments and public bodies in South Africa have been leaders in developing theory and providing real-world examples in the design and implementation of biodiversity offsets for several years. This learning has already been of use in the development of global guidelines[9] and this process is still underway.

Two major offset systems are covered in this case study. The first is the Western Cape Province Biodiversity Offset system (hereafter WC system), currently operational; this

[9] Such as the technical design details derived from the Western Cape Guidelines on Biodiversity Offsets http://www.capegateway.gov.za/Text/2007/3/pgwcoffsetsguidelinedraft_5march_07.pdf and made use of in the Business and Biodiversity Offsets Programme BBOP www.forest-trends.org/biodiversityoffsetprogram

system is currently being refined in another state, KwaZulu Natal , where revisions to this system are currently being developed (hereafter KZN system); this system is currently under development and not yet operational. The second major offset system covered in this case study is the National Grasslands Biodiversity Programme wetlands mitigation banking system (hereafter NGBP wetlands banking system), South Africa's first application of a banking system, currently under development, and not yet operational.

All systems have been developed as new ways to tackle continuing biodiversity loss and degradation of ecosystem services apparent nationwide: the National Spatial Biodiversity Assessment (NSBA) established that 30% of grasslands in South Africa are irreversibly transformed and only 2.8% are formally conserved; likewise, the fynbos habitats of the western cape are a botanical kingdom and subject to very high development pressures. Both systems are public sector lead and implemented. The first system was been initiated by the Western Cape state government and developed through public , private and third sector expertise alike. The second system is managed by the South African National Biodiversity Institute (SANBI) a public body reporting to the environment minister and charged with national biodiversity conservation and research.

3.2 Analysis

3.2.1 Objectives

The WC and KZN systems have as an overall aim to ensure that no ecosystem becomes more endangered and that the conservation status of species and the presence of 'special habitats' do not decline. This requires the specific objectives of no net loss of biodiversity, and preferably a net gain. The NGBP banking system has as primary objective "no net loss of ecosystem services, to the greatest extent possible".

Both systems are intended for use as part of the mitigation hierarchy, whereby offsets are used to compensate for residual impacts after avoidance, minimisation and restoration efforts have been put in place.

In the WC and KZN systems, the scope is largely restricted to impacts on biodiversity itself: the units of organisation are the threatened vegetation types already mapped in these provinces. Despite this, the ecosystem services they provide will also be largely conserved in the process. In contrast, the NGBP banking system focuses on the ecosystem services provided by the affected wetlands. These include cultural, provisioning and regulating services. Cultural services remain methodologically problematic however.

3.2.2 System Descriptions

The Western Cape Biodiversity Offset System is a functional operating biodiversity offset system, the guidelines for which were produced in an iterated This section describes the two major systems (WC/KZN and NGBP) in terms of impact thresholds, additionality, qualifying activities, location, duration and timing.

Western Cape / KwaZulu Natal biodiversity offset systems

Thresholds

In the South African biodiversity offset systems, the significance of impacts is determined using multiple criteria, resulting in ranking from low to critical. Small impacts do not require offsets – such as impacts in non-threatened ecosystem types. Critical impacts generally cannot be offset. In other words, the maximum threshold (i.e. 'not offsetable') for this system is set by any impacts deemed 'Critical' or concerning irreplaceable biodiversity. This upper threshold can be waived in exceptional circumstances of public interest. The minimum threshold is all impacts above 'low'. The criteria for determining the size of the impacts rely greatly on the exacting and comprehensive biodiversity data and spatial zoning already available within South Africa.

The criteria are:

1. 'composite considerations' – sites already designated as 'Critical Biodiversity Areas' or areas flagged in systematic conservation plans or similar, and/ or identified by conservation agency);
2. importance of area in terms of threatened ecosystem,
3. occurrence of threatened species,
4. occurrence of special habitats,
5. important process area (a priority ecological corridor linking mountain to coast or along climate gradients or along the coast, or along soil type interfaces)
6. important ecosystem services delivery (e.g. an area that's important for society as a whole (e.g. critical catchment area) to a local area on which communities depend for e.g. thatching grass for livelihoods)

The Western Cape Guidance specifically states as a principle that all actions must be in addition to any activities already planned or underway or required under law. The favoured action is averted risk or averted loss, particularly through material contribution to the National Protected Areas network. The particular nature of the cape flora means that restoration activities are not considered appropriate in the WC system. Whereas the different ecosystems of KwaZulu Natal allow restoration in some cases. General research, capacity building and training are not considered qualifying offset actions in themselves, though they may of course be involved the process by which an offset outcome such as averted risk is achieved.

Although the WC and KZN systems are not habitat banking systems, they make use of the concept of 'offset receiving areas' which are areas identified by a conservation agency or by systematic conservation planners as priority areas. South Africa is well fitted for this task as it has lead the world in several aspects of landscape level planning within conservation biology both as an academic discipline and an applied field. Of any global offset system, the WC and KZN systems probably lead the way in terms of the use of landscape level / regional planning in offset design. The academic and public sector expertise in ecology is also central to the application of minimum viable population sizes and minimum offset areas. Specialist and conservation agency personal judgement is relied upon for these issues. Notably, fragments and very isolated habitat patches are therefore unlikely to be considered as offsets.

For permanent impacts, offset outcomes are required in perpetuity. Usually, an offset project in terms of activities should run for at least the length of the development impact itself. These activities have to secure permanent gains in cases of permanent impacts. There is also a strong preference for offset plans to be drawn up, and preferably activities started, before development commences. Where this is not feasible, monetary compensation is further sought. There is no obligation to compensate for temporal loss. This probably reflects the fact that the values being compensated for are intrinsic, rather than immediate goods and services provided to humans.

National Grasslands Biodiversity Programme Wetlands Mitigation Banking System

The National Grasslands Biodiversity Programme (NGBP) is a programme of SANBI and therefore follows the principles and objectives of this larger organisation publicly charged with national biodiversity conservation. SANBI's wetlands mitigation banking programme is currently under development: several large reviews and analyses have taken place (SANBI, 2007, 2008, 2009) and work now focuses on the institutional structures, legislation, capacity and relationship building necessary on the ground to allow the first banks and trades to be set up.

As this programme is currently under development, no thresholds have yet been set. Offsets are expected to be triggered in the event of residual, unavoidable wetland loss sanctioned by authorities. Offset activities which replace pre-existing actions or those for which the state is already responsible are not allowed. Additionality will be ensured by comparing baseline trends in the state of ecosystem services to trends after offset implementation.

Activities that qualify for NGBP wetlands banking are still under consideration. Importantly, averted loss or degradation would qualify; whereas creation, restoration and enhancement will not qualify. This reflects South Africa's careful attention to

meaningful biodiversity metrics and a reasonable reflection of the unlikely creation of useful wetland values within human timeframes.

Similarly, offsets will be preferred within the same catchment as the impact. Site selection will be influenced by both the systematic conservation planning that already exists for most provinces and also the individual catchment management strategies under development in some areas. Like for like offsets will be preferred but it is already known that in highly transformed catchments this will not always be possible.

Perpetuity is not currently considered a useful concept in the NGBP wetlands banking system. Rather, conservation outcomes are expected to last at least as long as the impacts. This strategy may be possible in this context as the banking system is currently targeting the coal mining sector and after long periods, the ecosystem services being compensated for will begin to return. In regards to timing more generally, rules are not yet determined for this system. However there is a strong preference for offsets to be in place or at least underway before impacts occur, in order to avoid temporal loss.

3.2.3 Equivalence

For both of the major systems, this section firstly considers exchange criteria in terms of relevant metrics, currencies, proxies, like for like / trading up and the measurement of quality of conservation outcomes in the offset; secondly it covers the measurement of loss and gain; and thirdly it covers the management or risk in offset design and implementation.

WC / KZN biodiversity offset systems

Exchange criteria questions ask what metrics are used to determine equivalence between biodiversity at the impact and offset sites and what use is made of biodiversity proxies or economic equivalents as currencies. For the WC / KZN systems, the principal metric of exchange is area. Multiples or 'ratios' of area impacted to area offset are determined in an elegant way using pre-existing conservation targets for the ecosystems in question. This exchange criterion can then be modified based on the following sub-criteria:

1. The condition of the affected habitat;
2. The significance of residual impacts on threatened species;
3. The significance of residual impact on special habitats;
4. The significance of residual impact on important ecological corridors, ecological function or process areas; and
5. The significance of residual impact on biodiversity underpinning ecosystem services with socio-economic value;

The most distinctive feature of the exchange criteria in the Western Cape system is the use of a ratio to calculate the necessary offset size to ensure no net loss at the landscape level within an averted risk offset system with a finite amount of each ecosystem remaining and a pre-defined conservation target for each ecosystem. This ratio is defined for the ecosystem threat status (Cr, En, etc). More threatened ecosystems require a larger ratio (e.g. 10x) of habitat offset to that impacted. This ratio is determined a priori for each ecosystem status based on the original goal that no ecosystem should become more threatened (e.g. En to Cr).

The high area ratios used as the basis of the exchange criteria come about because the system is based on averted risk where the net amount of habitat in the landscape does not increase – there is no creation of new habitat. They are based on the logic that, where an ecosystem is limited in extent, when all the ecosystem land area has been used up for either development or offset, a 50% net loss of habitat will result from a 1x multiplier, a 33% net loss of habitat from a 2x multiplier, a 25% loss from a 3x multiplier, (etc.). Hence the multiplier required for any specific loss of a particular ecosystem to meet its area conservation targets in the province concerned can be calculated, depending on its conservation status. This approach is based on the fact that reconstruction or re-creation of natural habitats in the Western Cape is, to all practical extent, not possible. For example if we already know that an ecosystem will change from En to Cr if it suffers a 10% loss of habitat, this upper total loss is a threshold which can be used to define the area ratio for that particular ecosystem. Figure 1 shows graphically the relationships between the ratio and the amount of ecosystem area expected to be lost an endgame.

Biodiversity proxies—pre-existing classification of ecosystem types—are used to measure equivalency. Monetary exchange may also occur where the physical area is translated into a monetary value. This calculation remains somewhat conceptual and is yet to be fully put into practice. The amount would comprise four separate sums which require individual calculation and later summation:

The probable cost of acquiring an appropriate offset area of adequate size in an optimum location. This involves calculating the land area of offset that would be required to compensate residual negative impacts fully ('like for like' offset, assuming similar condition of habitat, close to affected site and in same subcatchment or bioregion). Then values of comparable land per hectare for properties located in that biotope are obtained from sources such as the rates base for affected local authority. An average price per hectare is then calculated; plus

An endowment for that area to cover costs of managing the habitat to ensure conservation of its biodiversity and, where necessary, obtaining specialist advice on management; plus

An endowment to cover costs of monitoring and auditing performance and compliance; plus

The cost of an administration and risk premium. The function of this premium would be to ensure that financial guarantees do not offer proponents an easy default route that would place a significant burden on the competent authority.

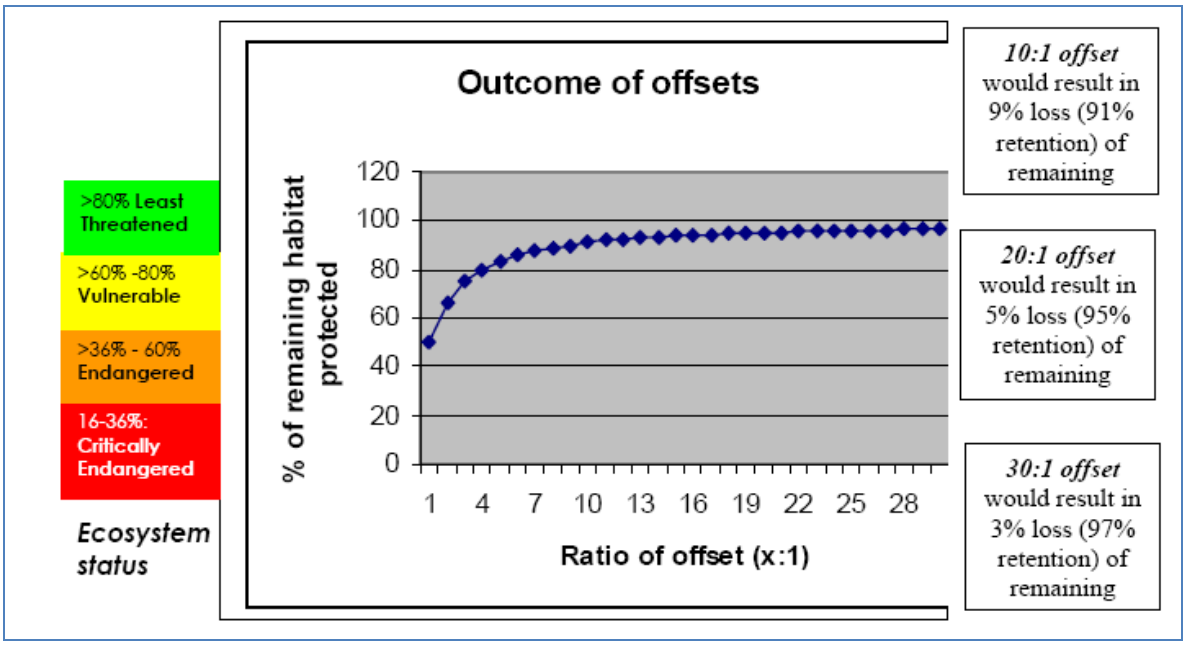


Figure 1. The relationship between the offset ratio and the % of the ecosystem that will remain protected in an 'endgame' scenario, under a purely averted risk offset regime. From Brownlie et al (2007). The DEA&DP final draft second edition.

Additionally, like for like is preferred but trading up is allowed. There is no downward adjustment of the ratio for trading up offsets. Trading up is allowed on a case by case basis where the relevant conservation agency regards the offset site as of higher priority than the impact site.

The quality of the exchanged areas is also a major consideration and is assessed by conservation experts in addition to data already existing within national databases. Similar levels of quality are sought; where this is not possible the area metric is adjusted accordingly. The basic ratio is revised based on the habitat condition, impacts on special habitats, ecological corridors or process areas, and impacts on ecosystem services or the biodiversity underpinning these services.

Habitat condition is measured in terms of the percentage of species supported by the affected habitat, compared with undisturbed habitat. Where the habitat is in 'moderate' to 'good' condition, then the basic offset ratio would apply. The guidance allows a reduced multiplier, by up to a half (e.g. 10x reduced to 5x) if the species

richness supported by the impacted habitat is less than 25% of the known pristine state for that habitat. These decisions can only be considered based on the advice of a local biodiversity specialist. If the initial metric of exchange based on quality-assisted multiples of area is not possible, then a financial measure is used, derived from the land value.

Loss and gain is primarily measured using hectares of comparable habitat, mainly using direct footprint impacts but also with provision to calculate indirect impacts. Comparable habitat means of the same type and quality. Loss and gain is therefore measured and adjusted using at least three steps:

1. The area of direct impacts are calculated (footprint);
2. This area is adjusted according to the condition of the impact and offset sites using the criteria outlined in 2.3.1.1.
3. An attempt is made to calculate the indirect impacts of a development. For example, suppressing fire on properties neighbouring a development for safety reasons may lead to serious biodiversity loss if this ecosystem is fire maintained, as many are in the western cape.

The unique multiple-area ratios used as exchange criteria are a form of managing risk because they consider the risk of further portions of the ecosystem in question becoming threatened with development. The use of multipliers in this way to tackle risk has been the subject of significant separate academic study (Moilanen et al 2006; Moilanen et al in 2008). Implementation risk is largely covered through adaptive management, a principle embedded within South Africa's advanced biodiversity management systems. However there are areas for improvement. The management of risk in biodiversity offsets is a new subject recently reviewed within Ekstrom et al (2008).

NGBP wetlands banking system

The proposal for equivalency under the NGBP system is to use a form of 'hectare equivalents' which are a product of area and quality of the site as measured against a pristine or benchmark site providing the same ecosystem services. For example, a wetland of 10ha rated (using various compound criteria) as 7/10 (where 10 is the benchmark) is 7 hectare equivalents.

Biodiversity proxies are used based on pre-existing tools designed in South Africa to measure wetland health and ecosystem services. The pre-existing tools designed to measure wetland health and ecosystem services include measures of quality and these are integral to the currency of exchange. Methods have not yet been developed to determine occurrences of trading up, however the process would be allowed.

Various metrics are being developed and should be sufficient to cover most situations. As the banks are not yet operational, there is no known secondary metric if the initial metrics are not possible. In general, amounts of loss and gain are measured using application of metrics proved within the pre-existing tools for measuring ecosystem health and wetland services.

Mechanisms and approaches for the management of risk have not yet been finalised for this banking system. Risk may partly be covered by the price of credits which will vary across bank sites depending on various factors. For instance the price of a credit (e.g. 1ha of wetland) on one property may be more than on another property because of different risks inherent to the development and maintenance of credits at different sites.

3.2.4 Links to other issues and policies

WC / KZN systems

Rather than crowding out other biodiversity policy objectives or considerations, so far this offset policy appears to support other biodiversity laws and regulations. They provide a mechanism to reach pre-existing biodiversity targets, and make use of other targets in their design.

For example, climate change resilience and connectivity are automatically considered within the landscape level planning used in the design of these biodiversity offsets. This is due to the exemplary nature of landscape level conservation planning in South Africa, and the unusually deleterious climate change impacts upon biodiversity predicted for this country's ecosystems and species.

NGBP banking system

The issue of crowding out of other biodiversity policy objectives or consideration has not yet been tackled in this incipient system. However, it is already acknowledge there will be necessary tradeoffs between biodiversity and water resource criteria with respect to site selection and the desired state of rehabilitated wetlands.

Similarly, the issue of network connectivity and climate change resilience have not yet been tackled. However, as for the WC / KZN systems, climate change resilience and connectivity would be automatically considered within the landscape level planning used in the design of these mitigation banks. This is due to the exemplary nature of landscape level conservation planning in South Africa, and the unusually deleterious climate change impacts upon biodiversity and ecosystem services predicted for this nation.

3.2.5 Institutional roles and responsibilities

WC / KZN systems

The introduction of biodiversity offsets was a logical addition to several laws and policies at both national and provincial levels which focus on achieving long term development benefits without compromising the natural environment and biodiversity. Many of these laws, policies or plans provide direction for, or inform, the use of biodiversity offsets as an instrument for environmental management. Importantly:

- The conservation of the natural environment is required in the Constitution, the National Environmental Management Act (NEMA), and the Biodiversity Act. NEMA is the legal structure which houses EIA. Requirements for offsets are determined during the EIA process in South Africa
- The principles of national environmental management in NEMA include the need to 'avoid, or minimize and remedy' the disturbance of ecosystems and loss of biological diversity, and the need for development not to jeopardize ecological integrity.
- The Western Cape Provincial Spatial Development Framework created the policy framework for biodiversity offsets to reduce the continual erosion of biodiversity
- The National Biodiversity Strategy Action Plan (NBSAP) recognises the need for biodiversity offsets.
- Biodiversity plans at different scales identify priority and/or irreplaceable areas for biodiversity conservation; these are typical 'receiving areas' for biodiversity offsets.

In terms of institutional infrastructure, a competent environmental authority carries responsibility for implementing offsets. The high quality of public sector expertise is an advantage in offset implementation in South Africa.

The offset guidelines[10] clearly state that offsets are a kind of last resort, attempted after the mitigation hierarchy has been followed. This allows the competent authority to return EIA applications back to developers requesting more attention is paid to earlier stages in the mitigation hierarchy. The principles of national environmental management in NEMA include the need to 'avoid, or minimize and remedy' the disturbance of ecosystems and loss of biological diversity, and the need for development not to jeopardize ecological integrity.

If the offset is tied to the title deeds, then the legacy would be fixed and the offset secure. However if the management arrangement is for example some kind of stewardship, this may be inadequate to ensure proper legacy of offset actions and outcomes. Offsets are embedded within the EIA process in South Africa and therefore are subject to the same rigorous stakeholder consultation processes. Additionally,

[10] http://www.capegateway.gov.za/Text/2007/3/pgwcoffsetsguidelinedraft_5march_07.pdf

offset sites are encouraged to be donated to state conservation agencies or other accredited public bodies. Otherwise, formal conservation agreements with landowners are required which are legally binding in perpetuity.

NGBP banking system

(The key requirements of a wetland banking system in South Africa are summarised in the Annex to this Appendix)

The requirement for offsets can be triggered through three systems: water use licensing through the National Water Act (No. 36 of 1998); mining licences (Mineral and Petroleum Resources Development Act) and environmental authorisations (National Environmental Management Act [NEMA]). The NWA addresses particular aspects of biodiversity, specifically water resource protection. NEMA is an enabling or framework act that sets the overarching principles that guide the formulation of subsequent laws and regulations. Within this framework, the Biodiversity and Protected Areas Acts have been promulgated. The broad policy framework within South Africa is comparatively well developed and comprehensive; offset implementers are confident this policy framework is sufficient. The institutional basis for banks is somewhat weaker and remains the focus for improvement; furthermore there are failures in regulatory decision making in some cases. Clear institutional mechanisms for the operation of banks are yet to be developed in this nascent system.

South Africa's international legal obligations under the Convention on Biological Diversity are addressed through the Biodiversity Act. The primary objective of this Act is to provide for the conservation, sustainable use and management of the country's biodiversity. The Protected Areas Act provides the statutory basis for the declaration and management of protected areas. The Act sets out the purpose of protected areas, which includes the management of the interrelationship between natural environmental biodiversity, human settlement and economic development; and the rehabilitation and restoration of degraded ecosystems and promotion of the recovery of endangered and vulnerable species.

In addition to the national legislation (see also section 1.1), a number of provincial statutes are relevant, in the areas of the grassland biome in which coal mining takes place. These include the Mpumalanga Nature Conservation Act (No.10 of 1998) and the Mpumalanga Parks and Tourism Agency Act (No.5 of 2005). The Mpumalanga Nature Conservation Act sets the provisions for the protection of rare and endangered species and the protection of sensitive natural sites from damage or transformation.

In regards to water resources, South Africa's legal obligations are primarily implemented through the National Water Act, which is the principal legal instrument for water resource protection and management in South Africa. The purpose of the NWA is to promote the efficient, sustainable and beneficial use of water in the public interest, the protection of aquatic and associated ecosystems and their biological diversity, and to meet international obligations. It establishes the Minister and the

Department of Water Affairs and Forestry (DWAF). Water resource protection and management in South Africa is more broadly addressed in the general environmental provisions of Section 24 of the Bill of Rights of the Constitution, and also in Section 27 which establishes a right to have access to sufficient water. South Africa is also party to a number of bilateral agreements and international conventions that are relevant to the protection and management of particular water resources

Beyond biodiversity and water regulation, the control and administration of prospecting and mining activities is undertaken through the Minerals and Petroleum Resources Development Act. Under the Act, the state is the custodian of the country's mineral and petroleum resources and has the right to prospecting or mining rights. The Act stipulates that prospecting activities may only be undertaken once an environmental management plan is in place. Similarly, mining activities may only be undertaken once an approved environmental management programme is in place. The Act also sets out the requirements for public consultation that must be undertaken.

Despite the range of regulations providing a basis for banking, oversight will be somewhat more streamlined. SANBI and a number of government departments will be implicated in the banking system. The roles of key players are summarised in Table 1, sourced from SANBI (2008).

Table 1: Summary of role players in the proposed mitigation banking model

Organisation/institution	Potential roles and responsibilities
SANBI/Working for Wetlands	Implementing/lead agent: ▪ Identifying rehabilitation sites. ▪ Negotiating with landowners. ▪ Planning rehabilitation. ▪ Implementing rehabilitation. ▪ Monitoring rehabilitation.
Government departments/agencies: ▪ DWAF. ▪ Catchment Management Agencies (CMAs). ▪ DME. ▪ Provincial Conservation Agencies. ▪ DEAT. ▪ National Department of Agriculture (NDA).	Mitigation Bank Management Unit – technical and financial assistance: ▪ Prioritising catchments. ▪ Support to Working for Wetlands through provision of technical, financial, institutional or legal support to facilitate functioning of the bank. ▪ Responsibilities and involvement defined in inter-agency agreement (memorandum of understanding). Application of relevant legislation at points identified in process to ensure that: ▪ Impacts are avoided through EIA and other licensing processes. ▪ Mitigation measures are entrenched in conditions for approval of unavoidable impacts. ▪ Implementation of conditions (mitigation) is enforced.

Generally, as for the WC / KZN systems, offsets benefit from their being part of the EIA process which is based on the mitigation hierarchy through the NEMA. These legal structures should be an adequate basis but it is clear there are weaknesses and inconsistencies in how various regulatory authorities incorporate the mitigation hierarchy in their decision making. Under the national mining legislation, section 41 of the Minerals and Petroleum Resources Development Act requires financial provisions for the repair of environmental damage. For an environmental management programme to be approved, a financial provision must be made for the rehabilitation or management of negative environmental impacts. This money is a form of guarantee. This financial assurance must be retained until a mine closure certificate is issued.

Specifically, the MOU between Wetland Bank Mitigation Unit members aims to determine and coordinate the necessary mitigation measures such as:

- Ensuring that any impact assessment is carried out by qualified and experienced wetland ecologists
- Ensuring that all possible on-site mitigation options are considered and a part of the EMP before resorting to off-site mitigation options.
- An agreement on the mitigation ratio – this tool has not yet been developed for this system.

The responsible authorities must also consider legacy, but suitable mechanisms to ensure legacy have not yet been considered. However similar structures are likely to be used to the WC / KZN systems. Potential bankruptcy has also not yet been considered. The public sector basis for currently planned banks should avoid these problems common in private sector banking systems.

Another issue of legacy surrounds stakeholder involvement. The NGBP wetland banking system will be run initially by an organisation called Working for Wetlands. The rehabilitation planning process followed by the Working for Wetlands programme (which will generate most of the credits) factors in extensive stakeholder and landowner consultation through provincial wetland forums, site meetings, EIA public participation processes and formation of project advisory committees.

Overall, a range of instruments is being explored for securing the rehabilitation outcomes in the long term. These include contracts with landowners, stewardship arrangements and statutory protected area status for rehabilitated sites.

3.2.6 The economic incentives

This section only covers the NGBP banking system as the WC / KZN offset systems are not habitat banking systems.

One of the suggested benefits of habitat banks is their economic effectiveness compared with case by case offsets. The NGBP banking system cannot yet comment on whether this may be true because it has not been implemented yet. It is likely however that using a government programme specialising in wetland rehabilitation to generate credits will result in economies of scale, fewer transaction costs and streamlining of systems and implementation processes.

Habitat banks are unlikely to be in the same location as impacts sites, thus creating issues of social and economic equity. The NGBP banking system aims to tackle this issue through giving preference to in-kind offsets, both in terms of the types of wetlands/ecosystem services selected for offsets and their location in the same catchment as the impact site.

There may need to be provision for multiple offsets arising from the same impact, for example if a wetland that a community was depending on for water supply is to be lost, then besides rehabilitating wetlands elsewhere, there may also be a requirement for the developer to provide the community with clean water. The issue of equity is important in SA, because of the direct reliance of many people, especially the rural poor, on natural resources. Mechanisms that incorporate payments for ecosystem services could also be considered to compensate for downstream/population-wide benefits that incur an opportunity cost to the landowner.

3.2.7 Legal issues and responsibilities

This section is also answered solely from the perspective of the NGBP banking system. The proposed roles and responsibilities set out in Table 2 have yet to be fully defined and agreed upon but provide an indication of how such a model may operate in South Africa.

Working for Wetlands, a government programme, will generate the credits. The public sector nature of the system will bring benefits in terms of reduced administrative burden over credit generation, retirement and implementation because of the necessary transparency of the process. The rehabilitation which will generate the credits can be implemented following the current Working for Wetlands process. The number of credits available in the bank is based on a specific methodology called the WET-Health tool. This step will result in the generation and valuation of credits for each site – each wetland - in the bank.

The bank ledger is the register of the number of credits within the bank, the different prices of these credits on different properties, and the nature of these credits. This bank balance will be signed off by the Wetland Bank Mitigation Unit, which includes the Department of Water and Forests, the provincial conservation agency and other relevant actors. Once consensus has been reached on the number and the nature of credits (i.e. the type of wetlands that need to compensate the impact) by the relevant

authorities, the client would be able to purchase the credits from the bank. The bank ledger will be amended accordingly and the record of decision can be attached as a reference.

Table 2: Roles and Responsibilities within the proposed wetlands banking system in South Africa (from SANBI 2008)

Organisation/institution	Roles and responsibilities
Bank clients (companies or individuals)	Bank clients: ▪ Purchasing credits to offset unavoidable impacts to wetlands. ▪ Purchase of wetland credits as commitment to society/biodiversity.
Landowners Rehabilitation can be undertaken under different types of tenure and landowners can therefore either be: ▪ Private. ▪ Communities. ▪ State.	Management of mitigation sites: ▪ Manage land and mitigation sites in terms of legal agreement established to secure mitigation in the long-term. Beneficiaries ▪ Benefit from direct financial compensation for foregoing development rights and/or existing use of mitigation site. ▪ Receive potential benefits associated with signing and adhering to certain management agreement such as priority attention from state programmes such as working for water.

Third parties will be engaged for monitoring and auditing. Clear success criteria will be developed for this system. Success criteria are a set of standards that are employed in order to evaluate the status of a bank's physical and functional development. They 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 2008).

Monitoring is required to ensure that the projected credits are established and are maintained. The details of this are currently being established (SANBI 2008, 2009). It is envisaged that the MOU between Wetland Bank Mitigation Unit members will determine which department or agency will be responsible for monitoring and enforcing the implementation of agreed conditions. Monitoring and auditing will take place according to the action and schedules set out in the mitigation planning process.

In the case where a biodiversity management agreement is established between the landowner and the provincial conservation agency, the conservation agency would be responsible for monitoring compliance with a management plan. In such cases,

Working for Wetlands would be responsible for monitoring and auditing the wetland rehabilitation during the set period before responsibility is transferred to the landowner. Monitoring and auditing reports should be submitted to the Wetland Bank Mitigation Unit for review and where considered necessary, it would need to approve the proposed remedial measures.

Monitoring and auditing will be undertaken by specialist/accredited consultants using available tools. Importantly, it is believed that Working for Wetlands cannot take responsibility for the mitigation site indefinitely or in 'perpetuity': responsibility for the mitigation works will be transferred to the landowner after a period considered necessary for the wetland to reach a point the wetland has stabilised to a point where it is no longer reliant on the rehabilitation input.

Options for ensuring sustainability of bank sites could include maintaining credit sites within productive landscapes, implementing PES systems and ensuring revenue flow to Working for Wetlands for ongoing credit generation.

A type of oversight body will be created consisting of relevant parties such as regulators, CBOs, Working for Wetlands etc. This is likely to provide the best means to involve stakeholders in the process.

Work to minimize transaction costs and administration is under development. Using a centralised public body – Working for Wetlands – should go some way to reducing these costs. As the regulator rather than an entrepreneur is running the banking system, many issues will be an internal accounting processes rather than an enforcement and auditing process, much reducing transaction and administration costs. The role of Working for Wetlands and the manner in which they plan, design and implement wetland rehabilitation projects aims to ensure consistency in the mitigation banking programme. Through the role of Working for Wetlands, the need to regulate a wide range of third parties with varying levels of skill and experience is avoided. In terms of land title and ownership, transaction costs and administration are reduced in this system through the use a range of mechanisms which avoid the sale of land, and allow for securing mitigation sites in productive landscapes under existing ownership. The level of control will depend on the circumstances and the mechanism considered appropriate to the specific property or situation. These reduced administration issues assist the programme because the state will not want to take on the administrative burden and costs associated with owning property or sections thereof.

Public agencies will run this banking system. The mitigation banking concept has the potential to assist various government departments in meeting their mandates. The proposed memorandum of understanding will need to clearly define relationships and responsibilities and provide a basis for monitoring participation of the various role-players and cooperation between them. However, consultants will need to be used at several points in the model to undertake much of the technical work. The financial

model is designed so that the cost for employing consultants is borne by the bank clients, thereby also avoiding unnecessary financial burden being placed on government departments.

Rules to prevent double selling have not yet been established. As the regulator rather than an entrepreneur is running the banking system, prevention of double selling will be an internal accounting process rather than an enforcement and auditing process.

3.3 Summary

The rationale for biodiversity offsets in the Western Cape of South Africa was both intrinsic and utilitarian. The province contains exceptional biodiversity that is globally unique; and its ecosystems underpin socio-economic development and the delivery of important services such as the reliable supply of clean water, ecotourism and coastal protection.

The Guidance produced to support introduction of biodiversity offsets in the Western Cape ((Department of Environmental Affairs & Development Planning, 2007) sets out some principles for offsetting, see Appendix A). It focuses on the consideration of offsets within the standard EIA process leading to an environmental authorization. The planning authority may request offsets to be considered, in which case an Offset Report sets out information gathered during the offset design process, and proposes both a type of offset and the preferred option of securing that offset. There are prescribed 'offset receiving areas' which reflect conservation priorities.

An 'Offset Management Plan' is required for on-site offsets or off-site offsets comprising habitat where agreement has been reached to secure these offsets, and this is submitted as part of the Environmental Impact Statement or an Environmental Management Plan submitted with the Final EIA Report. A key feature of the guidance is its comprehensive consideration of offset ratios which reflect the degree of vulnerability or threat associated with affected biodiversity.

NGBP banking system

The National Grasslands Biodiversity Programme banking system has been developed for impacts on wetlands mainly caused by the coal mining sector within the Mpumalanga Grassland Biome in South Africa. The model proposed envisages an appropriate government body with expertise and existing operations in wetland rehabilitation playing a central role. Such expertise exists within several government departments, notably SANBI through the Working for Wetlands programme. The government agency will generate credits in undertaking wetland rehabilitation and will thus act as the banker.

As the banker, it will also be responsible for the maintenance of the credits in the long-term. Other government departments will have key responsibilities at various

stages in the model to ensure that such banks are established and operated within legal frameworks. A memorandum of understanding (MoU) will be required to define the roles and responsibilities of the various government departments who will form a Wetland Bank Mitigation Unit. The MoU and other documents will define the steps which must be implemented in planning for the establishment and operation of mitigation banks.

Annex: Key requirements for the application of mitigation banking in South Africa.

From SANBI (2008)

Key requirements	Application within South Africa
Statutory requirements	
Legislation supporting the concept of "avoid, minimise and mitigate", and accountability and compliance with Records of Decision.	Legislation exists, principally within NEMA and the NWA.
Legislation accounting for the specific requirements of wetlands (including a legal definition of wetlands).	Legislation and guidelines exist, although perhaps requiring some refinement: ▪ Definition of a wetland – NWA. ▪ DWAF Delineation Guidelines (DWAF, 2005).
Legislation specifically tailored to enable the effective administration of mitigation banks.	Several legal mechanisms are available within existing structures that could be applied to address certain requirements of establishing and operating a bank. The Biodiversity Act provides for management agreements to conserve threatened ecosystems, which could be used to secure rehabilitation sites. The NWA provides for the establishment of bodies necessary for administering integrated water resource management. Specific policy and legislation for other aspects of developing and operating a bank need to be developed – such as guidelines developed in the Western Cape to govern biodiversity offsets in general. Such an instrument should cover issues such as bank size, service area etc. Capacity is also lacking to administer such a mechanism.
Institutional requirements	
Effective enforcement of the relevant legislation.	Inadequate resources and limited capacity are recognised as important limitations of the current situation.

Key requirements	Application within South Africa
A lead organisation to oversee the mitigation banking process at a national level.	There are several government departments that could take on this role. For example, Working for Wetlands, a division within SANBI, has stated that it intends to "encourage wetland rehabilitation efforts beyond the Working for Wetlands projects by, for example, providing tools, guidelines and standards, quality control criteria and planning techniques to support other rehabilitation efforts, and advocate the wider use of off-site mitigation, where appropriate." and "provide a service as a third party verifier for off-site mitigation projects".
Institutions for multi-stakeholder coordination and collaboration.	Useful entities exist at a national level in the form of the National Wetland Indaba and the wetland list server, and at a provincial level in the form of the Provincial Wetland for a. As CMAs and their associated institutions form, they are also likely to become useful. A specific MOU that defines the roles and responsibilities of organs of state and other stakeholders specific to a province or region that would have a role to play in overseeing the establishment and operation of a mitigation bank needs to be developed. Such an MOU will: ▪ Require a strong lead organisation. ▪ Require adequate capacity to operate and maintain participation by members. ▪ Need to be structured in a way that ensures that participation by members assists in them meeting their mandate i.e. there is incentive for involvement.
Technical requirements	
Technical tools: ▪ Guidelines/tools for assessing health and functionality. ▪ Guidelines/tools for determining credits/ replacement ratios. ▪ Guidelines for rehabilitation planning. ▪ Guidelines for rehabilitation (construction). ▪ Guidelines/tools for monitoring	Most of the required tools already exist: ▪ (WET-Health (Macfarlane et al., 2006) and WET-Ecoservices (Kotze *et al.*, 2005). ▪ Need to be developed. ▪ WET-RehabPlan (Marneweck *et al.*, 2005). ▪ WET-RehabMethods (Russell *et al.*, 2005). ▪ WET-RehabEvaluate (Cowden *et al.*, 2005).

success (structural and biological - vegetation and others).	
Knowledge and expertise of those planning and overseeing the process.	Reasonable existing knowledge and expertise on wetland rehabilitation resides within a network of organisations, notably WfWetlands and Mondi Wetlands Project, consultants and universities, and this continues to be enhanced through experience and the WRC/WfWetlands wetland rehabilitation research programme. Specific expertise in administering mitigation banks and monitoring and evaluating mitigation is, however, limited but is being developed.
Knowledge and expertise of those implementing the mitigation measures.	Numerous Section 21 companies have been established to implement wetland rehabilitation on behalf of Working for Wetlands. Although specific areas require improvement (e.g. re-vegetation techniques), a significant pool of knowledge and expertise has been built through their years of experience and the training, mentoring and monitoring and evaluation provided to these companies by WfWetlands and its partners (e.g. Mondi Wetlands Project).
Technical issues	**Recommendations to address them in South Africa**
Wetland definition and guidelines for delineation.	The existing NWA wetland delineation and DWAF guidelines for wetland delineation should be used.
On-site vs. off-site and in-kind vs. out-of-kind.	The principle of on-site and in-kind should be applied as far as is practically possible. However, off-site mitigation could be considered acceptable where impacts are unavoidable, the impacted wetland is not considered irreplaceable and no opportunities exist for on-site mitigation. For off-site mitigation, replacement should be in-kind unless data exists to demonstrate that the site chosen is of a kind that is rarer and/or more threatened than that being lost. The provincial biodiversity conservation agency and provincial biodiversity conservation plan should be referred to for guidance in identifying rare/threatened wetland types.
Size of mitigation banks.	As far as is practically possible, banks should be relatively large but with due consideration taken of the existing size distribution of wetlands in the region.
Geographic service area.	The principal means of designating the geographical service area should be based on a joint consideration of catchments and bioregions as specified in regional conservation planning and catchment management plans where they exist.
Transfer of ecosystem services from one area to another.	This issue has particular relevance to South Africa, which has a history of inequality. As would be the case around the issue of magnitude of impact and avoidability, any offsite mitigation would need to be preceded by a full assessment of impacts (i.e. offsite mitigation should never become a means of avoiding the standard regulatory requirements facing any development).

Different types of compensatory mitigation.	Rehabilitation should be the principal means of carrying out mitigation although judicious application of enhancement, protection and creation are also considered acceptable. However, it must be stressed that there is very limited experience in wetland creation in South Africa.
Determining credits and debits.	WET-Health and WET-Ecoservices can be used for determining credits and debits.
Replacement ratios.	Replacement ratios must ensure that in any mitigation project, credits must exceed debits, and that due consideration is taken of other relevant factors (e.g. if risks of failure are high then the replacement ratio should be increased accordingly). A tool needs to be developed to assist in the systematic determination of replacement ratios based on these multiple considerations.
Dealing with the risks of failure.	Rehabilitation credits should only be withdrawn when they are fairly advanced in terms of re-instatement of functions, and rehabilitation methods should be chosen that are largely self-sustaining rather than requiring frequent maintenance. In addition, banks should be well protected (in perpetuity) through legal means.
Legal and institutional issues	**Recommendations to address them in South Africa**
Appropriate policy and legislation.	While SA does not have policy or legislation specific to wetland management and conservation, the existing legislation is considered adequate to require and enforce mitigation of unavoidable impacts. Additional legislation is therefore not considered necessary. Guidelines are required to determine when particular legislation should be applied in establishing and implementing a mitigation bank. This relates to the co-ordination between relevant departments, which is elaborated on in the proposed model for mitigation banking discussed below.
Legal and institutional issues	**Recommendations to address them in South Africa**
Regulatory and other responsibilities.	There are a range of departments and agencies with a mandate to protect and manage wetlands. This situation can be beneficial if clear roles and responsibilities for implementing mechanisms such as mitigation banks are established. The mechanism should be one that will assist in the various departments meeting their mandates. Similarly, the role they play in administering such a mechanism should also be within their mandates.
Accessing and securing wetlands in perpetuity.	Mechanisms exist for securing wetlands in perpetuity. Of these, conservation agreements provided for under the Biodiversity Act appear the most appropriate. They provide flexibility to landowners and considerable security at various levels through different legal mechanisms. Financial incentives necessary to access priority mitigation sites are lacking where the landowner requires

	compensation for foregone income or potential income from unutilised development rights. Various innovative ideas are being explored, but presently a direct payment would appear necessary.
Timing of credit withdrawal and bank failure.	Various suggestions and factors in SA will reduce the risk of failure: ▪ Applying a conservative mitigation ratio as a minimum ratio e.g. 1:2 or greater (this requires consideration by relevant government departments and agencies). ▪ Applying rehabilitation only, as opposed to wetland creation and protection as the primary mechanism for mitigation. ▪ Using an implementing agency with accepted and proven consultants, which reduces the risks associated with many different bankers who may use different consultants of varying levels of expertise. ▪ Planning of wetland mitigation by government agencies mandated with conservation and who can draw on necessary expertise avoids the risk of site selection and compensation methods being influenced by financial gain (as is the case in USA). Ideally any banking model in SA should be designed to mitigate in advance of anticipated impacts – thereby allowing time for credits to be established and verified.
Capacity and enforcement.	Training and accreditation of wetland ecologists and managers in the application of tools and techniques required to delineate, assess impacts, and plan and implement rehabilitation, is required. Various universities and other organisations such as the Mondi Wetlands Project provide courses worthy of accreditation that should be recognised by government. The WfW programme uses a range of specialist consultants in the different steps of the rehabilitation project cycle. They have proven skills and experience. Financial and technical resources are required to develop wetland inventories in priority catchments – this information forms the basis for detailed planning and identification of thresholds for protection and key mitigation sites. This information is necessary for an effective banking model to be instituted and establishing it is one of the first steps in planning banks. The collection and development of this information falls within the mandate of several government departments. The example of the Upper Olifants River Catchment illustrates how relevant public (government departments and agencies) and private role-players (coal industry) have effectively combined to address this requirement.

4. Germany

4.1 Introduction

In 1976 the adoption of the Federal Nature Conservation Act, the *Eingriffsregelung* (hereinafter: Impact Mitigation Regulation, IMR) fundamentally changed nature conservation in Germany from a static and restrictive area-related system focusing on protected areas to a more dynamic approach aimed towards the preservation of singular ecosystem functions (Wagner 2007). This major landscape conservation instrument addresses mitigation and compensation for impacts from developments and projects in any biotope type in Germany. It is precautionary in nature and encompasses: (1) an assessment of significant impacts likely to occur; (2) a decision on whether to give permission to a project; and (3) various measures to avoid, minimise or compensate for impacts (including both restoration and replacement compensation, for a definition see Rundcrantz and Skärbäck 2003) that are to be applied in accordance with a mitigation hierarchy (see chapter "Objectives").

This IMR based within nature conservation legislation was later complemented by the inclusion of IMR into the Federal Building Code (Art. 1a (3) BauGB) and the Federal Spatial Planning Act (Art. 7 (2) 2 ROG). These acts respond to the specific requirements of overall spatial planning (Janssen and Albrecht 2008). They mandate the use of IMR in spatial planning in a comprehensive way, covering projects at the levels of both urban planning (e.g. development of new residential areas) and sectoral planning (e.g. construction of roads or railways). IMR is often used in combination with Environmental Impact Assessment.

A number of research projects have addressed the legal and technical requirements of IMR. As early as 1982, Krause and Winkelbrandt discussed the issues of determination of intervention, restoration compensation and replacement compensation. Papers on accomplishment recommendations, on the methodology of IMR generally, and on the requirements on the assessment of interventions were produced by, among others: ARGE Eingriffsregelung 1988 and 1995, Eissing and Louis 1996, Kiemstedt and Ott 1994, Kiemstedt et al. 1996a and b. For more details concerning the development of German IMR, see Deiwick (2002), Bruns (2007) and Louis (2007).

Despite the advanced development of the IMR and the long standing experiences with this instrument, a number of criticisms have been made regarding what has been seen as deficiencies (cf. Breuer 1991, Dierßen and Reck 1998, Jessel 2001):

- A lack of availability of appropriate land;
- The failure to integrate compensation measures into an overall spatial concept;
- Insufficient connection to the overall concepts and goals of landscape planning;

- Isolated compensation measures;
- Time lag effect (time which is needed before the implemented compensation measures can overtake the lost functions);
- A lack of cooperation with landowners and farmers;
- A lack of acceptance of compensation measures;
- Mistakes and deficiencies with the implementation of measures; and
- Inadequate monitoring and maintenance of measures.

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 (resulting in a loosened spatial and functional connection between impact and compensation) led to the emergence of innovative solutions and tools in planning practices.

One of the solutions that emerged was the concept of "Compensation pools" (e.g. Wende et al. 2005). Wagner (2007: 459) characterises these as compensation instruments that build on the idea of providing compensation areas and measures. In recent years, in addition to the framework legislation of the Federal Nature Conservation Act, several of the German states have enacted ordinances in support of this practice, and therefore establishing the basis for the occurrence of professional public and private providers of compensation services (hereinafter called "compensation agencies").

An ever growing demand and interest in the field led to the foundation of the Federal Association of Compensation Agencies ("*Bundesverband der Flächenagenturen in Deutschland e.V.",* BFAD) which pursues the goal of promoting compensation pools and compensation agencies, and calls for ecologically and economically sustainable conservation policy. The implementation of compensation pools and compensation agencies will be described in chapters "System Description" and "Institutional Roles and Responsibilities".

In conclusion, the combination of the legal anchorage of German IMR and long standing IMR practice, with the use of innovative instruments that are becoming current practice have "closed the gap between the mere description of compensation requirements, as is usual, for example, in environmental impact studies, and the actual implementation of compensation measures in practice" (Wende et al. 2005: 102).

4.2 Analysis

2.1 Objectives

The German Federal Nature Conservation Act (BNatSchG) focuses on "nature and landscape both inside and outside areas of human settlement" and stipulates that these be conserved, managed, developed and, where necessary, restored (Art. 1, "Goals of Nature Conservation and Landscape Management"). The instruments and measures laid out by the Nature Conservation and Landscape Management are to safeguard:

1. the functioning of the ecosystem and its services,
2. the regenerative capacity of the natural resources and their sustained availability for human use,
3. fauna and flora, including their natural habitats and sites, and
4. the diversity, characteristic features and beauty of nature and landscapes, as well as their intrinsic value for human recreation (Art. 1).

The German IMR (Art. 18 - 21 BNatSchG) addresses impairments of nature and landscape in general, and more specifically, of the natural assets (species and habitats, soil, water, climate and air quality) as well as aesthetic quality and the recreational function of the landscape. Art. 18 provides a definition of what is regarded as "interventions or impacts on nature and landscape". These are described as "changes to the shape and appearance or utilisation of land, or changes in the groundwater table with its close correlations to inhabited soil compartments, that may significantly impair the ecosystem, or the natural scenery". This underlines the comprehensive character of German IMR, which is applied to all projects, regardless of their dimension and origin, that may have significant adverse impacts.

As mentioned above, nature conservation under the Federal Nature Conservation Act follows a flexible approach oriented towards natural dynamics. Therefore, its overall objective is to ensure "no net loss", and to maintain the status quo, from a qualitative point of view. The preservation of the existing ecological situation has to be considered the minimum standard (Köppel et al. 2004). To comply with this objective, the purpose of IMR can be summarised in brief as to avoid any impairment of nature and landscape, and to compensate for the residual unavoidable impacts (Wende et al. 2005: 101). In Art. 19, the respective procedure is set out, including steps that follow a strict mitigation hierarchy. Figure 2 illustrates these sequential steps.

As mentioned in the previous section, the amendments to the Federal Nature Conservation Act and the Federal Building Code have led to a more flexible IMR implementation and the application of the "no net loss" principle. This implies a certain substitutability between ecosystem services and functions, so long as there is no loss in the overall balance. In this respect, compensation pools increasingly assume

a development function, for example municipalities tend to enhance poor landscapes through compensation measures. In addition, there is a tendency to use the IMR compensation payment as a financing tool. This undermines additionality, and therefore reduced benefits from the nature conservation point of view.

Compensation through financing measures had previously been a measure of last resort Due to amendments of the nature conservation laws in the German states and the widening of the regulations concerning compensation payments, these may now be applied earlier in the mitigation hierarchy, and even as the preferred alternative in some instances (see Bruns 2007: 363 f).

The IMR continuous assessment process follows a mitigation hierarchy. It consists of separate integrated decision steps, oriented towards the principle of full compensation: all significant and/or permanent impairments caused by project impacts must be fully compensated by appropriate measures, and possibly a compensation payment. Under the provisions of Art. 19, the obligations of the intervening party range from (1) avoidance through (2) compensation to (3) exemptions.

Avoidance

The duty of avoidance is established in Art 19 (1): “The intervening party shall be obligated to refrain from any avoidable impairment of nature and landscape”. The increased flexibility of IMR implementation does not impair the absolute priority of avoidance and minimisation. This means that given the option between avoidance and minimisation of the impacts on the one hand and compensation on the other, the project proponent must choose avoidance and minimisation of impacts (Wende et al. 2005: 102).

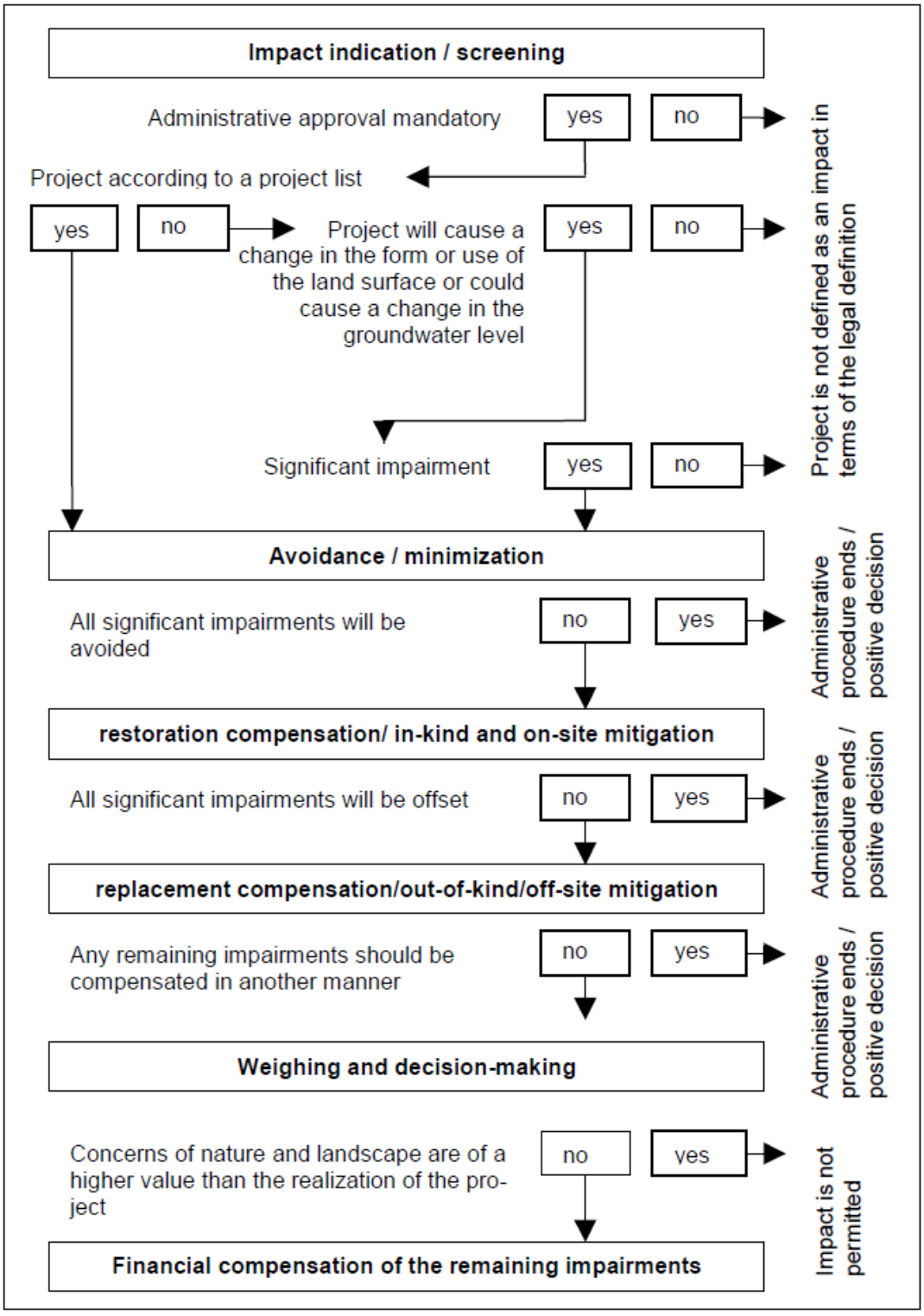


Figure 2: Decision-making sequencing under the German IMR, as defined by the amended Federal Nature Conservation Act (Source: Wende et al. 2005, after Deiwick 2002 and Kiemstedt et al. 1996b)

Compensation

For the remaining unavoidable impairments, appropriate compensation measures must be applied. The law distinguishes between two types of compensation; these are referred to as "restoration compensation" and "replacement compensation":

> *"The intervening party shall be obligated to primarily endeavour to offset any unavoidable impairment through measures of nature conservation and landscape management [restoration compensation], or to offset them in some other way [replacement compensation]. An impairment shall be considered to have been compensated for as soon as the impaired functions of the ecosystem have been restored and the natural scenery has been restored or re-landscaped in a manner consistent with the landscape concerned. An impairment shall be considered to have been offset in some other way as soon as the impaired functions of the ecosystem have been substituted in an equivalent manner or the natural scenery has been re-landscaped in a manner that is consistent with the landscape."*

According to the law, restoration compensation involves a direct spatial and functional connection to the lost components of nature and landscape ("in-kind" and "on-site"). Thus, the goal of restoration compensation measures is to restore the conditions of the affected natural landscape unit to the state prior to the impact, ensuring the equal ecological functioning and values, with no loss of major components of the visual composition of the landscape (Durner 2001: 2, Wende et al. 2005: 102).

If restoration compensation cannot assure full compensation, additional replacement compensation measures are to be implemented ("out-of-kind" and "off-site"). These do not necessarily have to restore the same functions, and may have only a loose spatial and functional relationship to the impact area (Louis 2004: 716).

In general, restoration compensation is preferable to replacement compensation. However, with the amendment of the Federal Nature Conservation Act, this preference and the strict spatial, functional and temporal relationship between impact and compensation have been loosened[11]. Thus, in some cases replacement measures may take priority, if this generates a greater overall benefit for nature and landscape (so-called "trading up").

Exemptions

If after the application of restoration and replacement measures residual impacts remain, the project will be considered through an exemption procedure according to Art. 19 (3) BNatSchG:

[11] According to another amendment planned by the German government, the prioritisation of restoration compensation measures will be abolished completely in the future IMR practice (see even chapter 3).

"The intervention shall not be permitted or carried out if the impairments cannot be avoided or cannot be compensated for within an adequate period of time, or cannot be offset in some other way, and the interests of nature conservation and landscape management take precedence over other interests when weighing all claims […] against each other. If biotopes which are irreplaceable for strictly protected species of wild animals and plants they harbour, are destroyed as a consequence of the intervention concerned, the intervention shall only be admissible if justified by imperative reasons of overriding public interest".

If as a result of the exemption procedure, no precedence of the interests of nature and landscape can be identified, or the project is justified by imperative reasons of overriding public interest, permission will be granted for the execution of the project. A project approved in this manner make be required to make a compensation payment according to the respective provisions in the nature conservation laws of the German states. The BNatSchG enables the states to establish more stringent provisions concerning monetary compensation (Art. 19 (4)). This additional compensation may only be used as a last resort, after the IMR decision making process has been exhausted.

4.2.1 Equivalence

At the very beginning of the complex IMR decision making process, the evidence of the impact must be determined. This may be confirmed via positive lists, if these are laid down in the state nature conservation law concerned, or case-by-case, by means of criteria indicating the significance and severity of the impact.

Once the significance of the impairments is identified, it is important to determine the scope of compensation measures needed. This requires assessment methods at different levels. The respective sequential assessment steps are shown in Figure 3in relation to the formal IMR steps. They include: the assessment of the initial situation (environmental baseline); the prediction of the impacts and their likely severity and scope (determination of significance); the design of appropriate avoidance and compensation measures; and the accounting of impacts and compensation.

Three main assessment stages within the scope of IMR can be distinguished (Bruns 2007):

- the assessment of the status quo,
- the prediction of the impacts, and
- the determination of the required compensation.

The assessment of the status quo classifies the impairment areas according to their value and functions, so as to compare them with the baseline state after all compensation measures have been carried out.

The impact prediction covers the description and assessment of the effects caused by the proposed development in terms of type and scope/severity (determination of significance), as well as the determination of possible avoidance measures. The determination of the required compensation examines the type (qualitative equivalence) and scope (quantitative equivalence) of the compensation measures.

According to an analysis of assessment and accounting methods in Germany (Bruns 2007) different types of approaches are applied: (1) an "argumentative" procedure with formal elements; (2) formal quantification complemented by argumentative reasoning; or (3) Formal quantification by itself.

These approaches can be defined with respect to the equivalence methods used (Bruns 2007: 221f):

- *area-value equivalence*, which relates to the importance (value) and extent (area) of the natural assets, functions or biotopes affected
- *area equivalence*, which focuses solely on the spatial extent (area)
- *function-related equivalence*, based on ecosystem function analysis; and
- *cost equivalence*, which builds solely on the costs needed for restoration.

These criteria may also be applied to balance impact and compensation. "Accounting" refers to a before/after comparison of various states or values, in order to assure that the proposed measures fully compensate for the interventions inflicted. This is done either quantitatively (e.g. using tables and matrices), or in descriptive/ functional form.

The Federal Nature Conservation Act enables the German states to develop guidelines for the assessment and accounting of impacts on nature and landscape. This led to the emergence of a variety of methodological approaches over the past thirty years. Bruns (2007) identifies at least forty-two published assessment approaches. Similarities exist between several of these assessment approaches, and because of these existing similarities, the assessments are generally broken up into four categories within the professional literature:

- the biotope-value approach,
- approaches related to a compensation ratio,
- the cost-of-restoration approach, and
- ecosystem function approaches.

In Germany, the biotope-value approach is most commonly used and the mapping of biotopes is established as standard in practice (Köppel and Müller-Pfannenstiel 1996:

345).The core elements of the biotope-value approach are biotope lists which specify value, credit points, or value stages for each biotope type (Bruns 2007: 200).

Wende et al. (2005) documented the example of the compensation pool of the Rheinisch-Westfälische Wasserwerksgesellschaft (Rhineland-Westphalian Water Supply Service, RWW). In this case, credit points are used for the accounting of impacts and proposed measures. Under a standardised assessment method by the State Ministries of Economics and the Environment of North Rhine-Westphalia (see Ministerium für Wirtschaft und Ministerium für Umwelt NRW 1999), the assignment of credit points is calculated by multiplying the standardised value of the habitat by the habitat's area. See Table 3 for an example.

Table 3: Example for the accounting of impact and proposed measures with credit points according to the RWW compensation pool

Criteria	Impact biotope	Offset biotope
Area	5,000 m^2	35,000 m^2
Habitat	Deciduous woodland with a sub natural understorey	Afforestation on grassland
Credit value before	7/m^2	
Credit value after	2/m^2	
Credit value difference	5/m^2	4/m^2
Credit points	5/m^2 x 5,000 m^2 = 25,000 (credit points lost that have to be offset)	4/m^2 x 35,000 m^2 = 140,000 (credit points gained for the offset)
Accounting of impact and proposed measures	As a result, 25,000 credit points are subtracted, so that 115,000 points remain for the compensation of other impacts. The original impact of 5,000 m^2 is effectively mitigated with 8,300 m^2.	

Compensation ratios are benchmarks that usually define upper and lower limits to determine the size of the compensation area. They refer to the environmental relevance/value of the affected area, which are generally based on biotope types. The limits make case-by-case-adaptations possible. The ratio illustrates the spatial scale between the size of the area of impact and the size of the area required to compensate for the impacted area (e.g. 1:2, i.e.: 1 ha of lost grassland has to be compensated by the changing of 2 ha arable land into grassland somewhere else).

Ecosystem function approaches are the least formalised, and may be adapted to the specific situation on a case-by-case approach (Spang and Reiter 2005: 48). However, they risk becoming arbitrary.

While the aforementioned approaches may be combined to a variety of mixed forms, there is one approach that is completely different: the cost-of-restoration approach. It includes estimating the costs that would occur to restore a state comparable to the one lost. These costs will then be used to quantify the dimension of the compensation obligation incurred by the polluter. With this money, appropriate measures are

implemented to ensure that the goal of no net loss is achieved, in accordance with the adherence to the mitigation hierarchy (Köppel et al. 1998: 218 ff).

In view of this multitude of assessment methods, a scientific discussion is ongoing to harmonise these at the federal, or at least at the state, level. However this is a very complex issue which cannot be expected to be resolved within the foreseeable future. When deciding upon a suitable assessment method, the quality and validity of the methods have to be considered as a priority, i.e. mere monetary assessments without detailed qualified explanation are not considered sufficient (Herberg 2009).

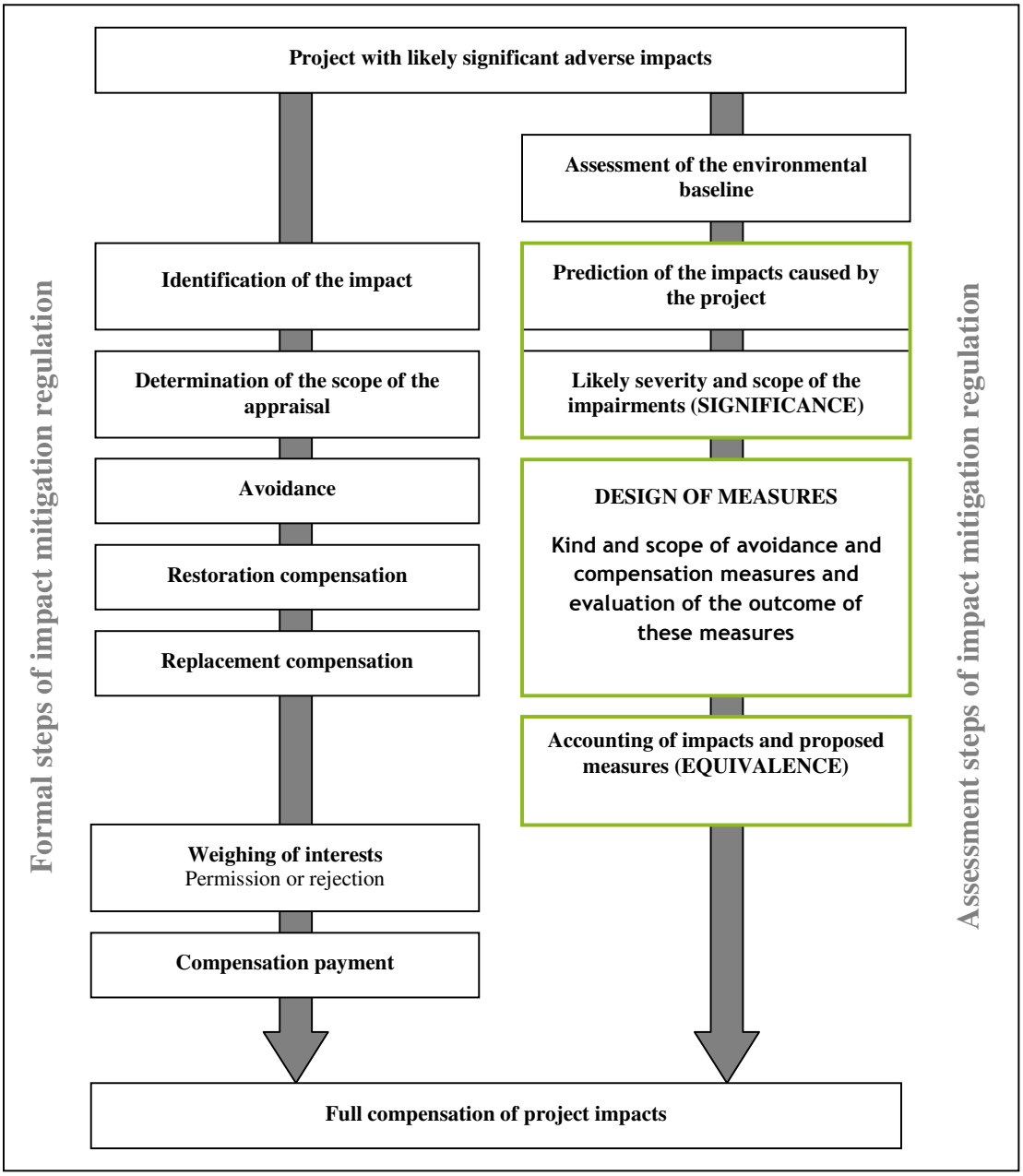


Figure 3: The formal and assessment steps in the decision making process of the German IMR (main assessment complexes framed in greens) (Source: modified after Bruns 2007: 86)

4.2.2 System description

As outlined in Section 1.2.1, German IMR follows a comprehensive approach and does not specify minimum or maximum thresholds. This means that it must be applied for all projects likely to have significant adverse impacts. However, it is important to stress that the principle of full compensation, to assure no net loss, does not imply the

realisation of an offset in every case. Rather, it means that the mitigation hierarchy (see Section 1.2.1) – avoidance, minimisation, restoration compensation and replacement compensation – must always be followed.

German IMR requires a strict additionality of offsets. The project proponent or compensation agency which carries out compensation measures must prove this to the competent authority, i.e. the nature conservation agency concerned. The latter performs a regulatory function, and may reject a compensation measure if it is considered inappropriate. As Herberg (2009) states, the evidence of additionality is a problem that is often encountered during the licensing procedure. It is a fundamental principle that in order to assure no net loss, offsets must demonstrate additionality, and should not replace regular nature conservation budgets and actions or measures.

This means that compensation requires an enhancement of an existing area, i.e. it must be possible to create additional value. For example it is easier to increase the ecological value of farmland, than it is to increase the ecological value of a biodiversity-rich habitat (e.g. alder swamps). Therefore, mere conservation of the latter is not accepted as an additional action. Moreover, measures have to improve the specific function of ecosystem and landscape scenery, rather than being of general environmental benefit. For example, improving the thermal insulation of buildings with the aim of reducing greenhouse gases, and research and capacity development, are not accepted as environmental offset measures.

This leads to another fundamental principle, regarding the appropriateness of land for compensation areas. According to Morgenroth (1998: 1), overall landscape conservation concepts should be used to identify appropriate areas, e.g. landscape plans (von Haaren et al. 2008), statewide biotope mapping and ecological network systems and buffer zones around protected areas. This is considered to be a major condition for making the choice of areas coherent and traceable.

As a result of more than thirty years of applying the German IMR, high quality standards have been established based on experience. The ministries of the German states and other institutions have developed numerous detailed guides. As mentioned above, nature conservation agencies are committed to ensure that these quality standards are applied properly in every case. The applicant has to provide a number of specifications in order to obtain approval for the proposed compensation measures by the responsible nature conservation agencies: general information on the project proponent himself and the proposed development, the impact area, the availability of appropriate compensation areas and the proposed compensation measures, including a description of the initial situation of the compensation area. Furthermore, in order to ensure additionality, the project proponent must prove that no other legal obligation to implement the proposed measures exists.

The nature conservation agency will then make the decision about whether to allow or reject the compensation measures proposed. This decision depends on whether the measures are judged to be suitable to assure full compensation in terms of quality (functional, spatial and temporal relation of impact and offset) and quantity (compensation ratio).

However, several examples exist showing that in practice, IMR proceeds are used to finance measures other than compensation measures. Herberg (2009) cites such examples as several recreational measures in the state of Berlin, or the financing of the Brandenburg Rangers. Additionally, some nature conservation agencies have been known to accept mere maintenance measures as compensation. This underlines again that the proper enforcement of IMR quality standards and additionality, depends to a great extent on the nature conservation agencies.

One important discussion, both in practice and in the scientific community, involves the question as to where and when an offset should ideally be realised. With reference to the location of compensation measures, a consensus exists that the minimum standard should be to implement offsets in the same natural landscape unit as the impact. In the inquiry among pool operators by Böhme et al. (2005: 177) (~87% municipal pools), the current practice of site selection for compensation pools was surveyed. Amongst factors affecting site selection, most often cited was acquisition capability of the properties, followed by environmental enhancement potential. Further factors were the functional relationship of the anticipated interventions, the lack of competitive claims, the spatial relationship to the anticipated interventions, costs of the compensation measures, costs of maintenance, etc.

The question of timing has been discussed extensively, which has led to the creation of compensation pools and greater flexibility of IMR. This development was initiated with the intention of preventing temporary degradation of nature and landscape due to the time lag between impact and compensation. In this way, compensation pools can contribute to ensuring that compensation measures are already in place when the impact occurs, even though there is no legal requirement for this (except in the case of Natura 2000).

By contrast, for the duration of the offset, the law requires that compensation measures be assured in perpetuity. However, project proponents and compensation agencies face several obstacles in implementing this in practice, e.g. uncertainties in assuring the continuous maintenance of the measures. As a result, a time period of twenty to thirty years is usually applied in practice.

Another problem that is even more serious is the general lack of implementation and control/ monitoring of the many small and dispersed compensation areas and measures. Hence, compensation pools and agencies try to apply a more standardised and centralised concept which will combine all activities from strategic planning,

including the definition of an overall concept (e.g. taking ecological networks into consideration) and the choice of appropriate areas, through the implementation of measures, to the allocation of impact and offsets and the maintenance of the measures. The tasks of the compensation agency should also include continuous performance reviews and monitoring.

Compensation pools as a new instrument to facilitate IMR implementation

The first compensation pools emerged in the 1990s and the number of pools continues to rise[12]. They facilitate IMR implementation by concentrating management and work by implementing a few large "pools" instead of a number of small isolated conservation areas.

Two types of compensation pools can be identified in practice: 1. Appropriate land is gathered in a pool, and is provided for implementation of compensation measures on request (compensation sites pool, *"Flächenpool"*); and 2. Measures are provided that have been implemented prior to impact (compensation measures pool, *"Maßnahmenpool"* or eco-account *"Ökokonto"*).

Table 4 illustrates the main differences between conventional IMR practice and compensation pool practice.

A developer may at present choose either to follow conventional IMR practice, i.e. to acquire appropriate land and implement measures in accordance with the conditions set by the competent nature conservation agency, or to fall back on compensation pools (see Figure 4). In this respect, the role of compensation agencies has to be highlighted.

Compensation agencies that provide compensation sites and services to project proponents have been successfully installed in recent years. Some of them operate mostly locally, while others are approved or certified by a German state, and thus provide compensation sites and measures for a larger area (e.g. the *Flächenagentur Brandenburg GmbH* in Brandenburg).

[12] For a documentation of the state of the art concerning pool practice in Germany based on a statewide survey see Böhme et al. (2005).

Table 4: Main differences between conventional IMR practice and compensation pools

Criteria	Conventional IMR Practice	Compensation Pool Practice
Functional and spatial relationship of impact and compensation	Close functional and spatial relationship between impact and offset, when finding appropriate sites and realising restoration compensation measures	Partial spatial dissociation between impact and offset, sometimes functional dissociation (belongs to the impairment caused by the project)
Temporal relationship of impact and compensation	Acquisition of appropriate land and implementation of measures when an impact occurs	Provisioning of appropriate land or measures before an impact may occur
Preference of restoration or replacement compensation	Preference of restoration compensation (on-site/in kind) over replacement compensation (off-site/out of kind	In practice, mostly measures can only be titled as replacement compensation (belongs to the location and the impairment caused by the project)
Dimension of compensation measures	Single isolated measures	Joint implementation of measures, combination to larger and more complex measures is possible
Conceptual basis	No conceptual basis; however measures may be deducted from landscape plans and other planning instruments	Possibility to integrate measures in an overall pool concept (which usually is developed on the basis of landscape plans and other planning instruments)

Hof Hasemann GmbH and Rheinisch-Wesfälische Wasserwerksgesellschaft mbH are two of the first private companies in Germany to operate a compensation pool and sell biodiversity offset credits to project applicants. However, not much is known about the German “market for compensation services”, and especially the market value of compensation credits. It is assumed that there is as yet not much competition between the providers of compensation services, and that prices vary significantly. However, the majority of pools are still run by municipalities to cover their own compensation demand. Jessel et al. (2006: 395) mentions, that there is a tendency in practice to provide “complete service packages” as it is in demand by project proponents.

Once a project proponent has contracted a pool operator, he has to pay all expenses at once, and is then exempted from further payments. This means that the provider of compensation services has to calculate the amount the investor is to pay carefully, including costs for implementation, maintenance and monitoring of the measures, as well as of land acquisition and the planning and management expenses. Table 5 shows some examples to illustrate the cost differences in implementation and maintenance of various biotope types, not including land acquisition costs.

Table 5: Examples for the implementation and management costs of different biotopes (modified after FGSV 1999 presented in Köppel et al. 2004)

Biotope	Implementation costs in Euro	Annual maintenance costs in Euro
Standard trees: maple, lime-tree, oak, elm, beech, hornbeam etc., circumference 18-20 cm	250 each	9,50 each
Orchard meadow ~ 50 trees/hectare	0,70/m^2	0,28/m^2
Afforestation	1,50/m^2	0,05/m^2
Arid grassland	2,25/m^2	0,11/m^2
Ponds >400m^2	5,00/m^2	0,13/m^2
Ponds 20m^2 - 400m^2	7,50/m^2	0,26/m^2
Ditches	12,50/m^2 (until 25/$m^{2)}$	0,13/m^2
Cane brake	1,50/m^2	0,05/m^2

In order to support the development of compensation agencies, the Federal Nature Conservation Agency (BfN) published a handbook giving general information about the tasks of compensation agencies, the safeguarding, management and long-term maintenance of compensation sites and measures, and about major issues which agencies have to address, for example price calculation, templates of contracts, etc. (Schöps et al. 2007).

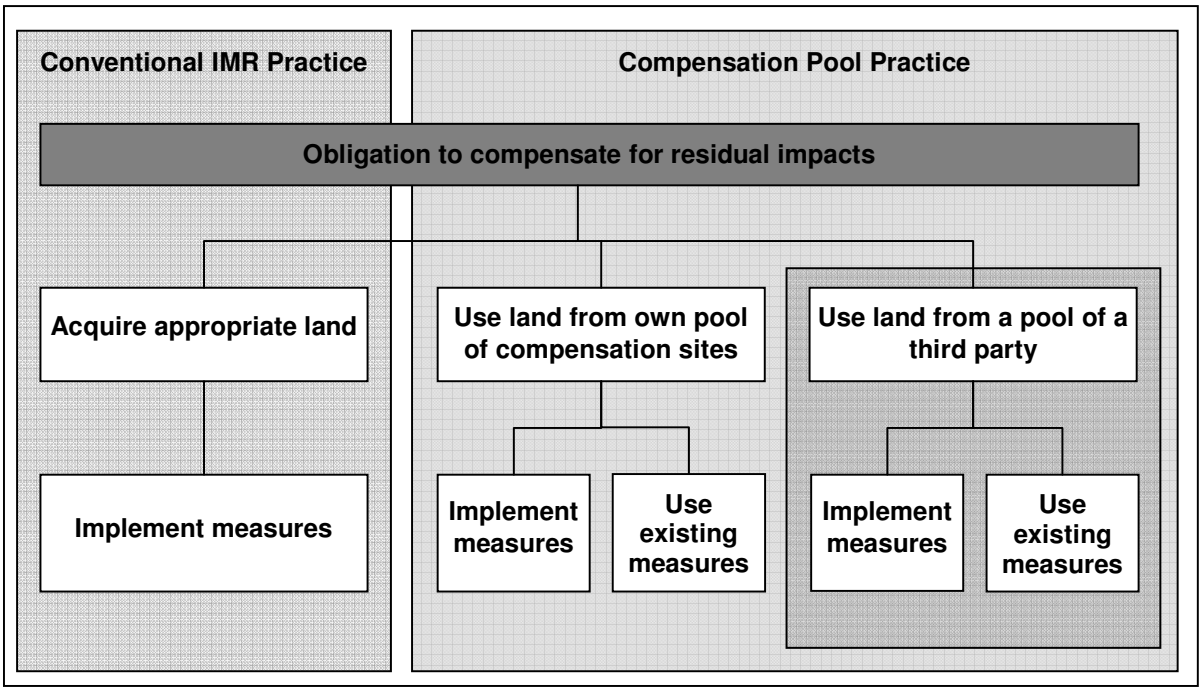


Figure 4: Implementation of compensation measures according to conventional IMR practice and compensation pools

4.2.3 Links to other issues and policies

Crowding out

Crowding out of other biodiversity policy objectives is an issue that has been discussed in the run-up to the establishment of compensation pools. Critics feared rising prices for land and land shortage, and thus a reduction of general measures of nature conservation and landscape management. However, this has not proven to be a problem. There are at present only a few cases known on municipal property markets where land prices increased due to potential pool properties (Herberg 2009, Bruns and Herberg 2004).

Ecological networks and climate change

Schöps (2008, BFAD chair) highlights several advantages of compensation pools with regard to biological diversity and climate change. Providers of compensation services (compensation agencies) may stimulate the creation of an extensive network of protected areas with sound natural dynamics. Concerted management can focus on the landscape and ecosystem functions, rather than on individual species. Compensation pools enable the combination of single compensation areas and measures to larger and functionally more effective habitat networks (Wilke 2001: 6), thus ensuring minimum habitat areas. In so doing, superordinate concepts of nature conservation may be applied to obtain a maximum outcome for nature and landscape, e.g. to close gaps in biotope networks and to create buffer zones surrounding protected areas, or areas worthy of protection. Moreover, measures may be channelled to regions where permanence of measures can more easily be achieved.

From the point of view of nature conservation agencies, the concepts elaborated for compensation pools may serve as a steering instrument to achieve policy goals (Herberg 2009). However in practice this often depends on the availability of land. According to an inquiry in 2003 among public and private pool operators, almost 40% stated that biotope framework concepts had been considered during the development of concepts for compensation pools (Böhme et al. 2005: 56).

In addition to the ecological benefits, compensation measures can induce synergies with climate protection goals (Schöps 2008). This has led to the current debate on whether such measures can be traded. In this respect, pilot projects are known in other countries, e.g. in Brazil, where the proceeds of the sale of carbon credits are placed in funds to be used to achieve biodiversity protection goals (Darbi et al. 2009). For the German situation, this has not yet been considered in practice. However, according to Herberg (2009), initial efforts are being made in this direction. In a research project which is currently being carried out at the Leibniz Institute of Ecological and Regional Development on the functioning and financing of compensation agencies, several interview partners showed great interest in the trading of carbon credits.

4.2.4 Institutional roles and responsibilities

The Federal Nature Conservation Act sets the framework for IMR. However, according to Art. 18 (5) and 19 (4), the states are responsible for implementation, and may provide further regulations, in particular on the conditions under which compensation measures can be made creditable. In fact, after these provisions entered into force with the 2002 amendment of the Nature Conservation Act, several states enacted ordinances specifying prerequisites for the creation of compensation pools and agencies, e.g. the compensation ordinances in the state of Hesse in 2005 and more recently in Saxony (autumn 2008). Pools of compensation areas or measures may be run by a variety of different institutions under several distinct organisational forms.

The most important distinction is between those used to cover own needs, and those where compensation services and biodiversity offset credits are traded. Compensation pools and agencies may be organised either under private or public law, by districts, cities and municipalities, or by associations, foundations, limited liability companies (LCC) etc. The organisational form significantly characterises the overall work of the pool or agency with regard to its capacity to act, to obtain pre-financing and particularly to safeguard areas and measures permanently. As the perpetuity of compensation measures is required by law, a conflict emerges if the responsible body could theoretically go bankrupt as in the case of an LCC. For this reason, a number of different ways to secure compensation areas have been developed. Perhaps the most commonly used is that of ensuring that the ownership of the land is assigned to a nature conservation foundation, as these are exempt from bankruptcy.

In any case, in legal terms, the project proponent remains responsible to demonstrate the execution and maintenance of the offset. They may contract a provider of compensation services (compensation agency), which will in practice carry out the necessary activities. Payment to this offset being calculated to cover the necessary amount of money the project proponent has to pay to assure perpetuity of the offset.

According to Wagner (2007: 461), the use of compensation pools includes two steps: First, areas and measures are registered in the pool. These can be "booked out" later when compensation areas or measures are needed. The registration procedure requires selecting and designing appropriate areas and measures, which then have to be made available to project proponents and secured from competing land use. These pools are registered by the local nature conservation authority.

One argument for pool models is that they can react more flexibly to high land use pressure. Most notably, conflicts have emerged in the past with farmers for whom the application of IMR implied a double disadvantage: first, due to the proposed project itself, and second, due to the need for appropriate compensation areas. It is important to involve local stakeholders, and especially local farmers and landowners, in the creation and operation of a compensation pool or agency. The efforts to initiate a

participative and communicative process improve local acceptance and thus facilitate the acquisition of appropriate land and broad support for the maintenance of measures. As outlined in the next section this may lead to a win-win situation, for example when farmers take the initiative to provide land that cannot be easily cultivated, e.g. small ponds or hedgerows (Böhme et al. 2005).

4.2.5 Timing of Compensation

In Germany, where case-by-case compensation is carried out the compensation must be in place when the impact occurs. This means that the compensation measures have to at least be implemented structurally, e.g. when the road is built. The major advantage of habitat banking, i.e. of storing of compensation measures compared to aggregated offsets not implemented in advance, would be a gain of biodiversity values and enhancement of other functions of the created habitats. The time-lag could be avoided or at least significantly reduced in many cases. From that point of view it would be preferable that only credits which already have been created can be sold.

A practical approach would be to implement a certification/approval-system in order that compensation agencies are able to safeguard the quality of the pool/bank and to ensure that compensation actually happens. In the list below the criteria for certifying compensation pools is shown as applied in the German state Brandenburg. The service area of a certified pool encompasses one of the fourteen landscape units of Brandenburg.

Criteria for certifying of compensation pools in the state Brandenburg (MLUV 2009)

- 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).

The Environmental Ministry of Brandenburg wants to support the establishment of compensation pools, primarily due to the higher nature conservation benefit of measures realised in such pools. Therefore, several additional incentive measures have been implemented. If a project proponent uses a certified compensation pool the required compensation area for the project is automatically reduced by 10 percent. As an additional financial incentive for project proponents, Brandenburg has introduced an ecological interest/yield. The compensation area can be reduced per 3 percent for each year if a compensation measure is realised prior to the assignment of an impact. The maximum reduction is 30%. For pool operators there is a competitive advantage to realise measures in advance. Project proponents who want to profit from the interest/yield regulation are able to do this if they are able to find and contract a pool operator who provides such measures.

4.2.6 The "economic incentives"

Economic advantages for investors, municipalities, landowners and compensation agencies

With the introduction of compensation pools, a new market has emerged for compensation services. Private and public compensation agencies can generate income by providing and managing compensation areas and measures. Municipalities may obtain a competitive advantage by operating a compensation pool as it may attract investors.

For investors, compensation pools may generate a number of advantages. According to Schöps (2008), compensation pools are a modern management instrument to facilitate development of measures with minimum land consumption, and a maximum of nature conservation value. They are designed to accelerate the licensing procedure and ensure a high degree of planning security for investors; hence representing an economic advantage. The costs for the acquisition of land and the maintenance of measures can be reduced significantly compared with case-by-case compensation (avoiding land speculation and price rigging) (Wilke 2001: 6). In most cases, pool

operators are able to buy land at the price of agricultural land (Böhme et al. 2005: 76).

One strategy for preventing rising property prices is to disclose search areas for potential pool sites in urban land use plans (or other informal plans) two or three times larger than the predicted demand (Bunzel 1999: 100). Another strategy could be a restrictive land acquisition policy by the pool operator, so as not to create additional demand on the property market (Böhme et al. 2005: 78). In 2003, approx. 50% of pool operators (n=193) stated that land acquisition, as well as such other pool development tasks as designing, implementation, monitoring and maintenance of offset measures, and staff and operating expenses were considerably cheaper than in case-by-case offsetting. There were also pool operators (about 2 to 8%) who stated that compensation with pools is more expensive than case-by-case offsetting (ibid: 133). However these results are subjective estimates of persons in charge, and have not been substantiated with economic surveys.

Consensual processes with landowners and farmers play an important role in generating economic benefits for both project proponents and providers of compensation services on the one hand, and landowners and farmers on the other: Providers of compensation services may systematically assemble land with limitations for land cultivation at a good price, and farmers may take the initiative to offer land for sale or exchange that cannot be cultivated, but usually represents a high ecological value, e.g. small ponds, succession areas or hedgerows (Morgenroth 1998: 61).

Distributional issues

Distributional issues are concerned with the location of impacts and the respective compensation areas in terms of loss and gain of land availability for different purposes and natural assets (including the landscape scenery and its recreational value). From a socioeconomic perspective, compensation pools contribute to a reduction of agricultural land consumption in boom areas (development projects require land both for the proposed development itself and the required compensation measures) and thus to a relief of pressure on local agriculture (Herberg, 2009).

Bunzel (2004b: 36ff) highlights another issue: When a project is to be realised in one municipality and compensation areas are proposed in a neighbouring municipality. In such cases, the area to be used for compensation purposes is excluded from other potential uses, so that, he argues, the provisions of the preparatory land use plan ("*Flächennutzungsplan*") and the landscape plan of the neighbouring municipality have to be taken into consideration. Furthermore, the contribution of the neighbouring community has to be integrated into the weighing procedure, within the scope of stakeholder consultation for the land use plan which causes the impact ("*Eingriffsbebauungsplan*") (Bunzel 2004b: 37). In practice however, this hardly presents any problem, as compensation measures will usually be beneficial to the recipient municipality. In this respect, Bunzel (2004b: 44) draws attention to the

possibility of combining compensation concepts with touristic and recreational goals. Several good examples for this practice already exist, e.g. the Frankfurt/Rhein-Main Regional Park.

Conversely, the question as to whether compensation pools risk creating inequalities between "built-up" impact areas and "green" compensation areas is not discussed in detail. However, due to the requirement that compensation should take place in the same natural landscape unit as the impact, this concern may not be of great urgency.

4.2.7 Legal issues and responsibilities

Three main actors take part in the IMR process when compensation pools are used to fulfil the offset demand (see Figure 5): first, the project proponent who is responsible for offsetting any impairments the proposed development may cause; second, the nature conservation agency concerned, as the regulatory authority which specifies the conditions for the offset and monitors the proper implementation of the measures; and third, the compensation agency, which provides a broad range of services, in accordance with the provision of compensation sites as well as the design, implementation and maintenance requirements of the offset.

In practice, the provision of compensation measures, and hence the generation of "credits" is undertaken either by a project developer who himself has an ongoing need for offsets, e.g. a municipality which develops new residential areas or commercial and industrial areas, or by a third party, a compensation agency, who sells these credits to the project proponent. Currently the issue of how compensation agencies can improve IMR implementation, and which obstacles might arise with the new compensation agencies, is being discussed. As mentioned in Section 1.2.5, several German states have enacted ordinances in which the conditions for the creation and work of compensation agencies are set out. The compensation ordinance of the state of Hesse specifies that the supreme nature conservation agency, which in this case is the State Ministry of the Environment, can approve a compensation agency, taking into consideration such criteria as its technical and economic aptitude.

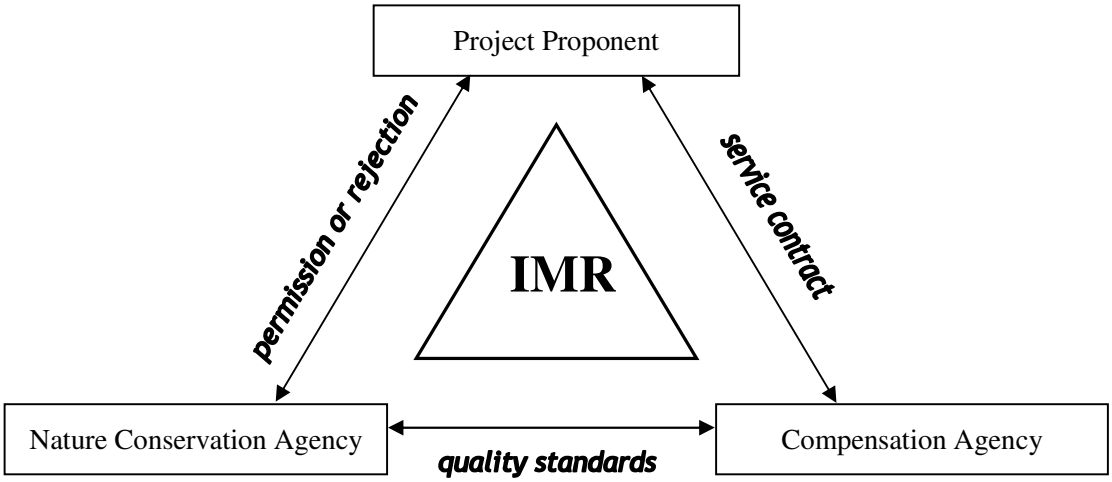


Figure 5: Main actors in German IMR

In the state of Saxony the State Ministry of the Environment opened a competitive bidding for the creation of a statewide compensation agency. The final choice was based on several criteria, including technical and methodological expertise as well as economic capacity and reliability. Thus, the ministry opted for a combined responsibility by the *Sächsische Landsiedlung*, a registered charitable institution, and the Nature Conservation Fund at the Saxon State Foundation for Nature and the Environment.

This example illustrates a top-down approach of certifying compensation agencies. By contrast, the majority of compensation agencies have been created bottom-up in response to specific compensation needs, e.g. for major projects such as road or waterway construction, or have emerged from pilot projects etc. Either way the nature conservation agencies have to oversee the licensing procedure and the proper implementation and maintenance of compensation measures. They provide quality standards and specify the conditions for the offsets. In addition, with the formation of the Federal Association of Compensation Agencies in September 2006, a platform to discuss and assure quality standards has been established. To date, five core criteria of performance standards have been formulated:

1. assuring enhancement from a nature conservation perspective;
2. safeguarding areas and measures over the long term;
3. monitoring and follow up of the development of the pool areas;
4. integrating offsets into superordinate strategies and instruments of landscape development; and
5. complying with high performance standards (BFAD 2007).

With these quality standards, compensation pools and agencies generally accelerate the offsetting procedure, and thus reduce planning bureaucracy and costs. They can thus also avoid competition with agricultural land use and achieve greater acceptance.

4.3 Summary of key characteristics and lessons

General characteristics of IMR

In Germany, IMR has been the main instrument for the assessment of impacts and compensation under the law since 1976. This law is of a mandatory and precautionary nature. The overall objective is to ensure "no net loss" by avoiding any impairment of nature and the landscape, and compensating for residual unavoidable impacts. German IMR is a comprehensive approach, and covers all natural assets under the German Federal Nature Conservation Act, including projects at the levels of both urban planning and sectoral planning.

A strict mitigation hierarchy (avoidance, minimisation, restoration compensation and replacement compensation) is to be applied, in order to assure the principle of full compensation. This implies a preference for a close functional, spatial and temporal relationship between impact and offset, which must be in the same natural landscape unit. Moreover, IMR requires strict additionality, requiring the project proponent to prove that no other legal obligation to implement the proposed compensation measures exists. The nature conservation agencies decide upon admission or rejection of the proposed measures which must take into consideration both qualitative criteria, such as the functional, spatial and temporal relationships of the impact and the offset, and such quantative criteria as the compensation ratio.

Advantages of compensation pools

Compensation pools and compensation agencies enabled by the mentioned amendment to the German building and nature conservation law share a number of advantages compared with conventional IMR practice, and can thus contribute to abolishing obstacles to IMR implementation (cf. e.g. Jessel et al. 2006: 395, Wende et al. 2005). These strengths may serve as good practice with regard to developing a habitat banking system at the European or international level. Among the most important are:

- **Increased flexibility:** Compensation pools can react more flexibly to high land use pressure. The project proponent can fall back on a pool of existing areas or measures, permitting a choice of the most suitable one in each case.
- **Acceleration of the licensing and offsetting procedure and reduction of effort and expense:** Compensation pools are a modern management instrument designed to facilitate the development of measures with minimum land consumption, and a maximum of nature conservation value. They can accelerate the licensing and offsetting procedure, reduce planning bureaucracy, and ensure a high degree of planning security for investors. Moreover, the costs for the acquisition of land and the maintenance of measures can be reduced significantly by concerted management.

- **Facilitation of land acquisition:** Appropriate land can more easily be acquired over the long-term, thus avoiding competition among different project proponents, and with agricultural land use. Thus, land speculation can be prevented and costs reduced.
- **Improvement of acceptance:** Conflicts have emerged in the past with farmers, due to the need of land for development projects and for the respective offsets. Compensation pools can improve this situation by involving local stakeholders, and in particular farmers, in their establishment and operation.
- **Reduction of time lag:** In the context of the implementation of measures, the time lag between impact and offset can be reduced significantly, as the offset is already in place when the impact occurs.
- **Bundling and matching of measures:** Compensation pools can contribute to the creation of an extensive network of protected areas with sound natural dynamics and larger and functionally more effective habitat networks, which is at the same time more cost-efficient due to reduced administrative effort.
- **Consideration of landscape planning:** According to Böhme et al. (2005), nature conservation and planning concepts are developed for the great majority of pools - almost 80%). These are usually based on landscape plans and other planning instruments.
- **Development function:** Compensation pools are increasingly assuming a development function, e.g. compensation measures can be used even to enhance poor landscapes.

Lessons learned

Even though compensation pools display a number of advantages over conventional IMR practice and can significantly improve IMR implementation, there are certain risks and conditions that should be considered in order to achieve best outcomes. These can be summarised as follows:

- **Biodiversity protection:** In most cases compensation pools can only provide measures with loose spatial and functional connection between impact and compensation. There is a risk that the ongoing decrease of biodiversity cannot be stopped even if Impact Mitigation Regulation and compensation pools are used. Strong quality requirements or a certification system for compensation pools/agencies/banks would possibly be helpful to better fit the target
- **Larger scale**: More extensive and coherent pool solutions are to be preferred over small-scale and dispersed insular measures, in order to achieve the objective of full and effective compensation, taking into consideration minimum habitats.
- **Perpetuity**: Appropriate mechanisms must be applied to safeguard compensation areas and measures in perpetuity.
- **Permanent maintenance**: Uncertainties in assuring the continuous maintenance of measures must be resolved by applying monitoring and follow-

up. Thus, a monitoring programme should be mandatory for every pool, so as to enable long-term statements about the success and the target fulfilment of measures.

- **Land availability**: In view of high land use pressure, the availability of land is in most cases a conditioning factor for proper IMR implementation, and for compensation pools.
- **Additionality**: Evidence of additionality is often cause for conflict during the licensing procedure, and must therefore be considered meticulously.
- **Quality of credit**: Nature conservation agencies have to make sure that quality standards are applied properly in every case.
- **GIS register**: A register of compensation areas and measures ("*Kompensationskataster*") is recommended to facilitate the efficient management of a pool, ideally using GIS.
- **Consistent assessment methods**: The goal of harmonising the existing multitude of assessment methods in Germany should be implemented over the medium term, thus reducing effort and expense, and making the compensation procedure comparable and more transparent.
- **Target habitats**: A clear pool concept is essential to precisely assign interventions in certain habitat types to the corresponding habitat types that have built-up in the pool. Pool concepts with defined target habitats are to be preferred over vague or abstract pool concepts.
- **Stakeholders**: As acceptance among existing land users is required but often hard to obtain, a major focus must be on acceptance-building during the initialisation period of a compensation pool.

Future development aspects

Another amendment to the Nature Conservation Law is being planned. The current draft (Bundesregierung, 2009) intends to provide for further standardisation by ordinance at the federal level, especially concerning content, character and scope of compensation measures, removal of imperviousness, reconnection of habitats, management and maintenance, and the level and calculation of compensation payments (§15 (7) of the draft).

Further regulations concerning compensation pools and storing of environmental offsets are to be implemented. For the first time, voluntarily implemented nature conservation and landscape management measures are to obtain a claim to be accepted as compensation measures, when the following criteria are fulfilled:

- Fulfilment of general legal demands for compensation measures (§15 (2) of the draft)
- Implementation without any legal requirement
- No use of public funding
- No contradiction with instruments of landscape planning

- Documentation of the initial state of the area (§16 (1) of the draft).

Another new source of flexibility in the amendment is to be seen critically from biodiversity protection point of view: there will be no longer a clear distinction between prioritised restoration compensation (in-kind and on-site) and replacement compensation (out-of-kind and off-site).

It is proposed that legislation at the state level (§16 (2) of the draft) regulates:

- The storage of compensation measures with the use of pools of compensation sites,
- Eco-accounts (especially booking into eco-accounts),
- Granting of planning permission,
- The tradability of eco-credits, and
- Allocating responsibility for safeguarding compensation sites and undertaking maintenance of measures.

In summary, the impact compensation approach in combination with compensation pools following high quality demands and especially with compensation measures realised in advance, is recommended for wider international application. In this context the formulation of quality standards is a key factor to success. In Germany, the nature conservation agencies and the Federal Association of Compensation Agencies in particular are making efforts in this direction. Figure 6 contains a list of quality standards.

A good compensation pool should ensure:

- Achievement of the technical IMR objectives: avoidance, minimisation, the technically appropriate development of compensation measures, and permanent protection of sites and measures;
- Improvement of the compensatory accompanying conditions for "full compensation";
- Reduction of the planning bureaucracy;
- Definition of clear compensation pool responsibility, and of a concept;
- Collection of land;
- Control of property prices;
- Achievement of financial advantages through compensation pools;
- Limitation of impacts on the local open-space structure;
- Avoidance of competition with agricultural land use;
- Achievement of acceptance.

Figure 6: Quality standards and benefits of compensation pools[13]

[13] Source: Wende et al. (2005); also cf. Böhme et al. (2005)

5. Sweden

5.1 Introduction

The concept of environmental offsets has been discussed in Sweden since the middle of the 1990s, but it was not until the Swedish Environmental Code came into force in 1999 that it became possible to formally require compensation for loss of environmental value caused by human exploitation and development projects.

The discussion of environmental offsets was germinated in earlier action plans for biological diversity by the Swedish Nature Protection Agency and the National Board of Housing, Building and Planning (Emanuelsson et al. 1996; Naturvårdsverket 1995), as a means to maintain biological diversity in Sweden. In an inquiry ordered by the Ministry of the Environment, Bengtsson (1997) recommended that offset measures be mandatory in certain protected areas such as nature reserves and protected wetlands, if exploitation of these areas would result in a severe loss of environmental value. Bengtsson also highlighted the possibility of integration into the Environmental Impact Assessment (EIA) Procedure. Following these first discussions, many reports, guides, handbooks and articles were written in relation to the use of environmental offsets (e.g. Grip et al. 1999; Eriksson and Lingestål 2002; Rundcrantz and Skärbäck 2003; Naturvårdsverket 2003; Boverket 2007; Naturvårdsverket 2009).

Today's Environmental Code incorporates only a reduced form of Bengtsson's recommendations, where offsets are mandatory in a few cases only. Legal regulations that provide for offsets attached to different permits, approvals and exemptions granted are not used extensively by the licensing authorities (in many cases the Swedish County Administration Board [Länsstyrelsen], hereinafter: SCA). With the exception of certain nature reserves including Natura 2000 areas, Sweden presently does not have strong legally binding requirements for environmental offsets.

There have been several voluntary attempts in Swedish municipalities to implement environmental offsets in urban development planning. The municipalities have set up interdisciplinary working groups, which have drafted theoretical studies, developed evaluation methods (in most cases similar to German approaches) and realised a number of pilot projects to test the so called "Balanseringsprincipen"[14] in theory and practice (Skärbäck 1997; Skärbäck 2003; Dahl et al. 2003; Ohlenburg 2004; Lomma kommun 2006; Olofsson 2006). Some municipalities (mainly larger towns, such as Gothenburg, or those with a high density of population, such as Lomma) have already used their local autonomy rights to politically anchor environmental offsets in urban development planning. Some other municipalities have rejected this measure, and yet others are still in the discussion process.

[14] The principle of achieving a balance of environmental assets before and after a development project.

Probably the most extensive regulations concerning offset issues can be found in the EIA-related regulations and guidance for road planning, in the Swedish road planning sector. The Scanian Roads Administration and the regional Swedish County Administration of Scania produced a report in 2004 with the main objectives of agreeing on questions of terminology and the appropriateness of offset measures and how they would fit into the road planning process. (Vägverket Region Skåne and Länsstyrelsen i Skåne län 2004).

To date, there have been no proposals for the implementation of an offset banking or compensation pool scheme in Sweden.

This case study focuses mainly on experiences from the road planning sector and the voluntary approaches of Swedish municipalities, but also provides information about the handling of Natura 2000 regulations in Sweden.

5.2 Analysis

5.2.1 Objectives

Although Swedish regulations do not stipulate a required approach towards implementing offsets in Sweden, mitigation hierarchy is a popular basis by which project managers approach the implementation of offsets. Various reports and handbooks have attempted to define a mitigation hierarchy in Sweden similar to the German mitigation hierarchy in the German Impact Mitigation Regulation (Eingriffsregelung). The EIA handbook for roads discusses the use of compensation methods if an impact cannot be avoided or mitigated (Eriksson and Lingestål 2002).

An agreement between the Scanian Roads Administration and the Scanian County Administration Board stipulates that any negative environmental impacts have to be (in order of priority):

(1) avoided,
(2) minimised,
(3) compensated (like-for-like in-kind, on-site and in an appropriate time) and replaced with the following offsets (in order of priority):
    I. in-kind but off-site,
    II. off-kind but on-site,
    III. out-of-kind and off-site and
    IV. compensation payments[15]

(Vägverket Region Skåne and Länsstyrelsen i Skåne län 2004)

[15] However compensation payments should be used very restrictively.

The municipalities of Malmö, Lund and Helsingborg have defined a hierarchy in four steps:

(1) avoidance,
(2) minimisation,
(3) compensation in a functional relationship, and
(4) compensation in a different manner (Dahl et al. 2003), similar to Gothenburg's definition (see Hansson et al. undated).

The legal regulations set a clear focus on biodiversity (as shown in the introduction), and therefore environmental offsets have been used predominantly for biodiversity conservation purposes (Naturvårdsverket 2009: 88). However there are also tendencies to include other ecosystem goods and services.

In guides and pilot projects developed in Swedish municipalities (e.g. Skärbäck 1997; Skärbäck 2003; Dahl et al. 2003), the following aspects have been considered in addition to biodiversity when analysing impacts and in designing relevant offsets: environmental assets, environmental services related to flora, fauna, soil, water, climate, and landscape (aesthetic), and cultural heritage. Gothenburg has also considered recreational uses on top of ecological services when considering offsets (Hansson et al. undated).

According to the final report from the municipalities of Malmö, Lund and Helsingborg (Dahl et al. 2003: 6) it is the goal of the offset approach "to achieve an overall balance in environmental values, containing both ecological and recreational functions of the environment". Gothenburg's approach of combining compensation for environmental and recreational values (Hansson et al. undated) is unique in Sweden; socio-economic and cultural impacts go unaccounted for otherwise.

According to Vägverket Region Skåne and Länsstyrelsen i Skåne län (2004: 8) it is the goal that "all environmental functions harmed should be considered and offset such that a balance with the pre-impact status is reached by the offset measures" (no net loss of functions). The EIA handbook for road planning even goes as far as to state that the purpose of environmental offsets is to create or enhance a positive development of environmental quality (Eriksson and Lingestål 2002), which could be interpreted as a goal of net gain. However, in practice, 'no net loss' has never been achieved in road planning practice to date (see next chapter). The goal of "net gain" has been discussed since 2008, but has no relevance in practice as yet (Rundcrantz 2009).

5.2.2 Equivalence

The goal of all known approaches is to achieve the same values and functions as those that existed before impact. In cases where the licensing authority requires environmental offsets as an attachment to permits, approvals and exemptions granted, the offset requirements are almost always determined through discussions

between the authority (usually the SCA) and other experts. In the special case of offsetting an impairment of a Nature 2000 area, the government determines the kind and amount of measures which are sufficient to offset the damage.

A point worth mentioning is that there have been occasions when environmental offsets have been used in Swedish road planning and design but have not always been so named (Rundcrantz 2007:50). Even when offset measures were proposed, they were seldom explicitly documented or interpreted as offset measures. Moreover, measures suggested in the Environmental Impact Report and the Detail Plan for roads seem to almost never be sufficient in proportion to the damage that will occur.

In Sweden "like for like" compensation is preferred (Rundcrantz 2009). It is usually aimed primarily to restore lost values and functions (e.g. when a grove edge has to be cut down, it has to be offset by planting a new one, which can take over the lost functions).

For determining the amount of offset measures and the equivalence to the damage caused by a project, the Roads Administration uses expert knowledge (best professional judgement) from various authorities or consultants. There is no specific information available about the use of biodiversity proxies. Methods of economic valuation are not used.

The municipalities of Malmö, Lund and Helsingborg have developed a factor based method for determining the value of offset needed (Dahl et al. 2003: 20ff). 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 bonus 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 sq.m. are multiplied by the site's specific biotope factor. 10% 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.

The calculation described involves only the biotope value; other impaired environmental values and functions should be analysed separately (verbal-argumentative) for each natural asset, as well as for landscape and cultural heritage. It is necessary to consider these functions when planning suitable offset measures, and these are determined case-by-case by experts. This evaluation method was recently applied to various pilot projects. In 2007 the Helsingborg municipal government came to the decision that the application of environmental offsets was required in principle, but felt that there was a need for the development of a further adapted guide with methods on how to apply offsets in daily urban development practice (Helsingborgs stad Kommunstyrelsen 2007).

Scientific and implementation uncertainties are handled case-by-case, depending on the project and which authorities and experts are involved. It is possible to set up a monitoring scheme of the offset, with requirements for additional measures. This can be regulated in a development contract with the developer. However it is unclear to which extent a monitoring scheme is used in Swedish practice.

Natura 2000 cases are usually handled much more strictly than other cases, for example, in one case involving the impact on a Natura 2000 area by a railroad-project the creation of 40 ha of wetlands was realised for each hectare of wetland lost – a compensation factor of 1:40 – so as to secure appropriate compensation for the impact (Rundcrantz 2009).

In summary, with regard to the issue of "equivalency of offset", the need for guidelines is obvious (this is concluded by Rundcrantz 2006: 364).

5.2.3 System description

As mentioned in the introduction, a formalised biodiversity banking scheme does not currently exist in Sweden. The current legal situation concerning offsets, as well as a review of the literature, guides and reports are presented below.

The Swedish Environmental Code requires environmental offsets for impairments on the environmental values in nature reserves when a decision to withdraw protection status or to grant an exemption must be taken by the licensing authority. Offsetting measures may be located within the protected area or "offsite" (Environmental Code, Chapter 7, Section 7). The environmental code even provides for offsets attached to various permits, approvals and exemptions (Chapter 16, Section 9). In such cases, the licensing authority is authorised to require compensation measures. However, a recent research study indicates that the SCA, who is the licensing authority in many cases, does not yet make extensive use of this possibility (Rundcrantz 2007, 364).

There are also further offset requirements in the Environmental Code that are related to the European Birds Directive and Habitats Directive (Chapter 7, Section 27 - 29), and, since 2007, in Chapter 10, Section 5, to the European Liability Directive (ELD).

The Swedish Roads Administration was the first administration in Sweden to adopt environmental offsets into its regulations (Lerman 2001). The road planning sector is governed by the Environmental Code and the Swedish Roads Law, both of which contain rules for EIA (Rundcrantz 2006). According to these rules and the related EU directives for EIA, an environmental impact report (EIR) needs to be produced to describe the measures designed to avoid, mitigate or remedy adverse effects on the environment. The EIA regulations for the "Road Design Plan" stipulate that potential compensation measures are to be clearly outlined within the plan (Vägverket 2001).

The EIA handbook for roads discusses the use of compensation methods if impact cannot be avoided or mitigated (Eriksson and Lingestål 2002).

A survey focusing on biological diversity in Swedish Environmental Impact Studies from various factors described the EISs from the roads sector and from the railway sector to be the best in terms of quality, with compensation measures often discussed within the documents, in contrast to EISs from other sectors (de Jong et al. 2004).

As mentioned in the introduction, there have been several attempts in Swedish municipalities to implement environmental offsets in urban development planning, although there are to date no specific regulations in Swedish planning and building law to support this (Boverket 2007). Under authorisation from the Swedish Government, the Scanian regional SCA adopted its own environmental quality objectives and an environmental action programme in 2003. According to measure No. 30 of the action programme, the urban development plans of Scanian municipalities must "indicate the compensation measures planned when the plans cause interventions in 'natural or cultural areas'", as of 2004 (Länsstyrelsen I Skåne län 2003).

Municipalities have discussed environmental offsets more generally, attempting to standardise terms, mitigation hierarchy and evaluation methods (e.g. Dahl et al. 2003). Gothenburg has developed checklists to analyse urban development plans with regard to significant environmental impacts. The decision about whether environmental offsets are required is made by experts of the authorities involved, with the aid of these checklists (Hansson et al. undated).

However, in regard to the severity of impacts, there are currently no legally defined thresholds. The existing developed guides and agreements (road planning sector as well as municipality level) do not contain registers of projects, or thresholds to be used to determine when an offset is to be required and when not. A proposal from the Scanian Roads Administration is that environmental compensation should be applied preferably in cases where it is stated that the project is likely to have a significant environmental impact. This should be determined at an early stage of the planning process, when the preliminary feasibility study of a road is drafted by the Roads Administration, or by the SCA in the ensuing formal assessment of the document at the approval of the project (Vägverket Region Skåne and Länsstyrelsen i Skåne län 2004: 18). The current practice is for the licensing authority (SCA for any encroachment requiring a permit, or for encroachments in certain nature reserves; or the government for encroachments in Natura 2000 areas) and involved experts to make case-by-case decisions.

The only environmental offset measures acceptable under existing regulations, guides and agreements are natural compensation measures (restoration compensation or replacement compensation) (Dahl et al. 2003, Vägverket Region Skåne and Länsstyrelsen i Skåne län 2004: 8, Naturvårdsverket 2003: 64). The certification of new

nature reserves, maintenance of already existing nature conservation areas, and public awareness and training activities do not constitute sufficient compensation.

There are no legal regulations for demonstration of additionality or monitoring of measures. Under the Swedish Environmental Code the developer is responsible for the realisation/payment of compensation measures. The licensing authority may monitor realisation and follow up, however this is not often done.

Within the road sector, there are cases where the Roads Administration and the SCA make a final joint inspection of a project, including compensation measures (Rundcrantz 2009). In the agreement of the Scanian Roads Administration and the Scanian SCA, a procedure was proposed under which the Roads Administration integrated monitoring of compensation measures into its monitoring schedule (Vägverket Region Skåne and Länsstyrelsen i Skåne län 2004: 19).

In cases where encroachments are made into Natura 2000 sites, it is stipulated that preference should be given to compensation in an area near the impacted site, which may not already fulfil the conservation goals of the impacted site. The enhancement of the area should lead to a state permitting certification as an additional Natura 2000 site, to compensate for the lost site. If on-site compensation is impossible, offsite compensation is permitted. In such cases, compensation should at least be carried out within the same bio-geographical region (Naturvårdsverket 2003: 63f).

Generally, however, the locations for compensation measures are mainly determined by the mitigation hierarchy laid down in guides (e.g. Dahl et al. 2003, Vägverket Region Skåne and Länsstyrelsen i Skåne län 2004, Hansson et al. undated, Naturvårdsverket 2009), where on-site measures are preferred. In practice the developer (e.g. the Roads Administration) and the licensing authority (e.g. SCA) decide together where the measures are to be located. Today, it is often a problem to obtain land, as landowners can refuse to sell. The appropriation of land based on legislation for compensation concerns has not been tested in court, however this may soon change (Rundcrantz 2009).

The question of the duration of compensation has not been discussed in Sweden. It is generally assumed that compensation should last as long as the impact lasts (ibid).

The issue of when the compensation measures are to be implemented has also not been legally defined. From an expert's viewpoint, they should be implemented before the impact occurs, as discussed in the Swedish Environmental Protection Agency's Handbook for Natura 2000 (Naturvårdsverket 2003: 63). However, in practice under Natura 2000 today, they are often implemented when the project is finished. The licensing authority can of course demand that the measures be implemented before an impact actually occurs (Rundcrantz 2009).

5.2.4 Links to other issues and policies

The phenomenon of "crowding out" has not registered in Swedish discussions of offsetting.

Network connectivity aspects play a role when handling impacts in Natura 2000 sites. Generally however, the inclusion of network connectivity aspects depends on the local situation (are biotope network concepts in place?), and the experts involved (Rundcrantz 2009). It is to be assumed that municipalities take into account regional or local biotope network or green structure concepts when determining compensation sites and include the aspect of enhancing network connectivity (see e.g. Hansson et al. undated).

The Road Administration has started discussing the issue of climate change resilience, however as yet the discussion has not focused on environmental offsets (Rundcrantz 2009).

5.2.5 Institutional roles and responsibilities

According to the Swedish Environmental Code and the EIA-regulations, the developer is responsible for implementing offsetting measures in case of interventions. The licensing authority (usually the SCA, except in Natura 2000 cases where the government takes over) is the regulatory authority which stipulates the requirement for compensation and can monitor the implementation and function of the measures. The demand is strongest for Natura 2000-related cases. In the municipalities, the town planning department is often the leading authority, however several other departments are involved as well. Different departments of the city council are involved in work with environmental offsets in urban development, and often urban development contracts are used to implement compensation measures.

Today the mitigation hierarchy is quite strong in Sweden. For example, in Swedish road planning and building, avoidance and minimising impacts are routine steps in the planning procedure, and these function well (Rundcrantz 2009). These steps are mainly determined by EIA-related regulations in the Environmental Code, or in sectoral regulations. In theory they should apply to other sectors than the road building sector. The last step of the mitigation hierarchy however, that of compensation or restoration, is not common in Sweden. All presented municipality approaches are based on a four step mitigation hierarchy consisting of avoidance, minimisation, restoration compensation and replacement compensation (see also chapter on "Objectives").

A special consultation procedure concerning offsets does not currently exist. In the road sector, consultations are integrated into the EIA and ordinary planning

procedures. Compensation measures are addressed in the context of the Environmental Impact Study (EIS).

The permanence of the compensation measures should be secured through the ordinary planning process and the quality control. But this is an issue that needs to be strengthened in the planning process (Rundcrantz 2007, Rundcrantz 2009). In regard to the long-term maintenance of compensation sites, a few private operators and municipalities expressed an interest in managing such sites in an inquiry conducted by the Roads Administration (Rundcrantz 2005).

5.2.6 The 'economic incentives'

Currently a banking system does not exist, nor even any discussion about potential economic incentives through such a system. Nonetheless, a discussion of the utility of such a system is worthwhile. It would focus on the issue of compensation and show that environmental damage has a price. Many experts believe it could make environmental measures more effective and possibly more efficient. Nonetheless, there are also a number of experts who are not in favour of a banking system, mainly because of fears of issuing a "licence to trash", even if there were well functioning procedures in Sweden to avoid and minimise impacts (Rundcrantz 2009).

5.3 Summary of key characteristics and lessons.

On the one hand, with the exception of Natura 2000 and ELD cases, Sweden today has no strong legally binding requirements for environmental offsets. The regulations of the Environmental Code support environmental offsets, but are very unclear in this regard. Therefore, environmental offsets are not used to as great an extent as, for example, in Germany, and there has been very little research about them. On the other hand, there have been several attempts to work with environmental offsets more intensively, particularly in the road planning sector and in municipalities.

The Swedish Roads Administration already utilises the legal possibilities in its planning context by restoring areas as a compensation measure for road building (Rundcrantz 2007: 55). The municipalities see environmental offsets as a tool for averting ongoing loss of environmental assets through the expansion or aggregation of urban settlement structures, to secure high living quality in urban settlements, and to achieve environmental quality objectives.

Within the road planning sector environmental compensation is linked to EIA, both in the planning process and in the planning documents. Rundcrantz (2007: 52) states that at present, EIA still appears to be the best tool for addressing and implementing environmental offsets. It is important to address environmental compensation in the Environmental Impact Study, and to make sure that the proposed measures are documented in the planning documents, increasing the chances of getting them into the legally binding documents, and therefore getting them realised. Rundcrantz (2007)

also concludes that interest by experts, close cooperation between them, and good coordination of the planning process are key success factors.

The prepared reports, agreements and guides presented in this case study show the willingness and the need to develop further guidelines on how to handle environmental offsets and their implementation in the planning process. It is notable that these initiatives include more stringent demands than current legislation stipulates (see e.g. Rundcrantz 2006: 364). It would be interesting to see if these developments motivate a "strengthening" of the law by establishing new regulations (e.g. in the Swedish Building Code) or at least clarifying the existing regulations, in order to better support environmental offsets for willing actors in Swedish society.

Other issues to be addressed in the context of environmental offsets, especially but not only, for the road planning sector (e.g. also the railroad sector) are (according to Rundcrantz 2007):
- How to deal with land acquisition for compensation requirements
- How to deal with the future management of compensation areas
- How to manage the permanence of environmental outputs
- How to implement an appropriate follow up/monitoring of the measures.

An interesting issue in this regard would be to investigate possible cooperation with the municipalities, so as to find areas and measures suitable for environmental compensation.

Swedish experts seem to have a rather good general knowledge of environmental offsets. What seems to be missing is more detailed knowledge as to why and how they can be used. Some still have misgivings, fearing that developers will "just compensate" or even worse "just pay some money", instead of avoiding and minimising impacts (Rundcrantz 2007).

However, environmental offsets offer the possibility of internalising environmental costs, and making them visible for project developers and the public. Offsets can become a solution for developers trying to avoid and minimise negative impacts on the environment through project modification and alternatives.

Pooling and banking of compensation measures could make compensation more effective (greater environmental outcomes) and more efficient (for lower costs). However in order to create a market for compensation credits in Sweden, the legal regulations concerning compensation will first have to be strengthened/expanded, or at least for the existing ones, such as the power of the SCAs to demand offsets, to be applied more strictly.

6. USA

6.1 Introduction

The US commonly uses two different types of federal environmental banking programs to mitigate impacts to the environment: wetland mitigation banking and conservation banking. Wetland mitigation banking originated in the early 1980's and became more widely used when the US Army Corps of Engineers (ACOE), the US Environmental Protection Agency (EPA), and other federal agencies published uniform guidance in 1995 (US ACOE et al., 1995).[16] Wetland mitigation banks attempt to overcome deficiencies in traditional mitigation approaches (e.g. permittee-responsible mitigation and in-lieu fee mitigation) and to create economic incentives for landowners to conserve wetlands or other aquatic resources. More specifically, it allows mitigation banks to sell credits for creating, restoring, enhancing, or protecting wetland function and value on lands protected and managed in perpetuity. Upon review of wetland mitigation bank performance by the Natural Resource Council (NRC, 2001), the US ACOE and the US EPA updated the guidance on April 10, 2008 (US ACOE and US EPA, 2008). Each year wetland mitigation banking preserves almost 14,000 acres of land in perpetuity (ELI, 2008). As of September 2005, the USACE had approved 405 mitigation banks in the US (ELI, 2008).

Conservation banking started as a state-level initiative in California. It took the concept of wetland mitigation banking and applied it to endangered species. California developed the first formal policy on conservation banking and established the first conservation bank in San Diego County, California (Anonymous, 1995). It was not until 2003 that the US Fish and Wildlife Service (FWS) promulgated federal guidance for the establishment, use, and operation of conservation banks (US FWS, 2003). Conservation banking strives to mitigate adverse impacts to species listed as endangered or threatened under the Endangered Species Act (ESA) of 1973. It does this by allowing project proponents to purchase credits from conservation banks that have secured access to land managed for the protection of sensitive species. Unlike wetland mitigation banking, there is little literature on the effectiveness of conservation banks in the US (due to its more recent development). As of January 2007, more than 70 conservation banks had been developed in the US, which represents approximately 70,000 acres of habitat for more than 50 federally listed species and other at-risk species (Carroll et al. 2008).

Wetland mitigation banks and conservation banks share similar characteristics and qualities, but they also have some important differences in theory and in practice. This report analyzes these similarities and differences by comparing and contrasting the following: banking objectives, methods of determining equivalence, system

[16] The U.S. Fish and Wildlife Service first issued interim guidance on wetland mitigation banking in 1983 (U.S. Fish and Wildlife Service, 1983), but it was not until 1995 that the trend in mitigation banking really began to rise.

descriptions, links to other issues and policies, institutional roles and responsibilities, the economic incentives, and legal issues and responsibilities.

6.2 Analysis

The many differences between wetland mitigation banking and conservation banking arise from the different laws that recommend their use as a way to compensate for adverse impacts to wetlands and endangered species. Section 404 (§404) of the Clean Water Act (CWA) requires project proponents who plan to discharge dredged or fill materials into waters of the United States (including wetlands) to acquire a permit issued by the US ACOE (or approved State) to authorize the discharge (40 CFR 230 §404). One of the steps required to acquire a §404 permit is to mitigate or offset the impacts of a proposed project. Purchasing credits from a wetland mitigation bank is one way a project proponent could offset its impact. The goal of the CWA as it pertains to wetlands is to achieve no net loss of wetland value and function.

Similar to the CWA, the ESA, under Section 7 or Section 10, requires project proponents obtain a permit if its actions will likely jeopardize the continued existence of an endangered and threatened species. In order to obtain a permit, the project proponent must first compensate for adverse impacts by purchasing credits from a conservation bank or by using some other method. The goal of the ESA is to reduce the likelihood that a threatened or endangered species will go extinct, eventually allowing for its removal from the endangered species list.

The next sections analyze the US experience in attempting to deliver this goal through wetland mitigation banking and conservation banking. It discusses the banking objectives, methods of determining equivalence, system descriptions, links to other issues and policies, institutional roles and responsibilities, the economic incentives, and legal issues and responsibilities.

6.2.1 Objectives

Section 4 of the CWA regulates the discharge of fill or dredged material into waters of the US, including wetlands, in order to protect wetland (and other aquatic resource) function and value. Wetland functions include the physical, chemical, and biological process that occur, such as water quality improvement, wildlife habitat, and flood protection. When a federal, state, public, or private agency or individual undertakes a project that would adversely impact a wetland or another aquatic resource (e.g. a stream), it must first acquire a permit from the US ACOE.

In order to fulfil its primary goal of “no net loss” of wetland function and value under the CWA, the US ACOE implements a three-step, mitigation hierarchy process: avoidance, minimisation, and compensation. All applicants for a §404 permit must complete each step in the correct order. First, they must evaluate other alternatives

that would avoid the impact. If another alternative exists, the US ACOE will not grant a permit. Second, when no other project can avoid the impact, the project proponent will have to take steps to minimize the impact. Third, the project proponent will have to compensate for any unavoidable impacts.

In this third step, the project proponent can choose one of the following options (or some combination of these options): permittee-responsible mitigation, in-lieu fee mitigation, or wetland mitigation banking. Wetland mitigation banking allows project proponents to purchase credits to offset the loss of wetland value and function and to promote the CWA's goal of "no overall net loss" and to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

To promote the objectives of the ESA, the US FWS and the National Marine Fisheries Service (NMFS) oversee the regulation of species listed as endangered or threatened.[17] The goal of the ESA is to reduce the likelihood that a listed species will go extinct so that the species can eventually be taken off the list. Section 7 of the ESA requires federal agencies to help conserve listed species and to make sure their activities are not likely to jeopardise the continued existence of listed species or to adversely modify critical habitat. Section 10 of the ESA allows non-Federal entities to apply for a permit for the incidental take of listed species. As part of the application, the non-Federal entity must produce a habitat conservation plan (HCP). The HCP ensures that there are adequate measures to minimize and mitigate the impacts of the proposed action so that the likelihood of survival is not reduced.

For both §7 and §10, the 2003 federal guidance states that conservation measures could include protection of off-site listed species habitat through purchase of credits in a conservation bank (US FWS, 2003). It also stipulates that the project proponent must purchase credits before the activity commences.

The goal of a conservation bank is to meet the conservation needs of one or more listed species through restoration, creation, enhancement, or preservation. Often times, the purpose is to preserve existing habitat that has long-term conservation value to mitigate loss of other, isolated and fragmented habitat that does not have long-term value to species. These actions are intended to reduce the likelihood that a listed species will go extinct, thereby perpetuating the goal of the ESA to eventually remove species from the endangered list.

6.2.2 Equivalence

A key factor for the regulatory agencies to consider when approving a permit for adverse impacts to wetlands or listed species is what metric should be used to measure the loss and gain. The federal guidelines suggest that the metric used to

[17] The US FWS has jurisdiction over wildlife on land and out to 3 miles at sea. The NMFS has jurisdiction over wildlife from 3 feet to 200 feet out at sea.

assess credits and debits should measure both wetland acreage and function. The credit system should always be expressed and measured in the same way as the impacts of the development projects. Acreage serves as the most commonly used metric used for most wetland mitigation banks even though federal guidance recommends using measures of wetland function instead. Techniques to assess wetland function and to compare habitat suitability include the hydrogeomorphic approach, the Wetland Evaluation Technique, the Wetlands Rapid Assessment Procedure, and Habitat Evaluation Procedures.

Regulations for wetland mitigation banks generally suggest a 1:1 loss to gain ratio to support the goal of "no overall net loss" of wetland value or function. The US ACOE may modify the 1:1 ratio depending on whether the functional values of the impacted wetlands are lower or higher than the functional values of the replacement site. It can also weigh in the likelihood of success of the mitigation project, differences between the functions lost and functions gained, temporal losses of function, the difficulty of restoring or establishing resource type and function, the distance between the affected resource and the compensation site, and the method of compensatory mitigation selected (e.g., preservation, creation, enhancement, or restoration).

Because the goal of section 404 of the CWA is "no overall net loss" of wetland value or function, the US ACOE requires mitigation to occur on-site, if practical. This is because wetland functions and values are very localized. The US ACOE will approve off-site mitigation if it occurs within the same watershed (or another local hydrologic unit) as the impact site. The objective of section 404 also requires that mitigation for one type of wetland or aquatic resource be compensated by the same type of wetland or aquatic resource.

For conservation banking, federal guidance allows more flexibility in the metric used to determine a loss and gain equivalence. One reason for this is that conservation banks can sell both species and habitat credits, depending on the conservation needs of the listed species. Ideally, the US FWS or NMFS would measure the amount by which a proposed action would reduce the likelihood that a particular species would survive and the amount by which the mitigation activity would increase the likelihood of survival. In practice, however, surrogate measures are used due to the difficulty of measuring this.

Several surrogate measures include: acreage of habitat, the amount of habitat required to support a breeding pair, a wetland unit along with its supporting uplands, or some other measure of habitat or its value to the listed species. Examples of other measures include habitat quality, conservation benefits, and available or prospective resource values. Also like wetland mitigation banking, conservation bank guidance suggests the use of weighting schemes to account for differences in habitat value, configuration, proximity to the protected site, and contribution to regional recovery

efforts. Unlike wetland mitigation banks, however, federal guidelines do not mention how to address the issue of temporal loss.

The goal of the conservation banking is to offset the impacts to listed species; therefore, mitigation efforts can be on-site or off-site, depending on whether the affected species or critical habitat is endemic. Federal guidelines require impacts to a particular species or habitat to be compensated for by offsetting losses to the same species or habitat type (e.g., a "species for species" tradeoff). Guidance also suggests using biological goals t assess the quality of outcomes, such as vegetative growth, the presence of invasive plants and animals, water quality, and listed species presence. The credit system should be expressed and measured in the same way as the impacts of the development projects.

Because the process of determining the amount of credits necessary to mitigate or offset losses is so critical to the success of the mitigation project, measures to incorporate risk are necessary. The new wetland mitigation banking regulations state that an adaptive management strategy may be required to "address unforeseen changes in site conditions or other components of the compensatory mitigation project, including the party or parties responsible for implementing adaptive management measures" (US ACOE and US EPA, 2008). This plan should "guide decisions for revising compensatory mitigation plans and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect compensatory mitigation success." Additionally, the sale of credits is conditional on the approval of a mitigation plan and appropriate real estate and financial assurances, which also helps reduce risk and uncertainty.

For conservation banking, uncertainty is typically incorporated as part of the banking agreement. The total number of credits that can be sold out of a bank are determined by the expected benefits that the bank will generate taking into account the potential that some of the actions may under perform. The agreements have a focus on a release of liability and compliance with the law. The US FWS guidelines do suggest that there needs to be flexibility in management practices and responses, including adaptive management practices.

6.2.3 System description

Under §404 of the CWA, a project proponent must compensate for any unavoidable impacts if it plans to discharge dredged or fill material into the Nation's waters, including wetlands. Other triggers for compensatory mitigation include the following: if a project will cause identifiable, significant resource losses; if the impacts will likely occur; if people value the impacted resource(s); if the impacted resource is important to the aquatic environment [33 CFR 320.4(r)]; or if the project will cause more than minimal impacts [33 CFR.330(1)(e)].

The US ACOE proposes four methods project proponents can use to mitigate against adverse impacts: creation, restoration, preservation, and enhancement. The most commonly used methods are restoration and enhancement. Generally, the project proponent must secure wetland mitigation credits before or concurrent with the impacts of the proposed project. In practice, some project proponents have purchased credits before wetland mitigation banks achieve required milestones (e.g., site selection, plan approval, and financial assurances). These milestones are generally required before the wetland mitigation bank can sell credits. This practice is called advance crediting.

When the US ACOE approves the sale of credits from a wetland mitigation bank, it assumes that the conservation outcome will last in perpetuity. An exception to this rule is when the impact site is not expected to last in perpetuity (e.g., result of nearby groundwater withdrawals, heavy salination, or the invasion of exotic plants that could destroy wetland function). The US ACOE should strive for temporal balance between impacts and mitigation when reviewing permits.

Before a wetland mitigation or conservation bank can begin selling permits, it should acquire short-term and long-term financial assurances. Short-term costs typically include up-front costs to the bank owner, including purchase of the habitat, enhancements or clean-up required, and property taxes. It may also include consultant or legal fees associated with management and development of the bank (Conservation Banking Guidance). The funding for short-term, start-up funding for conservation banks should be separate from long-term stewardship funds. Long-term stewardship is typically funded through an endowment, the purpose being that the fund will support management of the wetland mitigation or conservation bank in perpetuity. More specifically, guidance suggest securing a non-wasting endowment fund, defined as “a fund that generates enough interest each year to cover the costs of yearly management” (Conservation Banking Guidance). The benefit of the endowment fund is that its principal grows at the rate of inflation.

The challenge is to maintain funding that keeps up with inflation and to determine the amount of funds required to ensure adequate funds in perpetuity. Factors to consider when determining the amount needed in an endowment fund include: capitalization rate, the rate of inflation, interest rate, contingencies for unexpected needs (e.g., natural catastrophes), the amount of habitat associated with each credit, land management activities, the amount or degree of habitat restoration needed, the “risk” of such restoration failing over time, public versus private holders, and whether the owner and beneficiaries of the endowment qualify for an income tax exemption. For example, due to restrictions on types of investments, publicly held conservation bank endowments require at least twice as many funds as privately held endowments in order to produce the same earnings for stewardship. Stratus (2003) found that existing conservation banking agreements did not typically incorporate contingencies

for natural catastrophes. As a result, the endowment funds only provide funding for routine management needs.

Unfortunately, no formula exists to calculate the amount needed for an endowment fund. To help address this issue, California developed a system for estimating expected management costs and the size of endowments. The Center for Natural Lands Management developed this tool called Property Analysis Record, or PAR. "The PAR incorporates and projects the costs of essential management actions including surveying, monitoring and reporting (including required agency monitoring and reporting), and maintenance of physical and biological resources. Also included in these analyses are the costs for invasive exotic species control programs, fire management, educational and visitor service efforts and administrative expenses such as personnel, accounting, legal, and insurance items. This analysis is based upon the assumption that the resources will be managed in perpetuity and factors in the risk of sporadic natural and induced events that affect habitat areas." (CNLM, 2004)

Location of the wetland mitigation bank is critical to the success of the mitigation project. The credits and banks should be located within the same watershed as the impact site. While the mitigation banker has sole authority for determining the site location, the US ACOE determines what banks project proponents can purchase credits from. Land cost is a major factor that affects site selection, which has lead to a shift from urban to rural areas and from more complex to more simple wetland systems (ELI 2007). When deciding to approve an offset, the US ACOE should consider: aquatic habitat diversity, habitat connectivity, relationships to hydrologic sources (including availability of water rights), trends in land use, ecological benefits, and compatibility with adjacent land uses. There are additional considerations for impacts to marine resources and coastal watersheds. Additionally, the 2008 guidelines do not allow the placement of a bank where it would increase the risks to aviation by attracting wildlife to areas where aircraft-wildlife strikes may occur.

The new 2008 federal guidelines now require the production of a mitigation plan. The twelve fundamental components that comprise the mitigation plan include: objectives; site selection criteria; site protection instruments (e.g., conservation easements); baseline information (for impact and compensation sites); credit determination methodology; a mitigation work plan; a maintenance plan; ecological performance standards; monitoring requirements; a long-term management plan; an adaptive management plan; and financial assurances (US ACOE and US EPA, 2008).

The US ACOE approves administrative and ecological performance standards presented in the mitigation plan. These can vary depending on the bank, but generally, administrative standards include securing financial assurances and submitting monitoring reports. Ecological performance standards may include biotic (e.g., measures of plant density, cover by native or non-native invasive species, aquatic invertebrate density, and composition of fish assemblages) or abiotic (e.g., measures

of soil conditions, hydrologic criteria, and nutrient thresholds). The 2008 regulations state that performance standards must be based on the best available science and "on variables or measures of functional capacity described in functional assessment methodologies, measures of hydrology or other aquatic resource characteristics, and/or comparisons to reference aquatic resources of similar type and landscape position" (US ACOE and US EPA, 2008). Prior to the 2008 regulations, there were no national guidelines or models for developing ecological performance standards.

Section 7 and 10 of the ESA requires project proponents to offset any actions that will have adverse impact on listed species, including habitat loss or modification. Conservation banking suffices as an offset for a project that may jeopardise the continued existence of a listed species or that destroys or adversely modifies designated critical habitat. It is also an option for non-federal entities applying for an incidental take permit to engage in an otherwise illegal activity that would jeopardise the continued existence of a listed species.

As with wetland mitigation banking, project proponents should secure conservation bank credits before the damage to the affected site takes place. In practice, this is not always the case. Additionally, the bank is generally supposed to last in perpetuity. In practice, this is not always the case. There are three types of mitigation methods: enhancement, preservation, and restoration.

A site should either be capable of supporting a viable population or contribute to the maintenance of such a population by expanding an existing area managed for the species. It is also helpful to site banks in areas that can reduce the threat of fragmentation. It is also important to consider surrounding land use trends, management activities, topographic features, habitat quality, and species use of the area. Recovery plans for listed species do not typically identify priority habitat areas, but rather describe broad areas, so it can be difficult to prioritise habitat for listed species. State or federal agencies can influence site selection through the crediting process.

The offset has to be relevant to the current conservation needs of the listed species and is measured based on whether the required mitigation measures address the primary threats to a species and the extent to which they were likely to reduce those threats. Before a bank can sell its first credit, the land within (or its phase) must be permanently protected through fee title or a conservation easement. The amount of credits that can be sold are determined by US FWS based on their evaluation of the overall functioning of the bank.

Management actions need to consider several things that could impact the long-term survival of a listed species, such as minimising degree of fragmentation, controlling invasive exotic species, replicating natural disturbance regimes, preventing and area's use by off-road vehicles, illegal waste disposal, or others, and addressing other threats specific to the listed species.

6.2.4 Links to other issues and policies

So far, this report has focused on federal issues and policies. It is worth noting that states can also play a large role in establishing habitat banks, as mandated by local or state laws and policies. For example, California has several laws that may require mitigation, including the California Environmental Quality Act, the California Coastal Act, and the California Endangered Species Act. California has an "Official Policy on Conservation Banks" that guides how banks can be used to compensate for impacts on endangered species and wetlands, as well as on environmentally sensitive habitat areas, mudflats, sub-tidal areas, and less sensitive resources. Another California program, the Natural Community Conservation Planning (NCCP), strives to protect larger parcels of land that could benefit an entire natural community rather than just a few rare or endangered species.

6.2.5 Demand

The demand for mitigation and conservation credits rely in large part on the expansion of residential and commercial real estate development and on an increase in public infrastructure projects. Bank owners can adjust the price of credits to reflect current market conditions, for example, discounting credits where demand is low and increasing the price when demand is high and the supply of credits is limited. In the US, demand for credits has fallen as private development has slowed due to the global recession. Banks however are still developing new habitats and saving these credits in anticipation of a real estate recovery (Lamb 2009). In addition, conservation banks may see an increase in demand for credits as government infrastructure projects such as highway and bridge construction begin to be approved through the recent stimulus bill (The American Recovery and Reinvestment Act of 2009).

Local economic factors and local planning and environmental policies can also play a key role in the demand for conservation credits. Development in a fast growing area (e.g., California) creates a steady demand for options such as credits, while smaller, more stable areas (e.g., New England) may create low demand for such wetland mitigation and conservation banks. Demand is also subject to changing regulatory conditions. For example, if priority habitats identified in state plans do not support federally listed species, then there will be no opportunity to use federal conservation banks as a way of protecting those priority habitats. In areas that have adopted fee-based mitigation schemes, parties or developers can pay a fee to the county or agency (usually based on approval of a multi-species habitat conservation plan). Fee-based mitigation can eliminate demand for these credits at a private conservation bank.

6.2.6 Supply

The supply of credits for conservation or mitigation depends on many factors such as geography, technology and ecology. For wetland mitigation, it is preferable to develop on-site mitigation, which restricts the availability of credits as geographic options are

limited. Banking does allow for off-site mitigation in the same watershed area because wetland functions are typically very localised. The goal of the conservation banking is to offset the impacts to listed species; so mitigation can be either on-site or off-site, depending on whether the species affected is endemic to the locality.

The location of the wetland mitigation bank is critical to the success of the mitigation project. While the mitigation banker has sole authority for determining the site location, the US ACOE determines what banks project proponents can purchase credits from. The cost of real estate is also a major factor that affects site selection, which has lead to a shift from urban to rural areas and from more complex to more simple wetland systems (ELI, 2007). In addition, a site needs to be either capable of supporting a viable population or contribute to the maintenance of such a population by expanding an existing area managed for the species. It is also important to consider surrounding land use trends, management activities, topographic features, and ecological factors such as habitat quality and species use of the area. Technological issues include the ability to better recreate effective habitats. Past experience in the U.S. has shown that in some cases, banks were not successful in recreating such habitats.

6.2.7 Monitoring

The US experience with monitoring has provided valuable lessons learned but have also shown difficulties in establishing the success of mitigation and conservation banks. There are several flaws that have been identified with monitoring mitigation banks, including: failing to comply with permit conditions; consistent submissions, and not always meeting longer-term maintenance requirements. A nationwide study by the NRC showed that the percent of sites that are insufficiently monitored is 63 percent (ELI 2007).The 1995 Banking Guidance established that monitoring provisions must be outlined in the banking agreement, which is then approved by the US FWS at the time the conservation bank is created. The bank sponsor is responsible for accurate and timely monitoring of the bank. The Banking Guidance recommended several aspects to monitor, such as vegetative growth, the presence of invasive species (animal and plant), water quality, and listed species presence. The guidance also suggests that monitoring provisions should be “tailored to the specific restoration, creation or enhancement activity at the bank site or through the use of an appropriate functional assessment methodology” (ACOE 1995).

In the U.S. experience, many banks have not been able to replace the functions of the types of wetlands destroyed. A five-year monitoring period may also not be sufficient for determining whether mitigation goals will be achieved, particularly for many restored systems. It is recommended that banks tie their required monitoring periods directly to achieving final performance criteria. With past failures in mind, the new 2008 federal guidelines has established new monitoring requirements. It requires monitoring of mitigation projects for a minimum of five years with longer monitoring periods required for aquatic resources with slow development rates (US ACOE and US

EPA, 2008). Any State and local agencies that participate in the bank agreement should be part of the Conservation Bank Review Team (CBRT) that is established to monitor the development use, and operation of the conservation bank.

6.2.8 Timing

There are several issues surrounding how the timing of the creation of credits and their release for sale should be addressed. Wetland mitigation bank credits should be in place before the damage to the affected site takes place, however in practice, this is not always the case. The US ACOE does sometime allow advance crediting, however, in most circumstances, the offset credits must be in place before the impact can occur. A higher compensation ratio might be applied during advanced crediting (e.g., 2:1 rather than 1:1) to account for the timing difference. In addition, to address the risk and uncertainty that the timing issues bring, and to reduce temporal losses of aquatic resource functions, ACOE has established a preference hierarchy for mitigation options. These options in preferable order include; on-site banks, in-lieu fee programs, and permittee responsible mitigation through off-site and/or out-of-kind compensatory mitigation (US ACOE and US EPA, 2008).

Experience with timing issues have led to several recommendations for improvements. These recommendations include that monitoring periods should be tied to meeting project goals and ecological performance standards, rather than an arbitrary time interval. Bank sites should be protected in perpetuity through an appropriate real estate instrument and bank sponsors can be assigned a long-term steward prior to bank approval. Finally, credit release schedules, relief from legal and financial assurances, and length of monitoring period should be tied to banks meeting ecological performance standards (ELI 2007).

6.2.9 "License to Trash"

Concern about the license to trash perspective – is there an ability to truly offset – if so then there is no actual trashing is this really just an issue of relocating equally functioning habitats. There's a view that the US system has produced a license to trash. Is there an early release of some credits for some of the banks, or is it wait until all the function exists

Offsets such as conservation and mitigation credits are sometimes criticised for providing a so-called "license to trash" the environment. There are steps that need to be taken in order to ensure that a properly structured offset will relocate equally functioning habitats in the most efficient and cost-effective means available. Federal agencies acknowledge the risk incurred by wetland mitigation bankers through its significant up-front financial investment. In response, the agencies allow some percentage of the bank's anticipated credits to be debited before the bank meets all of its performance standards. This adaptive management strategy is required to "address unforeseen changes in site conditions or other components of the

compensatory mitigation project, including the party or parties responsible for implementing adaptive management measures." Accordingly, the plan should "guide decisions for revising compensatory mitigation plans and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect compensatory mitigation success" (US ACOE and US EPA, 2008). Credits may then be release in phases (i.e., phased credit release), as banks meet ecological performance standards. The sale of credits is conditional on the approval of a mitigation plan and appropriate real estate and financial assurances, which also helps reduce risk and uncertainty.

In addition, uncertainty and risk is typically incorporated as part of the banking agreement. The total number of credits that can be sold out of a bank are determined by the expected benefits that the bank will generate taking into account the potential that some of the actions may under perform. The agreements have a focus on a release of liability and compliance with the law. There are no bankruptcy provisions, but there is guidance to avoid financial failure. For wetland mitigation banking, federal guidance says 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 (ELI 2007).

Presumably, the primary objective of the private mitigation banker is to provide mitigation credits to permittees in a manner that maximises profits and minimises risk. As such, decisions about where to site wetland banks may be heavily influenced by land costs and may favour mitigation methods that are less expensive and have a high degree of success and the mitigation of wetland types that are more easily restored, rather than sites with complex ecological needs. As a result, wetland mitigation banking may actually be shifting wetland resources from urban to rural areas where land prices are less expensive and from more complex to more simple systems.

Management actions need to consider several things that could impact the long-term survival of a listed species, such as minimising degree of fragmentation, controlling invasive exotic species, replicating natural disturbance regimes, preventing and area's use by off-road vehicles, illegal garbage dumpers, or others, and addressing other threats specific to the listed species (US ACOE and US EPA, 2008).

6.2.10 Institutional roles and responsibilities

As previously stated, §404 of the CWA triggers the need for offsets when a development project proposes to discharge dredge or fill material into the Nation's waters, including wetlands. Common activities that require a §404 permit include fill for development, water resource projects (e.g., dams and levees), infrastructure development, and mining projects.

The US ACOE administers the §404 permitting program, makes general permit determinations, conducts or verifies jurisdictional determinations, develops policy and guidance, and enforces §404 provisions. The US EPA helps develop and interpret policy, guidance, and environmental criteria for permit applications, determines the scope of geographic jurisdiction and applicability of exemptions, approves and oversees state and Tribal assumption, reviews and comments on individual permit applications, and enforces §404 provisions. Additionally, the US EPA has authority to prohibit, deny or restrict the use of any defined area as a disposal site and to elevate specific cases. When a proposed project will affect fish and wildlife, the US FWS and the NMFS will evaluate the §404 permit.

The 2008 federal guidance established a preference hierarchy for the types of mitigation that project proponents can use to offset their actions. The first preference is for purchasing credits from mitigation banks. The primary reason the regulation prefers mitigation banks is because they are performance-based: the resource credits generated by the banks are tied to demonstrated achievement of project goals and must be secured before a proposed project can occur. This helps reduce the risk of and uncertainty that the compensatory mitigation project will fail.

The new wetland mitigation banking regulations also retained the same mitigation hierarchy that was defined in the 1995 regulations: avoidance, minimization, and restoration. The US ACOE enforces this process.

Another component of the §404 permitting process involves public comment. For any proposed mitigation bank, the US ACOE should notify the public and provide them the opportunity to comment on the bank proposals.

The ESA prescribes the use of mitigation to compensate for the loss of species or habitat, including conservation banking. Section 7 and §10 of the ESA trigger the need for compensation for federal and non-federal entities, respectively. The US FWS manages the approval of conservation banks and limits the number of habitat or species credits that a bank owner may sell.

As with wetland mitigation banks, conservation banks must first be established and demonstrate conservation goals before they can sell credits and before the development project can occur. There is not, however, a formal sequence for mitigation as there is for wetland mitigation banking.

The public can provide comments at different stages during the §7 and §10 process. For §7, the public can comment on the proposed project (including other project alternatives) and mitigation factors. For §10, there is a 30-day public comment period for all applications for permits authorising the take of listed species. Guidance suggests that if a banking agreement is controversial, then the US FWS should consider publishing a Federal Register Notice to invite public comment. The idea being that it is better to have public approval before a banking agreement is approved.

In general, it is difficult to ensure the permanence of outcomes. For example, natural hazards can damage or destroy a bank, which is out of the control of the permitting agencies or the bank sponsor. Adequate and regular monitoring of the function of the wetland and managing threats to species and habitat will help ensure a positive outcome. For conservation banking, an active management program that addresses the major threats to an endangered species (e.g., controlling invasive/exotic species, replicating natural disturbance regimes, preventing off-road use, illegal waste disposal , or others) will help ensure that the conservation value of the bank land will be realised and maintained.

6.2.11 The 'economic incentives'

Wetland mitigation and conservation banks provide economic incentives for landowners to create, restore, enhance, or preserve wetlands or to protect habitat for listed species in exchange for selling credits to others who need to mitigate impacts from projects. Banking allows landowners to make a profit from selling credits. And, it allows project proponents to engage in a lower-cost mitigation project. For conservation banking, landowners can turn a liability (having an endangered species on his/her land) into an opportunity.

6.2.12 Legal issues and responsibilities

The US ACOE determines the appropriate type and amount of mitigation required for §404 permits. The contracting partners include the permittee and the bank owner.

Not clear guidelines on how success should be determined or who should make this assessment. } The bank sponsor is ultimately responsible for the success of the bank, including the overall operation, management, and monitoring.

Wetland mitigation banks have a mixed track record of compliance with regulations. ELI (2007) identified several flaws with mitigation banks, including: mitigation banks often fail to comply with permit conditions; monitoring, submission, and longer-term maintenance requirements are not always met; banks have not often been shown to replace the functions of the types of wetlands destroyed. The US FWS approves a specified number of habitat or species credits that a bank owner may sell for §7 and §10 permits.

An active management program that addresses the major threats to an endangered species (e.g., controlling invasive/exotic species, replicating natural disturbance regimes, preventing off-road use, waste disposal, or others) will help ensure that the conservation value of the bank land will be realised and maintained. One way to increase the likelihood of success is to ensure performance through the sale of credits only after completion and verification of restoration outcomes. Guidance says, "As a general rule, species or habitat conservation value outcomes (e.g., numbers of nesting pairs and family groups, or enhanced or created habitat) not the implementation

actions that are causal to those outcomes and values are the standards by which the Service will evaluate banks and authorise issuance and sale of mitigation credits" (US FWS, 2003). The outcomes should be prescribed in the performance standards (both ecological and administrative) which provide the measurable outcomes of the project, and approved by the US FWS.

Monitoring is the responsibility of the conservation bank. Monitoring provisions are outlined in the banking agreement, which is approved by the US FWS at the time the conservation bank is created. The guidelines suggest some things to monitor, such as vegetative growth, the presence of invasive species (animal and plant), water quality, and listed species presence. Monitoring reports are to be sent to the CBRT. There have been monitoring delays in taking required actions and funding insufficiencies for several projects.

US FWS can coordinate its efforts with State or local activities to minimise expenses, burdens, or duplicative requirements for bank sponsors, project proponents, and other governmental agencies. State and local agencies that do participate in the bank agreement should be part of the Conservation Bank Review Team (CBRT), a group that monitors the establishment, use, and operation of the bank.

The contracting partners include the permittee and the bank owner. The conservation bank agreement is a legal agreement between the conservation bank owner and the regulatory agency. The regulatory agency identifies the conditions and criteria under which the bank will be established and operated.

Federal guidance does not allow a specific credit to compensate for more than one activity. This is only an issue when banks offer multiple kinds of credits. For conservation banking, the same credit may be used to compensate for an activity that requires authorisation under more than one program.

6.3 Summary

At the state level, habitat banking is used as a tool to protect sensitive habitat areas, mudflats, sub-tidal areas, and less sensitive resources, in addition to wetland mitigation banking and conservation banking (e.g., California). The many features of the US system provide insights on specific issues that require further investigation in the EU, in particular the inter-relationship between federal regulations and guidance and state-level schemes and operations.

The Conservation Banking system in the US has resulted in mixed reviews and efforts have been made to improve the offset quality of the banks. The 2008 regulations state that performance standards must be based on the best available science and "on variables or measures of functional capacity described in functional assessment methodologies, measures of hydrology or other aquatic resource characteristics, and/or comparisons to reference aquatic resources of similar type and landscape

position" (US ACOE and US EPA, 2008). Prior to the 2008 regulations, there were no national guidelines or models for developing ecological performance standards.

During a survey of the banking system, the bank owners and operators all viewed their banks as successful from an ecological point of view, with mixed reports regarding economic success. Several bank owners complained that the local US FWS office was not supportive of their bank and limited their access to potential purchasers of credits. The lengthy process to formalise banking agreements also was criticised. Bank owners that enjoyed good relations with the local regulatory agencies and had high demands for their credits were generally very pleased with the overall success of their banking effort. Banks successful if they held a monopoly for a certain type of credit in an area. The need to protect habitat from vandalism, unauthorised dumping, and other illegal uses was a common concern of bank owners (Stratus 2003).

7. Brazil

7.1 Introduction

The objectives of the offset systems in Brazil find their source in the original laws and policies set up following the Convention on Biological Diversity, to which Brazil was the first signatory nation. In Brazil, the CBD is implemented through the National Biodiversity Policy, set up by decree 4439/2002 (Ministry of Science and Technology, Secretariat for Policy and Programs on Research and Development 2006: 11). It defines thematic guidelines in terms of seven components referring to the main clauses of the CBD. Component 4 relates most closely to offset in that it focuses on "Monitoring, Assessment, Prevention and Mitigation of Impacts on Biodiversity" and "contains directives for the strengthening of systems for monitoring, assessing, preventing and mitigating impacts on biodiversity, as well as to promote restoration of degraded ecosystems and over-exploited biodiversity components" (Ministry of Science and Technology, Secretariat for Policy and Programs on Research and Development 2006: 12f).

Furthermore, Brazil established National Biodiversity Targets for 2010, in line with the framework of global targets and indicators, which was approved for the 7th Conference of the Parties to the CBD in 2004, to guide and monitor the implementation of the CBD 2010 Target (Brazilian Ministry of the Environment 2007). These National Biodiversity Targets are partly met through the two offset systems described here.

There are many different laws and policies relating to offsets and compensation systems within Brazil. This case study focuses on the two most well known and broadly implemented types of offset: The Legal Forest Reserves land rights trading system requiring landowners to conserve, or otherwise trade for, fixed percentages of properties as natural habitat; and the SNUC Law requiring industrial developments to provide 0.5% of the total initial investment towards the national system of conservation units.

7.2 Analysis

7.2.1 Objectives of the offset systems

Objectives of the Legal Forest Reserve System

The objective of this system is to maintain a set minimum % of all properties as natural habitat, normally forest. This objective was set within the Brazilian Forest Code in order to create an internal cap on the degree of deforestation in any one region. The damage being offset in this system is habitat loss – clearance of natural vegetation,

normally forest, beyond the stipulated limit. Hence the scope of the impacts offset may encompass both intrinsic and service (economic and cultural) values of biodiversity; however these are not explicitly measured or monitored

Objectives of the Environmental Compensation system

The objective of the Environmental Compensation system is to leverage finance from private development (which by its nature has environmental externalities unaccounted for) towards the public good of biodiversity conservation and its auxiliary ecosystem services. This is achieved by directing these forms of licensing fees towards the national system of conservation units (the SNUC), part of the national protected areas system. This offset system ensures that all industrial developments compensate for their impacts on the natural environment through graded investment relative to the project size. This objective was developed as a way of balancing development with environment in a pragmatic manner, to take account of the ecosystem goods, services, and biodiversity itself lost to society as an unaccounted externality. The specific objectives of the SNUC Act are given in Box 2. These objectives are effectively financed by the Environmental Compensation law.

Box 2[18]: SNUC Act Objectives Article 4: Ministry of the Environment 2002: 41

To contribute to maintaining the biological diversity and genetic resources,

To protect endangered species,

To contribute to the preservation and restoration of the natural ecosystems diversity,

To promote the sustainable development based on the natural resources,

To promote the use of principles and practices for the conservation of nature in the process of development,

To protect the natural landscapes of remarkable scenic beauty which are not very altered by human activities,

To protect the relevant characteristics of the geological, geomorphological, speleological, archaeological, paleontological and cultural nature,

To protect and restore water and edaphic (soil) resources,

To recover and restore degraded ecosystems,

To provide means and incentives for activities of scientific research, studies and environmental monitoring,

[18] From Darbi, M., Ohlenburg, H., Herberg, A., Wende, W., Skambracks, D. and Herbert, M. (2009), International Approaches to Compensation for Impacts on Biological Diversity. Final Report

To value the biological diversity both economically and socially, To foster conditions and to promote environmental education and interpretation, leisure in contact with nature and ecological tourism, To protect the natural resources necessary to the livelihoods of the traditional populations, respecting and valuing their knowledge and culture and promoting them both socially and economically.

7.2.2 System Descriptions

Legal Forest Reserve system

The Forest Code (Law 4771/1965) established the concepts of **permanent preservation areas (APP)** and **legal forest reserves (LFR)** (Ministry of the Environment 2002; Protected Areas Department 2008). Here we are concerned with Legal Forest Reserves only. Art. 16 of the Forest Code requires that rural landowners must maintain a fixed minimum percentage of natural vegetative cover on their property, ranging from 20% to 80% depending on the region, the clearing of which is prohibited (Ministry of the Environment 2002). A legal reserve is defined as "*the rural property area necessary for the sustainable use of natural resources, the conservation and restoration of ecological processes, the conservation of biodiversity and for the refuge and protection of native fauna and flora. In these areas, the vegetation cannot be removed, but it can be used under the sustainable management system*" (Ministry of the Environment 2002).

According to Art. 44, landowners who do not comply with these provisions are required to undertake one or more of the following measures:

- Replant vegetation to comply with their property LFR obligation; this involves replanting every three years at least 10% of the property area with native tree species
- Allow the natural regeneration of vegetation and / or
- Compensation for clearance beyond the % cap set for the property.

Compliance with this third option constitutes the types of biodiversity offsets, and recently emerging habitat banks, which are detailed in this case study.

The threshold at which a biodiversity offset is required under the LFR system are the percentage limits to natural habitat conversion set for private properties, and conversely, the area required to remains intact, normally as forest. In the Amazon, 80% of the rural properties must remain intact; in the Cerrado of the Amazon Region, 35% of rural properties; in the rest of Brazil, 20%. All clearance beyond these limits trigger the requirement for thresholds. This offset system is therefore unusual in that it is based on and known for the thresholds themselves. Determining the significance

of impacts can result in projects being rejected and not executed. These kinds of restrictions may apply, for example, to legal reserves under the Forest Code, where the removal of more than a fixed amount of vegetation cover is prohibited[19]. Likewise, under the Environmental Compensation system for new development, the entrepreneur must seriously consider the "no-go" option (Escorcio Bezerra 2007: 47). This is done through the standard EIA process. No formal de maximus upper limit to offsetable impacts has been set.

Additionality is not adequately assessed in this system. The assumption is that all habitat is threatened and therefore all habitat placed under easement as LFR is a form of averted risk. In other words, if a landowner clears all the forest on their property and is required to purchase the easement from a landowner in the same catchment, it is assumed that this other forest would otherwise be cleared for commercial purposes. The strong preference for these offsets to take place within the same catchment – or at least river basin – creates some degree of internal control which will support this additionality. This is because clearance rates are likely to be spatially autocorrelated, because land value and the economic incentives for clearing will be high throughout a catchment and not just on a single property. There would be much less additionality if it were possible to clear on the agricultural frontier and offset within remote properties not yet threatened within clearance.

The legal reserve (the 20/35/80% areas which are in mitigation terms a form of 'avoidance') must be maintained by law and only sustainable forest management is allowed within these. Clear felling for grazing or cultivation is not allowed.

To comply with the LFR obligations, Darbi et al (2009) state that landowners must either:

- rehabilitate the legal forest reserve of the property through plantation with native species (every three years, at least one-tenth of the necessary complementary area has to be planted, in accordance with the criteria established by the competent state environmental authority);
- conduct natural regeneration of the legal reserve; or
- compensate the legal reserve with another area with equivalent ecological importance, if it belongs to the same ecosystem and is located in the same watershed (Darbi et al., 2009; Medida Provisória no. 2.166-67 2001).

The trading and offsetting component of this system is the third option. Compensation takes the form of either renting areas under forest services or by the acquisition of a Legal Forest Reserve quota (Art. 16/5: Medida Provisoria no. 2. 166-67 2001).

The location of the original legal reserve on a property has to be approved by a competent environmental authority of the state or the municipality or any other

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appropriately qualified institution. According to Darbi et al (2009), it must take into consideration the social function of the property, the watershed management plan, the municipal master plan, any environmental or economic zoning and the proximity to other biodiversity sites such as other legal reserves (connectivity), Permanent Preservation Areas (APP), SNUC Conservation Units and other legally protected areas (Medida Provisória no. 2.166-67 2001).

The location of the compensation forest is required within the same watershed. These are relatively small areas defined by the drainage of 3rd or 4th order tributaries to major rivers. In some cases this requirement is impossible because of a lack of natural vegetation. In these cases, it is required that the offset is located as near as possible to the impacted property and within the same river basin and State. There is a general consensus within biodiversity offsets to date, globally, that like for like habitat and proximity are key in ensuring offset success and acceptability by major stakeholders. These location requirements effectively function as a proxy for habitat type and social equity.

According to Art. 44A the owner of a property who is already in compliance (e.g. >20%) with their LFR obligations can institute 'forest services' on their property, through which the right to suppress or explore the native vegetation outside of legal reserves is relinquished, permanently or temporarily. For permanent impacts, permanent offsets in the form of these forest services on alternative properties are required.

There is a preference for offsets to be in place before vegetation is cleared beyond the LFR quota on any property. This ensures that the cap is not exceeded within the watershed. As in many offset systems, offsets are often only put in place after impacts have occurred. There can be long delays in the organisation of land rights or the finding of suitable vegetation within the river basin.

Environmental Compensation system

'Compensação Ambiental' was developed and put in place in 2000. It requires developers to pay a licensing fee, usually between 0.5% and 2.0% of the total investment of their industrial project. These finances are then used to fund expansion and maintenance of a set of protected areas known as the National System of Conservation Units, set up and governed by the SNUC law[20] (9.985/2000). The payment is aims to bypass public budgets and go straight to either any protected area impacted by the development in question, or otherwise towards the creation or maintenance of a priority existing or identified SNUC site. The law hence creates a direct connection between private money and public action. The amount of money raised since the initial licensing began is estimated to be between $R230 million to $R460 million (c. $US500m – 1bn).

[20] http://www.ambiente.sp.gov.br/uploads/arquivos/legislacoesambientais/2000_Lei_Fed_9985.pdf

Whereas the LFR system deals explicitly with the areas of natural vegetation, particularly forest, the SNUC Act is designed to cover all kinds of environmental impact resulting from development. In this way it is broader in scope than the LFR system, covering pollution, hydrological impacts etc. However the offsets themselves are land based and designed to contribute to the national protected areas system.

Law no. 9985/2000 created the National System of Conservation Units (SNUC) which aims to establish, administer, maintain and enhance protected areas (Units of Conservation – UCs). The SNUC Act sets out objectives, guidelines and structure for the system, organising it around twelve management categories, divided into a „full protection areas" group and a „sustainable use protected areas" group, each of which include several management categories (Protected Areas Department 2008: 20, 29). The project developers' offset approach integrates environmental licensing provisions and the SNUC Act. The funds, necessary for the establishment and maintenance or enhancement of protected areas, come from compensation payments for investment projects as required by the environmental licensing system (Darbi et al., 2009).

Law no. 6938 (Resolution no. 001/86 from the National Environment Council, CONAMA) imposed the requirement for activities that affect the environment to undertake an EIA, including the preparation of an environmental impact report (Relatório de Impacto Ambiental, RIMA) and the related environmental impact study (Estudo de Impacto Ambiental) in order to obtain a license (Ministry of Environment 2005: 201). With regard to adverse impacts on the environment and biological diversity the SNUC Act forces the enterprise to support the implementation and maintenance of Units of Conservation (Petrobras n.d.). The SNUC Act includes as its first objective the maintenance of biodiversity, and thus is aligned with the "no net loss principle", although this is not specifically mentioned (this was confirmed through interviews with experts).

April of 2008, the Federal Supreme Court adjudicated on a case brought by the National Confederation of Industry (CNI), and abolished the floor of 0.5%, stating that the compensation must be proportionate to the impact of each project, rather than to the capital costs of the undertaking[21]. Formulae have been used in the past at the State level as the basis for this form of compensation and are now being discussed by policy-makers at the national level with a view to establishing guidance in line with the Supreme Court's guiding principle of proportionality to impact[22].

Environmental compensation is required through the Environmental Compensation system for any new enterprise with a significant environmental impact, as defined by

[21] Bourscheit, A. E Agora José *O Eco*, 16 apr. 2008. Avalable im:< www.oeco.com.br>.
[22] Pers.Comm. Leonardo Geluda, July 2008.

the relevant acting environmental authority at State or Federal levels. There are no formal objective definitions of 'significant impacts'. This is expected to be determined through the environmental impact study which '*identifies any (potential) physical, chemical or biological alteration of environmental properties, caused by any form of human activities which, directly or indirectly, affect the environment'* (Ministério do Meio Ambiente 2008). The following considerations are used in the identification of significant impacts:

- Positive and negative,
- Direct and indirect,
- Short, medium and long-term,
- Temporary and permanent,
- Cumulative, synergistic and distributional.
- In the state of Minas Gerais, the impact significance is determined using the following indicators:
  - Impact matrix,
  - Natural vegetation cover,
  - Proximity to conservation units within the Protected Areas network
  - Energy efficiency of the project,
  - Polluting potential of the project,
  - Risk assessment,
  - An index of deposit exploitation, and
  - Additional quality parameters as necessary

These factors are combined in an aggregated assessment of impact significance resulting in a classification from I-IV where IV is the highest category. This environmental impact is then related to a minimum percentage of costs for compensation measures as outlined in Table 6.

Table 6: Percentage of investment for compensation measures based on impact significance in the state of Minas Gerais

Framing of the enterprise (according to Normative deliberation COPAM no. 074/2004)	Degree of the environmental impact	Percentage of investment for compensation measures
Class 3	I	0.5 %
Class 4	II	0.75 %
Class 5	III	1.0 %
Class 6	IV	1.25 %

Source: Vieira de Almeida, R. C. (n.d.): Procedimentos para a aplicação da compensação ambiental, nos termos do artigo 36 da Lei Federal nº 9.985, de 18/07/2000 e dos Decretos 4.340 de 22/08/2002 e 5.566 de 26/10/2005. Instituto Estadual de Florestas (IEF), cited in Darbi, M et al (2009).

Additionality is a requirement of the system: funds are used to invest in new areas of biodiversity priority to be incorporated into the national system of conservation units.

Therefore in one sense additionality is ensured because the biodiversity is unprotected and gains protection through averted risk by inclusion in this system. However in two other senses, additionality is insufficiently tackled: firstly, there are no formal requirements for measures of background rates of biodiversity loss to allow assessment of gain through averted risk against a declining baseline (such as through grazing; or sale as agricultural land); secondly, there appears to be no consideration of whether this finance is replacing government finances and responsibility to invest in the national system of conservation units. Indeed, it appears likely that the 0.5% investments are regarded as a novel source of conservation investment by the state and federal governments.

All qualifying activities pertain to improving or expanding the national system of conservation units. The resources derived from this compensation system must be applied to the creation of new or management of existing protected areas. This covers five major types of activity:

1. studies for the creation of new reserves,
2. development of management plans,
3. administrative arrangement of land-tenure,
4. purchase of goods and services necessary for managing an area, and
5. scientific research to improve management of the protected area and its buffer zone).

The inclusion of scientific research within the accepted lexicon of offset activities could be regarded as a departure of the general global consensus on acceptable offset activities which result in demonstrable, additional, measurable biodiversity gains. However the need for appropriate scientific research to support protected areas management may be regarded as sufficient to account for and justify this type of ancillary activity as core offset investment: a process essential to the goal.

The location of the area is affected by whether a protected area is directly or indirectly affected by the development. Where a protected area has been affected by the development, investment is required into this impacted protected area. Where a protected area is not directly affected, money should be used to create, implement or maintain a 'strict' protected area, located in the same state and preferably in the same biome and same watershed of where the impact has taken place, considering the priority areas for conservation identified by law. These hierarchical rules are set out in RESOLUÇÃO CONAMA Nº 371, DE 5 DE ABRIL DE 2006[23].

This location is therefore defined hierarchically: first preference – same watershed; second preference. However investments are also expected to take place in the same

23 http://www.cetesb.sp.gov.br/licenciamentoo/legislacao/federal/resolucoes/2006_Res_CONAMA_371.pdf

State, a political boundary which sometimes bisects some watersheds. This hierarchy of location is important to note because it effectively acts as a form of like for like proxy in the exchange criteria.

Project activities from investments are usually finite in time but biodiversity benefits are expected in perpetuity. The simple structure of the system means that both enterprises with permanent and temporary impacts are required to make the investments (although this may vary according to impact significance – see 1.2.2.1). Hence permanent gains for biodiversity come about through project activities which are finite and depend upon the size of the original investment. For example, the consultative, legal and administrative work required in the setting up of a new protected area may take three years, but the positive gains continue into the future. There is no formal requirement for project activities resulting from the investment to last as long as the development itself.

The preference is for offsets before or during the development takes place. There is no formal matching of timing of losses and gains. Time discounting is not considered. Timing varies in this system because the investments are made into a prioritised system of protected areas, the management of may depend on a large number of factors such as opportunities for community consultation, or seasons appropriate for scientific research and habitat management.

7.2.3 Equivalence

Legal Forest Reserves

Equivalence between impact and offset areas is covered in the most rudimentary of ways within this offset system, using area alone as the currency of exchange and a preference for local offsets within relatively homogenous ecosystem landscapes ensuring the same type of biodiversity is conserved.

The kind of biodiversity that can be gained in compensation for the loss is determined by major habitat types, and this is mainly ensured through the local nature of offset requirements within the same watershed. Like for like trades generally take place within this offset system. This is largely because of the stipulation for offsets to be located within the same watershed or at least the same river basin. No detailed measures of biodiversity structure, composition or process take place in the assessment. Trading up is therefore not a concept used in this system.

The issue of whether the quality of compensatory outcomes is equivalent to the loss of biodiversity impacted is assessed in the most basic of ways. Areas of the property which are classified as forest land use can be used in the trading of these land rights with other property owners.

Area is always used as the metric in these systems.

Loss and gain is measured solely using the metric of area, with some assurance of quality made through public body inspection of properties. In other words, to ensure the areas mapped as intact forest meet certain minimum criteria of vegetation structure.

The issue of the management of sources of risk has been insufficiently tackled within this offset system

Environmental Compensation system

There are no formal mechanisms for equivalence to be determined between impacts and offsets in this system. The financial investment is expected to be put into the highest priority sites. Furthermore there is no obligation to invest financial resources in the same type of impacted ecosystem. One of the failings of 'Compensação Ambiental' is that the law failed to define a method for determining the size of the payment

Habitat type and the presence of threatened species are used as the main types of biodiversity proxies for choosing compensation sites. Economic equivalents are not directly used in this way. However the fixed % investment required is a type of economic equivalent in this system. The assumption here (recently challenged in the Federal Supreme Court) is that larger investments will tend to result in impacts of greater magnitude, scope, duration and / or significance. However, as demonstrated by the April 2008 decision by the Federal Supreme Court to overrule the 0.5% floor, the failure to create a carefully structured system for the calculation of economic equivalents is now leading to changes in this law.

Like for like is encouraged in order to ensure some congruence between impacts and offsets. Trading up is also aimed for, however, in that the finance is focused on expanding the national protected area system; these areas will be picked according to state and national priorities. Whereas the location of the industrial investment and the nature of the impacts may often be random with respect to biodiversity values. This will not always be the case, however, as in clearance of native vegetation for commercial agriculture. Trading up cannot be assumed.

The equivalence of the quality of the compensatory outcomes and the loss of biodiversity impacted is not formally assessed, but investment in the highest priority sites, in terms of biodiversity conservation, is a way of generally ensuring the offset site is likely to be higher within the irreplaceability or vulnerability rankings than the impact site.

There are no equivalence proxies – they are simply % investments. In fact the difficulty of establishing metrics for gain and loss is what lead to the decision to make compensation amounts percentages of the initial investment.

Loss is not measured. Rather, the size of the investment is taken as a coarse proxy for the size of the environmental impact. Gains are therefore not measured in relation to losses. However gains are measured within the performance indicators of the Brazilian protected areas system. One of the failings of 'Compensação Ambiental' is that the law failed to define a method for determining the size of the payment. This lacuna in the calculation of equivalence between impact losses and offset gains is currently under consideration, with recent advances in corroborating the two sides of the equation in a more transparent and equitable manner.

Risk is managed in the investment within the SNUC system in the same way as all public sector projects are managed. However this subject has not received sufficient attention within this offset system.

The development of equivalence research for offsets in Brazil

A number of pilot projects are currently attempting to assess the value of biodiversity to provide a basis for the measurement of gains and losses in biological diversity which are relevant to the environmental compensation system. In Brazil, the approach taken is to value of biodiversity using a number of parameters, related to "direct and indirect use value, non-use and future use value and also the intrinsic value man attributes to it". These include ecological, genetic, social, economic, scientific, educational, cultural, leisure and aesthetic values[24]. The concept of **Total Economic Total Value** (TEV) has been utilised (Darbi et al., 2009). The approach highlights the influence that biological diversity has on various human interests, for instance the provision of basic goods for the livelihood of human beings, food and medicinal plants and symbolic aspects. The economic valuation procedure is based on a total value comprised of the sum of five valuation components multiplied by a social factor (see Figure 7).

The application of these more refined methods to determine true equivalence is yet to be systematically applied in the field of biodiversity offsets within Brazil.

[24] (Ministry of the Environment 2002; CEFET-Campos).

Total Value of Biodiversity	=	Opportunity costs + Scenic impact + Ecosystem loss + Tourism visitation loss + Ancillary Environmental Risk	X	Social Factor

Figure 7: Method for the calculation of TEV of biodiversity in Brazil. From CEFET-Campos, cited Darbi et al. 2009.

7.2.4 Links to other issues and policies

Legal Forest Reserves

It is not clear whether the crowding out of other biodiversity policy objectives has been an issue in any of the states implementing the LFR system. The individual nature of some state legislation means there may be individual examples of this kind of phenomenon.

Network connectivity is covered through the preference for offset sites which are adjacent to larger blocks of habitat, including those on adjoining properties. The same is also true for the legal reserves themselves (see section 1.2.1.4). Climate change resilience has not been considered in this system.

Environmental Compensation system

Crowding out has been insufficiently studied in the SNUC system.

Climate change resilience is in its infancy in Brazilian protected areas planning. Network connectivity is a factor in the selection of national conservation units, whereby units will be favoured if they function as corridors or derive benefits through contiguity with large blocks of natural habitat.

7.2.5 Institutional roles, legislation and responsibilities

There are many legal texts related to biodiversity and the environment in Brazil. An example is Law 10257 of 10 July 2001 which includes environmental protection, preservation and restoration, as important items in urban planning and regulation (Ministry of Environment 2005); another is the Law of Environmental Crimes which regulates criminal and administrative punishments for behaviour and activities that cause harm to the environment. Regarding biodiversity compensation the two main

legal arrangements are the Forest Code (LFR system) and the SNUC Act (National System of Conservation Units Act) and Compensação Ambiental (Escorcio Bezerra 2007).

Legal Forest Reserve system

Law 4771 of 15 September 1965 establishes the Forest Code. Under this law a legal reserve is define as "an area located within a rural property or possession, except for permanent preservation, to the sustainable use of natural resources, conservation and rehabilitation of ecological processes, biodiversity conservation and the shelter and protection of fauna and native flora". These are effectively avoidance areas. Any liability beyond the set minimum percentages of avoidance are residual impacts requiring offsets. Habitat bloc offsets can take the form of renting 'forest services' from other landowners, or by the acquisition of a Legal Forest Reserve Quota (Art. 16/5, Medida Provisória No. 2.166-67 2001).

The Legal Forest Reserve systems are bound by individual state laws. In this way the state governments set the particular restrictions and rules over the trading of land rights and the determination of equivalence etc. However there are also some federal laws pertaining to this system which set out some national level details concerning issues such as areas caps within different regions of Brazil (Amazon, Cerrado, and other regions)[25]. State government public bodies and necessary environmental agencies are responsible for mediating the agreements between landowners. In some regions of Brazil, the poor compliance with this Forest Reserve law is evidence of insufficient capacity and expertise in some of these public bodies.

The LFR offset system has no formal link to the principle of mitigation and the hierarchy normally associated with bona fide biodiversity offsets. In a sense the meaning of residual impact is set by the 20/35/80% quotas set for each region of Brazil. Within these quotas, landowners are practicing avoidance. Beyond these quotas, landowners must either rehabilitate or invest in offsets to compensate for residual impacts.

Offsets generally transfer with land title and are permanent. The forest services above the LFR quota agreed within a property are sold with the property as land title. These titles may be permanent or temporary. Where temporary, the new landowner may change the land title, in which case the original buyer is required to find a new offset.

These systems do not generally constitute formal biodiversity banks. A few banking condominiums now exists under Art. 44b but bankruptcy has not been considered, mainly because the banks of biodiversity are pre-existing and involve avoidance of

[25] http://www.planalto.gov.br/ccivil_03/mpv/2166-67.htm

further activity rather than the active maintenance as required within many US biodiversity banks (Darbi et. al, 2009).

As these are offsets traded among private landholdings, there is a reduced requirement for extensive stakeholder consultation. Nevertheless Art. 44a and 44b both contain provisions to ensure stakeholders are sufficiently consulted.

Instituting forest services beyond the legal reserve quota involves a type of conservation easement where all activities – cutting, felling, exploration and all forms of major use – are relinquished as part of the agreement. In this way the outcomes are permanent as a form of averted risk, assuming without the conservation easement it would be economically profitable to use or operate within this natural habitat.

Environmental Compensation system

The Environmental Compensation system is based on Federal law – in contrast to the LFR systems which are based on State laws. However both Federal and State agencies can supervise the Environmental Compensation system, depending on which authority provides the environmental license. The Environmental Compensation Law[26] requiring (until April 2008, policy now in flux) fixed percentages of enterprise investments to be provided for offset activities, is effectively a financing mechanism for the SNUC system of national conservation units . The SNUC law in turn sets out the requirements for new compensation units within Brazil[27].

The Environmental Compensation Fund (Fundo de Compensação Ambiental, FCA) was created in 2006 to enhance the efficiency of payments under the Environmental Compensation system (Ministry of the Environment (undated); Ministry of the Environment 2007). This fund is the result of a partnership between IBAMA and the National Savings Bank (Caixa Econômica Federal, CAIXA) and provides an alternative (streamlined, efficient) means of implementing the SNUC Act obligations.

The FCA is operated as an investment fund. With the FCA, the entrepreneur has the choice to execute the compensation measures themselves (in-house or through third parties) as before, but also to deposit a compensation payment at the FCA. The FCA can lead to advantages both for the developer and the government authorities. The developer is exempt implementing the offset activities themselves or hiring third parties. Whereas the authorities gain more control over financial activities; higher capacity with respect to expenditure planning; and control of financial resources (Ministry of the Environment, Undated; Ministry of the Environment 2007). CAIXA, the bank operating the FCA, provides a range of services which can be purchased to aid the implementation, management and M&E of the compensation activities. According to Darbi et al. (2009), these include:

[26] http://www.cetesb.sp.gov.br/licenciamentoo/legislacao/federal/resolucoes/2006_Res_CONAMA_371.pdf
[27] http://www.ambiente.sp.gov.br/uploads/arquivos/legislacoesambientais/2000_Lei_Fed_9985.pdf

- Administration services
- Web portal purchases – online purchase of goods and services
- Public management - support for the planning, implementation, monitoring and monetization of programmes, projects and public policies.
- Gov corporativo caixa - ensures the monitoring and control of single accounts and the FCA as a whole.

These services offered by CAIXA are paid for through a 0.3% per annum fee on the assets of the fund. One part of the returns of the fund is kept as a contingency (20%). The remaining 80% is dedicated to operating the offsets through the Environmental Compensation Chamber and applied through the 'Programme for Structuring the Integral Protection Conservation Units and other programmes' (IBAMA; Câmara de Compensação Ambiental 2006: 4). The basics of these relations are shown in Figure 8 (Darbi et al. 2009).

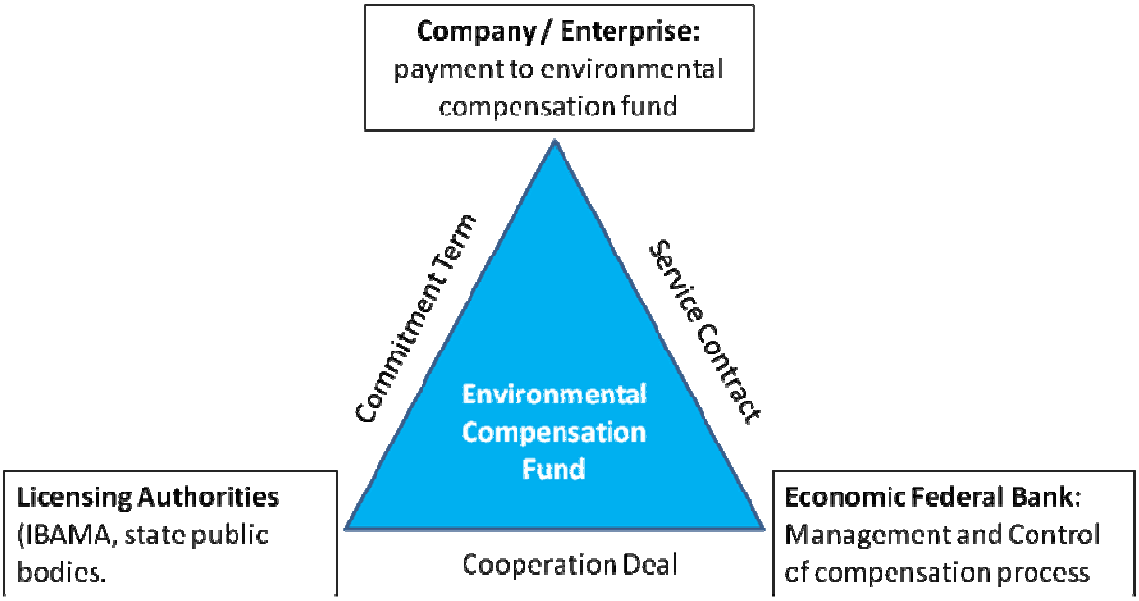

Figure 8: The structure of the FCA

The mitigation hierarchy is an integral part of the environmental compensation system because this system is embedded within the Brazilian EIA process. New developments pass through the standard EIA permitting process and the mitigation hierarchy is followed to an extent and quality commensurate with all other development projects. Where the size of the investment depends partly on the size of the environmental impact (see 1.2.2.1), this means in some cases there is an interplay between mitigation effort and the size of the offset. In other words, where the mitigation hierarchy is diligently followed and the residual impacts are small, this may lower the investment requested according to criteria such as those presented in section 1.2.2.1.

The SNUC offsets are by definition contributions to the national system of protected areas and as a result land title must change in the case of investments in new sites. These offsets are therefore of the same statutory basis as normal protected areas and will remain secure unless degazetted.

These are not biodiversity banks and the bankruptcy issues associated with small private banks is therefore not relevant.

Stakeholder consultation is carried out relatively well in Brazil within the EIA process. As a result, consultation is an integral part of the environmental compensation system. New industrial developments requiring offsets pass through the standard EIA permitting process and the stakeholder consultation processes like any other. Furthermore, there are stakeholder consultation structures within SNUC itself to ensure that new protected sites, or changed management of protected sites, takes place with appropriate community, rights holder, and political consultation.
Outcomes from this offset system are similar in permanence to other protected areas in Brazil and other PA systems within the world.

7.2.6 The economic incentives

These issues have been insufficiently tackled within either system.

As neither system described here is generally operates as a true habitat bank, the economies of scale purported for habitat banks over offsets cannot be assessed. There have been no explicit studies on this topic within either offset system. The LFR system effectively sets a cap (whether 80%, 65% or 20% [note these figures are reversed – area to be cleared vs. area to be left intact]) on the total amount of clearance allowed within a watershed or river basin[28]. Within this cap, trading is allowed between individual agents – landowners in this case. This cap and trade system is favoured in environmental economics, and used here in Brazil, because the flexibility in enterprise between agents leads to economic efficiencies.

Within the Legal Forest Reserve system, some banking arrangements have emerged in recent years however which appear to derive from economic incentives. Art. 44b establishes the LFR quota which is a land title allowing the 20/35/80 percentages to established in Art. 16 to be exceeded. These LFR quotas on some properties are emerging as formal habitat banking arrangements with government oversight. In some cases, groups of landowners have collaborated to create a form of aggregated offset – a large communal habitat bank – to compensate for their collective liabilities. This

[28] The difference between a microwatershed, watershed and river basin in Brazil is based on river dendrology specific to the country. For example, a microwatershed is a 3rd or 4th order stream.

kind of system appears to have evolved because of economies of scale (Escorcio Bezerra 2007).

For both systems, the careful requirements for location set out in sections above are effectively safeguards to ensure the gains are made as proximal to the losses as possible. This means that losing stakeholders are more likely to be gaining stakeholders, at least in terms of the spatial positioning of the offset. Extensive stakeholder consultation takes place in the design of new or newly managed SNUC areas. This consultation has the structure to encompass broader equity issues such as gender, wealth and ethnicity. Nevertheless, there are several cases of such offsets involving disagreements over the equity of the exchange for relevant stakeholders.

7.2.7 Legal issues and responsibilities in banks

Most of these issues are of little relevance to the LFR case study which is at some distance from a banking system. However it can be said that the contracting parties are two different private property owners, mediated by the state government, meaning public agencies are involved. It is the state government who monitors the sale of land areas on different properties, effectively a retiring of credits within the cap and trade system, and it is this process which prevents or minimises any form of double selling. Other questions relating to legal issues and responsibilities of banks are not relevant to this system

Environmental Compensation system

There are no strict credits in this system. Environmental activities which constitute the compensation have until 2006 been the responsibility of the developer themselves to implement. This may be done 'in-house' or may be subcontracted to a third parties such as an NGO or consultancy group (IBAMA; Câmara de Compensação Ambiental 2006. The Environmental Compensation Fund has provided a second option, whereby the entrepreneur may choose between direct execution or alternatively deposit the compensation payment at the FCA. This transfers responsibility for execution onto the Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade), which is an agency of IBAMA (Ministry of the Environment, undated; Ministry of the Environment 2007).

The success of the activities is normally judged by the agency responsible for managing the protected area. This can be a public sector or third sector body. There are no standardised methods for impact evaluation specifically designed around these activities as offsets – in other words, in comparison to the losses. However, the protected areas system in each state in Brazil has a set of guideline indicators of performance based on measures of habitat extent, quality and the presence of key species.

The management, monitoring and enforcement of banks is undertaken by the agency responsible for managing the protected area. The sustainability of the sites is ensured through their official gazetting and change of title through the executing public body. In this way their perpetuity is secured as much as any other protected area in Brazil.

Just as the SNUC law has a carefully mapped out process for the involvement of stakeholders in the creation of a new protected area, there are also provisions to allow stakeholders to be involved in the monitoring and evaluation of these sites through time. Details of these structures can be found in the appropriate guidelines[29].

As this is not a private sector banking system, there are none of the typical transaction costs and administration associated with private sector biodiversity banks which require a regulator. The Environmental Compensation system is a funding mechanism by which the SNUC system is expanded. Administration costs are therefore typical for protected areas management.

The issue of compliance with principles of efficient regulation has not been considered within this system. The contracting parties are the developer and a State or Federal environmental agency. However other agents may also be involved sub-contracting and implementation arrangements (such as NGOs) where appropriate.

The public agencies are the executors of the process and contracting parties in the implementation. The public agencies do not however generally carry the work out. However they are involved in impact evaluation.

Double selling is not a direct issue in this system as the sites are not usually true banks. Double selling – which in this case could be interpreted as the double-funding of a new site or changed management of an existing site is prevented or minimised in this system because the funds are being used by the public agency whose mandate is to protect biodiversity, rather than create profit as is the case in private sector banks.

[29] http://www.ambiente.sp.gov.br/uploads/arquivos/legislacoesambientais/2000_Lei_Fed_9985.pdf

7.3 Summary

There are two major biodiversity offsets arrangements under Brazilian legislation. Brazil's National Forest Code (1934, with subsequent laws in 1965, 1989 and 2001) establishes Legal Forest Reserves (LFR), which are protected areas with the goal of sustainable use of natural resources and the conservation and rehabilitation of ecological services and biodiversity. The Forest Code requires landowners to maintain a fixed minimum percentage of natural vegetation on their property (Darbi et al., 2009), effectively a type of set-aside provision. This percentage varies from 20-80% depending on the region of Brazil.

Landowners which do not meet the LFR minimum percentage are required to comply by replanting vegetation, allowing natural regeneration or through compensation which takes the form of purchasing land rights. These rights are types of conservation easements, on the properties of other landowners who have a surplus. Hence landowners that cannot accomplish the requirement on their own land can purchase appropriate forested areas from others - a form of trade in compensation liabilities.

'Compensação Ambiental' (hereafter Environmental Compensation Law[30]) was developed and put in place in 2000. It requires developers to pay a license fee, usually between 0.5% and 2.0% of the total investment of an industrial project. These finances are then used to fund expansion and maintenance of a set of protected areas known as the National System of Conservation Units, set up and governed by the SNUC law[31] (9.985/2000).

The payment aims to bypass public budgets and go straight to either any protected area impacted by the development in question, or otherwise towards the creation or maintenance of a priority existing or identified SNUC site. The law hence creates a direct connection between private money and provision of public conservation goals. The amount of money raised since the initial licensing began is estimated to be between $R230 million to $R460 million (c. $US500m – 1bn).

[30] http://www.cetesb.sp.gov.br/licenciamentoo/legislacao/federal/resolucoes/2006_Res_CONAMA_371.pdf
[31] http://www.ambiente.sp.gov.br/uploads/arquivos/legislacoesambientais/2000_Lei_Fed_9985.pdf

8. Canada

8.1 Introduction

Canada has had limited experience with environmental banking programs. However, one type of federal environmental programme has utilized banking to help mitigate impacts environment impacts. A fish habitat conservation programme was established in 1986 to provide a policy framework for habitat protection under the Fisheries Act. The primary objective of this programme, known as the Policy for the Management of Fish Habitat (or Habitat Policy), is to achieve a net gain in the productive capacity of Canada's fish habitat through conservation, restoration, and development [Fisheries and Oceans Canada (DFO) 1986]. The program establishes rules and guidelines for individual projects that will likely result in harmful alteration, disruption, or destruction of fish habitat (referred to as HADD) and requires compensation in order to achieve No Net Loss (NNL) of productive capacity of habitat.

This report analyzes habitat conservation objectives, methods of determining equivalence, system descriptions, links to other issues and policies, institutional roles and responsibilities, economic incentives, and legal issues and responsibilities.

8.2 Analysis

The Fisheries Act is federal legislation that dates back to Canada's Confederation during the 19th century. It was established to manage and protect Canada's fisheries resources and applies to all fishing zones, territorial seas, and inland waters of Canada. The legislation is binding to federal, provincial, and territorial governments. The Fish Habitat Management Program was established in 1986 as Section 35 of the Fisheries Act. Subsection 35(1) of the Act is a general prohibition of harmful alteration, disruption or destruction (HADD) of fish habitat. Under the Fisheries Act, fish habitat is broadly defined as spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes (Goodrich 2004). This means that any work or undertaking that results in HADD is a contravention of Subsection 35(1). Project developers and owners (known as proponents) must obtain permission before they proceed with any project that can result in HADD. Penalties for violating Subsection 35(1) include fines of up to $1,000,000, up to 6 months imprisonment, or a combination of both (DFO 1986).

Habitat banking under this program involves the completion of compensation prior to the development of a project. The proponent creates or improves fish habitat for future use as compensation. The design and location of a habitat bank must be approved by DFO and proponents should provide data describing the "before" conditions. Habitat banks are often used in situations where a proponent needs to

compensate for several small HADDs, and few compensation options exist at the site or sites (DFO 1986).

8.2.1 Objectives

The Fish Habitat Management Program's primary objective is the net gain of the productive capacity of fish habitat. Individual project proposals that will likely result in HADD of fish habitat, will require compensation in order to achieve NNL of productive capacity. The program defines compensation as: the replacement of natural habitat, an increase in the productivity of existing habitat, or the maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources (DFO 1986).

The program states that habitat compensation and monitoring to ensure NNL is the responsibility of the proponent. While proponents are responsible for achieving NNL, in some cases, compensation may function better than anticipated, resulting in a Net Gain. This incidental Net Gain cannot be considered for use towards future compensation requirements (DFO 1986).

8.2.2 Equivalence

Habitat management practitioners aim for greater than a 1:1 compensation ratio. In many instances it will take time for habitat to become functional and in some situations the compensation may not function as anticipated. The amount of compensation must be determined based on the residual net loss of productive capacity after all relocation, redesign and mitigation options have been taken into consideration (DFO 1998). There are several factors that must be taken into account when determining the amount of compensation required.

Scientific tools to determine NNL through compensation ratios are used when they are available. Higher (weighted) ratios are justified on the basis of uncertainty of success, variance in the quality of the fish habitat being replaced, and the recognition of the lag time required for the new habitat to become functional (DFO 1998). In many cases, replacement ratios may increase as practitioners move down the hierarchy of compensation options, as this decreases certainty that NNL can be achieved.

In some instances, the proposed project may result in the creation of habitat, for example, a scour pool forming downstream of a bridge pier. This inadvertent "passive" creation of habitat that is simply a by-product of the project should not be formally counted as compensation (DFO 1998). However, if practitioners are certain of the development, it can be taken into consideration when determining the net amount of compensation required. In the bridge pier example, practitioners may decide that less compensation will be required due to the inadvertent scour pools that may be formed.

8.2.3 System description

Habitat compensation is required when a Fisheries Act subsection 35(2) Authorization is issued. Habitat compensation does not include financial means for compensating for tangible economic losses, but deals only with actions intended to maintain the net production potential of fish habitat. The use of compensation to achieve NNL should be considered only after it proves impossible or impractical to avoid a HADD of fish habitat through project relocation, redesign, or mitigation. When compensation is required to achieve NNL, the Hierarchy of Compensation Options should be followed. The Hierarchy of Compensation Options is as follows (DFO 1998);

- **Option 1**. Create or increase the productive capacity of like-for-like habitat in the same ecological unit.[32] It is favoured because it is assumed that it has the greatest likelihood of ensuring that the habitat enhanced or created will meet the objective of NNL. "Like-for-like" compensation should aim to create or enhance habitat that has the same natural integrity, structure, and function of the habitat that was adversely affected. It is preferable to complete any enhancement on site before moving off-site.
- **Option 2.** Create or increase the productive capacity of unlike habitat in the same ecological unit. Creating or increasing the productive capacity of unlike habitat involves compensating for one type of fish habitat with habitat of a different type. This approach often means there is less assurance that a "No Net Loss" has been achieved. It is preferable to complete any enhancement on site before moving off-site.
- **Option 3.** Create or increase the productive capacity of habitat in a different ecological unit. This option may compromise biodiversity objectives since the HADD will affect one distinct population while the compensation will provide benefits to different species. For example, a rocky shoreline used by bass and other panfish may be replaced with a sloping vegetated shoreline to be used for pike spawning. Again, it is always preferable to complete work on site before moving off-site.
- **Option 4** represents the least preferred alternative under the policy and would be considered only in exceptional circumstances. As a last resort, use artificial production techniques to maintain a stock of fish, deferred compensation or restoration of chemically contaminated sites. Habitat Management practitioners must first consider not issuing an Authorization for the HADD before using a measure of last resort as compensation.

It is preferable to complete compensation at the higher levels before moving down the Hierarchy of Compensation Options. In many cases, the final compensation plan could

[32] Where ecological unit is defined as: Populations of organisms considered together with their physical environment and the interacting processes amongst them.

include elements at more than one level, with some like-for like habitat and some unlike habitat creation. To the greatest extent possible, like-for-like habitat options should be used.

A computerized Habitat Referral Tracking System (HRTS) is used to track every project, and the status of the habitat impact review and authorisation throughout the life of the project. Depending on the size of the project, more than 1 or 2 years of monitoring may be required to assess if the mitigation and compensation has been adequate and effective (DFO 1998). The requirement for more frequent monitoring and assessment is presently being assessed (Goodrich 2004).

8.3 Links to other issues and policies

8.3.1 Institutional roles and responsibilities

Canada's fisheries are under the authority of both federal and provincial governments. There is a substantial overlap between these jurisdictions in inland waters; however, the federal government retains the mandate of conserving and protecting fish habitat under the DFO. The Habitat Management National Headquarters is responsible for the overall coordination of the programme (DFO 1998).

The day-to-day delivery of the programme is carried out by habitat management staff in more than 50 departmental offices in five regions. Fishery Officers assigned by DFO's Conservation and Protection Programme undertake delivery of activities associated with compliance and enforcement. It is important that Habitat Management practitioners work closely with Fishery Officers by keeping them informed of the conditions in authorizations and potential *Fisheries Act* violations. Likewise, partner agencies should also be advised of compensation projects and conditions so that effective communications and support can be maintained.

8.3.2 The 'economic incentives'

The Habitat Policy reflects the "polluter pays" principle. All costs associated with compensation are the responsibility of the proponent. "Letters of credit" are financial instruments that secure the obligation of the proponent to complete the works. Letters of credit are more commonly used instead of performance bonds, because it is generally easier to obtain funds from a letter of credit (DFO 1998). Other mechanisms are available that would ensure compensation is achieved if proponents fail to comply with authorization conditions. Financial security instruments are used in order for DFO to ensure the completion of compensation works, monitoring and maintenance. If the proponent defaults on completing the work, DFO would then use the funds to complete compensation.

The DFO must be prepared to draw on letters of credit or take enforcement action where there has been unsatisfactory compliance with compensation conditions. In the absence of financial support from the proponent, or where work has been carried out contrary to the terms and conditions of the Authorization, enforcement action will be considered according to the DFO (DFO 1986).

8.3.3 Legal issues and responsibilities

Compensation requirements should be incorporated into the subsection 35(2) Authorization. This is the legally preferred approach, rather than using a separate compensation agreement that cannot be as effectively enforced as a Fisheries Act Authorization. A "Letter of Intent to Compensate Fish Habitat Loss" may be provided to DFO by the proponent as the basis to discuss and establish the specific terms and conditions of an Authorization. The Habitat Management practitioner should make it clear to the proponent that the Letter of Intent is not the Authorization and is non-binding (DFO 1986).

9. Other European Examples

9.1 Eastern European Biodiversity Projects

This section reviews other experience of relevance to habitat banking from Eastern Europe. The examples covered illustrate activity relating to some features of habitat banking, but are not sufficiently developed so as to provide full case studies of habitat banking.

The detailed case studies relating to the EU are from North and West Europe (France, Sweden, Germany), so the focus of these examples is to look at Eastern Europe. This is because different land use and economic conditions may arise in these newer Member States, which need to be taken into account in assessing an EU-wide habitat banking policy.

These examples do not provide sufficient information to complete the full case study checklist of issues. The habitat banking features they provide information on are limited to:

A. Concept of compensation for damage to biodiversity
B. Measuring biodiversity gain and loss
C. Monitoring systems for environmental projects
D. Location of biodiversity enhancements
E. Habitat management skills
F. Land ownership and legal status

The remainder of this appendix describes a number of observations in relation to habitat banking from biodiversity-management experiences from Eastern Europe under each of these headings. The examples[33] referred to for this analysis are:

- Biodiversity Technical Assistance Units (BTAU)[34], which have been developing a business-biodiversity banking framework in Poland, Hungary and Bulgaria for several years.
- Polish National Ecofund[35], established through a debt for nature swap in the 1990's, totalling several $100m, and mainly targeting infrastructure (e.g. water management), but also supporting some biodiversity projects.
- Polish National Fund for Environment Protection & Water Management (NFOSIGW)[36], which hypothecates fees and fines from industry to finance

[33] Based on information gratefully received from: Zbig Karpowicz, European Country Programmes, RSPB; Mark Hughes, EBRD; Lars Lachmann OTOP/RSPB; Paul Goriup, Fieldfare.
[34] http://www.smeforbiodiversity.eu/details.php?p_id=70&id=75
[35] www.ekofundusz.org.pl/us/ecoact.htm

environmental measures. Another large fund, administered by an agency of the Environment Ministry, 80% spent on water management, and 20% on natural environment, including Government programmes involving biodiversity measures and some co-funding of LIFE + projects.

- Fieldfare, a company that invests in habitat creation by a private enterprise in Romania, Bulgaria and Ukraine.

A. Concept of compensation for damage to biodiversity

The principles behind habitat banking can be regarded as an extension of the polluter pays principle (PPP); unless voluntary, banking is based on a requirement on those responsible for unavoidable damage to biodiversity to fund compensation. This principle is widely reflected in economic instruments around the EU.

The need to compensate for biodiversity damage must be accepted if people are to engage in a habitat banking system. There are variable levels of acceptance and implementation of compensation principles for different biodiversity resources across Europe. Some project managers suggest that this is easier to persuade people of in Eastern Europe, where the majority of people are more closely (in generational or family terms) connected to land management industries.

A further step is for this compensation approach to be established in environmental laws and management practices. For example, Government funds raised from business activities that damage the environment is the basis of funding for the Polish NFOSIGW. In Poland, the PPP is widely accepted, and a system similar to that for the NFOSIGW now exists for regional environmental funds.

By contrast in other new member states (e.g. Latvia) biodiversity issues are relatively low priority, and approaches to compensation are limited to legal requirements. Government payments in return for property rights over the environment may exist (e.g. in forestry management), but the concept of habitat banking may be regarded as premature.

B. Measuring biodiversity gain and loss

There are good examples of systems for measuring biodiversity gain in the schemes examined in Eastern Europe. For Natura 2000 sites, management plans exist but usually have not been implemented. These management plans provide relevant guidance for managing major habitat types (both inside and outside of protected areas).

They are generally supported by sufficient data (e.g. populations of wild birds), and examples exist of relating this data to ecosystem quality through scientifically sound

[36] www.nfosigw.gov.pl

parameters. For example, water levels and breeding bird populations have been linked to wider biodiversity value and rates of carbon sequestration.

However, as few Natura 2000 management plans have been implemented, and they do not equate to investment plans, they do not provide a resource from which to construct or evaluate plans for delivering biodiversity gain (as is required to verify that a banking credit can be sustained).

Depending on the biodiversity resources covered by a banking system, there could be a need for more landscape-scale data on natural environment resources to provide sufficient baseline information to allow assessment of biodiversity debits and credits. For example, more accurate assessment across the EU of ecosystem functions and services, or a ranking of landscape types for their biodiversity value, might provide a stronger basis for compensation assessments. Previous work has been developed in this area by IUCN, the European Centre for Nature Conservation and through Ecological networks analysis in the Czech and Slovak republics.

A range of expertise exists that can provide reference material to make assessments of biodiversity gain and loss in different Eastern European countries. It is generally believed to be sufficient to supply the information likely to be required in habitat banking. However, this information is not all in published form, so its further development (e.g. publishing as reference material on biodiversity resources or appropriate habitat management practices) might be needed to support habitat banking in an efficient manner.

C. Monitoring and auditing systems for environmental projects

Several of the examples examined for this work show the ability to monitor biodiversity outcomes:

- BTAUs provide a pool for expertise from within public, private and third sectors to assess and evaluate biodiversity impacts. The expertise is engaged as needed for projects through standing contracts for call-off work. They can thus supply monitoring skills for biodiversity projects. They also have access to relevant information (e.g. species population trends) necessary to put project impacts in context.
- Fieldfare projects receive finance with conditions that net ecological benefit is delivered. Loan conditions are advised on by a biodiversity management unit, with the monitoring work monitoring paid for by the businesses concerned.
- Under NFOSIGW funding of restoration projects producing net biodiversity gain is monitored through a register of projects and contracts. This demonstrates the extent of biodiversity impacts delivered by different projects. The agency responsible has developed a relatively large administration structure, with capability and skills to assess biodiversity gains and losses.

These systems, and those developed by some related financial banking systems, not only monitor biodiversity gain and loss, but also allow this information to be effectively audited. However, experience elsewhere in Eastern (and other areas of) Europe with agri-environment schemes raises doubts about the ability to provide administration for habitat banking.

D. Location of biodiversity gains

In general, biodiversity enhancements take place within Natura 2000 sites, under the framework of existing management plans. In general skills to determine appropriate locations exist as described under B and C. However, this is not always the case, for example compensation work for road development in the Rospuda Valley attempted to compensate for damage to one Natura 2000 habitat by converting another Natura 2000 habitat.

Elsewhere, it seems that sufficient land resources exist to deliver biodiversity gains. For example, in the Lower Danube there may be for 200,000 ha of wetland suitable for restoration. In particular opportunities exist in some countries on some state property. For example, there are permanently designated conservation zones for soil, water or forest resources which are under-managed for biodiversity. Fieldfare business investments are required to ensure net ecological benefit either through on-site actions (where business is engaged in land-management), or at other sites (for businesses not directly managing land e.g. those in supply chain). This system has established and monitors the principles of on-site and off-site biodiversity gain, as required in mitigation actions related to habitat banking.

E. Habitat management capacity

The existence of people with appropriate skills to manage land for biodiversity gain is not regarded as a problem. However, the application of those skills on sufficient scale to deliver habitat banking credits may present challenges.

The projects examined demonstrate that the skills to undertake the sustainable management of land for biodiversity gain are invariably present within local populations. Where necessary, people with experience of working in specific habitat types may need to be retrained to deliver management for biodiversity gain. For example, peat-bog re-wetting schemes within the EU have retrained peat excavation company employees, leading to publication of a management manual and knowledge exchanges with conservation projects in Ukraine.

There is less experience of habitat restoration on a significant scale. This may form a barrier to habitat banking if it restricts the supply of biodiversity gains. However, private and third sector bodies are becoming more ambitious in this respect, developing entrepreneurial capacity.

F. Land ownership and legal status

Fragmented land ownership and/or lack of clear legal status could create a barrier to establishing the in-perpetuity management agreements needed to deliver biodiversity credits. Land ownership systems have undergone a transition in many areas of Eastern Europe since the collapse of communism, and remain in transition in some non-EU former soviet-bloc countries (e.g. Ukraine).

In general, the land ownership and trading system throughout Eastern Europe is now regarded as capable of supporting the transactions envisaged within habitat banking. An exception to this may be Bulgaria. Another problem may relate to the permanence requirement on biodiversity credits. Existing habitat management agreements sometimes only cover short-term restoration activities (e.g. NFOSIGW), or at best a 20-year timeframe. However, LIFE project funding requires that purchased land is devoted to nature conservation in perpetuity. Although this is intended to secure ongoing conservation management activity, in legal terms it simply prevents resale or development.

9.2 UK Experience

There is extensive experience in the UK of determining compensation requirements under the Habitats Directive. In particular, offsets that have been implemented for loss of inter-tidal habitats in relation to Port developments are relevant to potential development of habitat banking in Europe. In addition, a research project has recently been completed for the UK Government (Treweek, et al. 2009) on biodiversity offsets which will produce results in time to inform latter stages of this project.

Examples[37] of compensation actions in the UK that reflect potential features of a habitat banking system include:

Hesketh Out Marsh is a managed realignment site on the Ribble Estuary in Lancashire in Northwest England. Part of the habitat is providing compensation for habitat that is being lost as a result flood defence operations to protect the nearby town of Morecambe. This site is also being developed by the RSPB, with funding coming from the Environment Agency in return for the habitat compensation.

Alkborough is a 400ha managed realignment site implemented by the Environment Agency[38] (EA) on the south bank of the Humber Estuary in Eastern England. ABP[39] owned 25ha of land within the site. Instead of selling this land to the EA as part of its land purchases for the site, ABP gave its land to EA, in return for an option to obtain

[37] Based on information gratefully received from: Andrew Dodd, RSPB; Peter Barham, Associated British Ports.
[38] The Environment Agency for England and Wales, and Agency of Defra.
[39] Associated British Ports, a major port operator in the UK.

25ha of compensatory habitat. It has effectively 'banked' this habitat, and can use it anytime over the next 15 years as compensation for impacts caused by developments at the nearby port of Goole. As the land ABP originally owned was relatively high (above mean sea level) within the site, the area it contributed to the scheme would be unlikely to produce the type of intertidal that would damaged at Goole. Inclusion of the ABP land facilitates the wider development of the site, within which appropriate intertidal areas suitable for compensation are likely to exist. Therefore, their agreement with the EA allows their 25ha to be 'swapped' within site for an area that delivers the appropriate compensation. The ABP-EA agreement can be described as an option contract for a credit of 25ha of intertidal habitat, with the exact nature of the credit being flexible in order to deliver the strict like-for-like equivalency to the debit, as required under the Habitats Directive, once it has been determined in the future.

Wallasea Island is located on the northern part of the Greater Thames Estuary, on the North Sea coast of England. It is supplying a number of compensation actions:

- It has already been subject to managed realignment project by Defra[40] along its northern flank to compensate for inter-tidal habitat lost to Port development elsewhere in the Thames Estuary.
- It is currently the subject of well-advanced major further managed realignment proposals by the RSPB[41], to create 100's of ha of inter-tidal habitats. A very small section of this proposed habitat creation has already been allocated as compensation for loss of inter-tidal habitat to a development in East London. Further habitat may be allocated as ex-ante compensation in relation to the Environment Agency's shoreline management plans, while other areas are intended to contribute towards UK Biodiversity Action Plan habitat creation targets (net gain).
- In addition, ABP were interested in purchasing habitat compensation at Wallasea. However, they could not obtain guarantees from regulators that credits at the site (on the East coast of England) would be in a permissible location for debits at one of their major ports on the South coast of England. Therefore, they understandably withdrew interest in the project because of the risks posed by this uncertainty over site proximity.

At **Snape** on the Suffolk coast of Southern England freshwater and intertidal habitat is being created by the RSPB. The EA is funding part of the scheme as compensation for habitat lost to coastal management processes at Easton and Benacre, wetland sites nearby on the same coast.

The scale of habitat creation being delivered by the RSPB (and other conservation charities in the UK) demonstrate how NGOs can be better at negotiating land purchases for habitat creation than public bodies. This may be due to factors such as:

[40] UK Department for Environment, Food and Rural Affairs.
[41] Royal Society for the Protection of Birds, an NGO.

- Image - the public-benefit objectives of charities being perceived differently to Government Agencies (even though they may share these objectives),
- Institutional factors - the inclination for other stakeholders to negotiate with charities differently to Government, or
- Efficiencies or a more ambitious vision in project development by NGOs - they often have greater freedom to articulate a vision of habitat creation than Government agencies who have to operate within specific duties, and NGOs have an incentive to innovate in order to attract support and continue operating.

In many of the cases above, the land banking or offsetting arrangements relate to Natura 2000 sites, and have been implemented after the relevant appropriate assessments have been completed. While NGOs and Government agencies are interested in net habitat creation, commercial operators such as ABP are focussed on compensation (no net loss) to meet the requirements of the Habitats Directive.

Development plans for coastal industries such as ports mean that operators are investigating purchases of further land to hold in reserve for further compensation actions in the future. In this sense, they are beginning to operate land 'banks' within their development strategies. A limitation on this approach has been uncertainty over the geographical range across which compensation can be delivered.

9.3 Czech Republic Planning System

The following laws, aspects of which are discussed in more detail below, are the main determinants for handling the effects of development on the environment in the Czech Republic:

- Law on Environmental Impact Assessment[42]
- Law on the Conservation of Nature and the Landscape[43]

Environmental Impact Assessment
Environmental impact assessment has be required since the Law No. 244/1992 of the Czech National Councils was enacted on 15 April 1992. It was amended by the Law No. 100/2001 Coll.

[42] Law No. 100/2001 Coll. on Environmental Impact Assessment and Amending Some Related Acts (Act on Environmental Assessment), as amended by Act No .93/2004 Coll.
[43] Law No. 114/1992 Coll. of the Czech National Council of 19 February 1992 on the Conservation of Nature and the Landscape in combination with:
Law of 8 April 2004, Amending Law No. 114/1992 Coll., on the Conservation of Nature and the Landscape, as amended; Law No. 50/1976 Coll., on Zoning and Land-Use Planning and the Building Code (the Building Code), as amended; and Law No. 219/2000 Coll., on the Assets of the Czech Republic and its Representation in Legal Relations, as amended.

The Czech EIA law provides a framework for carrying out environmental impact assessment which:

- Makes specifications for the proceedings (implementing authorities and authorities to be involved, public participation, deadlines etc.)
- Stipulates matters which must be dealt with in environmental impact assessments in any case (protection-worthy assets to be taken into account, investigation of alternatives, suggestions on reduction and compensation etc.), and also the structure for the presentation of this information
- defines projects generally subject to mandatory assessment in which the specific case must first be examined (screening) (Annex no. 1); and
- Stipulates criteria for the screening process (Annex no. 2), and specifies the contents of the documents assigned to the steps of the procedure (Annexes nos. 3 through 9).

In §1 of the Law, activities where the law applies to EIAs are defined. It refers to "plans and conceptions … [for] which implementation could have serious environmental impacts". In §3, it is specifies that a)"plans" in the meaning of this law be "construction work, activity and technology as set forth in Annex No. 1" (hereinafter, as is more usual, called "projects"); and that b) "conceptions shall be strategies, policies, plans or programmes […]" (hereinafter, as is more usual, called "plans and programmes").

Under §5 (4) of the Law, assessments of projects are also to include proposals for measures to prevent detrimental impacts on the environment through the implementation of the project, "to prevent, reduce, mitigate or minimise such impacts, or to increase the favourable impacts on the environment […]." Under §10b, concerning plans and programmes, the legal requirements go further. In these cases, compensation measures are also required.

The fact that compensation measures are to be proposed at the strategic level, but not at the project level, is somewhat surprising. This may involve an error of the legislative body, for the regulations in the Annexes on the contents of the documents of the procedure also provide for proposals for compensation measures for projects, e.g. in the Project Notification by the project applicant (Requisite for Notification, Annexes 3 for projects and 7 for plans/programmes), the documents to be submitted (Annex 4 Requisite for Documentation), the Expert Report (Annex No. 5) and the final statement (Annex 6).

The "Biological Assessment"

The assessment procedure for "Biological Assessment" (hereafter BA) is stipulated in the Law on the Conservation of Nature and Landscape. It refers to interventions in areas protected under this law. What is of particular importance here is that this law recognises an additional protection-worthy category, besides the category of formally certified protected areas: Significant Landscape Components.

These are defined in Sec. 3 b as following:
"*A significant landscape component, as an environmentally, geomorphologically, or aesthetically valuable part of the landscape, shall mean that which gives the landscape its characteristic appearance, or contributes towards its stability. Significant landscape components shall mean forests, peat lands, water courses, ponds, lakes, and floodplains. Other landscape components shall also mean parts of the landscape that the nature conservation authorities register as a significant landscape component, under Section 6, particular wetlands, steppe grasslands, game refuges, continuous grass areas, mineral and fossil deposits, artificial and natural rock formations, and geological outcrops and exposures. A landscape component may also mean valuable growths in settlement formations, including historical gardens and parks. Specially protected parts of nature shall be exempted from this definition […]*".

This regulation seems comparable to the legal biotope protection of German conservation law, although this is directed less towards landscape and cultural assets: The protection is not defined or delimited off explicitly spatially, but is available automatically for all objects to which the legal definition applies (Peters et al. 2003).

The procedure of "Biological Assessment" is regulated in Sec. 67 of the Law on the Conservation of Nature and Landscape ("Obligations of investors"):
"Whosever, within a framework of construction work or other use of the landscape, intends to carry out consequential interventions that could affect protected interests, under Parts Two, Three or Four of this act [this means formally certified protected areas, significant landscape components and protected species], must, at his own expense, arrange for a natural scientific study of the land concerned, and procure a written assessment of the effect of the intended intervention on plants and animals [BA, the author], should this intervention be found to be necessary [that means not avoidable, the author] by the nature conservation authority that has jurisdiction over it."

Therefore, the person who makes the BA must to be approved by the nature conservation authority but paid by the project developer. The BA is not required if another environmental assessment (e.g. EIA) is required for the project. The BA study is to be used as supporting material in decisions made by the nature conservation authorities.

Compensation measures under the Law for the Protection of Nature and Landscape can be justified either directly on the basis of the wording of the law (substitute plantations in cases of felling of trees [44] or result from the BA). The project applicant must pay the costs of the measures. The conservation authorities are to decide on the necessity and extent of compensation measures (Peters et al. 2003).

[44] These are stipulated in Sect. 8 of the Law. However, there are numerous exceptions which virtually exempt "normal forestry" completely from the compensation requirement.

Requirements of the Traffic Law
It is stipulated in the Traffic Law that in cases of infrastructural projects, areas for compensation measures must be reserved. For many roads, the decision in this regard lies with the administrative district, although the Ministry of the Environment has the possibility to reject project plans. However, since the principle of consensus prevails amongst the authorities, rejection is unlikely (Anděl 2003).

Natura 2000
The legal basis for Appropriate Assessment (AA) under §6 Sect. 3 of the Habitats Directive is established in the Law on the Conservation of Nature and the Landscape and the Law on Environmental Impact Assessment. Therefore, AA proceeds concurrently with the EIA procedure, but with two principal differences: screening is done by nature protection authorities; and the final report is legally binding under Habitats Directive requirements (Roth and Zicha 2003: 48).

Individuals carrying out Appropriate Assessments are required by law to have a license, which is awarded only after a rigorous testing procedure; the experts are paid under an individual contract. The fear of rising costs when only licensed experts had been hired to carry out assessments has not been experienced in the Czech Republic (Kunzmann et. al. 2007).

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