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Compensating for damage to biodiversity: an international benchmarking study

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This study exploits the responses provided by the economic services of 29 countries to the questionnaire drawn up by the Ministry of Sustainable Development and coordinated by the General Directorate of the Treasury.

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Thanks: The study exploits the responses to a questionnaire to which the economic services of the following 29 countries responded: Argentina, Australia, Austria, Brazil, Canada (Quebec), Chile, China, the Czech Republic, Denmark, Ethiopia, Germany, India, Japan, Kenya, Mexico, Morocco, the Netherlands, New Zealand, Norway, Peru, Poland, Russia, Spain, the United Kingdom, the United States, Slovenia, Sweden, Switzerland and Vietnam. We thank the economic services and the General Directorate of the Treasury for coordinating their responses within the framework of this benchmarking study.

This document reflects only the authors' views and not those of the institutions to which they belong. The aim of this dissemination is to encourage debate and invite comments and criticisms.

CONTENTS

I – Introduction	4
II – Legal and institutional frameworks	6
II.1 – Regulations	6
II.2 – Stakeholders	10
III – Offset terms	21
III.1 – In-kind offsets	22
III.2 – Financial compensation	27
III.3 – Sustainability of the measures	29
III.4 – Monitoring and audit means: assessment elements	31
IV – Compensation banks	36
IV.1 – United States: Mitigation Banks & Conservation Banks	38
IV.2 – In-lieu fee programme: Alternative to banks and direct implementation	43
IV.3 – Australia: BushBroker & BioBanking	46
IV.4 – Germany: Land pools (Flächenpools) & eco-accounts (Ökokontos)	48
IV.5 – Netherlands: Compensation bank pilot projects	50
IV.6 – France: Offset supply trial	51
V – Methodology	55
V.1 – In-kind offsets: assessment methods	57
V.2 – Financial compensation: calculation modes	86
VI – Conclusion	89
BIBLIOGRAPHY	92
APPENDICES	94
APPENDIX I: DETAILED LEGAL FRAMEWORK	95
APPENDIX III: FRENCH SITUATION	115
APPENDIX IV: SUMMARY TABLES BY COUNTRY	119



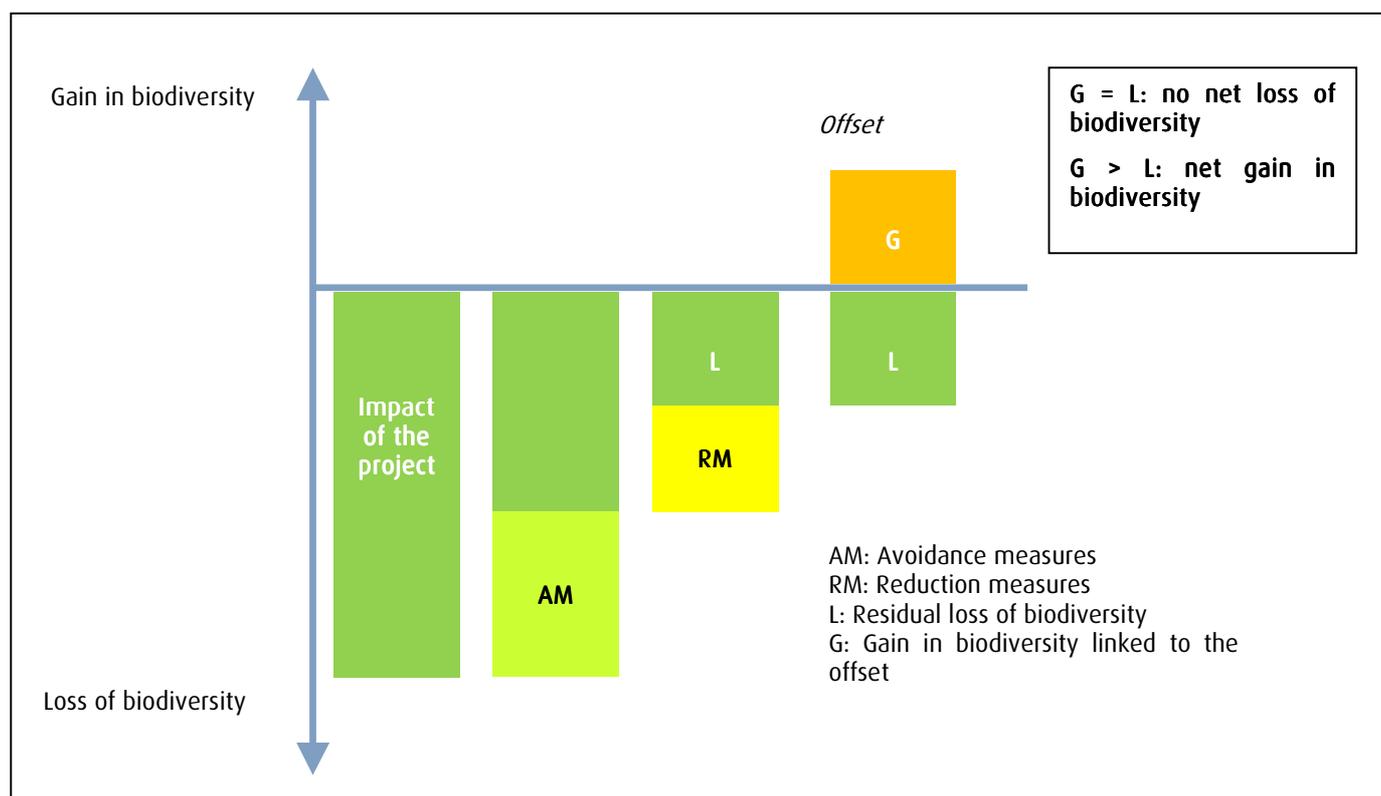
(Source: Delphine Vilaysack)

I – INTRODUCTION

Confronted with the constant erosion of biodiversity, the development of instruments such as offsets was strongly encouraged during the Conference of the Parties at the 2010 Convention on Biological Diversity (CBD) in Nagoya.

An offset is an action aiming to offer a positive counterbalance to an irreducible harmful impact caused by a development project, so as to maintain the biodiversity in an equivalent or better state than that observed before the project begins. It falls within the framework of the "avoid, reduce, offset" sequence. Consequently, offsetting is only envisaged as a last resort, once measures to avoid and reduce impacts have been implemented (see figure 1).

FIGURE 1: AVOID, REDUCE AND OFFSET IMPACTS ON BIODIVERSITY



This study falls within the context of policy changes relating to biodiversity offsets in France, with the introduction of stricter regulations relating to the scope, implementation conditions and inspection of measures. The aim of the work guided by the Ministry of Ecology, Sustainable Development and Energy (MEDDE) is to lead to a national doctrine¹ and guidelines on the "avoid, reduce, offset" sequence.

The study provides an inventory of the implementation of offsets outside of France in order to provide better knowledge of the offsetting system in other countries (legal framework, stakeholders involved, level of implementation, monitoring and audit mechanism, etc.), gather experience feedback and identify the best practices which may be applied in France.

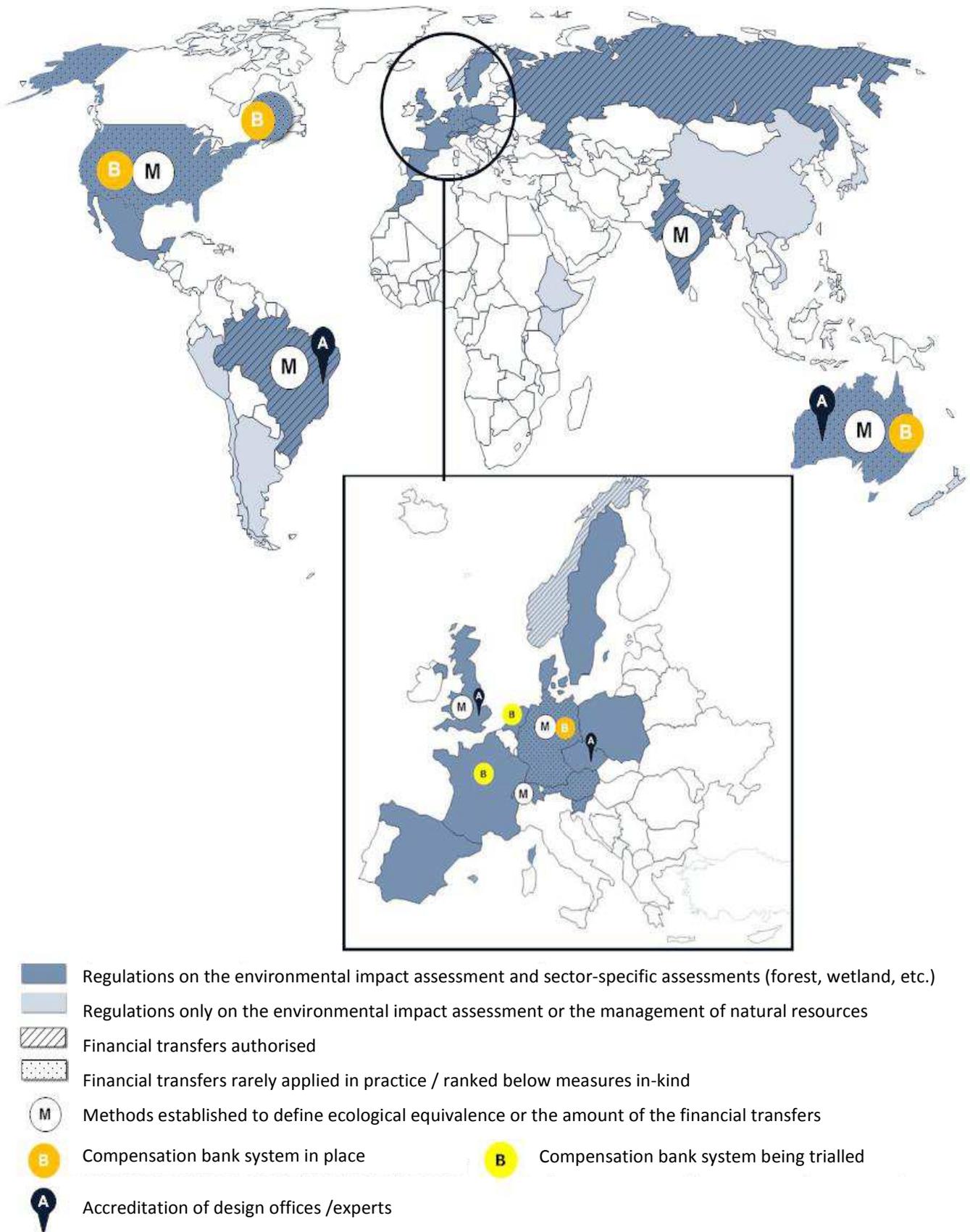
To do this, the MEDDE has conducted a survey by drawing up a questionnaire (see Appendix II), coordinated by the General Directorate of the Treasury, to which the economic services of 29 countries responded. These countries were Argentina, Australia, Austria, Brazil, Canada (Quebec), Chile, China, the Czech Republic, Denmark, Ethiopia, Germany, India, Japan, Kenya, Mexico, Morocco, the Netherlands, New Zealand, Norway, Peru, Poland, Russia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, the United States and Vietnam.

Not all countries appear in all parts of the study due to a lack of sufficient data or of a legal framework for offsetting. Nonetheless, all of the countries are included in a summary table in the appendix (see Appendix IV).

This report focuses on the regulations in each country, the institutional framework, the terms of offsetting, the methodology and the operation of compensation banks where these exist. The responses provided to the questionnaire have been compared with the available bibliography, in accordance with a country by country analysis and a comparative approach which, as far as possible, takes account of the differences in terminology employed in the countries studied.

¹ The French doctrine, adopted in May 2012, is available online: http://www.developpement-durable.gouv.fr/Doctrine-eviter-reduire-et,28438.html?var_mode=calcul. The guidelines, which will complement the doctrine in terms of methodology, should be published by 2013.

FIGURE 2: KEY CHARACTERISTICS OF OFFSETTING IN THE COUNTRIES STUDIED



II – LEGAL AND INSTITUTIONAL FRAMEWORKS

II.1 – REGULATIONS²

- The objective of offsets: "no net loss" of biodiversity

Biodiversity offsets fall within an aim for "no net loss" of biodiversity, although this objective has not been clearly defined in every country. It is a question of aiming for a neutral or even positive balance (net gain) between the loss of biodiversity linked to a development project and the gain offered by the offset. The first explicit "no net loss" policy was introduced in the United States for certain wetlands in the 1970s, although it was not until the 1980s that it became a genuine national ambition. The European directives from which the Natura 2000 network arose also follow this policy (Defra, 2009). In 2002, the state of Victoria in Australia established a net gain policy targeting native vegetation³ (DSE, 2002).

- A range of schemes with various constraints

The 29 countries studied have established more or less strict legislative schemes on biodiversity offsets, which are distinguished according to several criteria: whether they make the application of offsets mandatory or optional and therefore dependent on the good-will of the project developers; whether they are based on an international, regional or national framework; and whether they apply to the environment in general, or to biodiversity or one of its components specifically (see table 1).

In 1969 in the United States, the National Environment Policy Act (NEPA) established the first legal framework relating to impact assessments that set out to identify impacts on biodiversity in particular. This legal instrument has since been developed throughout the world: in France within the framework of the Law for the Protection of Nature (1976), in Germany through the Federal Nature Conservation Act (1976), within the European Union through the EIA⁴ directive (85/337/EEC) in 1985, subsequently transposed into the national law of each Member State and in Japan through the Environmental Impact Assessment Law (1999), etc.

In all the countries studied, offsets are mainly provided within the framework of the environmental impact assessments of development projects which target not just biodiversity but the environment in general. They can also be conducted at plan and programme level (biodiversity taken into account in regional planning in Germany, the United Kingdom and Norway in particular). In some countries that require environmental impact assessments, offsetting is practiced little or not at all, either because it is considered as equalling a "right to destroy" and therefore not recommended by the public authorities (Kenya), or because the mechanism requires new competence to be developed, possibly with the support of international NGOs, as is the case of the Business and Biodiversity Offsets Program (Vietnam).

Within the European Union, the Natura 2000 network was created in 1992 based on the "Habitats" (92/43/EEC) and "Birds" directives (79/409/EEC). This network brings together habitats and plant and animal species whose conservation requires the designation of a conservation area or strict protection. When a development project threatens a Natura 2000 site, the project developer is obliged to implement measures to avoid and reduce its impacts. If notable residual impacts persist, and the project is deemed to be of major public interest and there is no alternative, the adoption of offsets like for like is the essential condition for a project to be approved. The description of the measures adopted must be sent to the European Commission for information or opinion.

In most countries, sector-specific laws have been introduced to preserve biodiversity components that present particular challenges, such as wetlands (Canada, Russia and the United States), forest (Brazil, India, the Netherlands, Morocco and Russia), protected spaces outside the Natura 2000 network (Denmark, Mexico, Sweden, Switzerland, the United Kingdom, etc.); and protected species (Australia, the Netherlands and the United States). These sector-specific laws are either used to specify the offsetting obligations, or to impose the introduction of compensatory measures for the natural environments at stake. In India, for example, authorisation to establish a steelworks run by a Korean industrialist has been delayed by 5 years due to the insufficiency of proposed forestry offsets.

² Source: Responses to the questionnaire. See the detailed legal framework in Appendix I.

³ Native vegetation is the vegetation already found in Australia before European colonisation. It includes trees (small trees and shrubs), herbaceous vegetation, wetland plants, etc.

⁴ The EIA – environmental impact assessment – directive or "projects" directive of 27 June 1985 (85/337/EEC) requires the project developer to conduct a study into the environmental impact including a description of the measures envisaged to avoid, reduce and, where possible, offset any notable adverse effect on the environment (Appendix IV).

TABLE 1: SCOPE OF THE REGULATORY SYSTEMS IN THE COUNTRIES STUDIED

		Scope of the regulations stipulating offsets					Compensation bank	Financial transfer
Country	Environment	Protected spaces/species	Forest	Water / Wetlands	General biodiversity			
European Union	France	Scope covered	Scope covered	Scope covered	Scope covered	Scope covered	Existing system	
	Germany	Scope covered	Scope covered	Scope covered	Scope covered	Scope covered	Existing system	Being trialled
	Austria	Scope covered	Scope covered	Scope covered		Scope covered		Being trialled
	Denmark	Scope covered	Scope covered	Scope covered				
	Spain	Scope covered	Scope covered					
	Netherlands	Scope covered	Scope covered	Scope covered			Existing system	Being trialled
	Poland	Scope covered	Scope covered					
	United Kingdom	Scope covered	Scope covered			Scope covered		
	Czech Republic	Scope covered	Scope covered					
	Slovenia	Scope covered	Scope covered					Being trialled
	Sweden	Scope covered	Scope covered		Scope covered			
Outside of European Union	Australia	Scope covered	Scope covered				Existing system	Authorised
	Brazil	Scope covered	Scope covered	Scope covered				Authorised
	Canada (Quebec)	Scope covered	Scope covered		Scope covered		Existing system	Being trialled
	Chile	Scope covered						
	United States	Scope covered	Scope covered	Scope covered	Scope covered		Existing system	Being trialled
	India	Scope covered		Scope covered				Authorised
	Japan	Scope covered	Scope covered					
	Morocco	Scope covered		Scope covered				Being trialled
	Mexico	Scope covered	Scope covered			Scope covered		As a last resort or rarely applied
	Norway	Scope covered	Scope covered					Authorised
	New Zealand	Scope covered	Scope covered					Being trialled
	Peru	Scope covered						
	Russia	Scope covered	Scope covered	Scope covered	Scope covered			Authorised
	Switzerland	Scope covered	Scope covered			Scope covered		Being trialled

Scope covered

Existing system	Authorised
Being trialled	Deposit
	As a last resort or rarely applied

Source: 2011 survey of economic services on offsetting

The emergence of market mechanisms⁵

Although in the majority of cases compensatory measures are designed and implemented by the project developer to offset the impacts of its project only (calling on one or more service providers), some countries have introduced the possibility for the project developer to be released of its obligation to offset by approaching a specialist third party: the compensation banks.

The United States was the first country to introduce compensation banks and therefore has the most advanced system of this kind. There are two types of bank: mitigation banks, which apply to wetlands and water resources under the Clean Water Act (1977), and conservation banks focusing on threatened species under the Endangered Species Act (1973). Changes to federal

⁵ See part IV on mitigation banks.

legislation⁶, particularly with the rule on Compensatory Mitigation for Losses of Aquatic Resources which came into force in 2008, homogenising offset standards and ranking measures to the benefit of compensation banks, as well as the appearance of guides, have enabled the system to be improved with a view to reaching the objective of "no net loss" of wetlands set by the administration in 1989.

Australia has no framework for biodiversity offsets at federal level but in some states provides compensation bank mechanisms for the preservation of native vegetation: this is the case of the BushBroker programme, introduced in Victoria in response to the "net gain" objective set by the Native Vegetation Management Policy in 2002, and the BioBanking programme recently established in New South Wales.

The emergence of compensation banks in Germany has been made possible by changes to its legal framework to move towards greater flexibility in terms of equivalence, through the revision of the Federal Nature Conservation Act in 2002. Strict functional equivalence (measure like for like and in situ⁷) between impact and offset is no longer imposed: the offset must be similar to the impact in geographic and functional terms but may relate to a type of habitat other than that affected (Wende et al, 2005). The German "land pools", mainly held by municipalities to offset their own impacts, primarily target protected habitats and species but also ecosystems and their functions.

Two pilot compensation bank projects have been trialled in the Netherlands and France. A hybrid system for aquatic environments is being developed in Canada (Quebec), enabling a project developer to use its offset "surplus" for future projects. Two Swiss cantons have launched a database of potential offset sites based on the German model.

■ Financial transfers: from the terms of a last resort measure to an offset method in their own right

In 14 of the countries studied, financial transfers may be substituted for offsets. In other words, a project developer is allowed to pay a sum as a means of offsetting, and does not then need to account for the suitability or successful implementation of the measures planned in light of the residual impacts of its project. Financial transfers have different configurations in different countries. A distinction is made between:

- financial transfers accepted exceptionally as a last resort, when it is impossible to implement measures "in-kind"⁸ (Austria and Switzerland) and when the project is deemed of public interest or there is no irreversible destruction of protected species' habitats (Germany);
- financial transfers tolerated but ranked below measures "in-kind", as is the case in the Netherlands (Fauna and Flora Act and Forest Act), Slovenia, Quebec (Canada), New Zealand, Morocco and Queensland, Australia (Marine Fish Habitat Offsets Program);
- financial transfers considered to be an offset method in their own right, equal to the measures "in-kind" implemented by the project developer. This is the case in India (CAMPAs⁹), Brazil (National System of Conservation Units¹⁰), the United States (in-lieu fee programme¹¹), the state of South Australia (Native Vegetation and Scattered Trees Offsets Program), Norway and Russia.

The other countries studied require the project developer to implement measures "in-kind" and do not allow an offset to take the form of a financial transfer, due notably to the associated risks in terms of releasing the project developer from its responsibility and the uncertainty of how the sums are allocated¹².

Financial transfers are to be distinguished from the financial guarantee mechanisms which may exist in some countries. In Mexico for example, the General Law of Ecological Equilibrium and Environmental Protection requires the project developer to arrange insurance or pay a deposit that guarantees the offsets "in-kind" planned for projects located in wetlands or protected natural areas, or affecting endemic threatened and endangered species, or benefitting from specific protection¹³ will be

⁶ In 1980: provisions of the Clean Water Act in title 33, parts 325 and 332 of the Code of Federal Regulation for the US Army Corps of Engineers (USACE) and in title 40, part 230 of the same code for the Environmental Protection Agency (EPA).

In 1990: the Memorandum of Agreement (MOA) between the USACE and EPA clearly states the objective of "no net loss" and clarifies the conditions under which a permit can be granted, namely in compliance with the "avoid, reduce and offset impacts" sequence.

In 2008: the Mitigation for Losses of Aquatic Resources notably establishes a hierarchy of measures, i.e. that the purchase of credits from a compensation bank is favoured over an in-lieu fee programme and direct implementation by the project developer.

⁷ See part V on methodology for the definition of terms.

⁸ The term "in-kind" used in this study (translation in French: "*en nature*") characterises compensation measures that are implemented via direct ecological measures (e.g. restoration of habitats) and not via financial transfers. Note that the term "in-kind" also often refers to compensatory measures that are "like for like" (ecological equivalence).

⁹ If a development project affects the forest heritage, the project developer must pay a sum which is transferred to the State Compensatory Afforestation Fund Management and Planning Authority.

¹⁰ For all industrial projects, Brazilian legislation requires compensation in the form of payments to the National System of Conservation Units.

¹¹ See part IV on compensation banks.

¹² See part III on the offset terms.

¹³ The amount of the deposit is calculated based on the cost of the offsets (assessments, implementation of the measures, monitoring, audit, etc.). This cost is estimated by the project developer and must be validated or even reassessed by the Environmental Impact and Risk Branch (DGIRA).

conducted. In the event of non-compliance, the deposit is paid to the public authority which takes the place of the project developer in implementing the offset.

France requires the project developer to implement measures "in-kind" and does not make provision for financial transfers, except in the case of forest clearing (article L. 311-4 of the Forestry Code) where this option is rarely put into practice. Financing (e.g. financing of these, financial contribution to an action to protect a species, etc.) may accompany ecological measures as part of an offset programme but cannot replace them.

■ Limits to the application of offsets

The wording of laws, particularly relating to environmental impact assessments, can be open to interpretation. According to the country and the terminology used¹⁴, offsets may be considered to be mandatory or optional. Furthermore, there is divergence in the use of the term "offset" in different countries: in the United States, the term "mitigation" is used to describe avoidance, reduction and offset measures, whilst elsewhere the term "mitigation" is usually used only to qualify avoidance and reduction measures, with "offset" referring to measures to compensate for impacts that remain subsequent to avoidance and reduction. This type of divergence in terminology can be a source of confusion and does not facilitate the comparison between countries.

Furthermore, regulatory references to offsets do not always encompass the same conservation constraints and objectives. The scope of laws relating to offsets is varied. It extends from the wide notion of "the environment"¹⁵, of which biodiversity is just one part and therefore risks being considered marginally, to biodiversity components such as protected spaces and species ("remarkable" biodiversity) or certain ecosystems such as forest. A more targeted scope makes the laws more restrictive in terms of offsets but can lead to a loss of coherence if the objective is not to restore the overall function of the threatened environment.

Finally, several countries highlight the importance of avoidance and reduction in light of the impossibility of offsetting in-kind. In Germany for example, offsets cannot be used to justify going ahead with projects whose residual effects on biodiversity are unacceptable: the option of a project "no go" is seriously considered and is applied if a unique habitat is destroyed or impacts are irreversible. In Switzerland, regulations list biotopes that cannot be affected as they are considered irreplaceable, notably due to their age and the time it has taken them to develop.

A legal framework is essential for the successful implementation of offsets and all the more so for imposing them. It must be associated with an institutional framework clearly stating the responsibility of each stakeholder involved in the design, introduction and inspection of offsets.

¹⁴ In terms of offsets, laws use terms such as, for example, "where possible", "if possible", "as far as possible" (EU countries), "possibly" (Japan) and "and/or" (Chile and Morocco).

¹⁵ The environment is defined as an organised, dynamic and evolving system of natural (physical, chemical and biological) and human factors (economic, political, social and cultural) where living organisms operate and/or human activities take place, and which directly or indirectly, immediately or in the long term, has an effect or influence on these living beings or human activities at a given moment and in a defined geographic area (André et al, 2010).

II.2 – STAKEHOLDERS

bureaux
 d'étude
 opérateur
 service
 courtier
 instructeur
 maître
 Province USFWS
 experts Canton
 d'ouvrage
 ONG autorité
 EPA
 environnementale
 Land Etat
 USACE
 société
 civile

Summary

To be authorised to conduct a development project and counterbalance its possible residual effects on biodiversity, the project developer must commit to implementing the offsets for which it is responsible. To conduct prior environmental assessments, it can call on service providers and experts, who in some countries (Brazil, Czech Republic and United Kingdom) are accredited to guarantee the quality of the assessments and proposed measures.

The administrative authority assesses the suitability of the proposed offsets, supported in particular by the opinions of consulting bodies of experts and, where applicable, authorises the project. Environmental Compensation Chambers were created to this end in Brazil. Within the Member States of the European Union, an independent environmental authority is responsible for proffering a public opinion. In federal or highly decentralised countries such as Germany, the United States and the Netherlands, the decision-making power is generally assigned to local authorities (state or province according to the country in question).

An audit body is responsible for supervising the application of measures, such as the nature conservation agencies in the United Kingdom and the state administrative services in Austria.

Non-governmental and research organisations can play a considerable role during the public consultation and as an audit body, as is the case of NGOs in Switzerland and nature conservation associations in the Netherlands. In India and Brazil, they are perceived to be major stakeholders due to their expert abilities and political influence.

In countries that have compensation banks, other stakeholders may emerge to bring together the supply and demand for offsets and render the system transparent: this is the case in Australia, where brokers are accredited by the government to create the link between the private landowners who generate compensation credits and the project developers that require them.

Source: 2011 survey of economic services on offsetting



(Source: Reuters)

The implementation of offsets requires the mobilisation and coordination of several stakeholders. In general, although their presence varies by country, stakeholders are distinguished by their roles and responsibilities.

- The project developer¹⁶ is solely responsible for implementing the measures to offset its project's impacts on biodiversity, except in the case of authorised financial transfer or if it purchases credits from a compensation bank in the United States and the state of New South Wales in Australia. It can be a public or private industrialist, a regional authority, a government agency (e.g. Department of Transport) or a private individual conducting development.
- The service providers and experts generally commissioned by the project developer to conduct the impact assessment and design avoidance, reduction and compensatory measures: these are notably design offices, expert naturalists, nature conservation associations, etc. In some countries the service providers are certified. This is the case for example in the Czech Republic, where biodiversity impact assessments must be conducted by biology experts accredited by the Ministry of the Environment, and the United Kingdom, where 4,000 ecologists belong to the Institute of Ecology and Environmental Management and abide by its code of professional conduct.
- The decision-making administrative authority or instructing service (the two sometimes form the same entity) support the project developer in the impact assessment process, offering it advice and providing all available information necessary to the assessment. The degree of support, which varies by country, appears to be particularly high in Switzerland, Mexico and Spain. The authority grants authorisation for a project and is sometimes also responsible for auditing the implementation of the recommended offsets (see table 2).

TABLE 2: INSTRUCTING SERVICES AND DECISION-MAKING AUTHORITIES IN THE COUNTRIES STUDIED

Country	Instructing services and decision-making administrative authorities
France	<p>Departmental Territorial Directorate - of the Sea (DDT(M)): prepares the file, particularly for "Law on Water" impact assessments and clearing requests</p> <p>Regional Directorate of the Environment, Development and Housing (DREAL): prepares the file, particularly for waivers of the strict protection of protected species and impact assessments for installations classified for environmental protection (ICPE)</p> <p>Prefect or Ministry of Sustainable Development (according to the project): grants authorisation</p>
Germany	Authorities in the state (the state's Ministry of the Environment) and municipalities: examine the offsets and grant authorisation
Austria	District authorities: prepare the files and grant authorisation
Brazil	Authority responsible to the state (SEMA) or central government (IBAMA): evaluates the impact assessment, organises public consultations, authorises the project and sets the value and actions corresponding to the environmental or forestry offsets
Canada (Quebec)	Provincial authorities (Ministry of Sustainable Development, Environment and Parks and Ministry of Natural Resources and Wildlife): prepare the file and grant authorisation
Chile	Ministry of Environment, in coordination with the Ministries of Agriculture, Transport, Energy, etc.: sets the conditions of the offset and inspects the execution
Denmark	State (not specified)
Spain	<p>Ministry of the Environment: determines the offsets</p> <p>Autonomous communities: can assess the projects in certain cases</p> <p>General State Administration: approves the project</p>

¹⁶ Different terms are employed to qualify the project developer, notably: "promoter" (Canada, Mexico, Germany and the United States), and "project sponsor" (Germany, the United States and United Kingdom).

India	Ministry of Environment and Forests: prepares the projects affecting forest covering over 40 hectares Regional branches of the Ministry of Environment and Forests: prepare the projects affecting forest covering less than 40 hectares
Japan	National government (not specified)
Morocco	High Commissariat in charge of Water, Forests and Combatting Desertification (HCEFLD)
Mexico	Environmental Impact and Risk Branch (DGIRA): analyses and assesses the projects
Norway	Public authorities: grant authorisation and determine any offsets
New Zealand	Department of Conservation Local Authorities
Netherlands	The provincial authority's Departments of Spatial Development and Conservation (ROH) and Ecology (ECL): prepare the project Provincial authority: grants authorisation
Peru	Sector-specific ministries: grant authorisation
United Kingdom	Local authorities in charge of planning
Russia	Competent authorities: grant permits
Slovenia	Administrations (Technical Ministries of Agriculture and the Environment, the Economy, the Interior and Transport)
Sweden	National authorities, counties, environmental courts or government depending on the scenario: grant authorisation
Switzerland	Federal Office for the Environment (FOEN): grants authorisation for environments of national importance Canton: grants authorisation for environments of regional or local importance

Source: 2011 survey of economic services on offsetting

■ In some countries, the development project and planned avoidance, reduction and offset measures are submitted to an environmental authority and/or consulting bodies for their opinion to be sure of the project's advisability and the suitability of the measures (see table 3).

TABLE 3: ENVIRONMENTAL AUTHORITIES AND CONSULTING BODIES IN CERTAIN COUNTRIES

Country	Environmental authorities and consulting bodies
European Union	Independent environmental authority (development projects submitted to a public enquiry): gives an opinion on correct compliance with the avoid, reduce, offset sequence and the quality of the proposed offsets with regard to the residual impacts
France	Environmental authority exerted, depending on the project, by the prefect, the General Council for the Environment and Sustainable Development (CGEDD) or the Ministry of Sustainable Development Bodies consulted formally for certain procedures ¹⁷ : National Council for the Protection of Nature (CNPN), Councils for the Environment and Health and Ecological Risks (CODERST)
Brazil	Environmental Compensation Chambers comprising representatives of public bodies responsible for the environment as well as civil society and university organisations: assess and inspect the methods used to calculate the environmental impacts presented in the impact assessments; determine the terms for applying the sums paid
Canada (Quebec)	Municipalities: involved in implementing offsets when these are represented by the protection of natural environments and their integration into urban planning documents Public Audience Office (not in every case)
Mexico	Bodies commissioned in technical support of the instructing service: General Directorate of Federal Maritime and Terrestrial Zones, General Directorate of Forest and Land Management, National Commission for Biodiversity (CONABIO), National Commission for Protected Areas (CONANP), etc.
Netherlands	Provincial commission within conceptual councils (ICCA): verifies the observations of the provincial authority's instructing services
Sweden	Municipalities: right of veto, opinion during a consultation involving the public authorities (Environmental Protection Agency, Transport Agency, experts, etc.)

Source: 2011 survey of economic services on offsetting

In some countries (Brazil, India and Slovenia), civil society, composed of research centres, NGOs and environmental conservation associations, has a role comparable to that of an independent authority.

■ Associations and research centres may intervene at two levels. Firstly, they have the opportunity to express their opinion during the public consultation that forms part of the environmental assessments. In some countries such as Germany, India, Mexico, the Netherlands and Switzerland, they can also audit the implementation of offsets and alert the competent authorities in the event of their absence. This function sometimes compensates for the lack of manpower at the public agencies in charge of auditing.

In Switzerland, the implementation of offsets is monitored by NGOs in the cantons. These organisations, financially supported by the Confederation, have a right of appeal if they have been working nature conservation at national level for over 10 years. The Federal Office of the Environment (FOEN) relies on the NGOs to report any problems to the courts. They conduct effective monitoring of the entire Swiss territory, obtaining satisfaction for 90% of the appeals they lodge. This monitoring has contributed to limiting the loss of wetland surface area over 25 years to just 1%.

In Germany, civil society pays great attention, particularly for large-scale development projects, to whether authorities and project developers comply with European directives and national and local rules. If they do not, it does not hesitate to employ specialist lawyers to challenge the competent authorities.

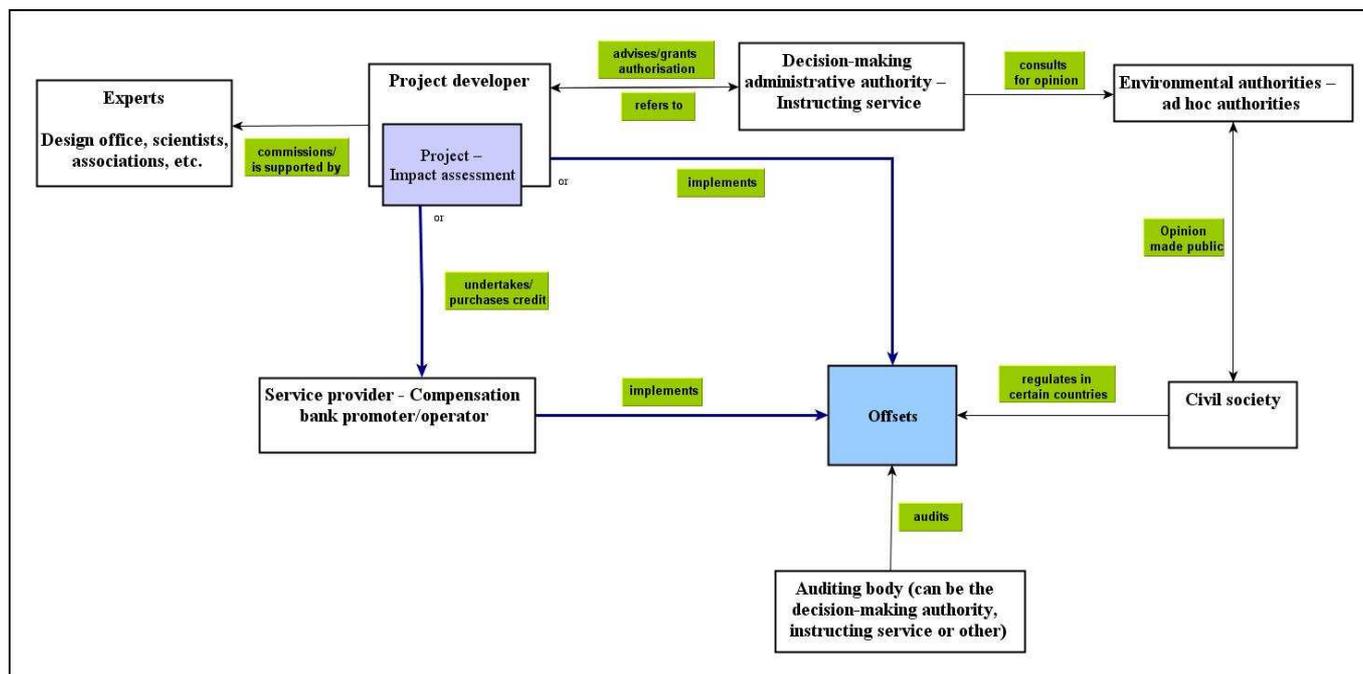
In the Netherlands, the pressure of nature conservation associations is leading some project developers to voluntarily implement offsetting. By way of example, within the framework of the proposed urban extension to the municipality of Almere (province of North Holland), local nature conservation associations have exerted pressure on the project developers to reforest even though they were not legally obliged to offset.

¹⁷ Other bodies, in particular certain public establishments, may be consulted by the instructing service to give an informal opinion or provide an assessment.

In Brazil, civil society, in relation with the Public Ministry, contributes to auditing the quality of impact assessments and monitoring the procedures relating to environmental permits. During public consultations, local associations (environment and human rights) generally present numerous challenges to the environmental impact assessments, arguing on the manipulation of data or the separation of components which should be taken into account in an integrated manner to minimise the degree of impact.

Finally, a body other than the instructing service or decision-making authority may be given special responsibility for auditing the introduction of offsets, such as the Quebec Environmental Control Centre; the services of the Federal Attorney Generalship of Environmental Protection (PROFEPA) in Mexico; the nature conservation agencies in the United Kingdom; the state administrative services and, in certain cases, voluntary mountain rescue and nature conservation bodies in Austria; the Forest Service and regional services of the Ministry of Agriculture and the Environment, technical municipal services and NGOs in Slovenia; the provincial authority's Department of Rural Areas and the Inspection Service at the Ministry of Economic Affairs, Agriculture and Innovation in the Netherlands.¹⁸

FIGURE 3: OVERVIEW OF OFFSET STAKEHOLDERS



Examples of institutional schemes

UNITED STATES: HEAVY INVOLVEMENT OF THE PRIVATE SECTOR (COMPENSATION BANK)

Within the framework of its development project, the project developer generally commissions environmental consultants or specialist design offices to conduct the impact assessment, which it then submits for evaluation by the competent authorities in order to obtain authorisation: the USACE¹⁹ when the project affects wetlands or water resources (see figure 4), the USFWS²⁰ if it impacts threatened and endangered species, and the NOAA²¹ for marine and anadromous species (see figure 5). When making its decision, the USACE relies on the opinions of the EPA²², the USFWS and the NOAA, which also take part in the evaluation. Unlike the other agencies, the EPA can oppose the granting of a permit by exercising its right of veto if it judges the damage to the environment to be too great.

The project developer has several options for introducing offsets: direct implementation, the purchase of credits from a compensation bank, or the payment of a sum into an in-lieu fee programme managed by a not-for-profit body, to which, on condition of receiving the approval of the USACE, it delegates its offset responsibility.

¹⁸ See part III on offset terms (monitoring means).

¹⁹ US Army Corps of Engineers (Department of Defence).

²⁰ US Fish and Wildlife Service (Department of Interior).

²¹ National Oceanic and Atmospheric Administration (Department of Commerce).

²² Environmental Protection Agency.

To develop a compensation bank²³, the bank's promoter, a for-profit body, must meet the requirements of the interagency assessment team (IRT or CBRT)²⁴, in particular by proving the ecological validity of its project in terms of site location and planned measures. The assessment team is responsible for evaluating the sites, monitoring the entire bank opening process and ensuring supervision. The promoter must also introduce a conservation easement²⁵ to guarantee the sustainability of the offsets and may call on specialist lawyers to do this.

The USACE then signs a framework agreement with the bank promoter, setting out the bank's responsibilities, the required performance and its assessment, the management and audit requirements and the bank's credit approval conditions. The promoter is allowed to begin selling its credits once the framework agreement has been signed.

Civil society has the opportunity of expressing its opinion on the establishment of a compensation bank during the public consultation or enquiry.

²³ See part IV on compensation banks.

²⁴ The Interagency Review Team is led by the USACE and comprises representatives of the different agencies, in particular the EPA and USFWS for the mitigation banks and the Conservation Banking Review Team for the conservation banks.

²⁵ A conservation easement or environmental easement agreement is a legal act concluded between a land owner and third party, which enables a space to be protected in perpetuity by forbidding its development or urbanisation. It procures actual rights attached to the funds, independently of the transmission of the property to another owner. In the study we use the term *conservation easement* in the American context and *environmental easement agreement* to refer to the tool developed in other States such as Australia.

FIGURE 4: STAKEHOLDERS IN OFFSETTING IMPACTS ON WETLANDS OR WATER RESOURCES IN THE UNITED STATES

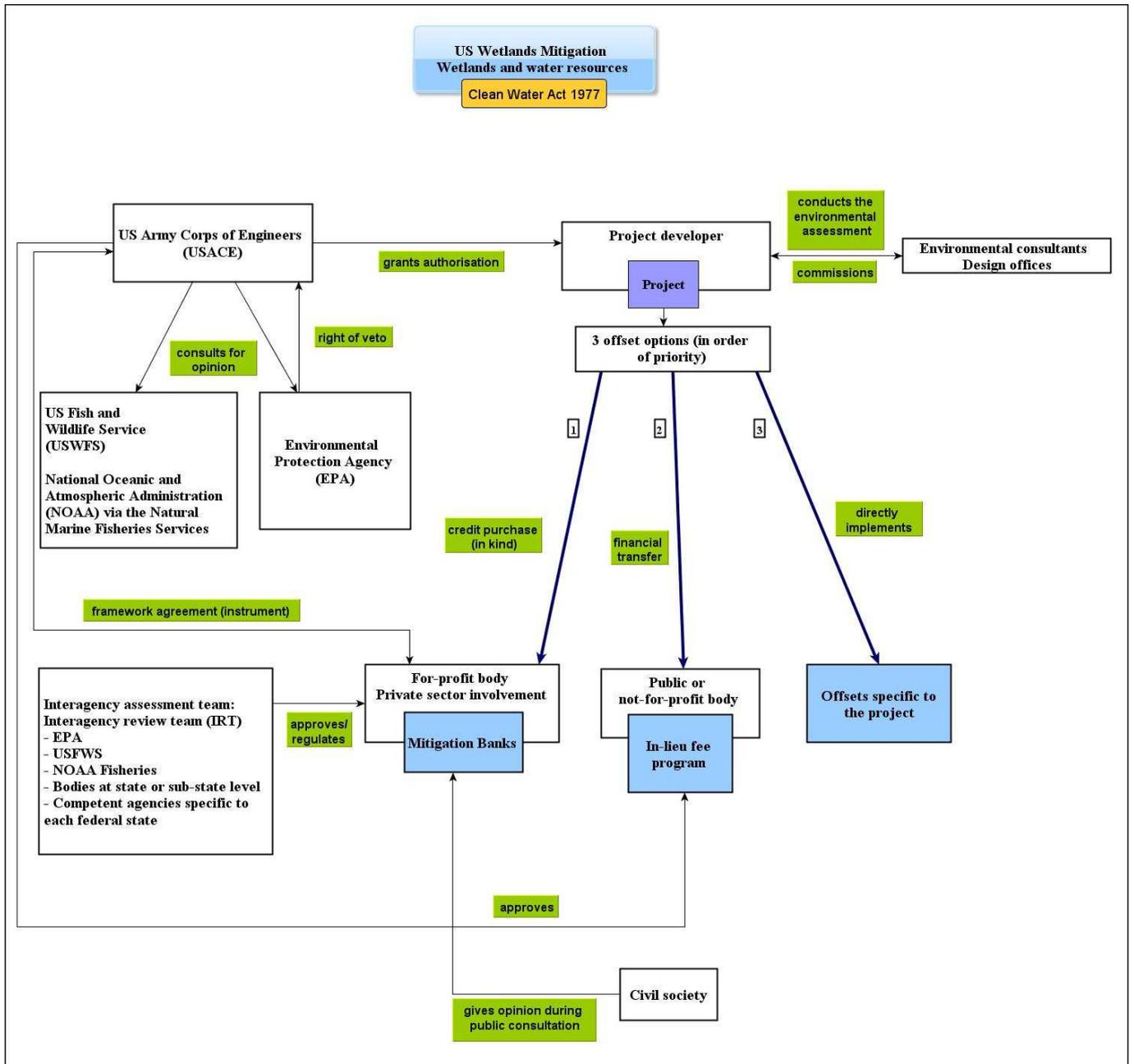
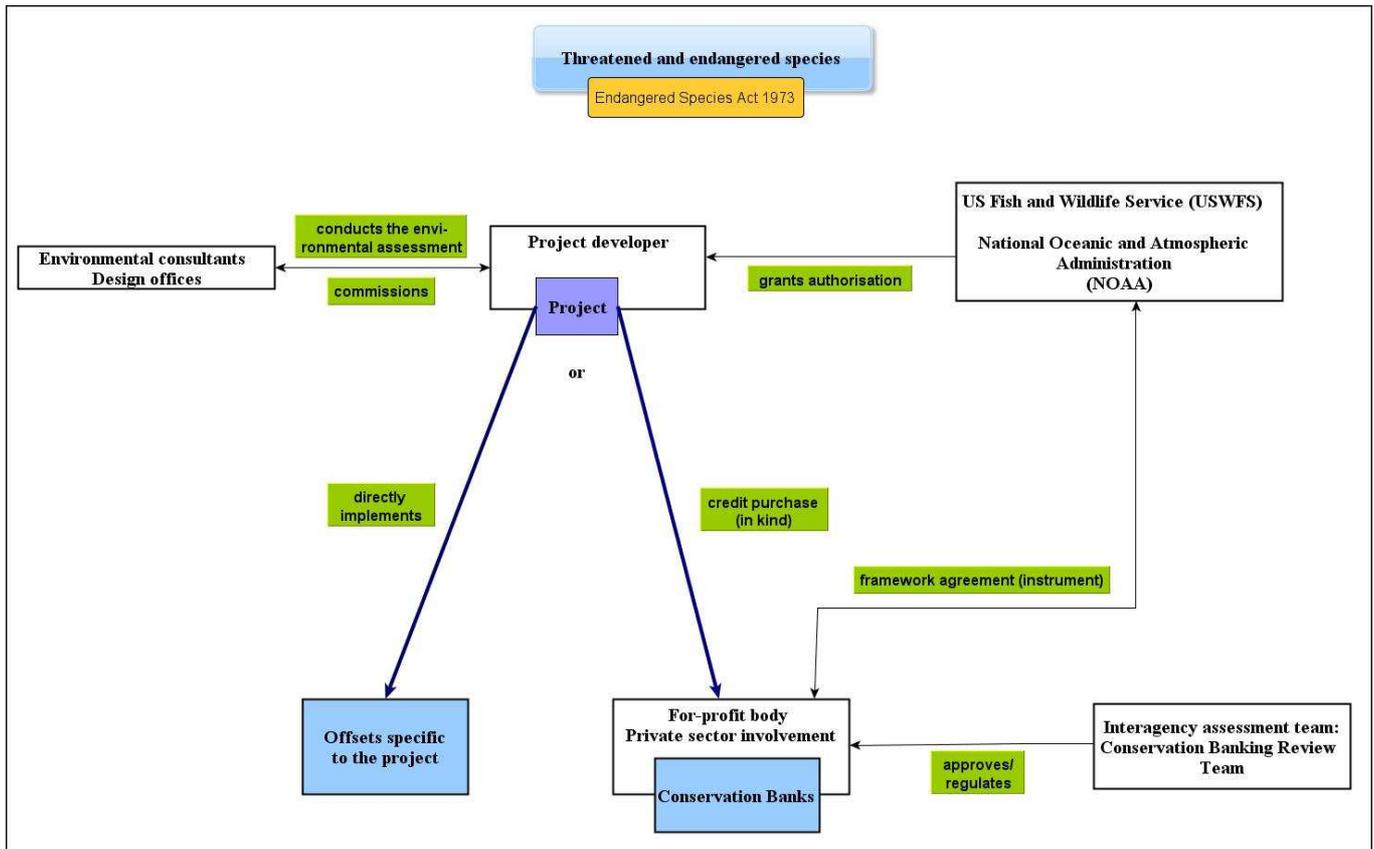


FIGURE 5: STAKEHOLDERS IN OFFSETTING IMPACTS TO THREATENED AND ENDANGERED SPECIES IN THE UNITED STATES



AUSTRALIA: A SYSTEM STRUCTURED AROUND OFFSET "BROKERS"

In Australia, the Department of Sustainability, Environment, Water, Population and Communities acts as a regulator and grants permits. Three types of stakeholder intervene within the framework of the compensation banks:

- Credit purchasers: project developers (urban development, infrastructure or mine extraction project sponsors), wind energy producers and farmers.
- Credit providers: landowners, government agencies and municipal councils.
- Government agencies acting as brokers within the different programmes (BioBanking in New South Wales, BushBroker in Victoria, the Native Vegetation and Scattered Tree Offsets Program in South Australia and the three offset programmes in Queensland): the brokers act as an interface between the project developers and credit providers, bringing together the offset supply and demand. For example, within the BushBroker programme, the brokers search the database for available credit in the weeks following the offset request. A list of potentially appropriate offset sites is then sent to the project developer. Accredited private consultants responsible for site audits and assessments may also be called to act as brokers; this is the case for EcoLogical and EarthTrade for BioBanking in New South Wales and Queensland respectively. In Victoria, to be accredited as a broker, a memorandum must be signed with the Department of Sustainability and Environment and the training provided by the Department must be followed²⁶.

²⁶ <http://www.dse.vic.gov.au/conservation-and-environment/bushbroker-accredited-organisations>

INDIA: CIVIL SOCIETY, A MAJOR STAKEHOLDER

The Biological Diversity Act 2002 established authorities responsible for biodiversity conservation at three levels: at national level with the creation of the National Biodiversity Authority, federal state level with the State Biodiversity Boards and local level with the Biodiversity Management Committees.

With regards to offsetting, the State Forest Departments within the 28 federal states are responsible for applying forestry law and auditing the measures. When they do not have the necessary expertise or need assistance in implementing the measures in the field they approach civil society as a major stakeholder in biodiversity. Environmental protection associations are numerous and do have a voice. Many of them have expertise in the field as well as political influence. Research centres are another stakeholder regularly called on by the State Forest Departments: they are asked to conduct impact assessments financed by the project developers or Ministry of Environment and Forests.

Large development and building and public works industrialists are also stakeholders in offsetting: in addition to the financial transfers required by the authorisation procedures, they generally have their own "green" teams responsible for the restoration measures planned as part of the offset within the framework of impact assessments. These industrialists call on the research centres and NGOs when necessary.

BRAZIL: AN AD HOC AUTHORITY FOR OFFSETTING

The project developer must commission an authorised design office to conduct the environmental impact assessment for its project. This assessment must propose "preventive" mitigation measures to minimise the impact and "corrective" measures as part of offsetting. If the assessment concludes that the project's impact is significant and that environmental or forest offsetting is necessary, the project developer must also conduct a technical assessment with the associated administrative procedures (including a public consultation), to define the boundaries and location of the "conservation unit"²⁷ to be created.

According to the administrative responsibility of the region concerned by the project, the environmental authorities may be responsible to the federal state (SEMA) or central government (IBAMA). In over 80% of cases, environmental regulation is conducted at state level within an institute or foundation responsible to the state's Secretariat of Environment (SEMA), itself subordinate to the Ministry of the Environment. As for the IBAMA (20% of cases), it is responsible for applying the law at federal level in collaboration with the Chico Mendes Institute for Biodiversity Conservation (ICMbio), responsible for managing the federal conservation units. The environmental authority is responsible for evaluating the impact assessment, organising public consultations, authorising the project where applicable and setting the value²⁸ and actions corresponding to the environmental or forest offset.

Environmental Compensation Chambers were instituted by Decree No. 4.340/2002 within the framework of the environmental authority. Firstly created in just a few states (notably Rio de Janeiro, São Paulo, Bahia and Rio Grande do Sul), they are composed of representatives of public bodies responsible for the environment as well as civil society and university organisations. Their role consists of evaluating and auditing the methods used to calculate the environmental impacts presented in the impact assessments and determining the allocation of the sums paid (Bezerra, 2007). The Federal Environmental Compensation Chamber was created in November 2010.

The state or federal Public Ministry can recommend civil or criminal liability actions for impacts on biodiversity. Within the framework of environmental protection, this institution is becoming important to civil society as a means of denouncing any lack of rigour in impact assessments and non-compliance with procedures relating to environmental authorisations granted by the state authorities.

NETHERLANDS: DECISION-MAKING POWER AT THE PROVINCIAL AUTHORITIES

At national level, central government is responsible for introducing the regulatory framework for offsetting and oversees the application of the offset scheme by the 12 Dutch provincial authorities.

At provincial level, the Dutch Structure Plan for Rural Areas of 1995 (*Structuurschema Groene Ruimte*) outlined the ecological network, *Ecologische Hoofdstructuur* (EHS), and charged the 12 provincial authorities with introducing a biodiversity offset regulation into the provincial spatial development plans.

The offset proposed by the project developer is submitted to the provincial authority's Departments of Spatial Development and Conservation (ROH) and Ecology (ECL). The observations of the ROH and ECL departments are verified by the Provincial Commission (ICCA). The project developer is informed of the conclusion and is responsible for making any required modifications. The project developer submits the final plan to the ROH department.

Finally, the provincial authority decides on the full or partial validation or rejection of the offset plan. With regards to development projects requiring offsets in the EHS and Natura 2000 ecological network, the provincial authority's Department of Rural Areas (LG) is responsible for conducting field visits and drafting a report on the implementation of the compensatory

²⁷ See the detailed legal framework in Appendix I. Conservation units are ecological reserves administrated by the government with the aim of preserving the environment.

²⁸ See part V on methodology.

measures. The Ministry of Economic Affairs, Agriculture and Innovation's (EL&I) Inspection Service (AID) is responsible for inspecting projects providing offsets under the Fauna and Flora Act. The AID is often informed of any non-compliance with the Fauna and Flora Act by local nature conservation associations.

In the case of the Forest Act, the provincial authority's LG department monitors compliance with the obligation to reforest in the 3 years following the cutting of over 10 ares²⁹.

According to the Court of Audits, the provincial authorities are no longer involved in implementing offsets when this is taken over by a nature conservation association such as *Natuurmonumenten*, which holds and manages 355 natural areas in the Netherlands totalling 102,000 ha and 2.5% of the national territory.

²⁹ Equivalent to 0.1 ha.

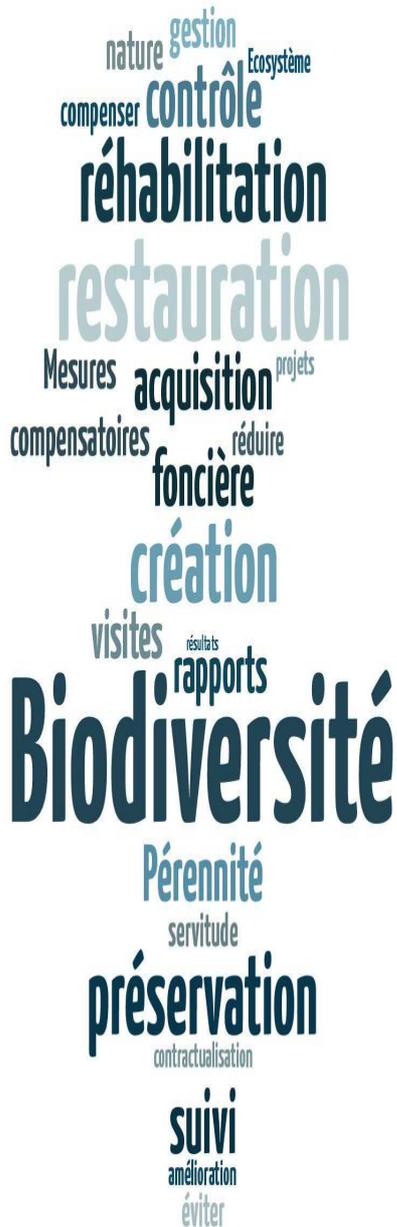


(Source: Arnaud Buissou – MEDDE)



(Source: Olivier Brosseau – MEDDE)

III – OFFSET TERMS



Summary

In-kind offsets can take the form of site restoration, rehabilitation and creation measures – actions that generally bring an ecological gain but whose results are uncertain – or preservation measures, which offer greater predictability but whose ecological added value in light of the threats weighing on the environment concerned remains to be demonstrated. The majority of countries, with the exception of the United States, do not favour one type of measure over another: the choice of measure(s) depends on the project's impacts and the condition of the site selected for the offset. In the United States, for projects affecting wetlands, restoration and rehabilitation are recommended over creation as they have a higher probability of success: a restored wetland can often benefit from the re-establishment of the initial hydrology, one of the hardest criteria to recreate. For projects that affect protected species, preservation actions take priority. This is also the case in Australia where native vegetation is considered to be irreplaceable.

In some countries, financial transfers represent an alternative to in-kind compensation, either as a last resort when the residual impact cannot be offset, or as a fully fledged offset method. Financial transfers may be similar to a payment for environmental services (Peru and India) or, when they are aggregated for several projects, to a post-impact compensation bank system (United States and Switzerland). Recourse to financial transfers must be regulated so as not to threaten the principles of the project developer's responsibility, the allocation of sums to equivalent measures and additionality with public financing. Recourse to funds (Brazil and India) is sometimes judged ineffective due to a lack of coordination in mobilising the financing.

The sustainability of the offsets relies on land acquisition or the establishment of a contract with a landowner or operator, accompanied with management measures. The period of commitment by project developers varies greatly according to country, from one year to perpetuity, and overall remains short. Sustaining the offset sites is made difficult in European and emerging countries, which suffer high pressure on land and do not have suitable legal instruments such as the environmental easement agreements in the United States and Australia.

Offsets are generally monitored and audited via reports from the project developer, field visits (often targeting large projects or banks) and, in some countries such as India, Brazil, Switzerland and the Netherlands, through the control exercised by the NGOs. Due to the lack of audit capacity and centralised monitoring data observed in all countries, it is difficult to assess the offsets and favour the experience feedback of one scheme over another. The assessments conducted in some countries (Australia, United States, Netherlands and Sweden) are mitigated and, with a few exceptions (Switzerland) far from the objective of no overall loss.

Source: 2011 survey of economic services on offsetting



The implementation of an offset is based on the choice of ecological terms, the equivalence between the compensatory measure (ecological gain) and the impact (ecological loss), the means of sustaining it and the monitoring and audit method. It is only considered after a development project's impacts have been avoided and reduced.

The means of implementing offsets vary from one country studied to another. Measures "in-kind"³⁰ under the responsibility of the project developer or a compensation bank operator are generally applied in priority over financial transfers, when these are accepted as offsets.

III.1 – IN-KIND OFFSETS

Offsetting mainly takes the form of ecological measures to restore, rehabilitate, create or preserve habitats, implemented near to the affected site.

■ Restoration aims to return the ecosystem to a state and conditions similar to those in which it was found before any disturbance. The ecosystem's structure (specific composition) and functions are recreated. The aim is to arrive at a natural functioning system, capable of self-regulating (*National Research Council, 1992*).

■ Rehabilitation aims to re-establish certain ecological functions and certain targeted uses (biogeochemical cycles, productivity, etc.).

■ Creation is the construction of a habitat or ecosystem which did not exist previously on the site (NRC, 1992). E.g. the creation of ponds, planting of trees, etc.

■ Preservation is the introduction of the protection and sustainable management of existing natural resources (NRC, 1992). E.g. designation of a new protected area.

Restoration, rehabilitation and creation measures generally bring an ecological additionality but the expected results are uncertain; preservation measures offer a greater guarantee of results but their ecological added-value is uncertain and must be demonstrated with regard to the threats weighing on the environment concerned. Recourse to one type of measure in preference to another is not clearly dictated in guides, except in the United States. The choice primarily depends on the project and the nature of the impact, and the techniques are generally used together or combined for the same offset. States do therefore not necessarily recommend a hierarchy of the ecological measures to be employed, even if in practice some are applied more often than others.

European Union

Source: *European Commission Guide, 2007*

Offsets must be applied in addition to the standard measures taken in accordance with the "Habitats" and "Birds" directives and obligations under European Law (principle of additionality).

Under these conditions, to counterbalance a project's adverse effects on a Natura 2000 site, the appropriate offsets may take the following forms:

■ the return to original condition or enhancement of existing sites: returning the habitat to its original state to safeguard the conservation value and guarantee compliance with the site's conservation objectives, or enhancing the remaining habitat proportionally to the losses occasioned by the project to a Natura 2000 site;

■ the reconstitution of a habitat: reconstituting a habitat on a new or extended site and integrating this site into the Natura 2000 network;

■ the reintroduction of species;

■ the acquisition of land;

■ the acquisition of rights;

■ the creation of reserves, accompanied by tight restrictions on the land use;

■ measures to encourage certain economic activities compatible with the essential ecological functions.

Of the different offset possibilities, the most effective option offering the best chances of success must be adopted.

Furthermore, it is generally preferable to choose an offset site as similar as possible to the area affected by the project, located within or near to the Natura 2000 site concerned, and which offers conditions propitious to success. If this is not possible, an

³⁰ The term "in-kind" used in this study (translation in French: "*en nature*") characterises compensation measures that are implemented via direct ecological measures (e.g. restoration of habitats) and not via financial transfers. Note that the term "in-kind" also often refers to compensatory measures that are "like for like" (ecological equivalence).

order of priority that meets the requirements of the "Habitats" directive has been defined and is to be complied with during the search for offset sites:

- 1) offsetting within the Natura 2000 site, on condition the elements necessary to guarantee the network's ecological coherence and function exist on the site;
- 2) offsetting outside the Natura 2000 site concerned, but within a common topographical or landscape unit, on condition the offset can offer the same contribution to the network's ecological structure and/or function. The chosen location can be another designated Natura 2000 site or a non-designated area. In the latter case, the area itself must be designated a Natura 2000 site and be subject to all the requirements of the "Nature" directives;
- 3) offsetting outside the Natura 2000 site, in a different topographical or landscape unit. The chosen location can be another designated Natura 2000 site. If the offset is applied in a non-designated area, the area itself must be designated a Natura 2000 site and be subject to all the requirements of the "Habitats" and "Birds" directives.

France

In France there is no recommendation on the ecological measures to be favoured, even though doctrines in this area are beginning to be established at regional level. In practice, particularly within the framework of requests to waive the strict protection of protected species, the measures implemented for offsetting are globally, in order of importance: rehabilitation or restoration, preservation and creation (Ministry of Sustainable Development's survey of DREALs (Regional Directorates of the Environment, Development and Housing)).

Inset 2: Case 1. France - East European LGV (High speed rail line) – section linking Vaires-sur-Marne to Baudrecourt

The development project was subject to an impact assessment in which the residual impacts were described. These included the complete disappearance or disturbance of ponds, the destruction of species of Community interest (Great Crested Newt) or protected on a national scale (Alpine Newt and Palmate Newt), the disturbance of amphibian movements, the clearing of alluvial woodland and impacts on Natura 2000 sites (Les Hauts de Meuse and Rupt de Mad valley).

Offsets were therefore planned: the **creation** of 3 ponds to host the captured species with **preservation** of a 30 to 40 metre wide buffer zone between the ponds and the neighbouring agricultural land; the **creation** of alluvial forests and, in the long term, retrocession to the Regional conservatory; the acquisition, **restoration** and conservatory management of 6.8 ha and 7.15 ha of chalk grasslands on the Natura 2000 sites of Hauts de Meuse and Rupt de Mad respectively.

Source: Analysis of measures to offset impacts on natural heritage; collection and analysis of cases, 2010

Germany

Germany favours offset actions that guarantee "no net loss" of biodiversity, although it does not propose a hierarchy of ecological measures. The impact assessment requires the definition of basic environmental principles and the identification of all of the key biodiversity components such as species, ecosystem functions, etc.

Inset 3: Case 2. Germany – the Karlsruhe/Baden-Baden commercial airport

The proposed airport will have construction, development and operational impacts on several sites designated Natura 2000, including the destruction of inland dunes with open *Corynephorus* and *Agrostis* grasslands, and the habitat of two butterfly species: the Large Copper (*Lycaena dispar*) and Jersey Tiger (*Euplagia quadripunctaria*).

The proposed offsets include the **restoration** of about 10 hectares of remodelled areas at the aerodrome and the **creation** of specific habitats for each affected site. In total, almost 60 ha must be secured to offset the forecast destruction or occupation of approximately 23 ha.

The project has been judged to be of major public interest (managing growth in air traffic, and upgrading safety standards for the runways and rainwater drainage system standards). The European Commission has issued a positive opinion on the strict condition that the offsets are applied upstream of the project.

Source: Opinion of the European Commission, 6 June 2005

Austria

Offsets are defined jointly by the project developer and the administration. Measures to be considered as a priority would be habitat creation, but only after restoration or rehabilitation.

Spain

The application of compensatory measures depends on the project, however in practice the actions of restoration/rehabilitation and the designation of new protected habitats on other sites are the most common. The creation of habitats is used to a lesser extent due to its complexity.

Inset 4: Case 3. Spain - La Breña II reservoir project

The construction of the dam requires the destruction of 626 ha of a Natura 2000 site which notably provides habitat to the Lynx Pardelle (*Iberian lynx*); this is 1.05% of the total area of the site. The planned offsets include:

- the expropriation of 2,134 ha of land where the activities of **improving the quality of the habitat** and increasing the Lynx's prey species are planned;
- the **restoration** of habitats (afforestation, coppicing, etc.);
- the construction of refuges for the Lynx.

As there are no possible alternatives to the project, which is deemed to be of major public interest (response to the water consumption required by the population and industrial and agricultural sectors), the European Commission felt that the planned offsets were satisfactory and issued a favourable opinion.

Source: Opinion of the European Commission, 7 May 2004

Poland

The Environmental Protection Act obliges all stakeholders concerned to protect the environment when conducting construction works and, if this is not possible, to undertake rehabilitation works to the affected area, notably by applying offsets.

In compliance with article 3 of the Environmental Protection Act, the term of ecological offsetting is defined as "a set of activities comprising in particular construction works, earthworks, rehabilitation of soil, reforestation or the concentration of vegetation to re-establish the natural equilibrium on a given terrain, offsetting impacts on the environment following an investment and maintaining the values of the landscape". These activities may be accompanied by the creation of new protected areas or extensions to them (this particularly concerns offsets in the event of an adverse effect on Natura 2000 sites).

For protected areas outside of Natura 2000, the project developer must present a written guarantee that it will proceed with offsets in order to obtain the permit authorising it to waive the prohibition on operating in such an area.

Offset requirements (art. 75 of the Environmental Protection Act) apply to all aspects of the natural environment. However, in practice they only apply to habitats and protected species.

United Kingdom

In practice, the preferred measures are restoration, preservation and then the creation of habitats. However, there is no clear hierarchy between these offsetting practices, which remain very rare and are only used in the event of a significant impact on Natura 2000 sites and Sites of Special Scientific Interest (SSSI).

Inset 5: Case 4. United Kingdom – restoration of the port of Dibden

The project planned the development of a new port on the estuary at Southampton, and the construction of roads and rail to reach it. The project had a significant impact on several Natura 2000 sites. The proposed offsets included refilling the intertidal area with sediment at the high tide mark at Hythe further down the river, and the **creation** of a small stream and natural conservation area. The government rejected the project as it considered the offsets to be unsuitable and insufficient for safeguarding the overall coherence of the Natura 2000 network.

Source: 2011 survey of economic services on offsetting

Sweden

The most common measures in Sweden are the preservation of a threatened habitat (e.g. expansion of a natural reserve and protection of primary forests), habitat creation (e.g. planting trees, rainwater basins, etc.) and, more rarely, habitat restoration and rehabilitation (e.g. measures applied for the *Hammarby Sjöstad* sustainable district of Stockholm).

Australia

All four types of measure are applied. The choice of a given type of measure depends on the programme, the development project concerned, the status of the sites threatened in the region and the feasibility of the measure in the region at the least cost to the project developer.

Although preservation poses problems relating to additionality, this is the most common measure, in particular if the conservation of the species concerned represents a major challenge, as it is difficult to revegetate like for like. Preservation may also form part of the mitigation efforts prior to the implementation of offsets.

Canada (Quebec)

In processing requests for authorisation certificates in application of article 22 of the Environmental Quality Act (LQE) relating to wetlands, current practices are, in order of frequency: preservation, creation and rehabilitation/restoration. The offset projects analysed via the environmental assessment process under article 31.1 of the LQE generally led to rehabilitation and more rarely to preservation.

United States

All four types of measure are used, some more often than others depending on the type of ecosystem concerned: for example, preservation for impacts on protected species, restoration for wetlands and rehabilitation for streams.

The mitigation banks are establishing an order in which the measures are to be employed: restoration and rehabilitation measures are preferred.

Japan

Offsets essentially consist of moving individuals to new habitats³¹. This can also involve the creation, restoration or rehabilitation of habitats and, to a lesser extent, full or partial preservation. There are trials which can be categorised according to three types:

- 1) Transfer/transplantation/sowing of protected species in an appropriate habitat (e.g. *Cyrtomium caryotideum* and *Boehmeria silvestrii* for the construction of the Yamatosaka dam on the Hijikawa River).
- 2) Development of the habitat focusing on protected species (e.g. *Rhinolophus cornutus* and *Micromys minutus* for the construction of the Irahara dam on the Haraigawa River).
- 3) Development of the habitat and transfer/transplantation/sowing of protected species in an appropriate environment (e.g. *Caridina rapaensis Edmondson* and *Neritodryas subsulcata* for the development of the Shin Ishigaki airport).

Mexico

The most common ecological measures are those of restoration, focusing particularly on fauna and flora, soil, water courses and afforestation. These measures are implemented once the projects and activities are complete and aim to conserve an appropriate percentage of the original habitats.

New Zealand

All four types of measure are used in New Zealand. However, the status of the implementation of offsets leaves it unclear as to whether certain types are preferred to others.

³¹ In France, the transfer of individuals is not considered to be an offset but a measure accompanying an operation to restore a habitat in favour of the introduction of the species.

Inset 6: Case 5. New Zealand

- *Waikatea station farm development*

The authorisation to eliminate 354 ha of *Kunzea ericoides* (native shrub species of the *Myrtaceae* family) from the Waikatea site in 2007 for the **creation** of grazing areas led to the implementation of offsets which included **protecting** 799 ha of forest and shrubs, keeping the animals reared in the pastures away from the protected areas, creating new enclosures and repairing those already in place.

- *Kate Valley Landfill*

Transwaste Canterbury Ltd. (entity comprising local government and two waste management industrialists) identified Kate Valley as the best site for landfill. The project had an impact on native vegetation (notably *Kunzea ericoides*). The proposal of offsets accepted included the **protection, restoration** and long-term management of 410 ha of a conservation area near to the Kate Valley Landfill (now known by the name of Tiromoana Bush: <http://www.tiromoanabush.co.nz/asp/default.asp>).

(Norton, 2009)

TABLE 4: TYPES OF ECOLOGICAL MEASURE IMPLEMENTED IN THE COUNTRIES STUDIED

Country	Measures applied near the affected sites				
	Restoration	Rehabilitation	Creation	Preservation	Other
France	✗	✗	✗	✗	
Germany	✗	✗	✗		
Austria	✗	✗	✗		
Denmark			✗		
Spain	✗	✗	✗	✗	
Netherlands	✗	✗	✗	✗	
Czech Republic	✗	✗	✗		
United Kingdom	✗		✗	✗	
Slovenia	✗	✗	✗	✗	
Sweden	✗	✗	✗	✗	"Recreative" offsetting
Australia	✗	✗		✗	
Brazil					Tree planting "Recovery" of a species
Canada (Quebec)	✗	✗	✗	✗	
Chile					Relocating threatened species to a similar habitat
United States	✗	✗		✗	
India			✗	✗	
Japan	✗	✗	✗	✗	Translocation of individuals to new habitats
Mexico	✗				"Recovery" of an ecosystem
Norway	✗		✗	✗	
New Zealand	✗	✗	✗	✗	
Russia	✗	✗		✗	
Switzerland	✗	✗	✗	✗	
Total	17	15	16	15	

Source: 2011 survey of economic services on offsetting

The measures on a blue background are those applied most often in practice.

III.2 – FINANCIAL COMPENSATION

The financial transfers tolerated or provided for in 14 of the countries studied³² are paid by the project developer to various entities depending on the country: a dedicated fund managed by the government or municipalities (India, Brazil, South Australia and Swiss cantons), an approved public or not-for-profit natural resource management body (United States), nature conservation foundations or associations (Germany) or municipalities (Germany and Russia).

³² See part II on the legal framework.

Financial transfers have the advantage of being easy to secure before the project is authorised. They can also be associated with the mechanisms of compensation banks, enabling the *a posteriori* financing of approved compensatory measures (in-lieu fee in the United States and funds managed by the Swiss cantons to the benefit of a pool of priority measures). However, resorting to them presents several risks, which some countries have been able to manage.

■ Risk of removing responsibility from the project developer

The project developer could directly seek to resort to a financial transfer in order not to be responsible for the efficacy and long-term management of the compensatory measures, and favour offsetting to the detriment of the avoidance and reduction of impacts.

This risk has been observed in Brazil, for example, where financial transfer is systematic even though the law does not specify the terms of the offset to be implemented³³: since 2006, the majority of decisions by the environmental authorities have favoured financial transfers to be paid to the State, working on the principle that it is more specialised in environmental management than the project developer and can therefore optimise fund allocation.

■ Risk of arriving at non-equivalent offsets

Several countries have minimised this risk by limiting the scope of financial transfers to certain biodiversity components, as in Australia (marine habitats and forests), the United States (wetlands and water resources) and India (forest). In the American in-lieu fee programme, funds must only be used to offset the functions and values of wetlands. In South Australia, financial transfers for impacts on native vegetation or scattered trees are paid into a fund held by the government, which takes responsibility for reforestation a site in the region.

However, in the majority of cases, financial transfers do not appear to offer a sufficient guarantee of attaining a neutral ecological balance on projects; in other words, equilibrium between the ecological loss relating to a project and the ecological gain related to the offset.

Under Brazilian law, it is not mandatory for the funds to be used for conservation units belonging to the same biome as the area affected by the project, except in the case of the Atlantic forest (Law 11428/2006). The distribution of funds between the units is based on the assessment by the authorities in each state, in accordance with the priorities and directives defined by the Environmental Compensation Chambers.

In Russia, financial transfers are not necessarily allocated to ecological measures: for example, transfers intended to offset impacts on biological resources in aquatic environments are used by the Federal Fisheries Agency to develop the activity of aquacultural industrialists and not to safeguard the biodiversity of these areas.

In Queensland, Australia (Marine Fish Habitat Offsets Program), financial transfers, although fairly rare, are used to finance training or research relating to marine habitats.

■ Risk of under-estimating the sums required to implement and manage the offset

The amount of the financial transfer is generally based on the estimated costs of implementing the corresponding offset, although the actual calculation method is not defined (except in India and Brazil). In the absence of a robust and accepted method, financial transfers can be associated with the "commodification" of biodiversity. Furthermore, the cost estimate does not explicitly include the management costs for the duration of the project developer's engagement. In Brazil for example, the financial transfer is made in a single payment which does not appear to cover management costs.

An experience feedback mechanism on the costs associated with offsetting would no doubt enable the financial transfer calculation methods to be strengthened.

■ Risk of not allocating financing

Managing financial sums requires an institutional framework to collect and allocate them to ecological actions. In Brazil for example, the national Environmental Compensation Fund, managed by *Caixa Econômica Federal* (a mixed bank), was created in 2006 to receive financial transfers: this fund, which establishes the financial character of the offsets, centralises resources and increases the transparency of their management.

However, the coordination of the established institutions can be lacking. In India for example, the national Compensatory Afforestation Fund into which the financial transfers are paid, and not used since 2002, had reached almost 2 billion Euros in 2009. The Supreme Court of India imposed management rules, notably with the creation of decentralised funds in each federal state under the control of a national authority charged with financing actions in favour of the protection, management and restoration of forest, as well as reforestation, research and training actions. In the Netherlands, where the amounts paid by

³³ The law requires the project developer to mobilise resources (economic and other) to "create and sustain" conservation units.

the project developers into the Dutch National Fund for Rural Areas are intended to ensure offsetting “in-kind” by the project developers themselves, the sums tend not to move (141 million Euros in 2008, 131 million Euros in 2009) due to the difficulty project developers have in identifying offset sites and meeting requirements relating to equivalence.

■ Risk of substituting public financing (lack of additionality)

If systematically resorting to financial transfers, there is the risk that these will gradually replace public financing of nature conservation. This risk can be observed in Brazil, where financial transfers have become the main financing mechanism employed by the environmental authorities at federal and state level.

III.3 – SUSTAINABILITY OF THE MEASURES

The sustainability of offsets relies on the means of land control (land acquisition) or usage control (contracts between the project developer and a land owner or operator), accompanied by management measures.

The length of project developers' commitment is very rarely included in regulations, with the exception of the compensation bank systems, and often corresponds to the development project's operating period. It varies greatly between countries, extending from one year to perpetuity.

Authorities' requirements relating to the length of commitment are strongly linked to the possible terms of securing the offset site and of its uses. Land management is difficult in Europe (Germany, Netherlands, United Kingdom and Switzerland) due to the high pressure on land, as well as in some emerging countries (India) due to priorities relating to development and food security. Management contracts are therefore favoured, particularly on agricultural land.

To enable a sustainable commitment, some countries (United States, Australia and Austria) provide for the implementation of environmental easement agreements, legal instruments forbidding construction or certain types of operation on the offset site in perpetuity, even if the land is sold. Trust funds have also been established in the United States and Australia to secure financing for the management in perpetuity; however, in Australia it has been observed that these funds are often insufficient.

TABLE 5: INSTRUMENTS ENSURING THE SUSTAINABILITY OF MEASURES AND LENGTH OF COMMITMENT ACCORDING TO COUNTRY

Country	Means of guaranteeing sustainability	Average length of commitment	
		Regulations	In practice
France	Land acquisition (amicably or through expropriation) Contract with an owner or operator (farmer, forester, etc.) Possible regulatory protection measures (e.g. prefectural decree protecting biotopes)	No minimum duration	From 5 years (e.g. contract with a farmer) to 60 years (e.g. length of a concession) Compensation bank trial: minimum of 30 years required in the agreement between the bank operator and the Ministry of Sustainable Development
Germany	Land acquisition (main tool): - either acquisition in the name of the project developer, with a management contract with an agency - or acquisition for a specialist entity (foundation, association or agency) responsible for the management Offset areas recorded by the state's competent authorities (e.g. Bavarian regional nature protection office)	-	25 years on average
Australia	Contract recorded on the property title (equivalent to an environmental easement agreement) Transfer of ownership to the government in	10 years minimum and up to perpetuity (BushBroker)	-

	order to be designated a reserve BioBanking: the agreement between the owner and Department of Environment and Climate Change remains valid should there be a change of ownership; trust fund Rural land: difficulty linked to the leasing of the majority of this land	Perpetuity (BioBanking)	
Austria	Land acquisition (often through the municipalities) Inclusion of encumbrances or easements in the land book (<i>Grundbuch</i>), obligation to conserve certain uses in the event the land is sold	-	-
Brazil	Single financial transfer from the project developer, which is used to finance the creation or maintenance of conservation units managed by the public authorities that cannot be converted back to exploitable land	-	-
Canada (Quebec)	If the project developer owns the offset site: agreement with a conservation NGO (preservation), easement If the project developer does not own the offset site: contract (preferred) or land acquisition (possible)	-	Monitored over 5 years (for a rehabilitation measure) Long duration or even in perpetuity (for a preservation measure)
Chile	-	-	Between 1 and 5 years
Denmark	Land acquisition Amicable agreements or temporary agreements	-	From 5 years to perpetuity
Spain	Land acquisition, leasing or expropriation Management contract with the private sector Designation of new Natura 2000 sites	-	Several years
United States	Conservation easement attached to the site, so that land acquisition is not systematic Regulatory protection (rare) Banks: trust funds	Perpetuity	-
India	Land acquisition difficult – measures implemented on the project developer's or Forest Department's (large public land owner) property	-	For the duration of the concession or the project developer's activity
Japan	Measures often taken by public agencies (prefectures or local councils) or major industrialists, presenting few risks of abandonment (Japanese culture)	-	-
Mexico	Deposit	-	Duration of the project's operation, i.e. from 15 to 50 years maximum
Norway	Regulatory protection Contract between the project developer and the land owner or operator	-	-
New Zealand	Land acquisition Contract	-	For the duration of the development permit

Netherlands	Land acquisition (often of agricultural land) Contract between the project developer and a farmer	-	Cost of management to be estimated over 30 years Compensation bank pilot project: 25 years
United Kingdom	Tools alternative to land acquisition	-	Lawton report 2010: long term management, duration often over 25 years
Slovenia	Regulatory protection Land acquisition Tools alternative to land acquisition	-	Between 5 and 8 years
Sweden	Land acquisition (creation or expansion of natural reserves) Contract between the project developer and a land owner	-	Duration specific to each project (e.g. 100 years for the Bothnia railway line, with an annual management cost estimated at €110,000)
Switzerland	Tools alternative to land acquisition (management contract) Land acquisition rare and expropriation not possible	-	Up to 30 years 20 years for rail infrastructure, 15 years for Federal Roads Office works and 2 years for farms

Source: 2011 survey of economic services on offsetting

III.4 – MONITORING AND AUDIT MEANS: ASSESSMENT ELEMENTS

Source: 2011 survey of economic services on offsetting

In the vast majority of cases, the implementation and efficacy of offsets are monitored via reports submitted by the project developer and field visits organised by the authorities in charge of auditing. However, auditing is often lacking in the majority of countries studied due to a lack of resources. For example, in Mexico this function is the responsibility of just two inspectors in each state who have other responsibilities in addition to this audit.

This lack of manpower leads to developing geographic information systems (Mexico and India) and targeting field visits on the most important projects and, in the countries concerned, on the compensation bank sites. As seen above³⁴, in some countries (Brazil, Chile, India, Mexico, the Netherlands and Switzerland) civil society also plays a key role in auditing: if the project developer does not meet its commitments, NGOs can alert the competent authorities.

Overall, it is difficult to acquire feedback on the effective implementation of offsets and judge their efficacy in terms of the objective of "no net loss" of biodiversity set by some countries. However, some statistics do exist.

For example, in Australia, the offset programmes implemented in the 2000s enable approximately 500 hectares of habitat to be re-established or preserved every year, primarily for native vegetation. However, the fact that the majority of programmes allow clearing before the habitats have begun to form engenders an accumulated loss. More precise information exists for each programme, enabling the merits of each instrument to be tested: in New South Wales, the insufficient frequency of audits has led to the observation that, in 2004, 700,000 hectares were cleared even though clearing had only been approved for 220,000 hectares.

In Slovenia, according to the Ministry of Agriculture and the Environment, of the 30% of projects giving rise to offsets, 90% of the measures prescribed are effectively implemented.

In Switzerland, where the implementation of offsets is widely monitored by civil society in the cantons, the effective monitoring conducted by NGOs has contributed to limiting the loss of the surface area of wetlands to 1% over 25 years.

In the United States, assessments of the efficacy of measures highlight mediocre results. For example, an assessment of 30 offsets in California showed that between half and three quarters of measures did not reach their objective (lack of implementation or results not attained).

³⁴ See part II on the institutional framework.

Another assessment available in the Netherlands: an evaluation conducted by the Court of Audits in 2009 of the implementation of offsetting in two Dutch provinces, underlines that the provincial authorities do not sufficiently guarantee that the compensatory measure is implemented appropriately, transparently or on time, or managed over the long term to avoid a net loss of the quality of the nature. According to another evaluation conducted in 2006 by the Inspectorate of the former Ministry of Housing, Spatial Planning and the Environment (VROM), of 40 projects providing offsets, 6 had effectively implemented the measures, 16 had partially implemented them and 18 had not implemented the prescribed measures at all.

The countries studied make little reference to the consequences of non-compliance observed during audits. In Australia, a draft federal policy relating to biodiversity offsets states that the conditions of authorisation can be amended if the monitoring reports demonstrate a lack of efficacy of the compensatory measures applied.

The insufficiency of audits also prevents experience feedback which would enable project developers to avoid repeating errors and establish the feasibility of measures at the time of their design. The lack of centralised information, in particular within federal countries (Austria and Brazil) and countries where responsibility is held at local level, accentuates the problem. Some countries are beginning to remedy this by establishing centralised databases (project in progress in Switzerland).

In countries that authorise financial transfers (particularly Brazil and India), the project developers generally always transfer the sums before receiving authorisation. The difficulty of the audit lies in the allocation of these sums to ecological actions. In India, the Supreme Court recommends using satellite data supported by field inspections to check the implementation of actions financed by the Compensatory Afforestation Fund.

France

The monitoring and auditing method varies according to the region, size of project and type of procedure. Some regions implement tools either over the long term (for example for impacts on protected species), or over the short term for key large-scale projects (monitoring tables, monitoring committees, requests for regular feedback from the project developer). Overall, the monitoring of offsets must be increased, and field visits could be more systematic. Recent legislative changes (the Grenelle Act) are moving in this direction by bringing in the duty to include in the project permit the monitoring measures the project developer undertakes to implement.

Germany

The audit of offsets is the subject of a report that the states submit to the Federal State every six years. Local authorities also make regular field visits to ensure compliance with the agreed compensatory measures.

The environmental assessment procedures require that the project developer includes the expense of monitoring these measures for a period of 25 years in the calculation of the cost of the offsets (for example, this could be the fees payable to an ecologist to assess the ecological status of the sites every 5 years).

Austria

The district's competent authority is responsible for monitoring the implementation of the offsets, notably through field visits. The laws also provide for monitoring instruments: for example, under the laws of the state of Salzburg and Carinthia, the authority can order "ecological monitoring" in the form of reports to the administration on the project's progress.

Monitoring data is not reported to the federal authorities. The competent services within the states deem this to be confidential information (2011 survey of economic services on offsetting).

Denmark

The State and municipalities concerned have the option of inspecting the site before, during and after a project's implementation. However, this option appears to be little used, especially considering the regulations are restrictive regarding the monitoring of sites once the project implementation is complete.

Netherlands

With regard to development projects requiring offsets in the EHS ecological network and Natura 2000, the provincial authority's Department of Rural Areas is responsible for conducting field visits and drafting a report on the implementation of the compensatory measures. Audits are conducted during implementation of the measures and, in all cases, 6 years after their closure.

The Inspection Service at the Ministry of Economic Affairs, Agriculture and Innovation is responsible for inspecting projects that require offsets within the framework of the Fauna and Flora Act. This service is often informed by local nature conservation associations in the event of non-compliance with the act.

Within the framework of the Forest Act, the provincial authority's Department of Rural Areas monitors compliance with the obligation to reforest in the 3 years following the cutting of trees.

Poland

There are no specific means of monitoring and auditing offsets. In general, the audit takes place during the post-completion analysis of an investment: before issuing an operating permit, compliance with environmental obligations is verified. The investor must also ensure the offsets for which it is responsible are monitored, as required in the decision on the environmental impact it needs to make its investment.

Czech Republic

With a view to authorising a project, the authorities can set conditions, including in relation to monitoring (reports by the project developers).

Slovenia

Offsets are audited in the field by the Forest Services, regional services of the Ministry of Agriculture and the Environment, municipal technical services and NGOs.

Australia

In the majority of cases, the project is not approved until the technical and financial details of the offsets have been provided and audited and the funds required for implementation have been secured.

The means to monitor and audit offsets vary greatly according to the specific strategy of the programme applied in each federal state, the good-will of local authorities and what has been decided on a case by case basis between the authority and the project developer. In general, the federal government's policy and the strategies of certain federal states require control based on annual reports from those responsible for the offset activities as well as audits and inspections.

The draft policy on biodiversity offsets, drafted in 2007 by the federal government, requires project developers to submit reports on their activities and the results achieved so that the conditions of authorisation can be amended if the offsets applied are ineffective or insufficient.

Brazil

Auditing firstly concentrates on the payment of financial transfers and then on the direct management of the conservation units by the ICMBio³⁵. For forestry offsets conducted through measures "in-kind", auditing is performed via reports from the project developers and field visits made by the environmental authority.

Canada (Quebec)

The project developer's written commitment to implementing offsets is an integral part of the conditions of authorisation included on the authorisation certificate issued by the MDDEP³⁶. Offset commitments in the form of preservation measures can in some cases be formalised in conservation agreements with an NGO or in notarial deeds (easements).

For projects subject to the environmental impact assessment process, monitoring reports are usually requested in the governmental decree authorising the project.

The MDDEP's Environmental Inspection Centre in Quebec (CCEQ) conducts annual inspection visits to a proportion of the offset sites based on an established timetable.

Chile

According to the Environmental Qualification Resolution (RCA)³⁷, each project must define an environmental monitoring plan which, notably, can include field visits, reports and databases. Only 2% of RCAs are audited (Source: 2011 survey of economic services on offsetting).

³⁵ Chico Mendes Institute for Biodiversity Conservation.

³⁶ Ministry of Sustainable Development, Environment and Parks.

³⁷ Document containing in particular the project summary issued once authorisation has been granted.

United States

Offsets (implemented directly or through banks) must always be audited via reports, field visits, etc. In practice, the agencies in charge of these audits have insufficient means to conduct them and concentrate on banks to optimise the use of their resources. Monitoring over the first five years of the bank is usually recommended (ELI, 2002).

For direct implementation, auditing is optimised by selecting only the most important or emblematic cases.

The information transmitted by associations plays a not insignificant role in the detection of cases of non-compliance (project development without offsetting).

In the event of non-compliance with requirements, sanctions generally take the form of fines, but can extend to prison terms. For the compensation banks, the main sanction is not granting or withdrawing the permit.

India

The authorities responsible for monitoring and auditing measures, the State Forest Departments, can delegate their role to local stakeholders (NGO or researchers)³⁸. Audits are conducted through site visits and on the basis of reports.

The Supreme Court has established a process of monitoring and assessing measures financed by the CAMPA³⁹ fund, and recommendations allow using satellite data supported by field inspections to verify their implementation.

Mexico

Monitoring is conducted through reports from the project developers, field inspections by the inspectors from the PROFEPA⁴⁰ and information received from civil society.

For three years, the DGIRA⁴¹ has been developing a geographic information system for projects subject to an impact assessment. This system, based on the use of satellite resources, should enable information on the situation of the authorised projects to be gathered in real time.

Russia

In the field of the environment, Russia has introduced an ecological monitoring system provided by the competent authorities (Federal Service for Hydrometeorology and Environmental Monitoring, Federal Service for Environmental, Technological and Nuclear Supervision, Federal Agency for Fishery, etc.).

Switzerland

The teams at the FOEN⁴² conduct field visits with specialists and experts, issue warnings and ensure the measures are monitored. They also carry out advisory and prevention work. In the cantons, the implementation of offsets is monitored by NGOs.

Monitoring is particularly exemplary for large projects. Although there are no available statistics, according to an agent at the FOEN, approximately 90% of national projects (large infrastructure) provide for offsets which are effectively implemented. (2011 survey of economic services on offsetting)

A database project at federal level is in progress and should be operational in two years. Some information, notably the names of industrialists, will not be accessible to the public.

³⁸ See part II on the institutional framework.

³⁹ Mitigation Afforestation Fund Management and Planning Authority.

⁴⁰ Services of the Federal Attorney Generalship of Environmental Protection.

⁴¹ *Dirección General de Impacto y Riesgo Ambiental*.

⁴² Federal Office for the Environment.

TABLE 6: MONITORING AND INSPECTION MEANS IN THE COUNTRIES STUDIED

Country	Reports from developers	Field visits by the competent authorities	Inspection by civil society
France	✓	✓	✓
Germany	✓		✓
Australia	✓	✓	
Austria		✓	
Brazil	✓	✓	
Canada (Quebec)	✓	✓	
Chile	✓	✓	
Denmark		✓	
United States	✓	✓ (priority on the banks)	✓
India	✓	✓	
Japan	Non-existent (law currently being revised)		
Mexico	✓	✓	✓
Netherlands		✓	✓
Poland	✓		
Czech Republic	✓		
Russia		✓	
Slovenia		✓	
Sweden	No general rules (case by case basis)		
Switzerland		✓	✓

Source: 2011 survey of economic services on offsetting

IV – COMPENSATION BANKS

Summary

Confronted with the difficulties encountered with the direct implementation of offsets by the project developer, compensation bank systems have emerged in some countries. The objective is to create an effective or potential supply of offsets for certain environments, habitats or species in advance, to meet the compensation needs of future projects. The most advanced banks exist in the United States, Australia and Germany. Pilot projects are being trialled in the Netherlands and France, and a hybrid system for aquatic environments is being developed in Canada (Quebec).

With these market instruments, a project developer can fulfil its obligation to offset by purchasing credits equivalent to its residual impact. The compensation banks are based on a variety of institutional schemes, all characterised by significant regulation by the State. Their emergence has often been preceded by a change to the regulatory and methodological corpus.

The United States first established mitigation banks to contribute to the objective of no net loss of wetlands and aquatic resources. They are distinguished by the status of the promoter (private, public or a combination of both), the type of credits sold and the measures implemented (restoration, enhancement, creation and/or preservation). Credits are sold in phases, with a certain number available for sale as soon as the bank is launched and then others as and when it reaches its ecological performance objectives. Easements are put into place to guarantee the sustainability of the measures. Conservation banks, modelled on the mitigation banks, were subsequently developed for threatened and endangered species. They are mainly concentrated in California (almost 90 of the hundred or so in the country) unlike the mitigation banks which are distributed across the entire American territory (over 1,000).

In Australia, the BushBroker and BioBanking programmes primarily target the preservation and management of native vegetation. The BushBroker programme is used to identify and include on a register the private landowners disposed towards conserving, enhancing and managing the native vegetation on their property. Brokers assess the number of credits available on a site, whilst the price of the credit is negotiated directly between the landowner and project developer.

BioBanking is similar to BushBroker, but tries to be more transparent with a freely accessible online database to bring together the project developers and landowners. The latter can generate credits that they sell to a project developer needing to offset the impacts of its project. Unlike BushBroker, recourse to BioBanking is just one of many options for compensation and the offset sites are managed in perpetuity (compared with a minimum of 10 years for BushBroker). Unlike the American compensation banks, which favour restoration, the Australian mechanisms concentrate on preservation.

In Germany, the system of land pools (Flächenpools) associated with eco-accounts (Ökokontos) has a wider scope as it targets the environment in general and not biodiversity or one of its components like the American and Australian systems.

Land pools are sites whose land is secured by institutions, primarily municipalities, to offset the impacts arising from their plans and programmes. These sites can either be made available to the project developers for them to conduct the offsets necessary to their project, or be subjected to ecological measures by the institutions to meet future compensation needs. In the latter case, an ecological value is attributed to the site in the form of eco-points held in an eco-account. A project developer can then purchase from the institution the number of eco-points necessary to offset the residual impacts of its project.

Recourse to a bank can be associated with a transfer of responsibility for implementing the offset from the project developer to the bank promoter (United States). Sometimes, the banks also establish trust funds (United States and Australia) to ensure the management and integrity of the sites over the long term using financing from the project developers.



opérateur
vente
promoteur
espèces
agence
menacées
anticipation
végétation
négociation
zone
projet
pilote
propriétaires
écopoints
humide
efficacité
demande
offre
perpétuité

The banks offer the possibility of offsetting on a site which is sometimes distanced from the impact site, but more judicious in terms of ecological results and cost effectiveness. To reduce the risk of disconnection between the nature of the impact and offset, the banks use local scales suited to their scope (e.g. the basin area for wetlands) and equivalence criteria which are more precise when the bank's target scope is restrictive (e.g. in Australia, an impact on a critical vegetation class must be offset by the purchase of a credit of the same class in the same bioregion). When the scope is wide (e.g. the environment in Germany), the system can result in offsets of a different type.

In the countries concerned, compensation banks are tending to become a preferred offset method due to their potential advantages and because they are clearly identified by the design offices conducting the impact assessments. In the United States, recourse to banks, which represent 26% of all offsets implemented, is recommended by the authorities. In Australia, the BushBroker programme is mandatory if the project developer's land is not suitable for offsetting.

The compensation banks effectively offer solutions to the difficulties associated with offsetting: implementation of the measure before the impact, better cost effectiveness, easier control, etc. However, there are constraints relating to their set-up costs and the uncertainty of the market, and assessments conducted in the United States and Australia demonstrate that the ecological objectives have not always been reached.

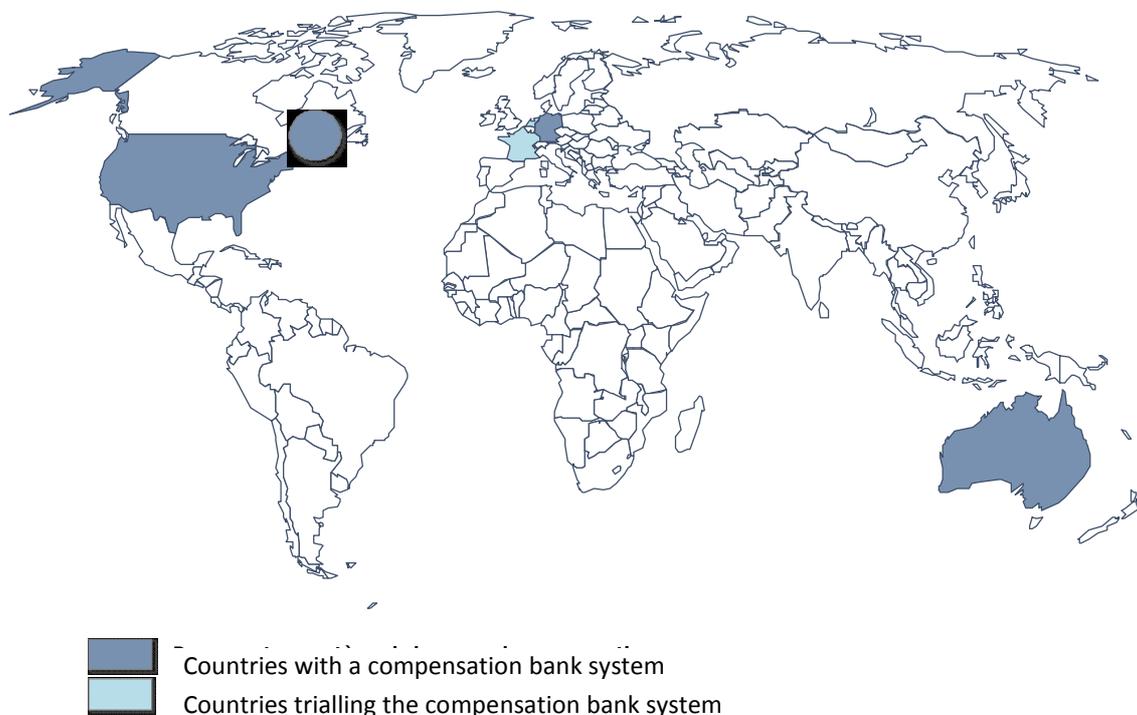
To implement the compensation bank mechanism, the countries studied equipped with this system recommend having a suitable regulatory and methodological framework, developing a strategic vision for the choice of suitable offset sites liable to meet the project developers' needs, having an overall monitoring system enabling the banks and available credits to be known and gaining the support of local stakeholders. The contacts questioned did not reveal any risk relating to compliance with the "avoid, reduce, offset" sequence and highlight the importance of dialogue with the authorities on the environmental optimisation of the project before considering offsets.

Source: 2011 survey of economic services on offsetting



(Source: Jonas Satkauskas)

To facilitate the implementation of offsets, the United States, Australia and Germany have established a compensation bank mechanism that France and the Netherlands are currently trialling. The idea is also developing in Canada (Quebec), where the project developer can implement a larger compensatory measure than required and subsequently use the surplus to offset the impacts of other projects, on the authorisation of the competent authority⁴³.



IV.1 – UNITED STATES: MITIGATION BANKS & CONSERVATION BANKS

In the United States, there are two types of bank: mitigation banks, which apply to wetlands and aquatic resources, and conservation banks, which concern threatened and endangered species.

American legislation has established a hierarchy of the offsets to be implemented⁴⁴:

1. The purchase of credits from compensation banks;
2. The purchase of credits from in-lieu fee programmes;
3. Direct implementation using the "watershed approach";
4. Direct implementation *in situ* and/or like for like (of the same type);
5. Direct implementation *ex situ* and/or like for unlike (of a different type).

The mitigation banks represent 26% of offsets, other measures being implemented directly by the project developer for its single project (67%) or via in-lieu fee programmes (7%) (Madsen et al, 2011).

⁴³ Exchange with the Ministry of Sustainable Development, Environment and Parks.

⁴⁴ See the detailed legal framework in Appendix I.

IV.1.1 – Definitions and characteristics

Wetland mitigation banks are wetlands or water courses restored, created, enhanced or, in exceptional cases, preserved in advance in the aim of offsetting the loss of aquatic resources caused by development projects, when the offset cannot be implemented on the same site as the projects for reasons of feasibility or ecological suitability.

Conservation banks are sites rich with important natural resources for threatened and endangered species, conserved and managed sustainably to offset impacts on these species' habitats (*Environmental Law Institute*, 2002). In most cases, these banks specialise in a particular species.

When a project developer purchases credits from a compensation bank, the responsibility for the successful implementation of the offset passes from the project developer to the bank's promoter (*Environmental Protection Agency*).

A compensation bank is defined by four elements (2011 survey of economic services on offsetting):

- A site that matches the affected terrain and has been treated with the aim of guaranteeing its environmental quality (creation, restoration, rehabilitation or preservation) and for which a deed to protect it in perpetuity – generally a conservation easement – has been put into place.
- The bank instrument, which is the framework agreement linking the bank's promoter and the public regulatory authorities. It stipulates the bank's responsibilities, the performance required and its assessment, the requirements in terms of management and audit and the bank's credit approval conditions.
- The interagency assessment team (interagency review team – IRT – for the mitigation banks or conservation banking review team for the conservation banks).⁴⁵
- The bank's service area, which corresponds to the geographic area within which the bank's credits can be used to offset the residual impact of projects. These areas are generally defined based on ecological criteria (basin area, homogeneity of the biotope, etc.) and administrative zones (districts of decentralised federal services, states and sub-state agencies).

Bank status (ELI, 2008)

The private commercial banks are managed by a private entrepreneur whose credits are available for sale on the market. They are independent of the project developers and represent almost 70% of compensation banks.

The public commercial banks are administered by public agencies to offset impacts caused by public and private development projects.

Single-user banks are banks where the promoter is also the client. Agencies (for example, the federal states' Departments of Transport) and industrialists can establish their own bank to offset several of their projects themselves.

Finally, when the same body establishes several banks benefitting from a scale effect and lower administration costs (because common to the different banks), these are qualified as umbrella banks. (2011 survey of economic services on offsetting).

Offset techniques (see table 7)

The offsets adopted for the mitigation banks are based on the techniques of restoration, enhancement, creation and, in exceptional cases, preservation of wetlands and other aquatic resources (ELI, 2008). These techniques are generally combined for the same project. Restoration is the most used method (35%), followed by enhancement (30%), creation (20%) and finally preservation (15%) (ELI, 2005).

⁴⁵ See part II on the institutional framework.

TABLE 7: TYPES OF OFFSET USED FOR THE MITIGATION BANKS (ELI, 2008)

Measure	Definition	Rule	Expected results
Restoration	The manipulation of a site's physical, chemical or biological characteristics with the aim of returning the natural or historical functions of a wetland.	First option to be considered when creating a bank.	Gain in terms of functions. Possible gain in terms of area.
Enhancement	The manipulation of the physical, chemical or biological characteristics of wetlands (not affected or damaged) to enhance one or more specific functions or the existing plant composition. The enhancement measure is undertaken to attain precise objectives (e.g. enhancement of the water quality).	Given that enhancement only targets certain functions (trade-offs), this method should only be used with the sufficient guarantee of an environmental benefit.	Gains or possible losses in terms of functions.
Creation	The manipulation of the existing physical, chemical or biological characteristics to develop wetlands or a deep water area where such an area did not exist before.	Given the difficulty in creating the hydrological conditions of wetlands, creation should only be used when the chances of success are deemed sufficient.	Gain in terms of area and functions.
Preservation	The removal of a threat to conditions or the prevention of the decline of wetlands through an action in or near the wetlands (e.g. land purchase, repair of water control structures).	To be used in exceptional cases (e.g. high threat on the environment).	No gains either in terms of area or functions. (application of high surfacic ratios, e.g. offset on 10 acres for an impact on 1 acre).

For conservation banks, offsets can take the form of the preservation, management or restoration of damaged habitat, the creation of habitat or corridors between separate habitats, etc. Unlike mitigation banks, no measure is favoured in the guides (Fox and Nino-Murcia, 2005) but in practice, the majority of conservation banks focus on preservation (ELI, 2008).

Process of opening a bank (2011 survey of economic services on offsetting)

Project approval

The bank's promoter must first receive the approval of the interagency assessment team on the ecological suitability of its project (site location, treatment envisaged to guarantee its environmental quality) and provide the information stipulated in the bank instrument.

Bank certification

With a view to obtaining certification allowing it to sell its credits, the promoter must then:

- introduce a conservation easement on the bank's site;
- conduct actions to enhance the site;
- secure an interim investment fund, which must be sufficient to manage the bank for its five year launch period;
- establish a trust fund: this fund will collect the product of the bank's credit sales, assumed to occur during the bank's launch period. Its size is calculated to sustain the bank's operation⁴⁶: the interest generated by the fund must be sufficient to support the bank's operation without touching the capital;
- establish a board of trustees responsible for managing the bank's funds (firstly the interim investment fund and then the trust fund).

Since 2008, it has been mandatory to establish a mitigation plan including: the bank's objectives, site selection criteria, site protection tools (e.g. easements), initial status of the sites potentially affected and of the offset sites, methodology used to determine the credits, ecological performance standards, requirements relating to monitoring, a long-term management plan, an adaptive management plan and financial guarantees.

The procedures for creating mitigation banks and conservation banks are very similar (see table 8).

⁴⁶ According to a bank promoter in Florida, the selling price of its credits must be at least 500 dollars per unit to reach the target amount in its trust fund (Responses to the questionnaire). It currently sells them for around 850 dollars per unit and before the financial crisis the price had reached 2,000 dollars a unit.

TABLE 8: PROCESS OF OPENING A MITIGATION BANK AND CONSERVATION BANK (USFWS)

<i>Mitigation bank</i>	<i>Conservation bank</i>
Application	Application
Public consultation	
Bank instrument including a bank closure plan	Bank instrument
Opinion of the Interagency Review Team	Opinion of the Conservation Banking Review Team
Approval of the US Army Corps of Engineers	Approval of the US Fish and Wildlife Service

During certification, the interagency assessment team does not assess the commercial profitability of the bank but its ecological contribution and the financial viability of the proposed organisation system (trust fund amount, hypothetical investment returns, bank management costs, etc.). In theory, a bank can be established to offset several types of impact (in particular several threatened species), but in practice this approach is only very rarely used (2011 survey of economic services on offsetting).

Sale of credits

Once certification has been obtained, the bank can begin to sell its credits. These are sold in phases, as the bank reaches its ecological performance standards, such as for example a certain percentage of plant cover or dominance of native species within plant communities (ELI, 2008). At the end of the launch period, if not all the credits have been sold, the promoter must add the missing sums to the trust fund, which does not prevent the bank from selling the remaining credits later and thus reimbursing the advance paid by the promoter.

A bank's credits can only be sold once and for a single type of environmental benefit (i.e. no overlap possible between wetland restoration and carbon sequestration credits). In certain cases, a credit can be used both for wetland offsetting and for biodiversity offsetting more generally: both types of credit must then be allocated to the same project. According to a bank promoter in Florida, the majority of its credits were sold by consultants conducting the impact assessments on behalf of the project developers (2011 survey of economic services on offsetting).

Inset 7: Definition and price of credits

A credit is a functional or surfacic (acre) unit of measurement corresponding to the ecological gain linked to restoration, enhancement, creation or preservation measures.

The number of one bank's credits is based on the surface of the wetland and/or the functional value of this wetland, depending on the practices of local authorities. In most cases, the number of available credits is inferior to the number of acres corresponding to the bank's area (Ecosystem Marketplace).

The functional approach is used when a bank targets complex environments and when a particular interest is paid to a particular ecological function. The surfacic approach is mainly used when knowledge on the functionality of a wetland is insufficient: for restored or created wetlands, one credit is often equivalent to one acre ; for enhanced or preserved wetlands, one credit is often equivalent to several acres, in order to take account of the low ecological value of the offset.

Among all credits of wetlands available in the United States (about 25 types of credits), the average price of credits is evaluated at 74 500 dollars (Madsen et al, 2010). However, the price may widely vary according to the local economic context (land availability and price), the type of ecological action (level of ecological engineering), supply and demand on the environment concerned (ELI, 2002) and the method applied. The price per wetland credit thus varies from 3 000 to 600 000 dollars (Ecosystem Marketplace).

Unlike the compensation banks, the price of an in-lieu fee credit is calculated based on a pre-established barometer. This is approved by the USACE, which must ensure it is sufficient for the programme to reach its objectives (2011 survey of economic services on offsetting).

There are between 1,000 and 1,500 mitigation banks in the United States. The conservation banks are much less numerous and mainly located in California where they were first established. This can partially be explained by the fact that this state has three times more threatened species on its territory than the other states and that the regulations there are stricter (offsetting can also be required for species not classified as protected species) (ELI, 2008; 2011 survey of economic services on offsetting). The United States is beginning to create maritime conservation banks of which there are currently three (2011 survey of economic services on offsetting).

FIGURE 6: DISTRIBUTION OF MITIGATION BANKS THAT ARE ACTIVE OR HAVE SOLD ALL THEIR CREDITS IN THE UNITED STATES (MADSEN ET AL, 2011)



FIGURE 7: DISTRIBUTION OF CONSERVATION BANKS THAT ARE ACTIVE OR HAVE SOLD ALL THEIR CREDITS IN THE UNITED STATES (MADSEN ET AL, 2011)



IV.1.2 – Advantages of the compensation banks

Source: 2011 survey of economic services on offsetting

The compensation banks as developed in the United States present significant advantages over direct implementation by the project developer.

- Implementation of the offset is ensured before the project has an impact. Due to the anticipation of the offset relating to the impacts of projects, the bank system enables uncertainty and the risks of failure to be reduced and the techniques employed to be more easily adapted. In addition, the bank must reach its performance standards before being able to sell more credits (ELI, 2008).
- Offsetting via a bank is of better quality due to a scale effect (larger area than on an isolated project), better training of their promoters regarding the techniques used and their interest in the project's success (either through personal involvement or commercial interest: maintenance of authorisations, sale of remaining credits, benchmark to facilitate procedures for opening new sites). Furthermore, the offset standards imposed on the banks are higher than those of the other two offset methods.
- It is easier to monitor the offsets as the sites to be audited are grouped.
- The number of offsets can be increased, particularly for small projects, as the process is easier both for the project developer and the administration.
- The mechanism enables owners whose land offers a habitat for threatened and endangered species to transform what they sometimes consider to be a handicap into an opportunity through the sale of credits (eftec, 2010).

IV.1.3 – Challenges of the system

Source: 2011 survey of economic services on offsetting

The American mitigation bank system does face certain challenges and difficulties.

■ Ecological challenges

- Numerous banks have not succeeded in replacing the functions and type of wetlands and have overall not reached the expected objectives (eftec, 2010; Brown and Veneman, 2001; Kihlsinger, 2008).
- Ecosystem services (e.g. water quality) are redistributed to the benefit of some local populations and the detriment of others (Ruhl and Salzman, 2006).

■ Financial challenges

- No particular mechanism is planned in the event of bank failure if the economic model proves to be incorrect.
- The initial costs of developing a bank, including the administrative costs, can be high (difficulties in obtaining loans from other banks and no specific financial aid).
- Due to a lack of profitability, the system can be unsuitable for areas where demand is low, in particular due to the lower density of the projects requiring offsets (e.g. states in the centre of the United States) and limited scope for the use of banks.

■ Audit and sustainability challenges

- The monitoring conducted has enabled several failings to be identified in relation to non-compliance with the permit conditions and the long-term management of the sites. A study conducted by the National Research Council has shown that 63% of the banks were inadequately audited (eftec, 2010).
- Monitoring over five years can be insufficient to determine whether the offset objectives have been attained, in particular for restoration projects (eftec, 2010).

Inset 8: Recommendations for countries wishing to develop compensation banks arising from experience feedback in the United States

- Choose "good sites" suitable to receiving compensation banks (determining success factor).
- Introduce an overall tracking system for the programme (banks available, credits available, etc.) to have a strategic overview of all projects (RIBITS website in the United States).
- Determine the monitoring period so as to ensure the performance criteria are met (eftec, 2010).
- Allow a certain amount of flexibility to adapt rules based on a system of assessments at regular intervals.
- Introduce measures with the aim of reducing the initial investment supported by the bank promoters.

Source: 2011 survey of economic services on offsetting

IV.2 – IN-LIEU FEE PROGRAMME: ALTERNATIVE TO BANKS AND DIRECT IMPLEMENTATION

In the absence of compensation banks, the in-lieu fee programme offers the project developer an alternative to direct implementation. It can also be used in addition to the direct implementation of offsets. In 2005, there were almost 46 active in-lieu fee programmes and 11 in the process of approval in the United States (ELI, 2006).

IV.2.1 – Definition and characteristics

An in-lieu fee programme provides for the restoration, creation, enhancement and/or preservation of aquatic resources based on financing paid by the project developers to a government agency or not-for-profit body to meet its obligation to offset. Like a compensation bank, an in-lieu fee programme sells credits to project developers whose duty to implement offsets is then transferred to the in-lieu fee programme promoter (Compensatory Mitigation Rule, 2008).

The types of impact that can be offset by the in-lieu fee programmes are those covered by the Clean Water Act §404, the water quality programmes and other state-specific regulatory programmes. Some in-lieu fee programmes feel they are not an option for fulfilling the duty to offset if credits are available via a mitigation bank (e.g. Louisiana Department of Natural Resources In-Lieu Fee Program).

In terms of guarantees of equivalence, the in-lieu fee programmes must be approved by the USACE (US Army Corps of Engineers), particularly in regard to the geographic area in which the programme is implementing measures subsequent to project authorisation, the framework agreement defining the type of measures and environments targeted, and compliance with a surfacic ratio of at least 1 to 1.

The sustainability of the measures is ensured by easements and property transfers to a federal agency or not-for-profit organisation.

An in-lieu fee programme has six parameters (ELI, 2009):

- The programme's framework agreement known as the in-lieu fee program instrument⁴⁷, which is the legal document relating to the creation, management and use of an in-lieu fee programme. This must include in particular: the location of the potential offset sites, the initial status of these sites and the projects, indicating the types of offset which may potentially be implemented. Some programmes specify a hierarchy of offsets to be adopted in the following order of priority: restoration, creation, enhancement and preservation.
- The assessment of the programme by the Interagency Review Team (IRT)⁴⁸ within which the USACE is the competent authority for programme approval. Each time the promoter of an active in-lieu fee programme wishes to establish a new offset project or modify the existing project, it must have it assessed and approved by the IRT.
- The programme's service area, defined as the geographic area (e.g. scale of the basin area, ecoregion, physiographic province⁴⁹) in which it is authorised to introduce offsets subsequent to project authorisation.
- The compensation planning framework included in the in-lieu fee program instrument aims to select, guarantee and implement the activities of restoration, creation, enhancement and/or preservation of aquatic resources. Offset sites must be selected strategically using the watershed approach, the aim of which is to maintain or enhance the quality and quantity of aquatic resources in the basin area (Wilkinson, 2008).
- An in-lieu fee program account created by the programme promoter to control the transfers paid in and out. Funds received from project developers must be kept separate from those from other agencies (associations, etc.). The funds collected must only be used for the purposes of offsetting wetland functions and values (e.g. habitat restoration or creation activities), and not to finance education or research projects (although some practice this). They should only be used when they are deemed sufficient to enable the programme to attain its objectives. The guide relating to the in-lieu fee programme published in 2000 stipulates that the funds collected "must achieve a minimum surfacic ratio of 1 for 1 acre"⁵⁰.
- Advance credits, which correspond to the limited number of credits available for sale before an offset project is even implemented. These advance credits are recovered as and when the credits are created by the offset project. Once the generated credits have reached the advance credit threshold, the same number of advance credits can be sold again. The in-lieu fee programme promoters can sell wetland credits, stream credits, both together, or both with the addition of another type of credit.

IV.2.2 – Advantages

In-lieu fee programmes are managed by not-for-profit bodies whose role includes the conservation of natural resources: these organisations have expertise enabling them to classify the sites according to their environmental and ecological values, and can undertake to ensure the long-term management of the sites. They can also implement offsets on a larger scale (watershed approach). They offer the possibility of offsetting lesser impacts located below the significant threshold and which would not normally be subject to compensatory measures. They offer an alternative to direct implementation by the project developers in regions where compensation banks are not developing due to a lack of profitability. (ELI, 2009)

⁴⁷ Example of an in-lieu fee program instrument: http://www.aswm.org/~aswm/pdf_lib/msd-ilfp_final_instrument_083010.pdf

⁴⁸ See part II on the institutional framework.

⁴⁹ Height or altitude of physical limits defining the relief or influence of certain natural phenomena, in particular sea level.

⁵⁰ An acre is 0.4 ha.

Like the compensation banks, they benefit from better monitoring and are overall considered to be more advantageous than direct measures.

IV.2.3 – Risks

The in-lieu fee system has been criticised in the past, notably due to a lack of visibility on the measures implemented at the end.

The promoters accept payments before even identifying the offset sites and therefore before the offsets have been implemented. For this reason, the lapse of time between the impacts and the introduction of compensatory measures can lead to a temporary ecological loss, whose offset and associated cost are difficult to estimate.

The promoters and the USACE do not necessarily share the same objectives: the in-lieu fee programmes aim to preserve natural resources in general without being limited to wetlands, whilst the USACE concentrates on offsetting the functions of lost aquatic resources with the aim of achieving the national "no net loss" objective (ELI, 2009).

IV.2.4 – Compensation bank versus in-lieu fee programme

The in-lieu fee programme and compensation banks are alternative systems for a project developer.

TABLE 9: COMPARISON BETWEEN COMPENSATION BANKS AND IN-LIEU FEE PROGRAMMES

	Compensation bank	In-lieu fee programme
Promoter	Entrepreneurs and for-profit bodies primarily	Not-for-profit bodies approved by the competent federal agencies
Sale of credits	After implementing the offsets (phased)	Before implementing the offsets (phased)
Price of credits	Negotiated between the project developer and promoter	Amount calculated based on a pre-established barometer approved by the USACE
Targeted development projects	Projects in progress or to come (anticipation)	Projects already authorised (offsets grouped <i>a posteriori</i>)
Transfer of responsibility	To the promoter	
Legal document with the authorities	Framework agreement (Instrument)	
USACE approval	At the time of the framework agreement	At the time of the framework agreement and offset projects
Scale of the offset	Variable (service area to be defined in the framework agreement)	Basin area (as a priority)
Financing	Loan from banks and trust fund	In-lieu fee account
Establishment of compensatory surface ratios	Yes	
Sustainability of the measures	Easement, transfer of ownership	

There is currently no study enabling the efficacy of the in-lieu fee programmes to be assessed (Robertson and Hayden, 2007). However, they have been criticised in the past for their lack of visibility on the efficacy of implementing the offset (2011 survey of economic services on offsetting).

IV.3 – AUSTRALIA: BUSHBROKER & BIOBANKING

In Australia, there are two systems similar to the compensation banks based on private property: BushBroker in the state of Victoria and BioBanking in New South Wales.

IV.3.1 – BushBroker

Source: 2011 survey of economic services on offsetting

The BushBroker programme was established in 2006 and the first exchange took place in early 2007. It introduced a credit transfer mechanism managed by the Department of Sustainability and Environment in the state of Victoria, which aims to facilitate the implementation of the Native Vegetation Management Policy of 2002⁵¹, under which any clearing must be offset such as to obtain a net gain in biodiversity. To fulfil its obligation to provide offsetting with a view to obtaining a clearing permit, if a project developer does not own a suitable site or is not able to manage the native vegetation over the long-term, it must register as part of the BushBroker programme.

The BushBroker programme identifies and includes on its register owners disposed towards actively conserving, enhancing and managing the native vegetation on their land⁵². A government agent inspects the land offered and evaluates the number and type of credits it represents. A ten-year management agreement is then concluded between the owner and the Department of Sustainability and Environment.

BushBroker requires the offset to be equivalent in terms of habitat type (like for like), but does not require the measure to be implemented near the affected site. The credits are determined using a methodology based on habitat hectares, which takes into account the quality and quantity of the biodiversity affected or preserved over a given area for a given period. An owner can increase its credits by agreeing to conserve its site in perpetuity.

The price of the credit, based on supply and demand (some types of credit are rarer, which affects the price) (eftec, 2010), is agreed between the credit vendor and the project developer. A credit can only be used to offset the impacts of a single project. A contract is then signed. Payments are transferred into a fund managed by BushBroker and forwarded to the vendor as and when the ecological gains are achieved. The offset site owner must provide the Department of Sustainability and Environment with an annual report of its activities. Audits and inspections are also conducted.

The BushBroker programme has enabled a total of 700 hectares to be conserved and managed between May 2006 and November 2009.

ADVANTAGES AND RISKS

BushBroker enables offsetting on a larger scale and with a higher success rate than the management of scattered sites. The time required to implement an offset is reduced, although the credit purchasers and providers still consider it to be too long. For the project developer, the procedure is simplified and enables it to find landowners providing offset credits. The cost of implementation is therefore reduced. For the landowners, BushBroker offers the opportunity to enhance the biodiversity of their land whilst generating revenue (BushBroker Implementation, 2009).

From the landowners' point of view, the main obstacles preventing them from participating in the *BushBroker* programme are:

- the uncertainty of whether the type of vegetation they have on their land will match the demand for offsetting on the market;
- the risk of not selling all of the credits on the site;
- the uncertainty of the management costs over the long term;
- the difficulties in understanding the way the price of the credits is determined and the profits from their sale accessed;
- the lack of knowledge of the programme or of the very existence of the programme.

Based on this experience feedback, the stakeholders agree on the utility of introducing an online register, both in terms of the system's transparency and of the availability of information (BushBroker Implementation, 2009). Currently, only a history of the average price by bioregion is available on the Department of Sustainability and Environment's website.

⁵¹ See the detailed legal framework in Appendix I.

⁵² Native Vegetation Exchange (NVX): <http://www.dse.vic.gov.au/conservation-and-environment/biodiversity/rural-landscapes/native-vegetation-exchange-trial>

IV.3.2 – BioBanking

Introduced in 2007, BioBanking is a market mechanism bringing together landowners who can generate biodiversity credits (species and ecosystems) and credit purchasers through a BioBank website. The purchasers may be project developers seeking to offset their projects' impacts on biodiversity, conservation groups or government agencies interested in conserving biodiversity in perpetuity. The purchase of credits transfers responsibility to the landowners. The credits can relate to ecosystems and species. BioBanking enables a project's impacts to be offset in an area other than that of the affected site, but with a similar type of vegetation.

This programme, initially launched as a pilot project, became official in Autumn 2009. Since then, one supply has been recorded covering 80 hectares and six BioBanks are currently being assessed.

An owner wanting to create a BioBank on its land must:

- have its land assessed to determine: the existing "biodiversity values" on its property, the management activities to undertake to conserve these values, and the number and category of credits generated⁵³;
- sign an agreement (BioBanking assessment) with the Department of Environment and Climate Change, which remains valid even in the event of a change of owner in order to guarantee the sustainability of the measures; this agreement notably stipulates the number and category of credits generated by the management activities, the nature of these activities and their financing.

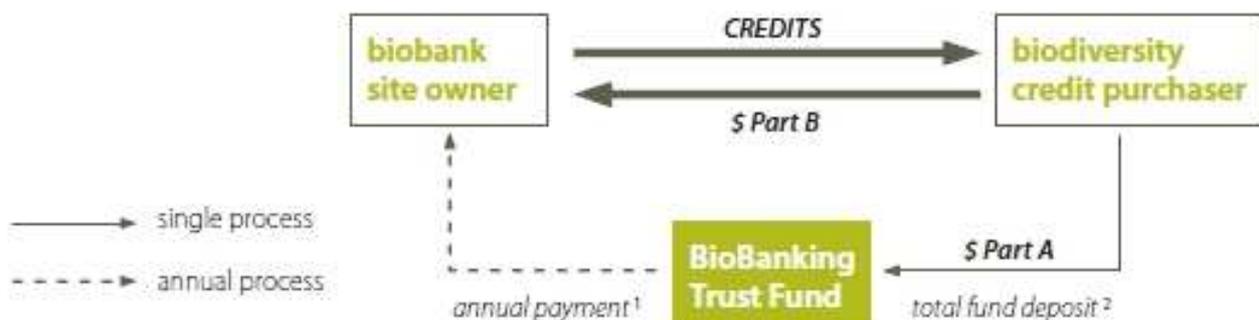
A project developer wishing to use a BioBank to offset its project's impact on biodiversity must:

- obtain an agreement (BioBanking statement) for its project from the Department of Environment and Climate Change, confirming the number and category of credits necessary to offset its impacts, and any other in situ measure required as part of the offset;
- reach an agreement with the landowner to purchase the appropriate credits to satisfy the above agreement and, once purchased, inform the Department of the transaction so that it can ensure the credits cannot be resold.

The government acts both as regulator and broker. It keeps a register of the credits generated on the BioBank sites and the agreements reached between the landowners and project developers.

BioBanking has a credit assessment methodology, a credit calculator and a fund managed by the government, the BioBanking Trust Fund (BTF), in which a proportion of the payments transferred to the BioBank owners by the project developers are centralised (see figure 8). The BTF invests credit sales revenue to fund the annual management payments to the landowners, in perpetuity. Each BioBank site holds an individual account in the BTF.

FIGURE 8: FINANCIAL TRANSACTION PROCESS IN A BIOBANK (DECC, 2007)



¹ Annual payment as per schedule in biobanking agreement

² Based on present value of estimated management cost

⁵³ See part V on the methodology.

BioBanking assessment. If it deems it necessary to protect the biodiversity, the Department can transfer the land to a third party in exchange for financial compensation.

BioBanking is similar to the BushBroker programme but is distinguished by the following characteristics:

BushBroker	BioBanking
Must be used by the project developer to offset its project's impacts (if own land not suitable)	Voluntary use to offset project impacts
No online register Government acting as regulator and broker, creating the link between the project developers and landowners	Free access to the online register ("market place") Government acting as regulator and broker; private consultants acting as brokers
Protection and management agreement for a minimum of 10 years and can be in perpetuity	Protection and management agreement in perpetuity, linked to the property title
Credit price based on supply and demand, negotiated between the project developer and owner	Minimum price based on the cost of establishing and managing the site, the administrative costs linked to the site assessment process and the investment returns required by the owner

ADVANTAGES AND DIFFICULTIES

Recently established, the BioBank mechanism has yet to prove itself but experts feel it is promising. It was introduced as a reliable and transparent means of ensuring offset sites are judiciously selected (cost-effectiveness ratio) and guaranteeing active management by the owner.

BioBanking reduces risks. The environmental assessment is conducted by experts who apply the same methodology to the impact sites as to the BioBank sites. This approach enables the offsets to be determined more objectively by calculating their equivalent credits. (2011 survey of economic services on offsetting).

BioBanking reduces the time taken to implement measures. The credit negotiation step is removed as the BioBanking Credit Calculator determines the required credits. The Department of Environment and Climate Change assesses requests within 28 days of receiving them.

BioBanking enables quality projects to be planned thanks to better identification of suitable sites. The risk that the project developers no longer seek to reduce their impacts as far as possible before resorting to offsetting is minimised by legislation obliging them to apply the mitigation sequence before considering compensatory measures (2011 survey of economic services on offsetting).

However, just one supply by a landowner has been recorded since BioBanking came into application in 2009. The reasons posited by the Environment Institute of Australia and New Zealand are:

- the difficulty in establishing a market price for the credits;
- the difficulty for the project developer in identifying which of the credits supplied match its needs;
- the high investment (of around 8,000 Euros) required of the owner to establish its BioBank;
- the voluntary nature of the programme, which leads to uncertainty regarding the supply and demand of credits (Scanlon, 2007);
- although the system is based on and adapted to the latest scientific knowledge, it remains imprecise and complex, and makes it difficult to determine "biodiversity values" (Burgin, 2008).

IV.4 – GERMANY: LAND POOLS (*FLÄCHENPOOLS*) & ECO-ACCOUNTS (*ÖKOKONTOS*)

Source: 2011 survey of economic services on offsetting

Since the 1990s, to address the lack of sites suitable for offsetting and avoid the problems of delays often observed, new market instruments in the form of land pools (*Flächenpools*) associated with eco-accounts (*Ökokontos*) have been developed following an amendment to Germany's Federal Building Code in 1998 and Federal Nature Conservation Act in 2002 (Wende et al, 2005). The German public authorities have encouraged the development of a range of offset services.

To implement offsetting before the impact and guarantee its sustainability, compensation agencies (mostly municipalities) can establish a land heritage (forests no longer used, fallow land, ponds, etc.), secure it and make it available to project developers

to implement offsets. In Bavaria (20% of the surface area of Germany), approximately 2,600 ha of land was placed in land pools between 2008 and 2009.

In addition to securing these land pools, some agencies implement anticipated offsets whose ecological gain is accounted for in the form of eco-points held in an eco-account. For its part, the project developer can either sign a contract for an agency to manage a land pool as part of the compensatory measures, or assess the ecological cost of its impact by calculating the number of eco-points to offset, which it will buy from the agency managing the *Ökokonto*. In the latter case, the sums paid to the managing agency enable it to maintain its land capital or acquire new land.

The land pools and eco-accounts are registered by the local nature conservation agencies (eftec, 2010). According to the European Commission, the German territory counts 21 eco-accounts. The price of the credit varies according to the state and the availability of land. In the state of Hessen for example, the price of the eco-point is set by law to 0.35 Euros (European Commission, 2011).

Land pool	Eco-account
Sites selected for the offset	
Land managed on the sites	
Sites represented on the land use plan	
-	Offsets implemented before the impact (anticipation)
-	Measures included in development plans
-	Refinancing by each developer (purchase of eco-points)

ADVANTAGES AND RISKS

Source: 2011 survey of economic services on offsetting

The land pool and eco-point systems have been created to facilitate the development of offsets with the minimum consumption of space.

The land is managed sustainably by specialist agencies and enables the offset to be implemented ahead of the project.

The system offers flexibility to the project developers, who can select a suitable offset site from a pool of pre-existing sites (eftec, 2010), and enables them to reduce costs. Anticipated and pooled land acquisition enables conflict between farmers and each project developer to be avoided.

In practice, these mechanisms, which are still quite new, do not enable optimum allocation of the land resource, which is rare in Germany. The risk remains that these systems will be favoured to the detriment of avoiding impacts.

One of the recurring difficulties is monitoring and managing the land over the long term.

Inset 9: Recommendations for countries wishing to develop compensation banks arising from the experience feedback in Germany

It is essential to establish a regulatory and methodological basis before introducing compensation banks (2011 survey of economic services on offsetting).

To be effective, a land pool must meet the following objectives and criteria (Wende et al, 2005):

- Compliance with the objectives of regulations; namely avoidance, reduction, compensation and the permanent protection of offset sites.
- Improvement of the conditions accompanying the offset: the creation of land pools must enable offset sites to be more available.
- Reduction of the time required for the procedure associated with implementing the offset.
- Clear definition of responsibilities relating to the land pools (offset site selection, pool management, etc.).
- Securing of sites in advance.
- Involvement of local stakeholders.

IV.5 – NETHERLANDS: COMPENSATION BANK PILOT PROJECTS

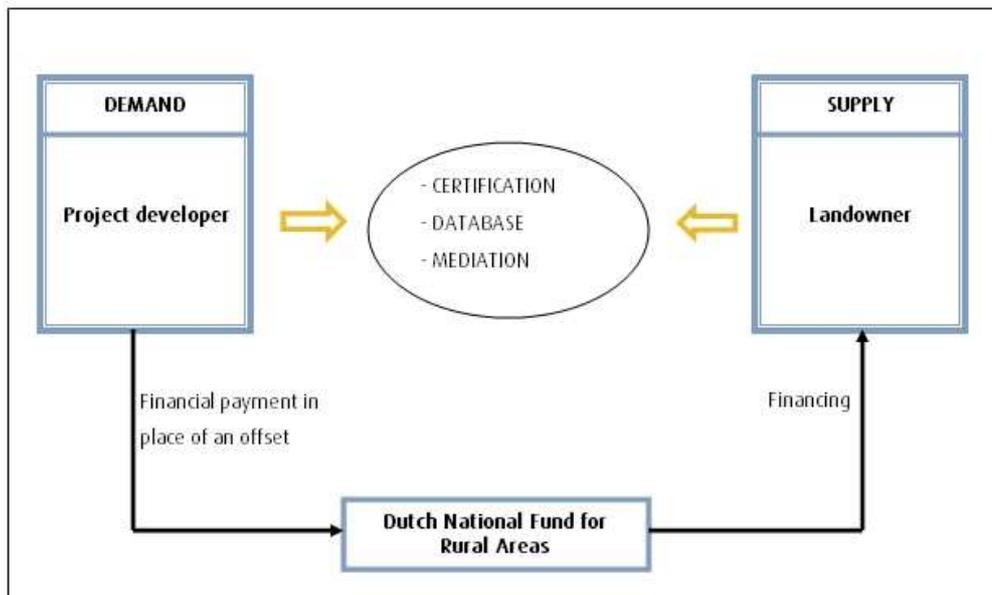
Source: 2011 survey of economic services on offsetting

To date, compensation banks do not formally exist in the Netherlands but faced with the insufficient implementation of offsets, the Dutch National Fund for Rural Areas is conducting compensation bank pilot projects. The objective is to accelerate and improve the quality of offsets by bringing together the supply and demand for sites where compensatory measures can be implemented. The project developer makes a payment through the Dutch National Fund for Rural Areas and not directly to the landowner.

To this end, it is planned to develop the following activities (see figure 9):

- Provide an overview of the land appropriate for implementing offsets ("certification");
- Develop a computer system in which this land is registered ("database");
- Introduce a process of information exchange between those requiring offsets (project developers) and the appropriate landowners ("mediation").

FIGURE 9: THEORETICAL OPERATING MODEL FOR THE COMPENSATION BANK IN THE NETHERLANDS (DUTCH NATIONAL FUND FOR RURAL AREAS, 2010)



The main pilot project in the Netherlands is based in the Rhine and Meuse polders (region straddling 5 provinces). This region includes Natura 2000 sites, often affected by developments conducted by the provincial authorities with the aim of reinforcing flood defences. Legislation requires offsetting in-kind to be implemented on the same Natura 2000 site.

Given the problems encountered in implementing offsets, the pilot project explores the possibility of financial compensation by the project developers (in this case, the provincial authorities). These will finance site creation projects outside the EHS ecological network and Natura 2000 sites. The Dutch National Fund for Rural Areas is responsible for collecting these sums and financing the pilot projects.

Equivalences in terms of ecological value of the habitats and species, which may require conversion tables, are being determined in collaboration with the Alterra research centre at the University of Wageningen on the basis of the European EcoTRADE⁵⁴ research project.

The possibility offered by the compensation banks of offsetting before the development project is executed is highlighted by the Dutch National Fund for Rural Areas, as this enables a temporary net loss to be avoided.

None of our contacts has reported any risks associated with the mechanism. However, the complexity of the legislation may, according to the Dutch National Fund for Rural Areas, hamper the successful operation of the compensation bank.

⁵⁴ www.alterra.wur.nl/UK, www.ecotrade.ufz.de

IV.6 – FRANCE: OFFSET SUPPLY TRIAL

The offset supply trial in France, launched in 2008, is based on the American compensation bank mechanism. It consists, for an operator, of anticipating the potential demand for offsets in regions where the expected pressure on the environment is high. The operator secures land via a land acquisition or permanent contracts. It restores the land through actions generating an ecological gain with the aim of subsequently promoting it as an offset by selling units to several project developers. Units are sold through contracts between the operator and project developers.

The logic of anticipating the supply of offsets forms part of an approach to take account of biodiversity as far in advance as possible when preparing a development project. Amongst the expected advantages are the introduction of large scale actions linked to the pooling of offsets, particularly for small projects (ecological coherence), the effective execution of the offset before the impact is made, and the reinforcement of its sustainability.

The trial falls under existing law. The project developers remain liable for the regulatory requirements relating to nature protection applicable to their project, in particular the sequence of avoiding and reducing impacts, and only using offsetting as a last resort. The environmental authority gives an opinion on compliance with these principles and the quality of the offsets with regard to the residual impacts. At enquiry stage, the administrative authority and, where applicable, the consulting bodies referred to (for example the National Council for the Protection of Nature) check that the offset planned via a trial operation fully meets the requirements of re-establishing the ecological situation (for example, for protected species, maintaining the local populations of the species affected by the project in a favourable state of conservation).

A trial operation must be subject to an agreement with the Ministry of Sustainable Development. It can be conducted by a public or private promoter. It must enable the impacts of several projects to be offset and cannot therefore be implemented for a single project developer needing to fulfil its obligation to apply offsets.

The trial operations must comply with the principle of additionality of the offset; in other words, they must not replace public nature conservation actions.

Operators must commit to a minimum management period of 30 years. Scientific monitoring must be continual for the first eight years at least. Beyond the management period, the operator must plan a solution to ensure the site's ecological vocation is maintained (for example, transfer of land to a public body or inclusion in a protected area) in consultation with the local stakeholders.

The price of the credits is determined by the operator based on the actual cost of the operation. The costs to be taken into account are linked to securing the land or usage, ecological measures, management over at least 30 years and administration costs. It must also take account of the technical and financial risks and be based on a unit sales scenario related to the estimated development pressure on the land. The price can be adjusted as certain costs change, particularly in the case of an operation based on usage control (contracts).

The project developers remain free to choose the way in which they fulfil their obligation to offset: trial operations are just one of many options. In the event of recourse to a trial operation, the project developers remain responsible to the State (through their regulatory authorisation decrees) for the commitments made in terms of offsets in the contract with the operator.

Recourse to a trial operation must comply with the principles of equivalence. The habitats, species and functions targeted by the trial operations must be the same as the habitats, species and functions affected by a project that resorts to a trial operation to offset. Trial operations can only be used to offset impacts located in nearby areas with an ecological function identical to that affected.

Currently, one pilot operation is in progress (Cossure operation). A request for proposals initiated by the Ministry of Sustainable Development in June 2011 should result in the launch of 4 new operations, representative of a variety of habitats, species and regions⁵⁵. The selected sites must be suitable in regard to the known or potential pressure for development, and the principles of additionality and equivalence. The selected operators shall bear the cost of the operations and benefit from the support of the trial's national steering committee coordinated by the Ministry of Sustainable Development and of a local committee coordinated by the Regional Directorate of the Environment.

⁵⁵ Link to the call for proposals: <http://www.developpement-durable.gouv.fr/Appel-a-projet-pour-tester-un.html>

IV.6.1 – Cossure Operation

In 2008, CDC Biodiversité⁵⁶ launched the first pilot operation aiming to assess the suitability and feasibility of an offset supply with the Ministry of Sustainable Development. It was launched in the PACA (Provence-Alpes-Côte d'Azur) region, in close collaboration with all the stakeholders concerned in the region (DREAL, DRDAF, SAFER, local councils, chamber of agriculture, agricultural profession, CEEP, and technical and scientific partners).

CDC Biodiversité is the overall operator of the operation: it is responsible for its technical and financial steering for its entire duration and bears all the resulting risks.

IV.6.1.1 – Context and interest of the operation

The Coussouls de Crau is a unique ecosystem in the world (semi-arid steppes), resulting from thousands of years of pastoral activity. It is home to remarkable fauna, in particular the Pin-tailed Sandgrouse, Little Bustard, Common Kestrel, Stone Curlew, Crau Plain Grasshopper and Crau Jewel Beetle (*Bupreste de Crau*).

The impact factors in this region are multiple and sometimes ancient, notably: the geographic position of the Crau plain between major freight routes, which generates strong development of logistics activities, the development of the *Grand Port Maritime de Marseille*, agriculture, etc.

In this context, the operation's objective is to rehabilitate an environment (short dry grassland) favourable to the characteristic species of the dry Crau, integrating as far as possible into the Coussoul's plant dynamic, via revegetation and sheep grazing.

Because it demonstrates ecological additionality, according to the project enquiry procedures in force, the operation can be viewed as offsetting by developers of projects liable to have a residual impact (after avoiding and reducing impacts) on equivalent environments near to the Cossure site.

IV.6.1.2 – An operation in four steps

As operator, CDC Biodiversité steers and is responsible for all the steps specified below.

Step 1: Land strategy and securing of land through the acquisition of 357 ha of abandoned orchards

For several years, the State services (DDAF⁵⁷ and DREAL⁵⁸) have implemented a land strategy with the local stakeholders aiming to identify land acquisition opportunities in advance in this particularly threatened sector.

The PACA land agency SAFER was responsible for enabling the liquidation sale of the assets of the former owner of the Cossure orchard. It acts as an intermediary on behalf of CDC Biodiversité, which financed the acquisition of 357 hectares of the Cossure orchard and became its owner in September 2008. The land acquired is adjacent to a Natura 2000 site and the Coussouls de Crau natural reserve, which makes the operation important from the point of view of ecological coherence.

Step 2: Baseline and engineering of the operation

CDC Biodiversité entrusted the assessment of the site's baseline to the University of Avignon and the Provence Ecosystem Study Conservatory (CEEP). This step is used in particular to assess what the action undertaken will bring to the site and frame the rehabilitation and management objectives.

Step 3: Rehabilitation work (period of two years)

Rehabilitation breaks down into 3 steps: 1) cleaning and recycling of equipment (wood and plastics), 2) return to topographic condition, and 3) experimental revegetation of the site. Rehabilitation involves conducting ecological engineering actions over vast areas, using innovative techniques developed by the Mediterranean Institute for Ecology and Paleoecology (UMR CNRS IRD IMEP) at the University of Avignon. To this are added pastoral developments (construction of two sheepfolds). All of these operations are financed by CDC Biodiversité, which is responsible for the steering and holds technical and financial responsibility.

Step 4: Conservatory management and ecological monitoring (period of 30 years)

As co-managers of the Natural reserve, the CEEP and Chamber of Agriculture are responsible for managing the 357 ha on behalf of CDC Biodiversité for a period of 30 years, after which CDC Biodiversité undertakes to guarantee the sustainability of the site's ecological vocation.

⁵⁶ CDC Biodiversité is a direct subsidiary of the Caisse des Dépôts, launched in February 2008.

⁵⁷ Departmental Directorate of Agriculture and Forestry.

⁵⁸ Regional Directorate of the Environment, Development and Housing.

Ecological management of the areas is based on eco-pastoralism. Scientific monitoring of the site's restoration objectives has been introduced based on habitat and species indicators and with a regular review of the management plan. All of these operations are financed by CDC Biodiversité, which is responsible for the steering and holds technical and financial responsibility.

IV.6.1.3 – Promoting the operation

ACCEPTABILITY OF THE "COSSURE" OFFSET

CDC Biodiversité can offer project developers with an obligation to offset the option of purchasing Cossure units, if they so wish and on condition they comply with the authorisation procedures in force (notably the avoid, reduce and offset sequence). For the project developer it is not a case of acquiring some of the land, but of buying a certain number of units of exchange (here equivalent to hectares, see V.6.3.2.) as part of a contract with CDC Biodiversité; the quantity of units depends on the offsets it must implement.

EQUIVALENCE

So that the Cossure "natural asset reserve" can be considered to be eligible as compensation for different projects, regional and ecological equivalence must be defined between the Cossure operation and the habitats or species whose loss or damage is to be offset. This definition is conducted at the end of the full impact assessment process for each project, and is the responsibility of the project developer. Scientific monitoring of the Cossure operation facilitates the definition of equivalences.

COSSURE UNITS

The operation is promoted through the sale of units ("natural assets") to project developers who need them to meet their obligations to offset.

The hectare is used as the basic unit for the transactions, due notably to the uniformity of habitat over the entire site. The Cossure operation generates as many units as hectares on which it is conducted, giving 357 units. The units generated by the Cossure operation are recorded in a register held by the PACA DREAL.

The price of a Cossure unit (35,000 Euros at September 2008 value) is determined by the full cost of the operation, namely the costs linked to land acquisition, rehabilitation, development, ecological and pastoral management and administration, as well as the unit sale scenario. It takes into account various technical and financial risks.

IV.6.1.4 – Governance of the operation

Two committees are responsible for monitoring the Cossure operation.

The national committee is responsible for establishing a methodology applicable to all trial operations, validating the progress reports relating to each operation and assessing the trial. It meets approximately twice a year.

The members of the national committee are the General Commission for Sustainable Development (CGDD), the General Directorate of Development, Housing and Nature (DGALN), the General Council for the Environment and Sustainable Development (CGEDD), the DREAL concerned by the operations and interested in the trial, representatives of the National Council for the Protection of Nature (CNPN) and the operators committed to the trial operations in progress.

The local committee is responsible for mounting the operation both technically (work, management methods) and methodologically (proposals of equivalence and the sale of units). It is steered by the PACA DREAL and meets every three months.



(Source: Malene Thyssen)

V – METHODOLOGY

Summary



(Source: Boricuaeddie)

The methodology associated with offsetting is essential as it must enable the requirements of the regulatory framework on equivalence to be met and reflects the priorities of biodiversity conservation.

An offset is characterised on a spatial scale, whether it is implemented near to the affected site (in situ) or on another site, geographically further away (ex situ); and by the scope it targets, whether the species or habitat is the same (like for like) or different to the affected scope (like for unlike). A preference is generally accorded to measures in situ and like for like, however, these are not always feasible or optimal. Some countries (Australia and the United Kingdom) allow trading up based on a prioritisation of the challenges: offsets can relate to a habitat type or species that has a higher priority in terms of conservation than that affected.

Implementing offsets requires a methodology for assessing the ecological losses and gains which, to date, is lacking in the majority of countries studied. The necessity for a scientifically robust method is opposed to the need for an accessible method that can be put into place within a short space of time and at the least cost. The assessments are generally made on a case by case basis and a multitude of approaches have thus been developed to assess the equivalence between ecological losses and gains.

The existing approaches can be based on species (wealth and diversity), habitats (condition and quality), functions and services. The majority of countries studied estimate equivalence based on habitats. Some countries, which have compensation banks (Australia, Germany and the United States), also determine equivalence in terms of functions to assess the ecological performance of the environments, which requires more data and a measurement of the ecological gain over the longer term.

The simplest approaches are based on a surfacic ratio with the application of multipliers. These multipliers are set by regulations (e.g. Forest Code in Denmark, Koala habitat protection programme in Australia) or proposed on a case by case basis by the project developer for its project.

To attain qualitative equality between ecological losses and gains, some countries (particularly those equipped with compensation banks) have developed methods based on an assessment of the sites before and after intervention. The values obtained, expressed as a number of points, are used to compare the ecological losses and gains using the same approach and same unit of measurement; they do not aim to express the ecological or economic "value" of a site. The assessment consists of a more or less defined multi-criteria analysis: it is based on predefined values by type of environment (Germany), a comparison of the affected or restored environment with benchmarks representing its optimum condition in a given region (Australia and United States), or matrices combining assessment factors and area factors (Switzerland and United Kingdom). The assessment is generally made by breaking down the area in question into uniform sub-areas (United States and Switzerland).

These methods cannot automatically be applied to offset all types of impact. Lines are drawn: not everything can be offset. For example, the Swiss method does not apply to corridors of national importance, which cannot be affected.

In Germany, like for like measures near the affected site are preferred but the application of this principle is flexible for non protected biodiversity. Several methods exist, based on an environmental or monetary equivalence. The most used consists of assessing the value of the sites based on a regional list, which assigns a value to each biotope according to its degree of "naturnity", rarity, degree of threat and capacity to be restored. This approach is based on the assumption that some biotopes can be substituted, with the objective of maintaining the overall level of function.

faisabilité

critères
particularité

in-situ

enjeu
biotope
site
ex-situ
conservation

ligne
rouge

évaluation

dimensionnement
trading-up
qualité

In Switzerland, the quality of the sites is assessed according to several parameters such as the age of the biotope, its connectivity with other sites, the presence of protected species, etc. Equivalence is achieved when the quality of the study area prior to impact is equal to the quality of this same area subsequent to the impact and offset. This method is based on a matrix that can be adapted on a case by case basis and is used to consider all components of biodiversity, both patrimonial and general.

In Australia, the standardised habitat hectares method is applied in the state of Victoria within the framework of the BushBroker programme targeting native vegetation. It is based on a comparison between the current condition of a vegetation class and a benchmark established for each bioregion. The BushBroker programme requires like for like offsetting, but trading up is permitted. In New South Wales an assessment method has been established specifically for the BioBanking programme. It also uses benchmarks and is equipped with software used to calculate the number of credits required or available for offsetting.

In the United States, numerous specialist approaches have been defined locally to determine the debits (losses) and credits (gains) applicable to wetlands in particular. The recommended methods are those that assess the ecological functions, including against benchmarks as in Australia. Nonetheless, the acreage assessment method remains the most used as it enables developers to save time and resources and requires a lower level of expertise than the other methods.

In spring of 2012, the United Kingdom started to trial the application of offsets outside protected areas on a voluntary basis. A methodology has been established and is to be tested in the pilot projects. It is used to determine the number of biodiversity units required or generated on a site as compensation in accordance with the distinctiveness and condition of the site. It favours like for like measures, but trading up is authorised. The measures to be implemented are quantified using pre-established multipliers in accordance with a matrix taking account of the risk relating to results, the location of the site and the time delay.

In the 14 countries studied that accept financial transfers as offsets, the amount is generally calculated based on the estimated costs of the corresponding compensatory measure. The question of equivalence is raised both in the design of the method to calculate the amount and, above all, in the allocation of the amounts to suitable ecological actions. India and Brazil have adopted a specific approach which, although established with a care for transparency, tends to disconnect the financial transfer from the biodiversity components affected. In Brazil, the sum required as environmental compensation corresponds to a percentage (degree of impact), which can vary between 0% and 0.5% of the total cost of the project. This percentage is based on several criteria such as the state of the biodiversity, the intensity of the impact, the influence on protected areas, etc. In practice, the maximum limit of 0.5% is often attained. In India, the amounts required for impacts on the forest are based on the economic assessment of certain services provided by the forest (ecotourism and medicinal plants), and are then managed globally within a fund to promote forest conservation.

Source: 2011 survey of economic services on offsetting



V.1 – IN-KIND⁵⁹ OFFSETS: ASSESSMENT METHODS

V.1.1 – European Union (Natura 2000): Qualitative assessment matrix

Source: *European Commission Guide, 2007*

The European Commission has drafted a methodological guide to facilitate the application of the "Habitats" (particularly article 6) and "Birds" directives relating to the Natura 2000 network⁶⁰.

In principle, the offset must be operational at the time the damage to the site concerned becomes effective. When this is not possible, extra offsetting may be required to counterbalance any temporary losses.

When designing the offset, clear objectives must be defined, determining:

- the total number of species affected, the main species affected and the approximate proportion of the total population(s) they represent;
- the main functions of the affected habitats which are of decisive importance to the species concerned (feeding, rest, etc.);
- the populations of species liable to be concerned and the habitat functions in a favourable state of conservation;
- the measures necessary to offset the prejudice caused to the functions and species of the affected habitat and to re-establish them, so as to arrive at a favourable state of conservation for the affected area.

Ratios are defined on a case by case basis, but it is generally recognised that the ratios must be markedly greater than 1:1. Offset ratios equal to or less than 1:1 must only be considered if it has been demonstrated that the planned measures will enable the site's structure and function to be re-established 100% within a short time.

The efficacy of the offsets is judged on the basis of an assessment matrix (see table 10) (European Commission, 2001).

⁵⁹ The term "in-kind" used in this study (translation in French: "en nature") characterises compensation measures that are implemented via direct ecological measures (e.g. restoration of habitats) and not via financial transfers. Note that the term "in-kind" also often refers to compensatory measures that are "like for like" (ecological equivalence).

⁶⁰ See the detailed legal framework in Appendix I.

TABLE 10: EXAMPLE OF AN OFFSET ASSESSMENT MATRIX (EU, NATURA 2000)

<p align="center">Name and brief description of the plan or project and the way in which it will have adverse effects on the Natura 2000 site</p>	
<p>It has been proposed to facilitate navigation in the deep waters within an existing port installation and place the dredged material on the mudflats that form part of a Natura 2000 site. This work will cause the area covered by intertidal mudflats to be significantly reduced.</p>	
<p align="center">Description of offsets</p>	
<p>The dredged material will be used to fill the port's intertidal mudflats and 4 hectares of intertidal habitat will be created using an existing marsh area. Managing the realignment will offset the loss of intertidal habitats resulting from the dredging. The location and quality of the existing habitat for birds using the site will be conserved.</p>	
<p>Assessment questions</p>	<p>Responses</p>
<p>How were the offsets identified?</p>	<p>Through continual consultation with the national nature conservation agency, the appropriate non-governmental organisations, the landowners, etc., through a management committee.</p>
<p>What alternatives were identified?</p>	<p>A certain number of other sites were considered for the location of the replacement habitat but the chosen site met the nature conservation agency's criteria.</p>
<p>How do these measures fulfil the site's conservation objectives?</p>	<p>The measures are a "like for like" replacement which is sufficiently close to the Natura 2000 site to be considered to be a recreation of the ecological conditions of the lost site.</p>
<p>Do these measures correspond, in comparable proportions, to the adverse effects on the habitats and species?</p>	<p>The area of the new habitat is the same as that which will be lost, with other offsets planned in the future.</p>
<p>How do the offsets conserve or increase the overall coherence of the Natura 2000 network?</p>	<p>The offsets will directly replace the existing Natura 2000 site and future development plans will further heighten, conserve and increase the overall coherence of the site.</p>
<p>Do these measures relate to the same biological region and the same Member State?</p>	<p>Yes.</p>
<p>If the offsets require land outside the Natura 2000 site affected to be used, is the land owned and managed over the long term by the project or plan promoter or by the appropriate national or local authority?</p>	<p>The land will be purchased and a legal agreement will be drawn up between the parties involved.</p>
<p>Does the offset site have the same geology, hydrology, soil, climate and other conditions as the Natura 2000 site affected by the project or plan?</p>	<p>It will be necessary to carry out some work for the new site to have the same conditions as the lost habitat. However, the nature conservation agency considers replacement of the intertidal area to be a "proven technique".</p>
<p>Do the offsets provide functions comparable to those that contributed to the selection of the original site?</p>	<p>The nature conservation agency considers that once the site has been appropriated and the legal protection measures are in place, the site will meet the benchmark criteria for belonging to the Natura 2000 network. The borders of the SPA will be adjusted to incorporate the newly created habitat.</p>
<p>What evidence exists to demonstrate that this form of offset will be a success in the long term?</p>	<p>The nature conservation agency thinks there are good reasons to believe the offsets have a good chance of succeeding. However, estuaries are complex and dynamic systems, and it is uncertain whether the offset site will be an exact replacement of the lost habitat.</p>

V.1.2 – Germany: Regional lists of biotope values

Source: 2011 survey of economic services on offsetting

In Germany, the general approach consists firstly of describing the baseline of the site prior to the project and then estimating the project's potential impacts. This second step includes the identification of all the key biodiversity components concerned and the impact assessment, the comparison of alternatives and the application of reduction measures. The last step consists of determining the compensatory measures in terms of quality and quantity to attain equivalence between the loss caused by the impact and the gain linked to the offset (Darbi and Tausch, 2010).

Compensatory measures of the same type (like for like) and near to the affected site are preferred⁶¹ in accordance with the following hierarchy: measure offsetting the same function on the same site, the same function on a different site, a different function on the same site or a different function on a different site.

To assess the environmental impacts, several methods have been developed at national and regional level based on research conducted for 30 years. There are over 42 approaches, which may lead to very different results with no particular method being universally accepted. However, it is possible to distinguish two main methodologies, which are sometimes used in combination: one a qualitative and descriptive method and the other quantitative.

The qualitative method is based on expert opinion (Darbi and Tausch, 2010). It proves to be particularly useful in cases with a lack of data and complex ecosystems.

The quantitative method uses two distinct procedures: quantifying offsets either by valuating biotopes or according to restoration costs. In Germany, over 70% of assessments are based on the valuation of biotopes.

Methods presented below are not applied for impacts on Natura 2000 sites and on protected species.

Quantification by valuating biotopes (*Wertbiotopverfahren*)

Biotope types are described in lists specific to each state, which attribute values (one or two depending on the state) to each biotope (Darbi and Tausch, 2010). These values are calculated based on biological criteria, abiotic factors (soil, water, air and climate) and landscapes, including their function and the services provided (2011 survey of economic services on offsetting). They depend on the biotope's degree of "naturity" and rarity, and also take account of the threats weighing on the environment and its capacity to be restored. In the state of Saxony-Anhalt for example, biotopes are allocated two values: a standard value before impact and an expected value subsequent to the implementation of an offset. They vary from 0 to 30 per square metre. The risk of not reaching the objective of the offset is incorporated into the expected value so well that this is lower than the standard value. In the State of North Rhine-Westphalia, the value allocated to the biotope also reflects the expected value on the condition an offset is implemented over 30 years. These lists no doubt require regular updating (for example, the law in Saxony-Anhalt is valid for 5 years). Table 11 shows an example of a list of biotopes in one state.

TABLE 11: EXTRACT OF A LIST OF BIOTOPES IN THE STATE OF SAXONY-ANHALT⁶²

Code	Biotope	Standard value	Expected value (after offsetting)
WLA	Beech forest	27	20
GIA	Intensive grassland	10	9
FFF	River	30	23
MXC	Marsh	18	15

According to the biotope valuation method, the ecological losses and gains are calculated by comparing the values before and after impact and offsetting respectively. The total losses and gains are assessed by multiplying the calculated values by the area. For every loss of value, the offsets implemented must offer an equivalent gain in value (see figure 10). In this method, the offset can relate to a biotope other than that affected but which has the same value and is close in geographic and functional terms.

⁶¹ See the detailed legal framework in Appendix I.

⁶² This example is just an extract and does not reflect the exhaustive nature of the list. For example, several species of beech are listed.

FIGURE 10: BIOTOPE VALUATION PROCEDURE (DARBI AND TAUSCH, 2010)

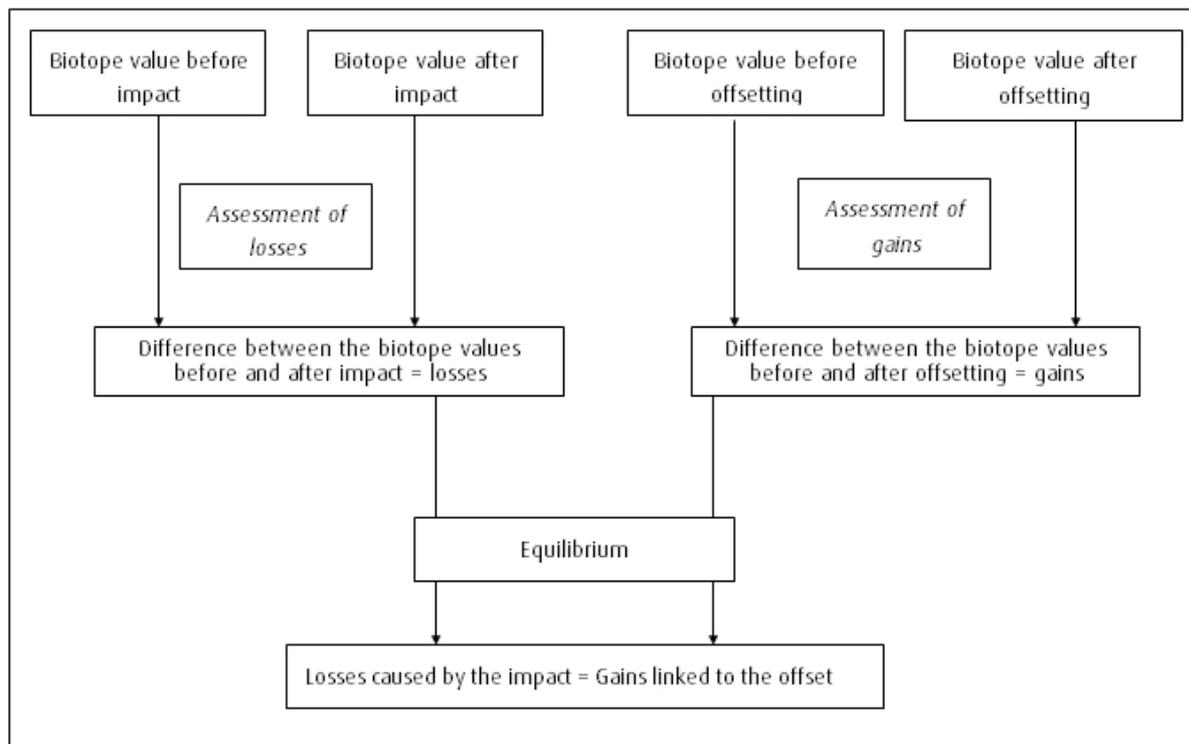


Table 12 shows an example of how the method is applied.

TABLE 12: EXAMPLE OF OFFSET CALCULATION (SIMPLIFIED)
BY THE MINISTRY OF THE ENVIRONMENT IN THE STATE OF THURINGIA (2005)

IMPACT	Nature of the biotope before impact		Extensive grassland
	Biotope value before impact	vb_1	25
	Nature of the biotope after impact		Tarmaced road
	Biotope value after impact	va_1	0
	Difference between the biotope values	$vd_1 = vb_1 - va_1$	25

	Size of the area	a_1	10 ha
	Losses	$v_1 = vd_1 * a_1$	250
OFFSET	Nature of the biotope before offset		Fallow land
	Biotope value before offset	vb_2	20
	Nature of the biotope after offset		Shrub
	Biotope value after offset	va_2	40
	Difference between the biotope values	$vd_2 = va_2 - vb_2$	20

	Size of the area	a_2	12.5 ha
	Gains	$v_2 = vd_2 * a_2$	250
Equilibrium		Losses = gains	

This method can also be used with offset multipliers, determined and validated by experts based on experience feedback. These take account of the importance of the affected site (high, medium or low) and the severity of the impact (significant or medium) (Darbi and Tausch, 2010).

**TABLE 13: EXAMPLE OF BIOTOPE VALUATION ASSOCIATED WITH OFFSET MULTIPLIERS
(DARBI AND TAUSCH, 2010)**

ASSESSMENT OF THE BASELINE BEFORE IMPACT				
Agricultural landscape lacking structure; impermeable soil with roads and buildings; weed verges with few species			Category I: Areas of low importance from an ecological point of view	
ASSESSMENT OF THE INTENSITY OF THE IMPACT TO DETERMINE THE OFFSET MULTIPLIERS				
Strong impact			Type A	
Medium or low impact			Type B	
ASSESSMENT OF THE DEGREE OF OFFSET				
Type of environment affected	Type	Size of the potential offset area	Offset multiplier	Size of the offset site (area*multiplier)
Construction land and tarmaced areas	A I	6 ha	0.6	3.6 ha
Recently tarmaced roads	A I	1 ha	0.3	0.3 ha
Green spaces	B I	0.5 ha	0.3	0.15 ha

Accounting for eco-points in the Ökokontos⁶³

Within the framework of the compensation banks, the list of biotopes is also used to determine the number of eco-points required to offset an impact or available on an offset site. In North Rhine-Westphalia, the number of eco-points is calculated by multiplying the habitats' standard values by their area. Table 14 presents an example of the calculation.

**TABLE 14: EXAMPLE OF CALCULATION TO DETERMINE THE NUMBER OF ECO-POINTS AVAILABLE OR REQUIRED FOR THE OFFSET
(WENDE ET AL, 2005)**

Criteria	Impact site	Offset site (Ökokonto)
Area	5,000m ²	35,000m ²
Habitat	Deciduous forest	Afforestation on the grassland
Initial value	7/m ²	(not known)
Final value	2/m ²	(not known)
Difference in values	5/m ²	4/m ²
Number of eco-points	5/m ² x 5,000m ² = 25,000	4/m ² x 35,000m ² = 140,000

In this situation, the project developer must offset the impacts of its project with 25,000 eco-points. These eco-points are subtracted from the number of eco-points available on the offset site. A total of 115,000 eco-points therefore remain in this Ökokonto and can be used to offset other impacts.

The eco-points method results in implementing measures *ex situ* and sometimes of a different type.

⁶³ See part IV on the mitigation banks.

Quantification by restoration costs ((Wieder)Herstellungskostenansatz)

The restoration cost approach is based on an equivalence of monetary values. This method calculates the cost of remediating the affected ecosystem to its previous state (costs associated with the ecological operation, securing the land and the management in particular). It is used to quantify offsets of different types. This approach is criticised as it is liable to favour a monetary approach to the detriment of the basic principle aiming first to avoid and then minimise the impacts. Table 15 shows an example calculation.

TABLE 15: EXAMPLE OF QUANTIFYING AN OFFSET ACCORDING TO RESTORATION COSTS (KÖPPEL AND MÜLLER, PFANNENSTIEHL, 1996, BOSCH ET AL, 1993)

2.5 ha of semi-arid grassland must be created as an offset. Faced with the impossibility of conducting this operation and the necessity of conducting the project, the creation of an orchard is proposed. The following calculation illustrates the method of determining the size of the orchard to be created.	
CALCULATION OF THE COSTS OF AN OFFSET OF THE SAME TYPE (SEMI-ARID GRASSLAND)	
Creation of 2.5 ha of semi-arid grassland on agricultural land	€175,000
Planning costs	€11,000
Management costs	€27,500
TOTAL COST (A)	€213,500
CALCULATION OF THE COSTS OF AN OFFSET OF A DIFFERENT TYPE (ORCHARD) PER HA	
Creation of an orchard on agricultural land (ha)	€27,500
Planning costs (ha)	€3,800
Management costs over 25 years (ha)	€45,000
TOTAL COST PER HA (B)	€75,800
SIZE OF OFFSET SITE REQUIRED (A/B)	<u>2.82 ha</u>

V.1.3 – Switzerland: Multiple variable matrices

Source: Federal Office of the Environment, Forestry and Landscape Guide 2002

Several methodological approaches are used in Switzerland to qualitatively and quantitatively assess and compare the affected biotopes and the replacement biotopes⁶⁴. There is therefore no standardised assessment method, but two examples of methods are presented below. These two methods are based on equivalence in terms of ecological value of the environments and can result in offsets of different types.

"Module" assessment method

The "module" method is used to define the equivalence between an offset and the threat incurred by a project by comparing the ecological value of the area concerned by the project before the impact and after the offset. This method is adapted on a case by case basis and, in simple cases, does not always require a high level of expertise.

To define the ecological value before the impact, the study area (including the areas with no heritage value) is divided into sectors. These sectors must be as uniform as possible in terms of structure of the vegetation and botanic composition (e.g. hedgerow, stream, lake, surface rocks, field, etc.). They are then marked on a map, numbered and their area is recorded on a form.

The value of each sector is determined based on variables to which quality factors are allocated based on the table below.

⁶⁴ In Switzerland, offsets are known as "replacement measures" or "reconstitution measures". See the detailed legal framework in Appendix I.

TABLE 16: QUALITY FACTORS PER VARIABLE TO DEFINE THE VALUE OF THE SECTORS AFFECTED BY THE PROJECT

N°	Critère:	Explication de la variable:	QF = 0.1	QF = 0.5	QF = 0.7	0.8	0.9	1	1.1	1.3	1.5	2
1	Age du biotope	Age effectif du biotope en années		0-5	5-10	10-15	15-20	20-30	30-50	50-100	100-150	150-200 ¹⁾
2	Qualité des environs	Proportion relative des surfaces proches de l'état naturel dans un rayon de 50 m autour du secteur		moins de 5%, secteur très isolé	5-10%	10-20 %	20-30%	30-40%	40-50%	50-60%	60-70%	plus de 70%, biotope bien mis en réseau
3	Fonction de mise en réseau	Fonction de relais ou de corridor faunistique						pas de fonction		fonction d'importance locale		fonction d'importance régionale ²⁾
4	Dynamique naturelle							très réduite			légèrement réduite	dynamique naturelle non réduite
5	Degré de naturalité	... par comparaison avec d'autres biotopes du même type		très éloigné de l'état naturel	fortes atteintes anthropiques			faibles atteintes		pas d'atteintes		
6	Qualité de la gamme d'espèces	... par comparaison avec d'autres surfaces du même type	que espèces banales					diversité spécifique moyenne				diversité spécifique très typique et précieuse
7	Espèces exigeantes	Présence d'espèces rares à exigences écologiques complexes ³⁾						aucune	1	2	3	plus de 3
8,9 10	Ev. autres critères ...											

¹⁾ Les biotopes de plus 200 ans sont considérés comme non remplaçables et ne doivent pas être touchés.

²⁾ Les corridors d'importance nationale sont considérés comme non remplaçables et ne doivent pas être touchés.

³⁾ P. ex. espèces des Listes rouges qui traduisent plusieurs structures ou exigent de très grands biotopes (huppe, grand murin, lynx, etc.). Dans ce cas, d'autres mesures pour la préservation de l'espèce sont éventuellement nécessaires.

To calculate the value of each sector, the quality factors are multiplied by each other and by the area. The ecological values thus obtained in each sector are added to obtain the total initial ecological value of the affected area.

For sector 1: Ecological value 1 (V1) = Area 1 x QF₁₋₁ x QF₂₋₁ x QF₃₋₁ x QF₄₋₁ x QF₅₋₁ x QF₆₋₁ x QF₇₋₁ x QF₈₋₁ x QF₉₋₁

For sector 2: Ecological value 2 (V2) = Area 2 x QF₁₋₂ x QF₂₋₂ x QF₃₋₂ x QF₄₋₂ x QF₅₋₂ x QF₆₋₂ x QF₇₋₂ x QF₈₋₂ x QF₉₋₂

And so on for all the sectors.

Total ecological value (V_{Tot}) = V1 + V2 + ... + Vn

The ecological value after the impact is estimated in the same way as the baseline, based on a second map showing the permanent influence of the project and the planned replacement measure(s).

The entire study area is subdivided into uniform sectors such as they should appear in the future. The area of the sectors is measured and their ecological value in final condition is determined using the table below. The area must be expressed in the same unit as that of the initial value.

TABLE 17: QUALITY FACTORS PER VARIABLE TO DEFINE THE VALUE OF THE REPLACEMENT SECTORS

N°	Critère:	Explication de la variable:	QF = 0	QF = 0.5	QF = 0.7	QF = 0.8	QF = 0.9	QF = 1	QF = 1.1	QF = 1.3	QF = 1.5	QF = 2
1	Faisabilité	Durée en années jusqu'à ce que le biotope réalisé puisse remplir sa fonction	plus de 50 ans ¹	50 ans	30 ans	20 ans	10 ans	5 ans	2 ans			
2	Qualité des environs	Proportion relative des surfaces proches de l'état naturel dans un rayon de 50 m autour du secteur		moins de 5%, secteur très isolé	5-10%	10-20 %	20-30%	30-40%	40-50%	50-60%	60-70%	plus de 70%, biotope bien mis en réseau
3	Fonction de mise en réseau	Fonction de la surface à apprécier en tant que relais ou de corridor pour les animaux						pas de fonction		fonction d'importance locale		fonction d'importance régionale ²⁾
4	Dynamique naturelle							très réduite			légèrement réduite	non réduite
5	Entretien nécessaire							entretien annuel nécessaire		entretien nécessaire tous les 2-3 ans	entretien nécessaire tous les 20-30 ans	pas d'entretien nécessaire
6	Représentativité régionale	du biotope		typique de la région, mais localement fréquent		non typique de la région, rare		ni typique de la région, ni étranger à la région		typique de la région et fréquent	typique de la région, mais rare	typique de la région, mais très rare
7,8	Ev. autres ...							aucune	1	2	3	plus de 3

¹ Les biotopes qui ont besoin de plus de 50 ans pour se former sont considérés comme non remplaçables.

² Pour la réalisation de couloirs d'importance nationale, on peut prendre le facteur 10.

As for the initial ecological value, the value of each sector is obtained by multiplying its area by the quality factors for each variable. The values obtained for each sector are then added. The total corresponds to the ecological value of the study area after the occurrence of the impact and offsets.

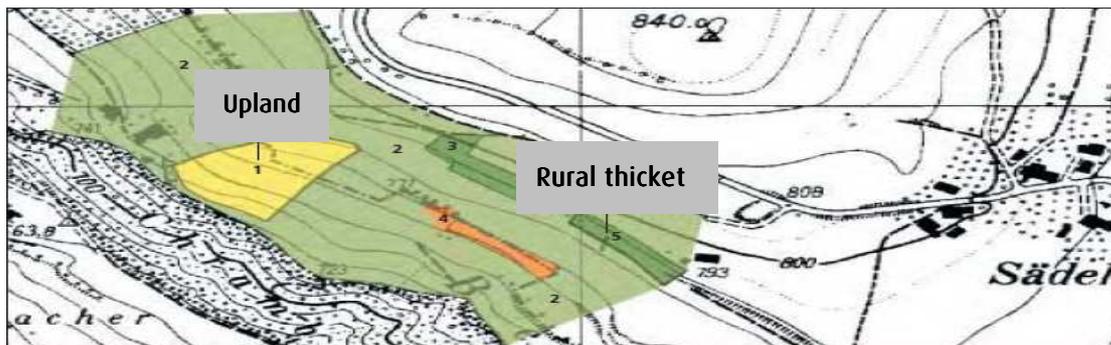
Finally, the ecological value of the study area in its baseline condition is compared with its forecast value after project completion. The planned offsets are adequate in ecological terms if the two values are close.

If the value of the final condition is markedly lower than the baseline, this means that the offset is insufficient. Improvements may be obtained by increasing the offset area, improving its ecological quality or planning an additional offset.

Fictitious example

Context

It is planned to construct an access road across a region, which will cross upland protected at canton level and cut through a rural thicket. The strips of upland and hedgerow destroyed either side of the road will be reconstituted. The original vegetation located on the route will have to be replaced (offset).



Approach

To assess the baseline of the study area, the following information is required:

- Sector 1 (upland of 120 ares⁶⁵): upland aged at least 50 years, with a network function of local importance, near to natural state, relatively rich in species and representing the biotope of four demanding animal species.
- Sector 2 (intensive grassland of 300 ares): mown grassland aged at most 10 years, of low maturity, low in species, with no network function, but with a potential to be extended.
- Sector 3 (rural thicket of 30 ares): 30 year old thicket, relatively rich in species, with a network function of local importance and few anthropic threats. It is used by one species with complex ecological requirements.
- Sector 4 (20 ares): 30 year old hedgerow, relatively natural, fairly rich in species and with a network function of local importance.
- Sector 5 (30 ares): rural thicket aged over 100 years, rich in species, with a network function of local importance and representing the biotope of two demanding animal species.

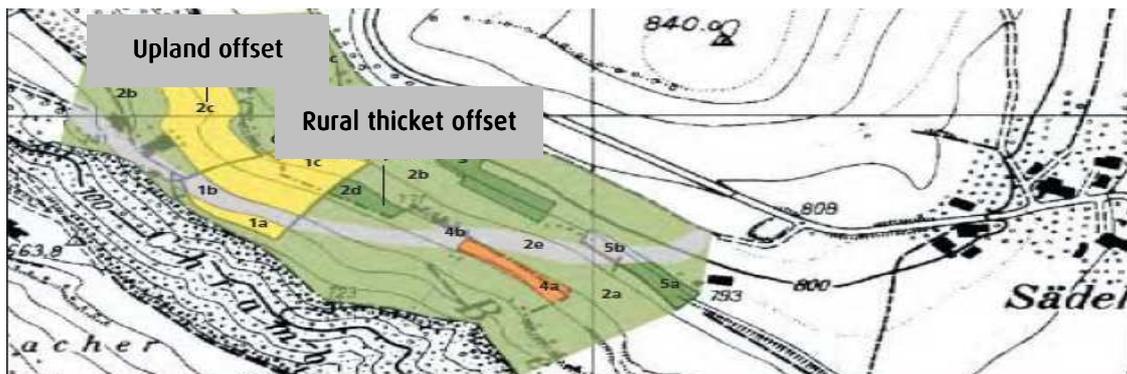
⁶⁵ One are equals 0.01 hectares.

Form for calculating the initial ecological value using the quality factor table:

Quality factor (QF)		QF1	QF2	QF3	QF4	QF5	QF6	QF7	Product
Sector No.	Area (in ares)	Age of the biotope	Quality of the environs	Network function	Natural dynamic	Degree of "naturity"	Quality of the range of species	Presence of demanding species	Area x QFn
1	120	1.3	0.9	1.3	1	1	1.3	2	475
2	300	0.7	0.8	1	1	0.5	0.1	1	8
3	30	1	0.5	1.3	1.5	1	1.3	1.1	42
4	20	1	0.7	1.3	1.5	1	1	1	27
5	30	1.5	0.7	1.3	1.5	1	1.5	1.5	138
Total	500	-	-	-	-	-	-	-	530

Key to reading the table: the ecological value of sector 1 is obtained by multiplying its area by all the quality factors, i.e. $120 \times 1.3 \times 0.9 \times 1.3 \times 1 \times 1 \times 1.3 \times 2 = 475$. The total value of the initial study area (before impact) is equal to the sum of the ecological values of all sectors. In this example it is 530.

The offsets below are planned near to the existing upland: 80 ares of mown grassland will be extended and the existing hedgerow will be enlarged by 10 ares.



To assess the final condition of the study area, the following information is required:

- The areas affected by the road (Nos. 1b, 2e and 5b) lose their ecological value⁶⁶.
- The road has adverse effects on the remaining upland, which is divided into two sectors: that below the road (No. 1a) is too small to remain fully functional and there is a risk of the populations of three of the demanding species dying out². The reduction of the sector above the road (No. 1c) however can be offset³ by the neighbouring replacement surface area⁴ (Nos. 2c and 2d): only the population of one demanding animal species will die out⁵.
- The thicket's existing network function continues following construction⁶ (Nos. 3 and 5a).
- The extension of the mown grassland markedly renovates the area⁷ (No. 2c). There are positive synergies due to the proximity of the new upland with the existing⁸ (No. 1c), but a certain amount of time will be necessary for the new biotope to be functional⁹.
- The extension of the hedgerow enables a valuable biotope to be placed in the right location¹⁰ (No. 2d).
- The rural thickets reduced by the project suffer a decrease in ecological value: the quality of the environs decreases¹¹ (Nos. 4a and 5a) and one demanding animal species will disappear from the thicket^{5,12} (No. 4b).

⁶⁶ See corresponding number in the form below.

Form for calculating the final ecological value of the study area following impact and offsetting:

Sect. N°	Surface [a]	QF1	QF2	QF3	QF4	QF5	QF6	QF7	QF8	QF9	Produit
1a	20	1.3	0.8	1	1	1	1.3	1.1 ²⁾			30
1b ¹⁾	40						0				0
1c	60	1.3 ⁸⁾	1.1 ³⁾⁸⁾	1.3	1	1	1	1.5 ⁵⁾			167
2a	70	0.7	0.7	1	1	0.5	0.1	1			2
2b	90	0.7	0.9	1	1	0.5	0.1	1			3
2c ⁴⁾	80	0.8 ⁹⁾	1 ⁸⁾	1.3	1	1.3	1.5				162 ⁷⁾
2d ⁴⁾	20	0.8	0.9 ⁶⁾	1.3 ⁴⁾	1.5	1.5	1.5				63
2e ¹⁾	40						0				0
3	30	1	0.5	1.3 ⁵⁾	1.5	1	1.3	1.1			21
4a	16	1	0.5 ¹⁾	1.3	1.5	1	1	1			16
4b ¹⁾	4						0	1.3 ¹²⁾			0
5a	22	1.5	0.5 ¹⁾	1.3 ⁵⁾	1.5	1	1.5				63
5b ¹⁾	8						0				0
Total	500										527

■ = facteur inférieur à l'état initial → réduction de valeur écologique

∴ = facteur supérieur à l'état initial → augmentation de valeur écologique

Key to reading the table: for example, sector 1b is completely affected by the road. Its ecological value is therefore reduced to 0. Sector 2d, which establishes a corridor for species (QF3) and whose quality of environs is better following offsetting (QF2), sees its ecological value increased: $0.8 \times 0.9 \times 1.3 \times 1.5 \times 1.5 \times 1.5 \times 20 = 63$. The total value of the study area in its final condition (after offsetting) corresponds to the sum of the ecological values of each sector.

The ecological value obtained (527) after implementing the offsets is very close to the initial value (530). The offsets are therefore considered adequate as they enable the ecological value of the study area overall to be maintained.

"Plateau" assessment method

This method can be applied for small projects on the Swiss plateau, particularly in agricultural regions. It aims to determine an area factor used to calculate the necessary size of the replacement biotope according to its type.

1. All protected (or "suitable") biotopes within the study area are recorded.
2. The development project and the biotopes affected are represented on a map.
3. Each of the protected areas directly affected by the project is assessed using three assessment keys, namely quality, regional importance and ecological function (presented below). The result is expressed in the form of eco-points.
4. The potential for renovating the biotopes in the study area which are not protected and have therefore not been taken into consideration until now is studied. One or more appropriate and achievable offsets are determined. The area intended for the replacement biotope is measured approximately.
5. For protected areas, the replacement biotope is assessed using the same assessment keys as the biotope to be replaced. The result is expressed in the form of eco-points.
6. The area factor is initially determined by comparing the biotope to be replaced and the replacement biotope using a table (see table 18).

TABLE 18: TABLE FOR DETERMINING THE AREA FACTOR

	A	B	C	D	E	F	G	H	I	J	K	L	(M)	N	O	P	Q	R	S	T
(+) Haies	A	1.5	1.5	1.5	1.5	2	X	1.5	X	X	X	1.5	1	1.5	1	1.5	2	X	2	2
(+) Bosquet champêtre	B	1.5	1.5	1.5	1.5	2	X	1.5	X	X	X	1.5	1	1.5	1	1.5	2	X	2	2
(+) Boisement riverain	(C)	1.5	1.5	1.5	1.5	2	X	1.5	X	X	X	1.5	1	(1.5)	1	1.5	2	X	2	2
(+) Lisière forestière	D	1.5	1.5	1.5	1.5	2	X	1.5	X	X	X	1.5	1	1.5	1	1.5	2	X	2	2
(+) Fossés	E	1.5	1.5	1.5	1.5	1.5	X	1.5	X	X	X	1.5	1	1.5	1	1.5	2	X	2	2
(+) Canaux proches de l'état naturel	F	1.5	1.5	1.5	1.5	2	X	1.5	X	X	X	1.5	1	1.5	1	1.5	2	X	2	2
(+) Ruisseaux	G	1.5	1.5	1.5	1.5	1.5	X	1.5	X	X	X	1.5	1.5	2	1.5	2	X	2	X	2
(+) Rivières	H	X	X	X	X	X	X	X	1	X	X	X	X	X	X	X	X	X	X	X
(-) Sources	I	X	X	X	X	2.5	X	1.5	X	X	X	1.5	1.5	2	1.5	2	X	X	X	X
+ (+) Ruissellements	J	X	X	X	X	2	X	1.5	X	X	1.5	1.5	1.5	2	1.5	2	X	X	X	X
(+) Eaux dormantes	K	X	X	X	X	2	X	1.5	X	X	X	1.5	1	1.5	1	1.5	X	X	X	X
- Bas-marais	L	2.5	2.5	2.5	2.5	2.5	X	2	X	X	2	2	2	2	2	2.5	2.5	2.5	X	2.5
(+) Prairies marécageuses, mégaphorbiées	M	2	2	2	2	2	X	1.5	X	X	1.5	1.5	1.5	1.5	2	2	2	X	2	2
(+) Station sèche riche en espèces	N	2	2	2	2	2.5	X	2	X	X	2	2	1.5	2	1.5	2	2.5	2.5	X	2.5
+ Station sèche pauvre en espèces	O	1.5	1.5	1.5	1.5	2	X	1.5	X	X	1.5	1.5	1.5	1.5	1.5	2	2	2	X	2
+ Autres prairies permanentes	P	1	1	1	1	1	X	1	X	X	X	1	1	1	1	1	1	X	1	1
(+) Vergers, allées, arbres isolés	Q	1.5	1.5	1.5	1.5	1.5	X	1.5	X	X	X	1.5	1	1.5	1	1.5	1.5	1.5	X	1.5
- Rochers	R	2	2	2	2	2.5	X	2	X	X	X	X	X	X	1.5	2	X	X	X	2
+ (+) Autres éléments écologiques	S	111.5	111.5	111.5	1.5	1	X	1.5	X	X	X	1.5	111.5	111.5	111.5	111.5	1.5	1.5	X	1.5
+ (+) SEléments structuraux	T	111.5	111.5	111.5	1.5	1	X	1.5	X	X	X	1.5	111.5	111.5	111.5	111.5	1.5	1.5	X	1.5

Key to reading the table: for example, if riparian woods (allocated letter C) offset an impact on marshy grassland (allocated letter M), the area factor applied is 1.5.

The factors in the table vary from 1 to 2.5. These variations are not explained in the guide; however it can be assumed that they vary according to the feasibility of offsetting, the rarity of the biotope, etc. Furthermore, some biotopes are not allocated an area factor, either because they are not considered to be equivalent (e.g. forest edge compared with surface runoff), or because they cannot be replaced (e.g. rivers).

7. In a second step, the area factor is adjusted according to whether the replacement biotope's number of ecological points is higher or lower than that of the biotope to be replaced, the minimum value being 1 (see table 19). The difference in ecological values between two sites is thus offset in terms of area.

TABLE 19: AREA FACTOR ADJUSTMENT TABLE

Number of future points			Area factor correction
4 points and above	More	than the baseline	- 1
2 or 3 points			- 0,5
1 or 2 points	Less		+ 0,5
3 points and above			+ 1

8. Finally, the adjusted area factor is multiplied by the area of the biotope to be replaced, in order to determine the necessary area of the replacement biotope.

Protected area assessment keys

The factors taken into account in the three assessment keys are the area of the biotope, its specific diversity, maturity, integrity, vulnerability, sustainability, regional rarity, landscape importance, age, degree of networking, protection status, biological potential, presence of rare animal and plant species and the existence of disturbances. Adding the points for each key gives a maximum value of 11 points.

- Quality (0-3 points, counted twice):

The quality criterion varies from 0 to 3 points. Given the importance of this criterion, the points awarded are doubled. The number of points is set according to the number of conditions fulfilled.

According to the biotope, the following conditions apply:

Biotope	Conditions
Hedgerow, forest edge, rural thicket and woodland strip	<ul style="list-style-type: none"> - entire biotope near to natural condition - richly structured - in all, at least 30 woody or herbaceous species - has existed for at least 50 years - presence of a wide herbaceous border - space available for expansion or dynamic biotope
Water	<ul style="list-style-type: none"> - entire biotope near to natural condition - stagnant water with level banks close to natural condition, water courses with natural beds - presence of riparian woods and/or vegetation - in all, at least 20 woody or herbaceous species - has existed for at least 50 years - space available for expansion or dynamic biotope
Extensive permanent grassland	<ul style="list-style-type: none"> - use suited to the station - low anthropic threats - richly structured - in all, at least 30 herbaceous species over 25m² - has existed unchanged for at least 30 years - existence of an herbaceous border
Standard orchards, avenues and stands of trees	<ul style="list-style-type: none"> - planted with traditional/old varieties - proportion of old trees of at least 50% - existence of trees with nesting possibility - existence of at least 1 rare bird species typical of the biotope - ground: extensive mown grassland

	- at least one side with no intensive human influence
Other important ecological components	<ul style="list-style-type: none"> - entire biotope near to natural condition - in all, at least 20 woody or herbaceous species - biotope important for amphibians/reptiles - biotope important for insects/invertebrates - presence of at least 2 characteristic or rare animal or plant species - space available for expansion of animals and plants present in the biotope or dynamic biotope

TABLE 20: POINTS ATTRIBUTED TO THE QUALITY CRITERION ACCORDING TO THE NUMBER OF CONDITIONS FULFILLED

5 or more conditions are fulfilled	3 points
3 ou 4 conditions are fulfilled	2 points
1 or 2 conditions are fulfilled	1 point
No conditions are fulfilled	0 point

- Regional importance (0-3 points):

Very rare type of biotope even outside the landscape compartment due to its frequency and/or development, or biotope type marking the landscape compartment but rare in Switzerland	3 points
Very rare type of biotope in the landscape compartment due to its frequency and/or development	2 points
Rare type of biotope in the landscape compartment due to its frequency and/or development	1 point
Frequent type of biotope in the landscape compartment due to its frequency and/or development	0 point

- Ecological function (0-2 points):

The biotope is very well connected with other biotopes in the environs near to natural condition. The closest biotope of ecological importance is less than 100m away. The biotope is not fragmented by an ecological barrier.	2 points
The biotope is in contact with other biotopes near to natural condition. The closest biotope of ecological importance is less than 250m away.	1 point
The biotope is isolated. The closest biotope of ecological importance is more than 250m away.	0 point

Fictitious example (continuing the previous example)

Context (see page 60)

Approach

The protected areas are assessed according to the three assessment keys.

a) Existing upland:

Assessment:

Quality: 1 point x 2 = 2 points

Regional importance: 3 points

Landscape ecological function: 2 points

Total: 7 points

Area lost: 40 ares

b) Existing rural thicket:

Assessment:

Quality: 3 points x 2 = 6 points

Regional importance: 1 point

Landscape ecological function: 2 points

Total: 9 points

Area lost: 10 ares

Projected offsets

The loss of 40 ares of upland may be offset along the slope by extending this use.

The loss of 10 ares of rural thicket is offset by enlarging the existing hedgerow.

a) New upland:

Assessment:

Quality: 1 point x 2 = 2 points

Regional importance: 3 points

Landscape ecological function: 1 point

Total: 6 points

For replacing one area of upland with another (extension), an area factor of 1.5 is applied in accordance with table X. With an ecological assessment of 6 points, the new upland obtains 1 point less than the estimate for the existing upland. Consequently, the area factor is increased by 0.5. Thus the area factor is adjusted to 2. This means that for the new upland an area of $2 \times 40 \text{ ares} = 80 \text{ ares}$ must be created.

b) New hedgerow:

Assessment:

Quality: 2 points x 2 = 4 points

Regional importance: 1 point

Landscape ecological function: 2 points

Total: 7 points

When replacing a rural thicket with a hedgerow, an area factor of 1.5 is applied in accordance with table X. With an ecological assessment of 7 points, the newly created hedgerow obtains 2 points less than the value of the old rural thicket. The area factor is thus increased by 0.5 points and obtains the value 2. The new hedgerow must therefore cover an area of 20 ares.

V.1.4 – Australia: Methodology based on the benchmark

Unlike the other countries studied, which have no standard method, the habitat hectares method is universally accepted in the state of Victoria. In New South Wales, the BioBanking assessment methodology is specific to this programme.

In the other Australian states, the importance often attached to the most exact possible reproduction over the short term of what has been lost (like for like), means that the ecological gain is measured by the composition of species – the only legally recognised short-term criterion (2011 survey of economic services on offsetting).

Habitat hectares method in BushBroker

In Victoria, the approved brokers of the BushBroker programme⁶⁷ established in 2006 determine the credits available and required for offsetting using the habitat hectares method. According to the experts of the Business and Biodiversity Offsets Program (BBOP)⁶⁸, this method may usefully be applied elsewhere in the world, provided there is sufficient data to use function as a biodiversity indicator, and that invasive species and micro-habitats for the key species are taken into consideration.

This method is based on a comparison between a native vegetation class concerned by a project or offset and this same native vegetation class in a natural and mature state (benchmark). It was designed to measure the quality of plant communities and not the quality of particular species (Parkes et al, 2003). This approach applies equally well to the affected site and the offset site.

BushBroker requires the offset to be of the same type, however trading up is authorised under certain conditions.

1. Identification of Ecological Vegetation Classes (EVC)

The first step is to identify the Ecological Vegetation Classes – EVCs present on the site (Parkes et al, 2003).

EVCs are aggregations of floristic communities defined by their species composition, physiognomy, and location in the landscape in an environment specific to them (eftec, 2010). They tend to have similar ecological responses to disturbances such as fires, for example. According to their conservation status (rare, endangered, etc.), EVCs are split into four levels of significance: very high, high, medium and low (Nemes et al, 2008). The EVC benchmarks are available by bioregion from the Department of Sustainability and Environment's website⁶⁹.

2. Assessment of the site's value (in habitat hectares)

To measure the quality of an EVC, there are 10 parameters (7 relating to the condition of the site and 3 at landscape level) to which a score is allocated. These parameters can be adjusted according to the EVC concerned. This score, expressed as a percentage, results from the comparison between the condition of the affected or offset site and the corresponding EVC benchmark (Nemes et al, 2008) (see table 21).

⁶⁷ See part IV on the mitigation banks.

⁶⁸ The BBOP (<http://bbop.forest-trends.org/>) is an organisation uniting industrialists, financial institutions, governments and representatives of civil society, which has developed principles and standards of biodiversity offsetting.

⁶⁹ <http://www.dse.vic.gov.au/conservation-and-environment/ecological-vegetation-class-evc-benchmarks-by-bioregion>

TABLE 21: PARAMETERS USED TO ASSESS THE HABITAT SCORE (IN %)

	Parameters	Maximum value (i.e. if equivalent to the benchmark) (%)
Site	Large trees	10
	Canopy cover	5
	Understorey	25
	Absence of weeds	15
	Recruitment (i.e. the arrival of new individuals)	10
	Litter	5
	Logs	5
Landscape	Size of the patch	10
	Neighbourhood	10
	Distance to core area	5
	Total	100

For example (Parkes et al, 2003):

- Large trees provide nesting sites and are sources of food. Their influence on other species can extend over a considerable distance from their location. The criteria for this parameter include the number of large trees present and their "state of health". The more trees there are and the better their health, the higher the score (max. 10%).
- Weeds are plants that can enter into competition with the native vegetation and become dominant on a site. The lower the weed cover, the higher the score.
- Recruitment is assessed based on woody perennial plants. The higher it is, the higher the score.
- Litter cover can indicate the degree of disturbance on a site. It can be important for the recruitment of other plants and a habitat for numerous species. The score is highest when the litter cover is between 50% and 150% of the expected value.
- The size of a vegetation patch plays an important role in the survival of plant species. The larger the patch, the more the survival rate increases and the higher the score.

The final score expressed in habitat hectares is calculated by multiplying the sum of the scores for the ten parameters (habitat score) by the site's area:

$$\text{Habitat hectares (ha)} = \text{Habitat score (\%)} \times \text{Area (ha)}$$

For example, 10 ha of wet heathland with a habitat score of 50% corresponds to 5 habitat hectares.

3. Determination of offsets according to the conservation significance

The conditions of the offset to be implemented differ according to whether the project affects native vegetation (see table 22) or old trees (see table 23).

**TABLE 22: OFFSET CRITERIA FOR IMPACTS ON NATIVE VEGETATION
(NEMES ET AL, 2008; DSE, 2002)**

Offset criteria	Conservation significance			
	Very high	High	Medium	Low
Objective in terms of habitat hectares to offset	Significant net gain i.e. number of habitat hectares required to offset at least twice the number of habitat hectares on the affected site	Net gain i.e. number of habitat hectares required to offset at least 1.5 times the number of habitat hectares on the affected site	No net loss i.e. number of habitat hectares at least equivalent	
Habitat score for the offset site	At least 90%	At least 75%	At least 50%	-
Proportion of revegetation⁷⁰	Limited to 10%	Limited to 25%	Limited to 50%	-
Scope (bioregion)	In the same bioregion		In the same bioregion or in an adjacent bioregion if the vegetation's conservation significance there is high or very high	
EVC	Identical	Identical or other EVC if its conservation significance is very high	All EVC The impacts affecting an EVC of low significance can always be offset using compensatory measures aimed at an EVC of higher significance.	
	When the offsets concern an EVC whose significance is higher than that of the affected site, the number of compensatory measures required is proportionally reduced.			

Key to reading: for example, if a project threatens an EVC that benefits from very high conservation significance, the project developer should offset this loss in the same bioregion with twice the number of habitat hectares, and a habitat score of at least 90% (condition close to the natural state, requiring very few revegetation actions).

⁷⁰ The higher the significance, the lower the permitted proportion of revegetation. The plant species planted are effectively often different to the native vegetation and have difficulty in successfully becoming established. For lower significance, the measures can target a compromise by creating a habitat capable of supporting representative communities of species.

TABLE 23: OFFSET CRITERIA FOR IMPACTS ON OLD TREES (NEMES ET AL, 2008; DSE, 2002)

Offset criteria	Type of clearing	Conservation significance			
		Very high	High	Medium	Low
Recruitment (i.e. the arrival of new individuals)	Large, old trees in one patch	Preservation ratio of 1:8 40 new individuals	Preservation ratio of 1:4 20 new individuals	Preservation ratio of 1:2 10 new individuals	-
	Medium, old trees in one patch	-			
	Scattered, large, old trees	Preservation ratio of 1:8 40 new individuals	Preservation ratio of 1:4 20 new individuals	Preservation ratio of 1:2 10 new individuals	10 new individuals
	Scattered, medium, old trees	Preservation ratio of 1:4 20 new individuals	Ratio of 1:2 10 new individuals	Ratio of 1:1 5 new individuals	5 new individuals
Scope (bioregion)	All types	In the same bioregion		In the same bioregion or in an adjacent bioregion if the vegetation's conservation significance there is high or very high	
EVC	All types	Identical	Identical or other EVC if its conservation significance is very high	All EVC	
Substitution	All types	Impacts on medium trees can be offset by the introduction of large trees.			

Key to reading: for example, if a project affects scattered, medium, old trees whose conservation significance is medium, for every tree lost, the project developer must preserve another and plant five new trees in the same bioregion, or in an adjacent bioregion if the trees targeted by the offset there must be protected as a priority.

BioBanking assessment methodology

Introduced in the state of New South Wales in 2007 as a pilot project which then became official in 2009, BioBanking has its own methodology⁷¹. The biodiversity values of the credits required for the offset must correspond to those of the credits generated on a BioBank site. A project developer must therefore purchase credits either of the same type of vegetation or of another type of vegetation associated with the same species. The objective of BioBanking is to arrive at offsets of the same kind.

⁷¹ <http://www.environment.nsw.gov.au/biobanking/assessmethodology.htm>

A project developer wishing to obtain a BioBanking statement⁷² must demonstrate that its project engenders either no loss or a gain in biodiversity values, via the improve or maintain test.

The scientific principles upon which the BioBanking test is based are as follows (Gibbons et al, 2009):

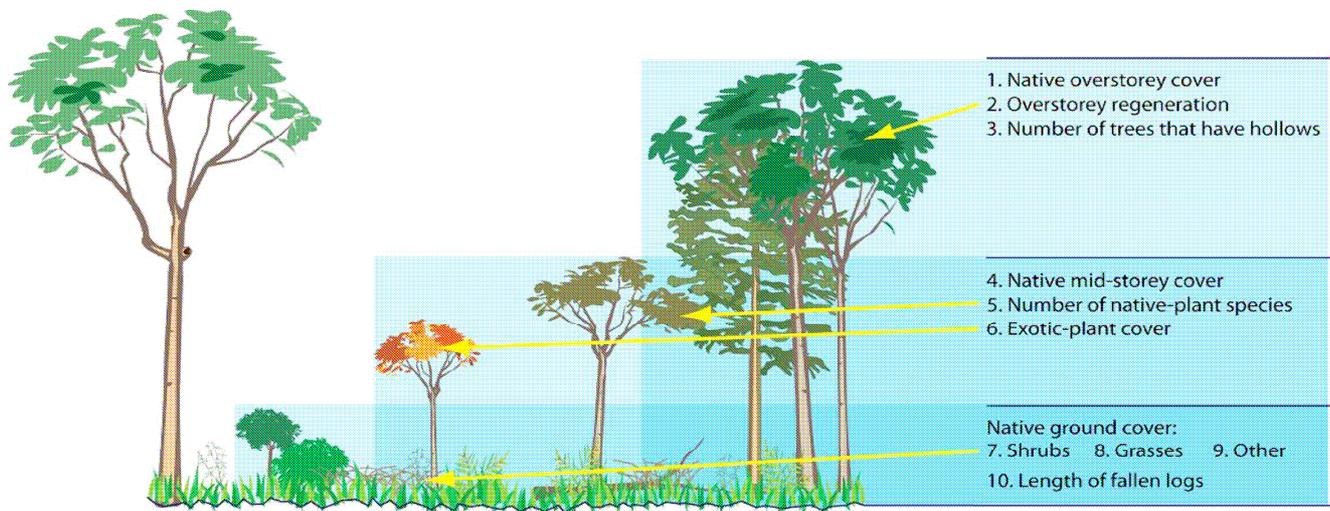
- 1) biodiversity encapsulates the structure, function and composition of communities on the scale of a site, region, state or country (federal level);
- 2) representative examples of all ecosystems must be conserved and the sites are assessed in regard to conservation priorities on a larger scale;
- 3) priority must be given to actions enabling better survival of the species.

1. Estimation of the biodiversity value on the impact site and on the BioBank site

An accredited consultant uses the recommended methodology to assess the biodiversity value, which comprises the composition, structure and function of ecosystems and includes in particular the threatened species, populations and ecological communities as well as their habitats, both on the affected site and on the BioBank site, according to seven criteria:

1. conservation priorities at state and federal level, determined according to the list of threatened plant communities;
2. regional value, determined according to the conservation status of the type of vegetation (percentage of clearing); in general, vegetation cleared by over 70% or listed as a threatened or highly threatened community will lead to designation as a "red flag area"⁷³;
3. 'landscape value', based on the variation of native vegetation cover and the degree of fragmentation; a project that increases the fragmentation of the landscape has a higher impact on the biodiversity value than a project that maintains corridors and connectivity;
4. 'site value', determined based on monitoring the condition of the vegetation according to 10 attributes relating to benchmarks;

FIGURE 11: THE 10 ATTRIBUTES FOR ASSESSING THE SITE VALUE



5. threatened species, assessed based on targeted monitoring, their association with specific vegetation and a habitat, and their geographic distribution⁷⁴;

⁷² See part IV on the mitigation banks.

⁷³ The red flag areas are areas considered to be important for biodiversity conservation and which cannot easily be replaced.

⁷⁴ The threatened species database is used for this assessment.

6. nature of the impacts on the site concerned and the management activities on the BioBank site;

Affected site:

Current biodiversity value – project/clearing impact = loss of biodiversity values

BioBank site:

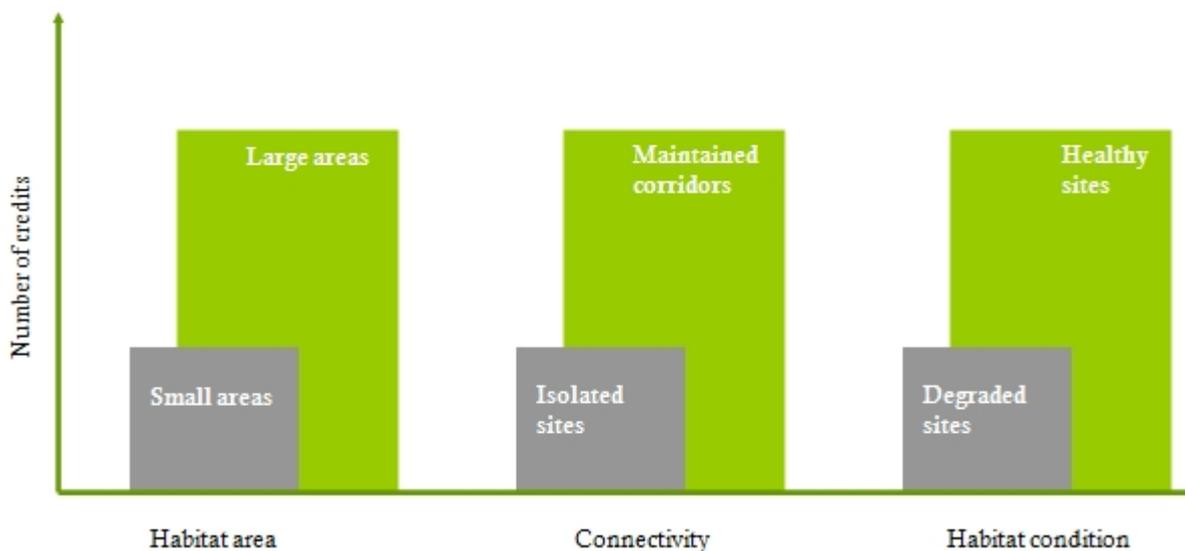
Current biodiversity value + management activities = gain in biodiversity values

7. area (in ha) of the affected site and BioBank site; sites that cover a large area are more resilient to disturbances.

2. *Determination of the number of credits available or required for the offset*

Of the above criteria, the determination of the credits available or required for the offset essentially depends on the area and condition of the habitats and the connectivity between them (see figure 12)

FIGURE 12: THE KEY FACTORS IN DETERMINING THE CREDITS (DECC, 2007)



The BioBanking Credit Calculator software calculates the number of credits required to offset a project's impact and the number generated on a BioBank site using the following equations:

Number of ecosystem credits required to offset the impact = (Site value_{avt-ap} x area) / threatened species' response to the management activities + (Landscape value_{avt-ap} x area)

Number of ecosystem credits created on a BioBank site = (Site value_{ap-avt} x area) + (Landscape value_{ap-avt} x area)

Number of species credits required to offset the impact = (Area / threatened species' response to the management activities) x 10

Number of species credits created on a BioBank site = (Area x Site value) x 10

V.1.5 – United States: between surfacic and functional assessment methods

Due to the size of the country and the diversity of the ecosystems, the federal government has not developed standardised assessment methods on a country-wide scale. However, benchmark methods specialising in types of environment or species have been developed locally by the decentralised services of federal agencies (in particular USACE and USWFS). In a certain, not insignificant, number of cases, these methods have still not been put into place (2011 survey of economic services on

offsetting). The adjustment between ecological losses and gains is therefore established based on simple metrics (surface or linear).

In the mitigation banks, which relate to wetlands, losses are qualified as debits and gains as credits. The determination of credits and debits requires an assessment before and after the project and is conducted in three steps (Stein et al, 2000):

- 1) Credit assessment: credits = value before development – value after development.
- 2) Debit assessment: debits = value before development on affected site – value after development on affected site.
- 3) Application of an offset ratio: the surface ratios required for the banks are lower than for the other forms of offset due to the increased certainty of the outcome of the operation (Robertson and Hayden, 2007).

Credit and debit assessment

Credits and debits can be measured either as a surfacic unit (acres) or as a functional unit. The choice between the two units is made according to several criteria on a case by case basis. In general, the choice of functional unit is linked to the importance and complexity of the system, the size of the bank and losses and the particular interest held for a function. The use of the acre as a unit may be necessary when knowledge is insufficient.

There are four possible methods of determining the credits and debits: the acreage, expert opinion, diversity indices and the assessment of one or more ecological functions. In general, the function assessment method is recommended but the acreage assessment method is more widely used (approximately 60% of banks apply it) (ELI, 2002). Using the acreage combined with the ecological offset techniques to assess the credits generated on a site saves time and money and requires less assessment than the other methods.

Acreage (ELI, 2002)

This method consists of determining the number of acres of restored, enhanced, created or preserved wetlands. In general, one credit is equivalent to one acre of restored or created wetland. The credits attributed to acres of enhanced or preserved wetlands are often lower than for the acres of restored or created wetlands.

Expert opinion (ELI, 2002)

The definition of credits is based on the knowledge of an expert in wetlands and their functions, such as a member of the interagency assessment team⁷⁵.

Diversity indices (USACE, 1995)

The data gathered on the diversity or production of wetlands and other aquatic habitats may be translated into indices (e.g. the wealth of species). These indices associated with the area can be used to determine the credits and debits. For example, on the assumption that a high wealth of species is synonymous with a better quality of wetland, if there are 24 plant species in a mitigation bank (credits), and 12 species in the 10 acres of wetland to be affected (debits), the loss may be offset by purchasing 5 acres (credits) from the bank. This method can therefore result in applying an offset over a smaller area than that affected.

Function assessment methodology (USACE, 1995)

1. Habitat Evaluation Procedure (HEP) (USFWS, 1980)

The HEP is a quantitative method of determining the suitability of a site as a habitat for given species. The HEP is based on a Habitat Suitability Index (HSI) and the results are expressed in Habitat Units (HU) and can be used to directly determine the credits and debits. It is used to know the relative value of different areas at the same point in time, or the relative value of the same area at different points in time using Average Annual Habitat Units (AAHU), which incorporate changes to the habitats in terms of quality and quantity over time.

$$HU = \text{Area}_{\text{habitat}} \times \text{quality}_{\text{habitat}} \text{ (Habitat Suitability Index - HSI)}$$

The HSI scores range from 0 (habitat not appropriate) to 1 (habitat in optimum condition). A site that obtains a score of 0.8 HSI is twice as suitable for a given species as a site with a score of 0.4 HSI.

⁷⁵ See part II on the institutional framework.

The objective is to identify which measures can be used to offset the ecological losses in HU caused by a development project's impacts. The offset is then obtained by applying specific management measures to an existing habitat to obtain a net increase in HUs on the site. There are three offset objectives:

- Like for like: precisely offsets the HUs lost for each affected species. The list of species targeted by the offset must be identical to that of the affected species. The ideal offset plan will provide an increase in HUs equal to the lost HUs for each species.
- Of the same value (equal replacement): precisely offsets the lost HUs via an equal gain in HUs. One HU for any target species can be used to offset the loss of one HU for any affected species.
- Relative replacement: one HU from a target species is used to offset the loss of one HU for an affected species at a differential rate which depends on the species concerned.

Once the offset objectives have been set, the approach is as follows: select an offset area, conduct a basic assessment of the habitat for each target species, determine the HUs for the offset area prior to any measure, identify a management practice enabling the set objectives to be reached, compare the HUs for the case prior and subsequent to measures and determine the resulting increase in HUs. It is then possible to calculate the size of the offset area required to fully compensate for the losses.

The advantages of this method include the quantifiable nature of the results, the structure of the procedure, and its replicable and adaptable character. However, it does require a strong understanding of the relationship between habitat and species.

2. Wetland Evaluation Technique (WET)

The WET method was designed to provide a quick qualitative assessment of a wetland's functions. It is used to assess the probability of a wetland providing a specific function or service. This probability is based on the wetland's biological, physical and chemical characteristics and the value society accords the function. The WET method can attribute a qualitative score for 11 functions corresponding to their probability (high, medium or low) of being provided by the wetland. The difference in scores between a high and medium level does not necessarily represent the same amplitude as between a medium and low level.

3. Hydrogeomorphic Approach (HGM)

This method is based on the classification of wetlands into groups according to their geomorphic and hydrological characteristics and the various water sources that feed them. The functions are assessed in terms of Functional Capacity Index (FCI). This index corresponds to the ratio of the functional capacity under the expected conditions and in those considered to be optimum. In other words, the FCI is a comparison between the function of one wetland and that of a similar, undamaged wetland in the same region.

The functional capacity assessment is based on a model that measures the characteristics of the ecosystem and landscape variables. These variables are estimated using metrics that measure the relation between the condition of a given variable and the functional capacity of the benchmark wetland. The value of the variables can range from 0 to 1. The benchmark wetland is assigned the value 1, representing the level of functional capacity under optimum conditions. The scores for each variable are added to obtain the value of the wetland's overall functional capacity.

The advantage of the hydrogeomorphic approach lies in the consideration of the regional characteristics of wetlands. Furthermore, several functions can be evaluated in one assessment.

The HGM approach is recommended over other methods of assessing functions but in practice it is very little used as it is more complex and requires more time and resources.

Determining the banks' offset ratios

The mitigation banks apply offset ratios to their credits which can be defined in different ways and notably, according to (ELI, 2002):

- the phase in which the bank sells its credits;

For example, in a mitigation bank in Chicago, the acre is the unit of measurement used to quantify the credits: one credit is equal to one acre. Credits are sold in four phases. During the first three phases, the ratio is 1:1.5. In the fourth phase it changes to 1:1 as the now operational offset should enable temporary losses to be avoided (Robertson and Hayden, 2007).

- the quality of the bank's wetlands and of those affected (a higher quality on the offset site necessitates a lower ratio);
- the location and type of wetland, and the offset method.

A 1:1 ratio may be deemed sufficient when it is a question of measures like for like but must be higher if they are of like for unlike (Federal Guide, 1995). When the offset is applied outside the basin area, the required offset ratio must be higher (Robertson and Hayden, 2007).

The ratio can also be estimated based on expert opinion (King and Adler, 1991).

On a national scale, the offset ratio used for the banks is on average 1:1.4 (Brown and Lant, 1999; King and Price, 2004).

Method using standard ratios

Standard ratios can be applied by the banks to calculate the credits required to offset a development project's impacts. These standard ratios vary according to the offset technique (restoration, enhancement or preservation) and the qualitative value of the affected wetland. They take account of the time necessary for the offset site to reach a mature state and the risk of not recovering the lost function. The table below presents the standard ratios that each compensation bank must take and adapt according to the offset techniques used.

TABLE 24: STANDARD RATIOS FOR THE COMPENSATION BANKS (RIBITS)

Offset technique	Value of the affected wetland		
	Low	Medium	High
Restoration	1:2	1:3	1:4
Enhancement	1:3	1:5	1:9
Preservation	1:7	1:12	1:23

The example below shows how these standard ratios are applied to determine the number of credits available in a bank.

Fictitious example

The first step consists of estimating the proportion of each offset technique used within the bank. Let us assume that the bank extends over 1,300 acres. The bank's acreage is divided according to the techniques implemented on parcels of its site as shown in the following table:

Offset technique	Acreage	Proportion of total acreage (%)
Restoration	1,000	77
Enhancement	200	15
Preservation	50	4
Others	50	4
Total	1,300	100

The bank therefore holds a total of 1,300 credits (acres) and each credit represents 77% restored, 15% enhanced, 4% preserved and 4% other wetland. The standard ratios are then applied to determine the bank's offset ratios (see table 25).

TABLE 25: DETERMINATION OF THE BANK'S OFFSET RATIOS

Offset technique	Proportion of the site (AA)	Value of the affected wetland		
		Low	Medium	High
Restoration	0.77	1:2 = 1:1.54 [*]	1:3 = 1:2.31	1:4 = 1:3.08
Enhancement	0.15	1:3 = 1:0.46	1:5 = 1:0.77	1:9 = 1:3.8
Preservation	0.04	1:7 = 1:0.27	1:12 = 1:0.46	1:23 = 1:0.88
Others (not accounted for as minimal fraction)	0.04	-	-	-
Total	1	1:2.27	1:3.54	1:5.35
Bank's standard ratio		1:2	1:3.5	1:5

* (Standard ratio x AA)

Key to reading: for example, if a development project affects three acres of medium quality wetlands, the project developer must purchase 10.5 credits from this bank to offset the loss of wetlands (3 x 3.5 = 10.5 credits).

Source: RIBITS⁷⁶

⁷⁶ https://rsgis.crrel.usace.army.mil/ribits/f?p=107:2:1388509010808267::NO:RP:P27_BUTTON_KEY:9

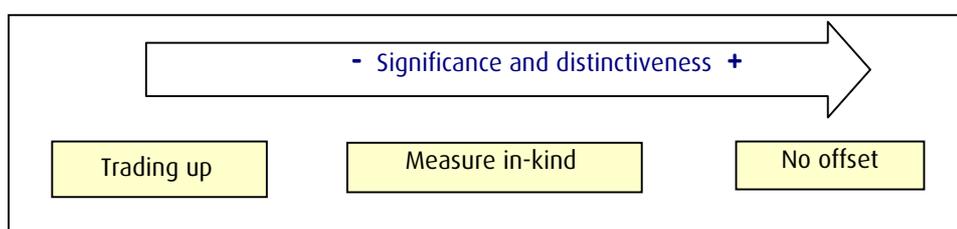
V.1.6 – United Kingdom: habitat valuation and multipliers

Source: Defra, 2011⁷⁷

Following the publication of its white paper on biodiversity in June 2011, the United Kingdom is introducing pilot projects to trial the application of offsets based on a voluntary approach⁷⁸. One method, which needs to be tested in the field, has been established to assess the biodiversity losses and gains and quantify the offsets. This is based on classifying habitats according to their distinctiveness and condition⁷⁹.

a) Habitat distinctiveness

Habitats are split into one of four type bands based on their distinctiveness, which includes parameters such as species richness, diversity, rarity (on a local, regional, national and international scale), etc. The offset criteria vary according to the habitat's classification. For example, trading up is permitted for a habitat with low distinctiveness.



A value is attributed to each band according to its level of distinctiveness (see table 26).

TABLE 26: VALUE OF EACH HABITAT TYPE BAND BASED ON ITS DISTINCTIVENESS

Habitat type band	Distinctiveness	Habitat type	Offset type	Value (biodiversity unit per ha)
Very High	High	Benefiting from an action plan (BAP ⁸⁰) with a "no loss" objective	On a case by case basis, left to the discretion of the local authorities as to the suitability of applying offsets	6
High	High	Benefiting from an action plan (BAP)	Like for like	6
Medium	Medium	Semi-natural habitats (with no BAP)	From the same type band or trade up	4
Low	Low	Agricultural habitats	Trade up	2

b) Habitat condition

The condition of the habitat is assessed using the higher level agri-environment scheme methodology⁸¹ and is used to classify the habitats into four categories which are also attributed a value (see table 27).

⁷⁷ <http://archive.defra.gov.uk/environment/biodiversity/offsetting/documents/110714offsetting-technical-metric.pdf>

⁷⁸ See the detailed legal framework in Appendix I.

⁷⁹ Note: assessment based on these two criteria alone can appear limited. In effect, it is often observed that a highly distinctive habitat is in poor condition and vice versa.

⁸⁰ Biodiversity Action Plan.

⁸¹ Plan enabling a farmer or land manager to benefit from revenue paid by the British government in exchange for the protection of nature in rural environments.

TABLE 27: VALUE OF THE HABITAT ACCORDING TO ITS CONDITION

Habitat condition	Value (biodiversity unit per ha)
Optimum	4
Good	3
Moderate	2
Poor	1

c) Total value of the habitat

Table 28 is used to determine the total number of biodiversity units per hectare on the affected and offset site by combining these two criteria. To do this, it suffices to multiply the values of the two criteria by each other. For example, for a habitat of medium distinctiveness in good condition, the number of biodiversity units is equal to 12 (4 x 3).

TABLE 28: DETERMINATION OF THE TOTAL NUMBER OF BIODIVERSITY UNITS PER HABITAT

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

The number of biodiversity units required for the offset or generated on an offset site depends on the distinctiveness and condition of the habitat. The more distinctive the site and the better its condition, the more the number of biodiversity units increases.

d) Adjustment by multipliers

Multipliers have been established to quantify the offsets in terms of area. They take account of the risks and uncertainties relating to results (see table 29), location of the offset site (see table 30), and the time lapse between the impact and the offset (see table 31). The multiplier applied to the time factor is subject to a discount rate of 3.5%, the percentage recommended by the Treasury.

TABLE 29: MULTIPLIER LINKED TO THE RISKS OF THE OFFSET TECHNIQUES

Risks linked to the difficulties of restoration or creation	Multiplier
Very high	10
High	3
Medium	1.5
Low	1

TABLE 30: MULTIPPLIER LINKED TO THE LOCATION OF THE OFFSET SITE

Location of the offset site	Multiplier
Strategically well placed site (contributes to the offset strategy)	1
Site used as a buffer or link zone outside an area identified in the offset strategy	2
Site that does not contribute to the offset strategy	3

TABLE 31: MULTIPLIER LINKED TO THE TIME FACTOR ASSIGNED A DISCOUNT RATE OF 3.5%

Years to attain the target condition	Multiplier
5	1.2
10	1.4
15	1.7
20	2.0
25	2.4
30	2.8
32	3

Fictitious example

A housing development results in the loss of 6 hectares of perennial ryegrass. The habitat is of low distinctiveness (which means trading up is possible), but forms part of a wider ecological network providing a migratory and dispersal route enabling the genetic mixing of species.

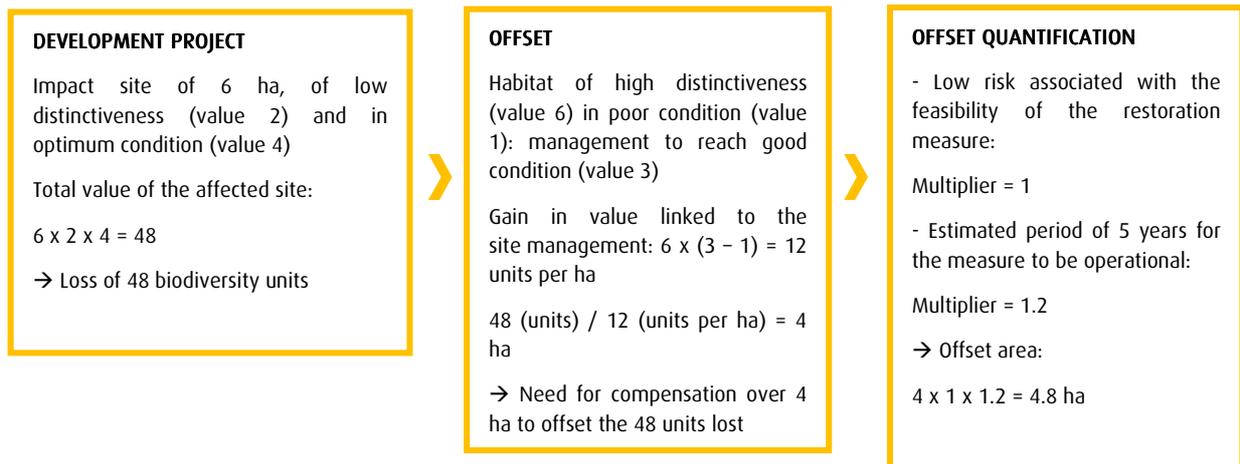
As it is of low distinctiveness but in optimum condition, according to the matrices the habitat is awarded a value of $(2 \times 4) \times 6 = 48$ units.

The project developer must therefore offset its project via 48 biodiversity units. It decides to collaborate with a local conservation charity to acquire these units.

This charity owns land which could potentially connect important habitats. This site is a highly distinctive habitat but is in poor condition. By managing the site to reach a moderate ecological condition, the charity can provide 12 units (6×2) per hectare, i.e. 48 units over 4 ha.

The risk associated with the restoration measure is considered to be low. The multiplier is therefore 1, which does not change the offset area.

The time expected for the restoration measure to achieve its objective is 5 years so a multiplier of 1.2 must be applied: $4 \times 1.2 = 4.8$. The offset site will therefore extend over 4.8 ha.



Source: Defra, 2011

V.2 – FINANCIAL COMPENSATION: CALCULATION MODES

Of the 14 countries that authorise financial transfers as offsets⁸², only India and Brazil have introduced a methodology for calculating the amount.

V.2.1 – India: Monetary valuation focussed on ecotourism and the pharmaceutical potential of forests

Source: 2011 survey of economic services on offsetting

In India, any assignment of a forest to another use must be offset. The project developers must pay a sum that includes the forest's "opportunity cost", a tax to offset deforestation and the cost of the environmental losses (preservation of wildlife, conservation of biodiversity, treatment of pollution, etc.).

For each development project, the CAMPA⁸³ committee determines the appropriate amount of the financial transfer. It has used the university work of the Indian Institute of Technology in Mumbai as a basis for the monetary valuation of the biodiversity of Indian forests. This takes account of two types of service provided by the forest, namely the recreational value linked to the potential for ecotourism and the medicinal value of the biodiversity (Gundimeda et al, 2006).

Recreational value

Two approaches are generally used to assess the value of ecotourism: the travel costs method and the contingent valuation method. As both of these approaches require a large database and a lot of time, values are transferred so that existing data can be used in different contexts.

By taking all the information available on consumer surplus arising from several studies, a function has been obtained between the consumer surplus (capacity to spend) per hectare and variables such as the fauna and flora specific to each site.

Using this function, the values of the consumer surplus per hectare in the different Indian states have been extrapolated: these have been multiplied by the number of tourists who have visited national parks and their environs. Given that tourists visit several destinations and not just national parks, the proportion of consumer surplus attributed to the parks has been estimated via an econometric study linking the number of tourists in a state with the variables that influence ecotourism. The proportion of the surplus coming from the national parks has thus been identified. This simulation was conducted using separate parameters for domestic and foreign tourists, given their different levels of expenditure and behaviour.

Medicinal value

Numerous molecules of pharmaceutical interest have been discovered in forests and subsequently replicated by industrial processes. The pharmaceutical value of biodiversity hotspots in India has already been assessed by several experts, such as Rausser and Small in 1998 for the Western Ghats and Eastern Himalayas. In 2000, Rausser and Small slightly modified their methodology to estimate the marginal medicinal value of the species found in 18 of the world's hotspots, in other words, the probability that a species can contribute to the discovery of a new pharmaceutical product (Gundimeda et al, 2006).

This methodology has been employed to estimate the medicinal value of the forests in the Indian states. In this model, the information on all the species found in the forests must be assigned to groups according to its quality level. The assumption is that each state has species of a different quality. The probability of discovering a species in relation to the quality of the group is then calculated. This is assumed to be proportional to the density of the species in a given state. Thus, by using financial parameters such as the cost of discovering a species and the revenue earned by the pharmaceutical industrialists that use it, a site's potential medicinal value can be estimated as a component of the biodiversity value of forests in India.

⁸² See the detailed legal framework in Appendix I.

⁸³ Compensation Afforestation Fund Management and Planning Authority.

V.2.2 – Brazil: Amount proportionate to the cost of investment and the project's impact

Source: 2011 survey of economic services on offsetting

According to law 9985/2000 which establishes the National System of Conservation Units⁸⁴, the project developer of a project with a significant impact on biodiversity must create or support the creation or maintenance of a full protection conservation unit.

In its first version, the law established that the value of the compensation should be proportional to the environmental impact caused and at the same time be greater than 0.5% of the total amount of investment in the project. This approach proved to be incoherent as it defined the value of the compensation based on the investment in the project and not on the environmental impact. The calculation method was not specified and in practice, the percentage could be much greater than 0.5% (Bezerra, 2007).

Given these inconsistencies, in 2008, the National Confederation of Industry (CNI) lodged a complaint with the Supreme Court of Justice, which pronounced the percentage to be unconstitutional. In 2009, the government modified the law: now the sum of the transfers must correspond to a percentage between 0% and 0.5% of the total amount of investment in the project and be proportionate to the scale of the impacts. The formula involves six variables (see inset 10).

The method defined in 2009 could again be legally contested. It does not enable the complexity of the variables that characterise the extent and duration of the impact to be taken into account. In practice, the environmental authorities almost always set the amount to 0.5% of the cost of investment in the project.

Furthermore, pilot projects are being trialled in Brazil to assess the total economic value of biodiversity, which will be used as a basis for measuring ecological losses and gains at project level. The assessment is based on ecological, social, economic, scientific, cultural and other parameters (Darbi et al, 2009) in accordance with the following calculation:

Total value of biodiversity = (opportunity cost + scenic impact + ecosystem loss + loss of tourist visits + ancillary environmental risk) x social factor.

These economic assessment methods need to be tested further for compensation in Brazil (eftec, 2010).

Inset 10: Criteria included in the calculation of the degree of impact in Brazil

The financial amount is calculated using the formula: VR x DI where VR is the amount of investment necessary to the project and DI the "degree of impact" (between 0 and 0.5%).

The formula for calculating the "degree of impact" (DI) is as follows:

$$[MI \times BI (EI + TI)/140] + [MI \times IPA \times TI/70] + ICU$$

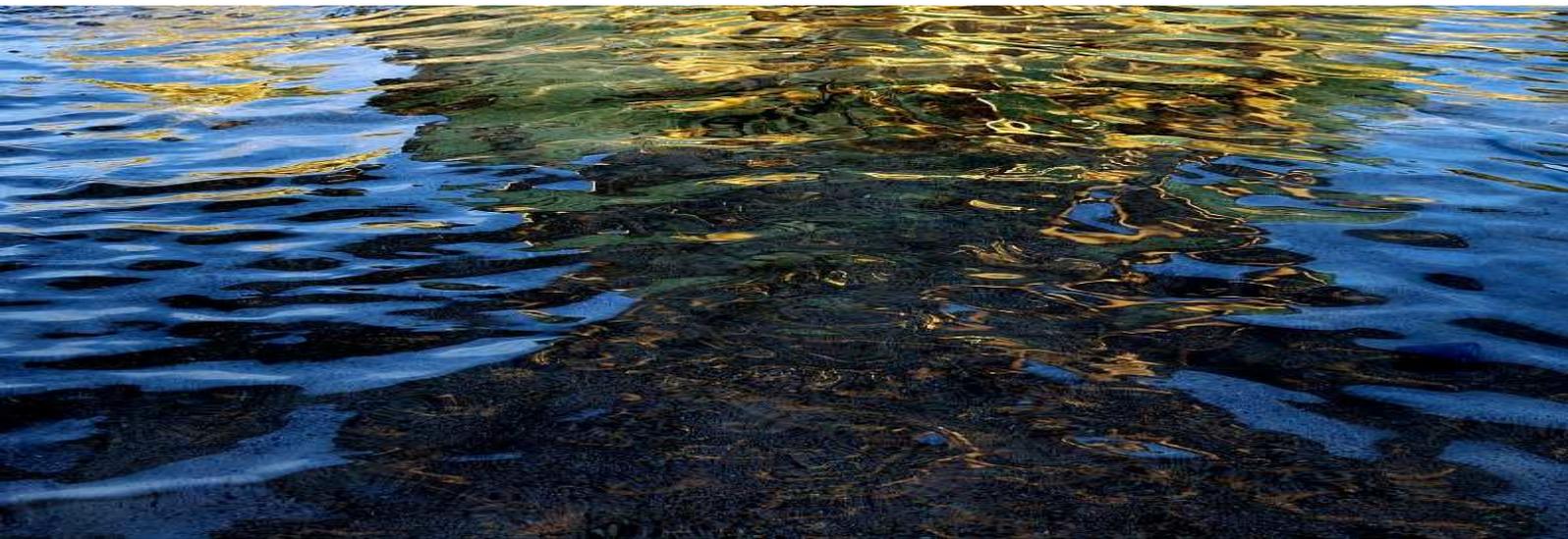
Impact on biodiversity + *Impact on Priority Areas* + Impact on the Conservation Units

- Magnitude index (MI – value between 0 and 3): assesses the existence and extent of significant adverse effects engendered on natural resources simultaneously;
- Biodiversity index (BI - value between 0 and 3): assesses the state of biodiversity before the development project is established;
- Extent index (EI - value between 1 and 4): estimates the surface area of the region threatened;
- Temporal index (TI - value between 1 and 4): corresponds to the duration of the impact, inversely proportional to the resilience of the biome in which the development project is integrated;
- Impact on Priority Areas for Biodiversity index (IPA – value between 1 and 3), a priori set by the Ministry of the Environment;
- Influence on the Conservation Unit (ICU – value between 0.05% and 0.15%): where applicable, assesses the project's impact on Conservation Units.

Sources: 2011 survey of economic services on offsetting; Ministry of the Environment⁸⁵

⁸⁴ See the detailed legal framework in Appendix I.

⁸⁵ <http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=250>



(Source: Laurent Mignaux - MEDDE)

VI – CONCLUSION

This comparative international study of offsets highlights the variability of situations in the countries studied, particularly in terms of legal framework, maturity of the mechanism, scope covered and economic, methodological and legal instruments established to implement and ensure the sustainability of compensatory measures. However, common schemes are revealed in terms of the principles of operating compensation banks, the approach to assessing ecological losses and gains and regulatory practices.

Although the lack of offset monitoring prevents genuine experience feedback, the outcome is overall mitigated; the application of offsets faces numerous difficulties, often common to all countries studied. Nonetheless, best practices are to be noted whose suitability and applicability to France could be assessed whilst guidelines on the sequence of "avoiding, reducing and offsetting" impacts on natural environments are being established.

Difficulties observed in the countries studied	Best practices developed in the countries studied	Possible lessons for France
The offset mechanism can have the effect of reducing the project developer's efforts to firstly avoid and then reduce the impacts of its project.	The majority of countries highlight the importance of following the "avoid, reduce, offset" sequence, with compensatory measures only representing an instrument to be used as a last resort.	A doctrine and guidelines are being established to support and strengthen the implementation of all avoidance, reduction and offset measures relating to natural environments. The doctrine insists on the priority given to avoidance and highlights that not everything can be offset.
The quality of the measures proposed is highly dependent on the quality of the impact assessments and therefore the service providers commissioned by the project developer.	The accreditation of design offices in Brazil, the Czech Republic and the United Kingdom and the authorisation of brokers in Australia certifies the approach of service providers.	In France, subsequent to a report by the General Council for the Environment and Sustainable Development, current discussions could lead to the establishment of a code of ethics in the form of a voluntary commitment charter as a first step before the introduction of a system of qualification for the design offices.
The absence of a method of assessing ecological losses and gains in numerous countries adds to the complexity of implementing offsets. On the other hand, having several methods can lead to developers only using the most simple and least suitable method from an ecological point of view (method based on area or direct recourse to surfacic ratios).	<p>The methods developed by some countries, often to support the development of compensation banks, rely on multi-criteria analyses. These are used to assess the quality of the environments and compare them based on several approaches (attributes matrix, benchmarks, list of pre-established values).</p> <p>To adjust the quantification of offsets, the majority of countries use multipliers to take account of the risks in terms of results, time delay and different sites.</p> <p>The methods applied often depend on the conservation significance. For significance of the lowest priority, some countries allow trading up. For the highest significance, limits to what can be offset using these methods are determined and lines are drawn (e.g. very old biotope, priority species, national corridor, etc.).</p>	<p>The development of a harmonised methodological framework could be envisaged to facilitate the implementation of offsets (quality, equity, time saving, least cost). This framework would be used to determine the value of a site based on a multi-criteria matrix that can be adapted on a case by case basis. The values associated with this matrix could be developed for each region and/or for certain significant sites.</p> <p>This type of methodological framework could facilitate the quantification of offsets in compliance with the principle of compensation like for like as close as possible to the impact.</p>
Financial transfer as an alternative method of offset to measures "in-kind" risks removing responsibility from the project developer and	Financial transfers as offsets are not authorised in every country and, where they are, measures "in-kind" are generally favoured.	Financial transfers as offsets are not authorised in France, except within the framework of the Forestry Code, where they are rarely used.

<p>replacing public financing to promote biodiversity.</p> <p>The method of calculating the amount is rarely specified and does not explicitly take account of the management costs for the duration of the project developer's commitment.</p> <p>The allocation of financing to equivalent ecological actions is uncertain, requires coordination by the authorities (costs and means) and is difficult to regulate.</p> <p>Financial transfers can be associated with the "commodification" of biodiversity.</p>	<p>generally favoured.</p> <p>In countries where financial transfer is designed to be an offset method in its own right, its scope is generally restricted to certain ecosystems (forests, marine habitats, etc.). The fund put into place to manage the transfers requires decentralised coordination to allocate them to ecological actions.</p> <p>Compensation Chambers have been created in Brazil specifically to regulate the methods of calculating the financial transfer.</p> <p>The in-lieu fee programme in the United States represents an intermediate system between financial transfer and compensation banks. It enables grouping <i>a posteriori</i> of the offset requirements for small projects in areas that have no banks due to a lack of profitability.</p>	<p>they are rarely used.</p> <p>The principle of measures "in-kind" is the rule, so as not to remove responsibility from the project developer.</p>
<p>The lack of land suitable for the implementation of offsets is problematic, especially in countries with high demographic or development pressure.</p>	<p>Through its land pools system, Germany enables potential offset sites to be secured in advance and made available to project developers.</p> <p>The introduction of tools alternative to land acquisition (contracts) and appropriate legal instruments, such as environmental easement agreements (United States, Australia and Austria), reduces the land pressure linked to offset requirements.</p>	<p>The offset supply trial in France partly aims to better manage the land issue by creating synergy effects. In 2012 it will be extended to new pilot operations subsequent to the launch of a call for proposals by the Ministry of Sustainable Development.</p> <p>Discussions are in progress on environmental or public utility easement agreements whose scope exceeds the offset.</p>
<p>The sustainability of the measures is rarely guaranteed, particularly due to a low period of commitment from project developers and the absence of appropriate legal and financial tools.</p>	<p>In practice, management periods are generally set based on the project's life span.</p> <p>Commitment periods going up to perpetuity are provided within the framework of compensation banks: such a commitment is possible due to the legal (environmental easement agreements) and financial instruments (trust funds) put into place to ensure the long term management of the measures.</p>	<p>The demand for a commitment period only appears within the framework of the offset supply trial (minimum 30 years) and in certain regional guides (PACA region, for example).</p> <p>Guidelines indicate the criteria to be taken into account to define the management period suited to each development project.</p>
<p>The lack of monitoring and inspection, essentially due to the lack of resources and operational databases, makes it impossible to be aware of the actual application of the proposed offsets and generate experience feedback.</p> <p>There is a lack of centralised information, in particular in Federal States and highly decentralised countries.</p>	<p>The strong involvement of environmental and research NGOs in auditing offsets has been highlighted in several countries such as Germany, Brazil, India, the Netherlands and Switzerland.</p> <p>Monitoring is facilitated by grouping offset sites via compensation banks.</p> <p>In Mexico, the payment of a deposit by the project developer obliges it to meet its commitments to implement offsets.</p>	<p>French regulations on impact assessments have recently been modified to ensure the planned environmental measures are effective and audited. Offsets and the terms for monitoring them must now mandatorily and systematically be transposed into the authorisation acts. Furthermore, the administrative authority can take the place of a project developer that has not implemented the planned offsets, based on a financial guarantee system.</p> <p>A centralised tool to monitor measures to avoid, reduce and offset impacts on the environment is being assessed to track the location of the measures, the state of their execution and their efficacy.</p>

<p>Within the framework of the compensation banks, the lack of transparency and visibility of the supply and demand makes the market uncertain.</p>	<p>Databases are available online in the United States for the mitigation banks and in-lieu fee programmes, and in Australia for the BioBanking programme.</p>	<p>A centralised register of available credits could be introduced if the offset supply trial is extended and maintained.</p>
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- French law: <http://www.legifrance.gouv.fr/>

APPENDICES

APPENDIX I: DETAILED LEGAL FRAMEWORK

Source: 2011 survey of economic services on offsetting

Almost every country in the world, with the notable exception of the United States, has signed and ratified the 1992 Convention on Biological Diversity (CBD). In its preamble, it states that "the conservation of biological diversity is a common concern of humankind". All Parties to the CBD have committed to curbing biodiversity loss, notably within the framework of national conservation strategies and the sustainable use of biodiversity. To contribute to reaching this objective, the development and application of tools – such as offsets – to integrate the challenge of biodiversity at the heart of development projects were recommended during the Conference of the Parties at the CBD in Nagoya in 2010⁸⁶. The implementation of biodiversity offset is therefore *not* an obligation at international level, and it falls to each country to introduce its own strategy to curb biodiversity loss.

In general, it is possible to distinguish between mechanisms based purely on environmental assessment and mechanisms also equipped with sector-specific procedures (e.g. wetlands, forest, native vegetation, etc.).

1. Countries equipped with legislation on environmental assessment and sector-specific assessments

Of the 25 countries effectively studied, 20 have a legal mechanism that provides for the application of offsets within the framework of environmental assessments and procedures relating to biodiversity components (wetland, forest, etc.). These countries are some of the 27 Member States of the European Union (EU) subject to European Law studied, namely Austria, the Czech Republic, Denmark, France, Germany, the Netherlands, Poland, Slovenia, Spain, Sweden and the United Kingdom, and 9 other countries studied outside the EU, namely Australia, Brazil, Canada (Quebec), India, Mexico, Morocco, Russia, Switzerland and the United States.

EUROPEAN DIRECTIVES

EU Member States are obliged to transpose European directives into national law (table 32).

The EIA – Environmental Impact Assessment – directive or "projects" directive of 27 June 1985 (85/337/EEC) conditions the authorisation of certain development projects on an assessment which must determine the direct and indirect effects of these projects on the environment. It particularly targets hazardous industrial installations, thermal power stations and transport infrastructure. The EIA directive is currently being revised and should include explicit reference to biodiversity. In addition, the SEIA – Strategic Environmental Impact Assessment – directive or "plans and programmes" directive of 27 June 2001 (2001/42/EC) widens the scope of the EIA directive to cover plans and programmes. Both directives require the project developer to conduct an environmental impact assessment (project) or environmental report (plans and programmes) which includes a description of the measures envisaged to avoid, reduce and where possible offset all notable adverse effects on the environment (annex IV of the EIA directive and annex I of the SEIA directive).

A Natura 2000 network impact assessment regulation completes this environmental assessment mechanism. The Natura 2000 network, established by the "Habitats, Fauna and Flora" directive of 21 May 1992 (92/43/EEC), is based on Special Areas of Conservation (SAC), composed of sites representing habitats and/or species of Community interest, and Special Protection Areas (SPA) under the "Birds" directive of 2 April 1979 (79/409/EEC)⁸⁷. This network is the largest ecological network of protected areas in the world. For any development project liable to impact a Natura 2000 site, the competent authority must decide whether the project "individually or in combination with other[s]" will have a "significant effect" on the Natura 2000 site. In this case, it is above all imperative that the effect be avoided and reduced as far as possible. If a significant residual impact remains (which requires a threshold to be defined), this must be offset. The offsets must specifically relate to the habitats and/or species of Community interest affected.

Finally, when accidental environmental damage occurs, the Environmental liability directive (2004/35/EC) of 21 April 2004 obliges the operator to take the necessary restoration measures⁸⁸. Compensatory restoration is implemented to offset the loss of resources and/or services that occurs between the time the damage was incurred and the time the environment returns to its baseline condition⁸⁹. It can be implemented on the same affected site or on another similar site and cannot take the form of financial offsetting (Gaubert and Bas, 2010).

⁸⁶ "To encourage the development and application of tools and mechanisms that can further facilitate the engagement of businesses in integrating biodiversity concerns into their work, such as, consistent and in harmony with the Convention and other relevant international obligations, certification, verification, the valuation of biodiversity and ecosystem services, incentive measures, **biodiversity offsets**, etc.;" (COP10)

⁸⁷ Now directive 2009/147/EC of 30 November 2009, it includes modifications regarding environmental powers.

⁸⁸ The Environmental liability directive (ELD) applies to damage caused to water, land if it affects human health and Natura 2000 sites.

⁸⁹ The ELD defines the baseline condition of the site as being the condition of the natural resources and services that would have existed had the environmental damage not occurred. It is estimated based on the best information available.

TABLE 32: TRANSPOSITION OF EUROPEAN DIRECTIVES INTO NATIONAL LAW IN THE EUROPEAN COUNTRIES STUDIED

EU Member State	EIA "Projects" directive	SEIA "Plans and programmes" directive	"Habitats" and "Birds" directives (Natura 2000)	Environmental liability directive
Scope	Environment, health		Specific habitats and species	Water, land, Natura 2000
France	Environment code: article L.122-3 article R.122-3 (§4)	Environment code: articles L.122-4 to 11 articles R.122-17 to 24	Environment code: article L. 414-4 articles R. 414-19 to 26 (modified by the decree of 9 April 2010)	Law on Environmental Liability No. 2008-757 of 1 August 2008 Decree No. 2009-468 of 23 April 2009
Germany	Federal Nature Conservation Act 1976 (<i>Bundesnaturschutzgesetz</i>)/article 19	Federal Nature Conservation Act 1976 (<i>Bundesnaturschutzgesetz</i>)	Federal Nature Conservation Act 1976 (<i>Bundesnaturschutzgesetz</i>)	Not available
Austria	Not available	Not available	Nine laws relating to nature conservation (nine states) E.g. <i>Upper Austria Nature and Landscape Protection Law</i> ⁹⁰	Not available
Denmark	Not available	Not available	Law 2003/1 LSF 15 ⁹¹ Decree 477 of 7 June 2003 ⁹²	Laws No. 446 and 507 of 17 June 2008
Spain	Not available	Not available	Law 42/2007 on Natural Heritage and Biodiversity/article 45	Not available
Netherlands	Not available	Not available	Nature Conservation Act of 25 May 1998/articles 19h and 19k	Not available
Poland	Act on Access to Information on the Environment and its Protection and on Environmental Impact Assessments 2008/article 51	Not available	Nature Conservation Act 2004/article 34	Act on the Prevention and Remedying of Environmental Damage 2007 Order of the Ministry of Environment of 4 June 2008
Czech Republic	Act No. 100/2001	Not available	Act No. 114/1992 on the Protection of Nature and the Landscape	Not available
United Kingdom	Town and Country Planning Regulation 1999	Planning and Compulsory Purchase Act 2005	The Conservation (Natural Habitats, &c.) Regulations 1994 No. 2716 Part IV Regulation 53 The Conservation of Habitats and Species Regulations 2010 (update of the previous regulation)	Not available
Slovenia	Not available	Not available	Environmental Protection Act 1999 Decree on the Special Protection Areas (Natura	Not available

⁹⁰ <http://www.naturschutz.at/>⁹¹ <https://www.retsinformation.dk/Forms/R0710.aspx?id=89443>⁹² <https://www.retsinformation.dk/Forms/R0710.aspx?id=12654>

			2000) – Official Gazette of the RS, No. 49/04, 110/04-	
Sweden	Not available	Not available	Swedish Environmental Code (<i>Miljöbalken</i>) of 1 January 1999/Chapters 7 and 16	Not available

France

The Law for the Protection of Nature of 10 July 1976 and the Decree of 12 October 1977 introduced the impact assessment regulation for development works and projects liable to threaten the natural environment. Articles R.122-3 (§4) and L.122-3 of the Environment Code indicate that the impact assessment must in particular include the measures envisaged by the project developer to eliminate, minimise and, if possible, offset the harmful consequences of the project on the environment and health, as well as an estimate of the corresponding costs.

The environmental assessment regulation relating to plans, schemes, programmes and other planning documents is referenced in articles L.122-4 to 11 and R.122-17 to 24 of the Environment Code. Article R.122-17 lists the plans, schemes, programmes and other planning documents subject to environmental assessment.

The scope of the impact and environmental assessment regulations is wide because it applies to the environment. However, there are provisions specific to biodiversity.

This is the case of the Natura 2000 network, for which the "Habitats" and "Birds" directives are transposed into national law in the impact assessment regulation (article L.414-4 of the Environment Code). This regulation specifies that when an assessment concludes that there is a threat to the conservation status of a Natura 2000 site, in the absence of alternative solutions "the competent authority can give its permission for reasons of overriding public interest. In this case, it will check that compensatory measures are taken to maintain the overall consistency of the Natura 2000 network". The provisions of article 6, paragraphs 3 and 4 of the Habitats directive relating to impact assessments have been transposed into French law via articles R.414-19 to 26 of the Environment Code (modified by the Decree of 9 April 2010). Article R.414-19 lists the operations subject to impact assessment at national level.

The procedure for waiving the strict protection of protected species is conducted within the framework of establishing a development project via the Order of 19 February 2007 and articles L.411-1 and 2 of the Environment Code, which stipulate that an exemption can be 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". In the event of a significant effect on a protected species giving rise to a request for exemption, the project developer must introduce measures to avoid, reduce and, as a last resort, offset these effects.

Within the framework of the introduction of the green and blue infrastructure, the Grenelle II law stipulates that at local level the planning documents and projects of local authorities and their municipalities take account of the regional ecological coherence diagrams and specify the measures applied to avoid, reduce and, where applicable, offset the impacts on ecological continuities liable to be caused by implementing these planning documents, projects or linear infrastructures. This concerns the territorial planning and sustainable development directives (DTADD), the coherent territorial planning schemes (SCOT) and the local urban planning schemes (PLU) that the draft Grenelle II law modifies to include the objective of ecological continuity.

Article R.214-6 of the Law on Water requires a document (or declaration, art. R.214-32) specifying, where applicable, the envisaged corrective or compensatory measures to be submitted with the request to the Prefect of the department in which the installation requiring authorisation is to be executed.

Finally, for the clearing of wooded areas, the Forest Code (L.311-4 of the Environment Code) stipulates that it is mandatory to offset at least with a ratio of 1 ha compensating for 1 ha destroyed or even 2 to 5 ha for 1 depending on the ecological and social role of the cleared woods.

Offsets therefore not only concern protected habitats and species. They can target the general biodiversity (impact assessment regulation), and more specifically hedgerows, unprotected wetlands, green verges in urban areas or even afforestation.

In France, only ecological measures are eligible as offsets and must therefore be made "in-kind" and not via financial transfers to the State. Financial transfers by the project developer, for example in the form of financing for conservation programmes, can constitute optional "supporting" measures, but not offsets.

Germany

Legislative power for nature conservation is shared between the federal state and the states, and measures can be executed at federal, regional or municipal level. In the states, whose powers have increased since the Federalism Reform of 2006, the regulations have a common basis adapted according to the organisation and specific features of each region (sea, mountains, etc.). The Federal Nature Conservation Act of 1976, modified and added to in 2002 and 2010, is the main legislative instrument. Article 19 defines the impact mitigation regulation (*Eingriffsregelung*). This regulation is not limited to specific projects if there is a significant effect on nature and the landscape (Wende et al, 2005)⁹³.

The urban planning law and road construction law also stipulate, within the framework of large projects (infrastructure and factories), that construction activities and plans, as well as other plans, take the interest of nature conservation into consideration. These parameters must be included in the design of the development plan. The impact mitigation regulation is more detailed but less restrictive than the Nature Conservation Act: in effect, interventions in nature and the countryside must be minimised and then offset as far as possible. In practice, numerous offsets are implemented at plan and programme level, with repercussions on land prices.

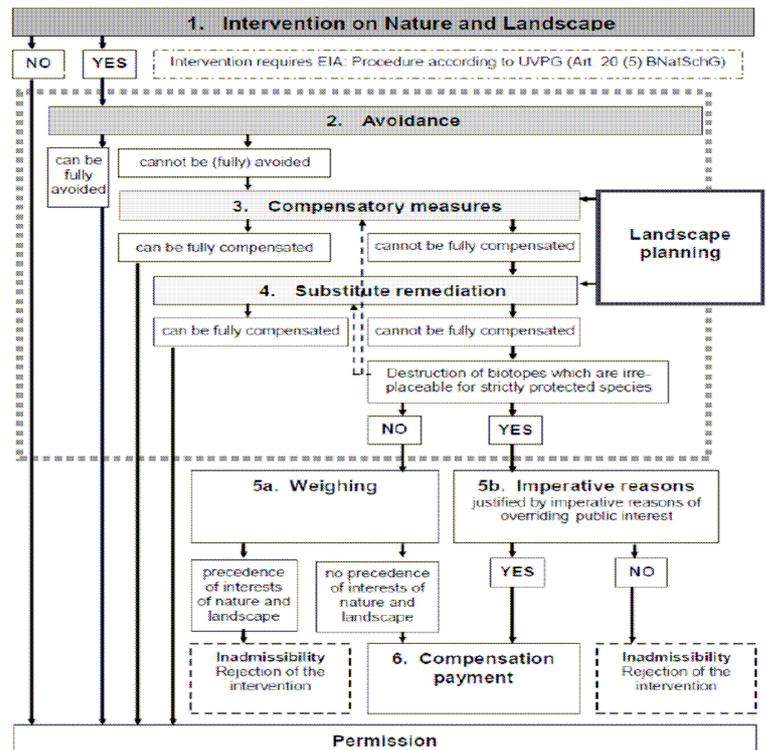
In Germany, offsets cannot be used to justify going ahead with projects whose residual impacts on biodiversity are unacceptable. The option of a project "no go" is seriously considered and is applied if a unique habitat is destroyed or the effects are irreversible.

Germany distinguishes between three types of offset:

- as a priority, equilibrium measures (*Ausgleichmassnahmen*): the impact is offset by recreating an environment with identical natural functions which is geographically close;
- replacement measures (*Ersatzmassnahmen*): the impact is offset by creating an environment as similar as possible to the environment affected in the same area, or as a last resort in another area;
- as a last resort, when the first two types of measure cannot be executed "in-kind", monetary compensation (*Ersatzzahlung*) is possible in two cases: 1/ if there is no irreversible destruction of the habitats of protected species and the natural interest is not a priority, and 2/ if there is irreversible destruction of the habitats of protected species and reasons of overriding public interest: financial transfers are then paid to the benefit of foundations, nature conservation associations or municipalities. In other cases (priority natural interest or absence of reason of overriding public interest), the project is cancelled.

The impact mitigation regulation applies to all types of habitat. Offsets primarily target protected habitats and species, as well as the unprotected biodiversity (e.g. wetlands, hedgerows and thickets) although requirements have become less strict for this second category due to the emphasis placed on Natura 2000.

The 1976 version of the Federal Nature Conservation Act was based on a strict functional approach: impacts on a function⁹⁴ had to be offset by a measure to restore the same function. The revision of this law in 2002 and the amendment to Germany's Federal Building Code in 1998 widened the scope of the impact rules to cover ecosystems and introduced greater flexibility in the application of measures: outside of Natura 2000 and protected species, strict equivalence (measure like for like and *in situ*⁹⁵) between impact and offset is no longer imposed. According to the new criteria, the offset must be close to the impact in



⁹³ In the event of an impact, a prior environmental impact assessment procedure (*Umweltverträglichkeitsprüfung* or UVP) is systematically conducted to analyse the direct and indirect consequences of the project on the environment. The project developer generally has this assessment conducted by cabinets of experts based on information made available by the competent authorities (state Ministries of the Environment, municipal authorities, foundations, etc.).

⁹⁴ In Germany, an impact is a change to the condition or use of ground, groundwater and living soil strata, which can *seriously* compromise nature's functions and its abilities to provide services, or threaten the landscape.

⁹⁵ See part V on methodology for the definition of the terms.

geographic and functional terms and can relate to a type of habitat other than that affected. This framework has supported the emergence of land pools and ecological accounts⁹⁶ at municipal and regional level (Wende et al, 2005).

Austria

Under the terms of the Austrian Constitution (*Bundesverfassungsgesetz* - BVG - art. 15), the nine states have legislative power relating to nature conservation. There are therefore nine laws relating to nature conservation but no specific regulations on biodiversity. For a number of years, environmental associations have been demanding the introduction of a national framework law defining the outlines of the conservation and management of natural heritage.

However, other laws such as the National Forest Law and the state laws on hunting and fishing do have provisions relating to biodiversity offsets. The offsets therefore do not just concern protected habitats and species.

The nine laws relating to nature conservation require the implementation of measures in-kind, distinguishing between measures prescribed in the authorisation to reduce the severity of the impact on nature (offsetting ex-ante, charges for the project developer, limitations in time, etc.) and "offsets" (measures to "replace" the destruction of biodiversity, forbidden in principle). The latter measures must in general intervene in the three years preceding the request for authorisation of the project: the project developer can ask the administration to formally recognise them as such through an administrative decision.

Financial compensation is only authorised under exceptional circumstances when an offset in-kind is not possible (e.g. impact on a glacier).

Denmark

The Protection of Nature Act (*Naturbeskyttelsesloven, LBK nr 933 af 24/09/2009*) stipulates that if a development project enters into conflict with the protection of a habitat mentioned in article 3, the project developer can obtain an exemption if it commits to offsetting the adverse effect of its project by recreating the affected habitat in another location. Article 3 lists a certain number of habitats such as peat bogs and marshes⁹⁷. The majority of municipalities have adopted an informal rule according to which the area of the recreated habitat must be twice that of the destroyed habitat.

The Forest Law protects all state-owned forest. If a state-owned forest has to be felled, an equivalent forest of an area 1.5 to 2 times that of the felled forest must be replanted.

The offsets implemented in Denmark almost exclusively concern protected habitats and species. Unprotected habitats and species (such as certain hedgerows, for example) can be indirectly concerned if maintaining them helps conserve protected habitats and species.

Spain

National legislation submits to the European directives ("Habitats", "Birds" and EIA), and has no other specific laws on offsets (Villarroya and Puig, 2009). The scope of offsets in Spain, which aim to guarantee the global coherence of the Natura 2000 network, focuses on "significant" impacts on habitats and/or species of Community interest.

The 17 autonomous communities can also legislate on the subject and in some cases have legislation relating to biodiversity offsets. To cite a few examples (Villarroya and Puig, 2009):

- Autonomous community of Andalucía: law 7/2007 authorises the competent authority to demand offsets "when damage caused to natural resources on the affected site is irreversible". The payment of a fine which will be used to implement offsets is authorised.
- Autonomous community of the Balearic Islands: law 11/2006 obliges project developers to implement offsets for impacts in protected and unprotected areas.

Netherlands

The principle of offsetting came into force in 1993 within the framework of large scale projects (such as the construction of motorways) with the publication of the National Structure Plan for Rural Areas (Cuperus et al, 2001).

The obligation to offset biodiversity losses is provided for in various mechanisms (Spatial Development Plan and its EHS sector-specific plan of 2007, the Fauna and Flora Act of 25 May 1998, the Forest Act of 20 July 1961 and the Nature Protection Act of 25 May 1998) and varies according to the project's location.

⁹⁶ See part IV on compensation banks.

⁹⁷ <https://www.retsinformation.dk/Forms/R0710.aspx?id=127104>

Within the Dutch ecological network known as "*Ecologische Hoofdstructuur*" (EHS), which notably comprises national parks linked by natural corridors, development projects are only approved if there is no other alternative outside the network or if the projects are of major public interest. In the event of authorisation, offsets are required for the residual effects. The Fauna and Flora Act also obliges project developers to offset if the development affects protected species, whether within or outside the Natura 2000 and EHS networks⁹⁸. Finally, the Forest Act of 1961 requires reforestation if trees are felled.

Although they are not implemented in practice, the regulations authorise financial transfers as a last resort in the EHS ecological network and in unprotected areas where the Fauna and Flora Act and Forest Act apply. Financial transfers are forbidden in the Natura 2000 network. In the EHS network, financial compensation can only be envisaged after having considered offsets "in-kind" in extension of or near to the network, on the same type of biodiversity or on "quantitatively comparable values". According to the EHS plan, the amount of the transfer depends on the cost of acquiring the land on which the offsets will be implemented and the costs linked to developing the land (excavation work, modification of the hydrology, etc.) and the ecological measures (planting trees for example); an additional budget can be applied to take account of the ecological losses linked to the duration of the resulting impacts. The sum is paid into the Dutch National Fund for Rural Areas (*Nationaal groenfonds*) managed by the public and provincial authorities.

A project developer can also fulfil its management obligation by paying the land management costs for a period of 30 years. The offset site is then managed by a manager such as a nature conservation association or the water and forests agency.

Given the problems encountered in implementing offsets, the Dutch government is currently studying the possibility of developing a system of compensation banks and reorganising the administrative system to facilitate the implementation of measures. The "No net loss initiative" has been introduced by a multi-stakeholder working group on biodiversity and natural resources, with the aim of being able to objectively qualify and quantify ecological losses and gains.

Poland

Article 75 of the Environmental Protection Act of 2001 obliges all the stakeholders concerned to protect the environment during construction works and, should this prove impossible, to undertake work to rehabilitate the damaged environment, notably by applying offsets. Article 34 of the Nature Protection Act of 2004 stipulates that all intervention necessary in Natura 2000 areas is subject to the obligation to proceed with offsets. Article 15 of this same act imposes the implementation of offsets in protected areas other than Natura 2000 such as natural reserves and national parks.

The 2008 Act on Access to Information on the Environment and its Protection and Environmental Impact Assessments states in article 51 that all strategic environmental assessments for an investment must define the measures to be undertaken to avoid, limit or offset the harmful effects of this investment on the natural environment.

Requirements relating to offsets target all components of the natural environment. However, in practice, they only really apply to protected habitats and species.

Polish legislation only provides for the implementation of measures "in-kind".

Fines can be imposed if obligations to offset are not complied with.

United Kingdom

In the United Kingdom, legislation on biodiversity mainly follows from European law. The Biodiversity Action Plan (1994) presents the objectives relating to the protection of biodiversity. Furthermore, national law includes a "biodiversity duty". According to the definition used by the Department for Environment, Food and Rural Affairs (Defra), this duty means that "every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity". This duty appears in the Countryside and Rights of Way Act (2000) and Natural Environment and Rural Communities Act (2006).

In practice, although this biodiversity duty is mandatory in nature, it does not necessarily require offsets to be implemented. These are only required for Natura 2000 sites and Sites of Special Scientific Interest (SSSI) established based on the Wildlife and Countryside Act of 1981. To date, the offsets implemented therefore only concern protected habitats and species. However, subsequent to the publication of a white paper in 2011 (see inset 11), Defra is studying the possibility of extending their application to unprotected biodiversity. Note that the Lawton report on the implementation of biodiversity offset mechanisms, submitted to the government in 2010, recommends that each individual compensatory measure target a net gain in biodiversity, whilst applying the precautionary principle.

The local authorities in charge of planning hold the main responsibility for compliance with the biodiversity duty. When preparing building permit requests, they are encouraged to take account of this duty and reject permits for development

⁹⁸ In 2010, the EHS network covered an area of 613,000 ha. The Natura 2000 network comprises 162 sites over a total area of 330,000 ha, which is 10% of the national terrestrial surface area. Outside these two networks, there are approximately 100,000 ha of terrestrial nature in the Netherlands (source: Responses to the questionnaire).

projects that would have severe effects on biodiversity. The legislation also requires local authorities to identify appropriate sites for the restoration or creation of habitats to contribute to national objectives to reduce biodiversity loss.

The administrative rules relating to regional planning encourage the introduction of offsets. These are primarily the following mechanisms:

- Planning Policy Statement No. 9 (PPS9) of 1994 defines the framework of the national regional planning policy with which administrative authorities issuing building permits must comply. It establishes a mitigation hierarchy for impacts on biodiversity which requires avoiding the destruction of biodiversity, reducing its impact where applicable, and, as a last option, offsetting the loss of biodiversity. Offsetting is not mandatory even though PPS9 has a legal basis.
- Section 106 Agreement of the Town and Country Planning Act (1990) is often used by local authorities to require project developers to undertake conservation activities (ten Kate et al, 2004). Every project developer or promoter pays the local council a contribution which aims to cover a proportion of the financing required for the public infrastructures made necessary by the construction of the development project concerned. These contributions are negotiated when preparing the building permit and the discussion between the sponsor and council leads to the signature of a 106 Agreement which makes the sum the project developer will pay the council contractual. These contributions may also require the sponsors to pay for the impacts on biodiversity resulting from their development projects. However, under current law and practices, it is not possible to proceed with financial transfers as an offset in the United Kingdom.

Inset 11: "Making space for nature"

In June 2011, the British government published the white paper for the preservation of biodiversity. In 2012, pilot projects will be launched in six regions to test the application of offsets outside protected spaces on a voluntary basis for a period of two years. The pilot projects aim to assess the suitability of applying offsets in the United Kingdom and, where applicable, to improve their efficacy.

These projects will involve the local authorities, project developers and any entity with an interest in biodiversity conservation. The local authorities will offer the project developer the option of responding to biodiversity preservation requirements via offsets. The latter may nonetheless fulfil its obligation using current procedures. The project developers may implement their measures themselves or use a third party. In agreement with the local authorities, the potential providers of measures, local conservation associations and landowners will identify the offset sites and determine the number of biodiversity units they may provide using the recommended methodology⁹⁹. They will also have to register their measures on a central register of pilot projects managed by Defra¹⁰⁰ or Natural England¹⁰¹. If a service provider wishes to implement its measure before it has found a buyer (this concurs with the compensation banks' principle of anticipation), it will have to register its "intention" in advance. A consistent and pooled approach to offsetting at regional level, enabling the accumulation of low impacts to be considered, is favoured.

As far as possible, the pilot projects must notably cover a coherent geographic area, enable cooperation between local authorities and partners to agree on the strategy of applying offsets in the trial area and anticipate development projects. These trials will be used to test the recommended methodology of assessing ecological losses and gains, see whether the projects enable better management of resources and have a better understanding of the costs of offsetting.

Source: <http://www.defra.gov.uk/environment/natural/biodiversity/uk/offsetting/>

Slovenia

Slovenia has no legal instrument other than the European directives. Offsets therefore focus on protected habitats and species. In the Natura 2000 area, which covers 35% of the national territory, offsets can also relate to unprotected biodiversity.

The Ministry of Agriculture and the Environment defends a concentrated development policy and rejects projects that lead to the fragmentation of habitats. Of the 30% of projects giving rise to offsets, 90% of the measures prescribed are effectively implemented. (2011 survey of economic services on offsetting).

Although financial transfers are authorised, the Ministry of Agriculture and the Environment is not in favour of them as they do not allow the project developers to be held responsible. The Ministry insists its recommendations are heard, particularly in the alpine region, where the municipalities are in favour of proposals of financial compensation faced with the high pressure on natural habitats (tourism complexes).

⁹⁹ See part V on methodology.

¹⁰⁰ Department of Environment, Food and Rural Affairs.

¹⁰¹ Regional conservation agency.

Sweden

In Sweden, numerous projects linked with energy infrastructure (wind parks, electricity networks) and urban development imply compensation needs.

According to the Swedish Environmental Code, project developers must offset the residual effects of their project on Natura 2000 sites and protected spaces outside the network, such as natural reserves, reserves protected for cultural heritage and biotope protection areas. An offset can also be required in the event of impacts on water courses and areas recognised to be of high cultural or environmental priority at national or international level. Outside these cases, compensation remains voluntary. A decree by the Swedish Road and Rail Agency mentions "the possibilities of offsets for new transport infrastructure". In a report on biodiversity offsets¹⁰², the county of Scanie and the transport agency *Trafikverket* feel that the counties should require the study of offsets as of the first stages of the consultations with the project developer.

Biodiversity offsets are "in-kind" and implemented at a very local scale in order to take account of the local populations impacted by development projects.

According to a 2004 study by the Swedish Biodiversity Centre (*Centrum för Biologisk Manfald*) relating to the application of the Convention on Biological Diversity in Sweden, 23 of the 274 impact assessments (8%) conducted over three years presented offsets.

TABLE 33: ENVIRONMENTAL IMPACT ASSESSMENTS PROVIDING FOR PREVENTION AND COMPENSATORY MEASURES IN SWEDEN BETWEEN 2000 AND 2003 (SWEDISH BIODIVERSITY CENTRE, 2004)

Sector	Prevention measures	Compensatory measures	Monitoring measures	Uncertain
Energy	0	0	1	1
Quarries	9	5	2	3
Water	6	0	3	1
Roads	43	5	23	6
Industry	9	0	3	3
Agriculture	1	1	0	0
Rail	7	6	4	1
Planning	23	6	12	7
Total	98	23	48	22

OUTSIDE THE EU

United States

The United States was one of the first countries to have adopted a system of offsetting the environmental impacts of development projects. At federal level, the National Environment Policy Act (NEPA) of 1969 covers impact assessments to identify impacts on biodiversity, although no overall regulatory instrument exists to mitigate them. However, two types of threat are regulated and can give rise to offsetting: residual impacts on wetlands and water resources under the Clean Water Act of 1977, and on threatened and endangered species under the Endangered Species Act of 1973.

In addition to the federal laws, 23 states have a statute and regulations in place on offsetting, notably authorising the use of compensation banks (Environmental Law Institute, 2002). State laws vary greatly and can, in certain cases, be more restrictive than federal legislation. This is particularly the case in California (California Environmental Quality Act) which imposes offsets for unprotected species.

Three types of offset are used in the United States:

- direct implementation by the project developer of measures aiming to offset the residual impact (permittee-responsible mitigation): these measures can be implemented *in situ* (approximately 55% of cases¹⁰³), on another site (18%) or a combination of both (27%);
- the purchase of credits from a compensation bank (mitigation bank for water resources or conservation bank for endangered species)¹⁰⁴;

¹⁰² Page 18 of the report "*Kompensation vid förlust av miljövärden*".

¹⁰³ Estimated in 2005 by the USACE based on the applications processed in 2003.

¹⁰⁴ See part IV on compensation banks.

- financial transfer to an approved public or not-for-profit body that manages natural resources (in-lieu fee programme¹⁰⁵), which will use the fund created to offset the biodiversity losses.

In 2003 (only statistic available), offsets linked to wetlands and aquatic environments were split into these three types with a relative distribution of 60%, 33% and 7% (in offset area) respectively. However, there is great disparity between states.

American legislation recommends a hierarchy of the types of offset to be applied; firstly the purchase of credits from the compensation banks, then from in-lieu fee programmes and, finally, direct implementation.

Impacts on water resources: Clean Water Act

The application of section 404 of the Clean Water Act (CWA)¹⁰⁶ of 1977 is the shared responsibility of the US Army Corps of Engineers (USACE) and the Environmental Protection Agency (EPA) (Hough and Robertson, 2009). The EPA is responsible for the application law (title 40, part 230 CFR¹⁰⁷) upon which the USACE (title 33, parts 325 and 332 CFR), as the competent authority, must base its decision to grant an authorisation permit (Environmental Law Institute, 2002). Section 404 of the CWA stipulates that an impact will be avoided if there is an alternative which would have a less adverse impact, that all possible and appropriate steps are taken to minimise the impact, and an offset on certain residual impacts is put into place (McKenney 2005; Hough and Robertson, 2009). The Memorandum of Agreement (MOA) of 1990 between the USACE and EPA clarifies the law cited above and instigates a three step process to "avoid, reduce and offset impacts" before a permit can be granted (Environmental Law Institute, 2002). In 2008, the EPA and USACE published *Mitigation for losses of aquatic resources* (CWA application laws), which aims to improve the offset system for aquatic resources, by establishing equivalent standards for all forms of offset (mitigation banks, in-lieu fee programme and direct implementation) (Hough and Robertson, 2009).

Impacts on endangered species: Endangered Species Act

Section 7 of the Endangered Species Act of 1973 (ESA)¹⁰⁸ (title 16, chapter 35 CFR) obliges federal agencies to consult the US Fish and Wildlife Service (USFWS) in order to assess the potential impact of development projects on threatened and endangered species. The USFWS is in charge of all terrestrial and freshwater species. The National Oceanic and Atmospheric Administration (through the National Marine Fisheries Service) is the main agency responsible for marine and anadromous species¹⁰⁹.

Change to federal legislation: non-threatened species

New laws that do not focus on endangered species were adopted in 2009. These protect migratory birds, bald and golden eagles. The latter two are species recently removed from the list of endangered species: specific regulations have been introduced in order for them to continue to benefit from protection.

Australia

In 2007, the federal government established a draft policy on the application of offsets for biodiversity conservation within the framework of national legislation on biodiversity (Environmental Protection and Biodiversity Conservation Act of 1999). This draft, currently sidelined, could result in an explicit mandatory national system of offsetting, following avoidance and reduction. It targets protected biodiversity, proposes an assessment of proposed offsets on a case by case basis (all direct and/or indirect measures), favours offsetting near to the affected sites (bioregion or sub-region, unless greater efficacy elsewhere), and requires at least one auditable like for like offset, preferably conducted before the start of the work, over a duration at least equal to that of the impact.

Although Australia appears to be moving towards a uniform system at federal level, the management of land, water and biodiversity is the responsibility of each federal state. In total, around ten programmes to offset residual impacts on biodiversity have been put into place, thanks to which almost 500 habitat hectares are re-established or preserved each year (2011 survey of economic services on offsetting). All integrate offsetting into the mitigation sequence and favour like for like offsetting.

Based on a precise regulatory framework (Table 34), the states of Victoria, New South Wales, Queensland and South Australia have developed offset policies primarily targeting native vegetation (McKenney and Kiesecker, 2010). This plays a primordial role within ecosystems (e.g. carbon storage, water purification, support of other species, etc.) (Smith et al, 2000). Within the framework of these programmes, some of which are similar to compensation banks, the project developer is held liable for providing the offsets.

¹⁰⁵ See part IV on compensation banks.

¹⁰⁶ The CWA is an amendment to the Federal Water Pollution Control Act of 1972, which establishes the foundations of the regulation on pollutant discharges into water in the United States.

¹⁰⁷ Code of Federal Regulation.

¹⁰⁸ Codified in the US Code, title 16, chapter 35, section 1531 and after.

¹⁰⁹ An aquatic species that usually lives in the sea but swims up streams and rivers to reproduce and lay eggs.

TABLE 34: OFFSET PROGRAMMES INTRODUCED IN AUSTRALIAN STATES

State	Victoria	New South Wales		Queensland			South Australia
Programme	BushBroker Program	BioBanking	Property Vegetation Plan (PVP)	Vegetation Offsets Program	Marine Fish Habitat Offsets Program	Koala Offsets Program	Native Vegetation and Scattered Trees Offsets Program
Legislation	Planning and Environment Act 1987 Native Vegetation Management Policy 2002	Threatened Species Conservation Act 1995 Threatened Species Conservation Regulation 2008	Native Vegetation Act 2003	Vegetation Management Act 1999 Regional Vegetation Management Code	Fisheries Act 1994 Integrated Planning Act 1997	Nature Conservation Agreement 1992 Nature Conservation (Koala) Plan and Management Program 2006-2016	Native Vegetation Act 1991 Native Vegetation Regulations 2003
Scope	Native vegetation	Protected species and native vegetation	Native vegetation	Native vegetation	Marine habitats	Koalas and their habitat	Native vegetation
Characteristics	Precise assessment method Ex-situ offset possible Brokers (government)	Precise assessment method Ex-situ offset possible Brokers (government and private consultants)		Brokers (government and private consultants)	Financial transfer possible Brokers (government and private consultants)	Brokers (government and private consultants)	Precise assessment method Financial transfer possible Brokers (government)

Source: 2011 survey of economic services on offsetting

Australia has indicated it is no longer uniformly committed to reducing the cumulative biodiversity loss, unlike South Africa, which has established a national map of its priority sites and calculated the offset/gain ratios to impose to ensure biodiversity is preserved and/or gained over the long term.

Victoria: BushBroker programme¹¹⁰

The BushBroker programme is a credit transfer mechanism between a landowner, who conserves, enhances and manages the vegetation on its land, and a project developer, who must undertake compensatory measures for the development of its project. This programme, launched in 2006, is based on the Planning and Environment Act of 1987 which establishes a framework relating to the use, development and protection of land in Victoria (McKenney 2005). This law imposes the application of a hierarchy of measures to minimise the impact on native vegetation. The programme is also based on the Native Vegetation Management Policy of 2002, in which a large proportion of the offsetting terms (conditions of equivalence, proximity to the site of the development project, etc.) are specified. This policy introduces the "net gain" objective for native vegetation and stipulates that "any losses associated with clearing are mitigated by commensurate gains through appropriate offsets."

¹¹⁰ See part IV on compensation banks.

New South Wales: BioBanking¹¹¹ programme & Property Vegetation Plan (PVP) programme

■ Established in 2007, the BioBanking programme enables landowners to generate biodiversity credits if they commit to improving and maintaining "biodiversity values". These include the composition, structure and function of ecosystems and notably comprise threatened species, populations and communities with their habitats. The programme is a response to the legal obligation to offset the impact of urban developments and is based on the Threatened Species Conservation Act of 1995, which lists the threatened species, the Environmental Planning and Assessment Act of 1979, which introduces impact assessments, and the Threatened Species Conservation (Biodiversity Banking) Regulation of 2008 (Department of Environment & Climate Change NSW 2007; Madsen et al, 2010).

■ The Property Vegetation Plan (PVP), a precursor to BioBanking established within the framework of the Native Vegetation Act of 2003, primarily concerns agricultural projects affecting native vegetation. It is based on legally recognised agreements between the landowners and local environmental authority relating to how this vegetation is managed. The offsets are implemented directly by the owner of the development site and no credit is sold. According to the register held by the Department,¹¹² from 2005 to the end of 2009, 421 PVPs were approved, and the clearing or deforestation of 8,865 hectares was offset by the enhancement of 25,564 hectares. For 2009 alone, 7,341 hectares were enhanced for 1,983 hectares cleared or deforested.

Queensland: Vegetation Offsets Program, Marine Fish Habitat Offsets Program & Koala Offsets Program¹¹³

Three offset programmes are in force in the state of Queensland, targeting vegetation, marine fish habitats and koala habitats. This state is unusual in that almost 70% of the land is owned by the government, which leases it for periods ranging from 10 to 30 years: under these conditions, it is not possible to guarantee the conservation of sites in perpetuity. The government of Queensland is about to introduce a new policy relating to offsets. It also plans to establish a market mechanism similar to BushBroker and to this end has created the EcoFundQ fund.

■ The Vegetation Offsets Program is used to offset the residual impact on vegetation caused by clearing, regulated by the Vegetation Management Act of 1999 which stipulates that every clearing request is assessed against the criteria of the regional vegetation management code. Project developers that request authorisation to clear a site can conduct offset activities within a radius of 20km around the development site. Financial transfer is forbidden. The impact is measured by area and must be offset at a ratio of 1:1 to 1:4. According to the results of a survey published in March 2009, only 8 offsets have been implemented for 62 clearing requests.

■ The Marine Fish Habitat Offsets Program (2002) compensates for activities causing a loss of marine habitats, including mangroves. The residual impacts of projects authorised following assessment based on the Fisheries Act of 1994 and Integrated Planning Act of 1997 must be offset. In-kind and like for like compensation is favoured, either on or off-site; however, the Department of Agriculture, Fisheries and Forestry accepts other types of offset, often taking the form of financing for training or research relating to marine habitats.

■ The Koala Offsets Program enables impacts on koalas and their habitat to be offset in compliance with the Nature Conservation Agreement of 1992 and the Nature Conservation (Koala) Plan and Management Program 2006-2016. The direct (reafforestation) and indirect offsets (measures to reduce Koala deaths on roads) must arrive at a net gain, with an offset ratio of 1:5. Financial transfer is not authorised.

South Australia: Native Vegetation and Scattered Trees Offsets Program

This programme has been created to respond to the requirements of the Native Vegetation Act of 1991, which obliges the landowner to obtain a permit for clearing, and the Native Vegetation Regulations of 2003, which require a "net gain" to be provided after having applied the mitigation hierarchy. Impacts on native vegetation or scattered trees must be offset by conducting reafforestation activities in-situ or via a payment to the Native Vegetation Fund ran by the government, which will take responsibility for the reafforestation on a site in the region.

The state of South Australia is about to modify its legislation to allow offsetting on sites outside the affected region, in cases where the offset could produce a greater gain in habitat for threatened species. It also plans to develop a new system of quantifying credits and to introduce an assessment and regulation framework for the programme.

West Australia and Tasmania

Offsets are proposed on a case by case basis during a project's environmental impact assessment, which is required to obtain the development permit. They must only be considered after avoiding and reducing the project's impacts. Financial transfers, permitted in the past, are no longer practiced today. In 2008, 15 negotiations regarding offsets were in progress.

¹¹¹ See part IV on compensation banks.

¹¹² <http://www.environment.nsw.gov.au/resources/vegetation/09465nvcestrategy.pdf>

¹¹³ These programmes concern impacts on biodiversity resulting mainly from urban development projects, water infrastructure projects (dams and viaducts) and mining.

Brazil

The Constitution of the Federal Republic of Brazil (1988, art. 225) defines the environment as a public asset to be protected and preserved for future generations. It stipulates that the public authorities must ask developers of projects with an environmental impact for a prior assessment of this impact, which will be made public. However, the obligation to rehabilitate damaged areas is only imposed on activities that exploit natural resources. For all other activities, the Constitution speaks of penal or administrative sanctions, "in addition to the obligation to repair the damages caused".

In 2003, a constitutional amendment relating to the principles to be complied with by economic activity, including respect of the environment, underlines the obligation for handling suitable to the environmental impact of a product, service or activity. The same project with several impacts on several biomes must therefore handle each one separately: this provision is important in a country like Brazil that contains a rich and complex heritage of biological diversity.

In 1981, law No. 6938 introduced the national environment policy, which instigates the environmental impact assessment including the introduction of offsets. These must be put into place after avoidance and reduction, for significant residual impacts on the environment.

A distinction must be made between impacts on biodiversity in general (environmental offsets) and impacts relating to protected areas in the forest (forest set-aside offsets). Two regulatory mechanisms are of particular interest in relation to offsets: the Forest Code and the National System of Conservation Units (Darbi et al, 2009).

The forest set-aside offset

Law 4771/1965 of the Forest Code introduces the concepts of permanent preservation areas (PPA) and legal forest reserves (LFR). Permanent preservation areas are defined as "areas covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, biodiversity, gene flow of wild fauna and flora, soil protection and the welfare of human populations". No impact on vegetation is permitted in these areas and can only be authorised by the competent environmental authority under exceptional circumstances, on the condition that offsets are adopted (Darbi et al, 2009). These take the form of in-kind measures (tree planting, species recovery, etc.).

Legal forest reserves are 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". Article 16 of the Forest Code imposes that at least 20% (this percentage varies by region and can be as high as 50% in the Amazonian forest) of the vegetation cover is preserved on each property (Madsen et al, 2011). According to article 44 of the Forest Code, landowners that do not meet this condition must adopt offsets. They can ask another landowner to conserve the area necessary to comply with this percentage of vegetation cover on its land, in addition to meeting its own obligations (Bezerra, 2007).

In addition to this mechanism, law 11428/2006 on the Atlantic forest obliges the project developer to offset the effects it causes on the Atlantic forest, the most damaged biome in Brazil. Unlike law 9985/2000 (below), which makes no link between the damaged biome and the type of biome concerned by the environmental offset, the law on the Atlantic forest obliges the project developer that damages the Atlantic forest to conduct offsets in this same biome and, if possible, in the same hydrographic basin. In each case, the definition of the types of action to be conducted and the geographic area always depends on the environmental authority.

The National System of Conservation Units defined by law 9985/2000 and regulated by decrees 4340/2002 and 6848/2009 (environmental offset)

Conservation units are ecological reserves legally established and administered by the government. They are of two kinds: "full protection areas", where no human intervention is permitted, and "sustainable use protection areas", which tolerate certain human activities provided they respect the environmental equilibrium. For any project with a "significant impact" on biodiversity (degree of impact calculated according to a series of criteria¹¹⁴), Brazilian legislation imposes an offset in the form of financial transfers proportional to the scale of the project and its impacts¹¹⁵ in the National Protected Areas System (McKenney and Kiesecker, 2010; Madsen et al, 2010). These payments must be used to finance the creation, installation or maintenance of full protection conservation units.

Canada (Quebec)

Quebec has the power to legislate on the environment on its territory. Its legislation in this field and its regulations on the assessment and examination of impacts are autonomous and are not subject to the Canadian law on environmental assessment (André et al, 2010). Section IV.1 of the Environmental Quality Act (LQE) obliges the project developer to follow the

¹¹⁴ See part V on methodology.

¹¹⁵ Currently, the value of these transfers must correspond to a percentage between 0% and 0.5% of the total investment in the project. See part V on methodology for the payment calculation.

environmental impact assessment and examination procedure (article 31.1). A ministerial directive sets the content that must be presented in the environmental assessment, which includes the nature and scale of the residual impacts.

The Ministry provides the project developers with the guide to conducting environmental impact assessments. This guide adopts the principle of no net habitat loss. In section 4.4, it states that the project developer can propose offsets for the biotic environment, citizens and communities affected and that the loss of habitats in an aquatic environment or wetlands should in particular be offset by creating or enhancing equivalent habitats or safeguarding equivalent environments or habitats elsewhere. The adopted offsets are part of the decree issued by the Ministry, setting the conditions for conducting the development project, when it is authorised.

Only projects submitted for authorisation in wetlands are subject to an obligation to offset as part of the "avoid and minimise" sequence (offsets are included in the minimisation step).

Specific measures apply to projects affecting threatened or vulnerable species and their designated habitats under the Quebec law on threatened or vulnerable species.

Financial compensation is authorised, but in the vast majority of cases offsets are "in-kind".

India

In India, biodiversity conservation focuses on the forest heritage, mountain ecosystems, coastlines (mangroves and coral), wild animal species (Tiger) and traditional medicinal plants.

Biodiversity offsets are only established under the law relating to the protection of forest heritage, a law dating from 1980 whose original version had been drafted in 1927. The Forest (Conservation) Act requires all allocations of forested land to another use to obtain prior authorisation from the central government, which then demands offsets (e.g. reforestation). Since 2002, if the project is approved, the project developers must pay a sum that includes the "forest opportunity cost", a tax to offset deforestation and the cost of the environmental losses (preservation of wild fauna, conservation of biodiversity, treatment of pollution, etc.). These sums are paid to the Compensation Afforestation Fund Management and Planning Authority, or CAMPA¹¹⁶.

Under the Forest Act, revegetation actions are systematically required for all projects that involve tree felling.

Unprotected biodiversity is also included within the scope of the Biodiversity Act of 2002. Nonetheless, the actions of the Ministry of Environment and Forests and the Indian states focus on protected areas and the protection of traditional medicinal plants whose abundance makes India one of the richest countries in terms of medicinal flora (Gundimeda et al, 2006). Note that in India, the living conditions of local people, which depend on natural resources, appear to be systematically associated with biodiversity conservation.

Morocco

Morocco has not yet established a coherent set of laws relating to biodiversity, which is rarely mentioned as such.

Law No. 12.03 relating to environmental impact assessments (Official Bulletin of 19 June 2003) makes mandatory an assessment to determine the measures to eliminate, mitigate *or* offset the adverse effects and enhance the positive effects of a project on the environment. The developments subject to the impact assessment are infrastructure, industrial, agricultural, aquacultural and piscicultural projects (Diapo, Moroccan Ministry of Environment). Large infrastructure projects are the subject of an in-depth impact assessment, all the more so as a large proportion of them involve financing from international backers. Offsets are provided on a case by case basis, sometimes through negotiations with NGOs.

The dahir (decree) of 10 October 1917 on the conservation and exploitation of forests (Official Bulletin of 29 October 1917 p.1151) introduces an explicit offset mechanism (although it still does not clearly identify the biodiversity challenge) and imposes an exchange or compensation in the event of alienation of part of the forest property area. For forests, compensation as much concerns the protected (cf. Arganier) as the unprotected biodiversity (common species). The compensation can be financial, but in practice it takes the form of the exchange of parcels of land or reforestation (ratio of 1:2), which are the standard tools for fulfilling the obligation to offset.

Mexico

Within the framework of the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA), which came into force in 1988, and the Biodiversity Code¹¹⁷, all developments in the agricultural, industrial, tourist or infrastructure sectors are subject to an impact assessment.

¹¹⁶ See part V on methodology for the calculation of the amount.

¹¹⁷ The Biodiversity Code includes in its objectives the promotion and regulation of the sustainable use, conservation, rehabilitation and restoration of natural resources (Darbi et al, 2009).

Measures to reduce and offset impacts, as well as to rehabilitate environments, must be proposed both by the project developer and by the Environmental Impact and Risk Branch of the Ministry of Environment and Natural Resources (*Dirección General de Impacto y Riesgo Ambiental* – DGIRA – of the *Secretaría de medio Ambiente y Recursos Naturales* – SEMARNAT). Of the 6,000 applications submitted to the DGIRA every year, approximately 30 to 40% of the projects will be rejected in their first version (2011 survey of economic services on offsetting).

Impacts can also be regulated by:

- the General Law on Sustainable Forest Development, which came into force in 2003; the regulation associated with this law came into force in February 2005; it provides for financial transfers to the Mexican Forest Fund as compensation;
- the General Law of Wildlife, which came into force in 2002;
- the Official Mexican Standard relating to the environmental protection of native species of wild flora and fauna; list of endangered species, which came into force in March 2002 and is regularly updated;
- the Official Mexican Standard establishing the specifications for the preservation, conservation, sustainable use and restoration of coastal wetlands in mangrove areas.

In addition to these laws, the DGIRA has published sector-specific guides aimed at developers. The federal states and municipalities can also adopt additional restrictive provisions.

Although more restrictive for protected species, the measures proposed or imposed for a project developer apply to all species present in the affected area. The objective is to affect the entire ecosystem concerned as little as possible and ensure it is restored.

In terms of reforestation, to target a net gain for the environment, the area replanted must be at least three times greater than the affected area. Likewise, with regard to the restoration of riparian zones, the offset site must be larger than the affected site.

For development projects located either in wetlands or a protected natural area, or liable to affect endemic, threatened or endangered species (flora or fauna) or those benefitting from specific protection, the project developer must, in accordance with the LGEEPA, take out insurance or pay a deposit which guarantees the implementation of the planned offsets. The amount of this deposit is calculated based on the costs of the offsets to be put into place (cost of assessments, implementing measures, audit and monitoring, etc.). This cost is estimated by the project developer and must be validated or even reassessed by the DGIRA. In the event of non-compliance with the agreed measures, the deposit must be paid to the public authority, which will take the place of the project developer in implementing the offset.

For other development projects, the main tools used by the authorities are the fines stipulated by environmental regulations and penal sanctions (prison). Economic sanctions can also be applied such as the stoppage of the work in progress, the forced ceasing of activity and the demolition of completed structures.

Russia

General provisions on offsetting environmental impacts, including on fauna and ecosystems, are regulated by article 77 of federal law No. 7 of 10 January 2002 "on protection of the environment": moral and physical persons responsible for environmental impacts produced by the pollution, impoverishment, destruction and irrational exploitation of natural resources, damage and rupture of the equilibrium of natural ecological systems or impacts on landscapes, and any other threat to the law in the domain of the environment, are obliged to fully offset them in compliance with the legislation. Nonetheless, the legislation is ambiguous as article 78 stipulates that environmental offsets are implemented on a voluntary basis or based on notification of a court judgement. Under the terms of Russian legislation, the development of green spaces is considered to be one method of offsetting environmental impacts.

Impacts on specific components of the environment and on biodiversity are also regulated by:

- article 56 of federal law No. 52 of 24 April 1995 "on wildlife";
- article 100 of federal law No. 200 of the Forest Code of the Russian Federation of 4 December 2006;
- article 69 of federal law No. 74 of the Water Code of the Russian Federation of 3 June 2006;
- article 53 of federal law No. 166 of 20 December 2004 "on fisheries and conservation of aquatic biological resources".

In theory, offsets relate to all species of fauna and flora. They can be implemented via measures in-kind or via financial transfers. The latter are paid into the account of the municipal budget in accordance with Budget Code N 145 of the Russian Federation of 31 July 1998, and are not assigned as targeted compensation. The calculation of the amount does not take into consideration the actual level of the impacts or the cost of the measures to restore habitats, but is essentially based on the number of species concerned according to the methods and taxes approved by the authorities. In some cases, these financial transfers are not intended to fund biodiversity offsets. For example, financial resources intended to offset the effect on the biological resources of aquatic environments are used by the Federal Fisheries Agency to develop the business of aquacultural enterprises, and not to safeguard the biodiversity of these areas.

Switzerland

The Swiss Constitution stipulates that "The costs of avoiding or eliminating [damage to the environment]... shall be borne by those responsible for causing it" (art. 74).

The Environmental Protection Act (EPA) of 1995 establishes both the precautionary and polluter pays principle. Before making a decision on the planning and construction or modification of installations, the competent authority must conduct an impact assessment. For authorisations requiring a federal procedure, the cantons are heard by the competent authority.

The Federal Act on the Protection of Nature and Cultural Heritage (NCHA) of 1966 sets out four successive steps in development projects: the decision in principle for or against the project, the best possible protection (adaptation of the project to reduce its impacts), reconstitution measures and, finally, replacement measures. The law thus requires the developer of a project threatening protected biotopes or landscapes to take "reconstitution" or "replacement" measures. "Reconstitution" measures are measures to repair the temporary impacts on biotopes in the affected location, whilst "replacement" measures correspond to offsetting impacts on biotopes in another location. Both types of measure are necessary when an intervention affects biotopes worthy of protection, whether inside or outside protected areas. Not only is the visible part of a landscape covered, but also the parts located under the surface of the water or ground, such as immersed vegetation or hollows. A distinction is made between protected areas, environments of national importance such as preferential sites and emerald sites (Swiss equivalent to Natura 2000 sites¹¹⁸), and sites of local and federal importance.

To determine the biodiversity impact assessment criteria, both of these laws are based on art. 14 of the Ordinance on the Protection of Nature and Cultural Heritage (NCHO) of 1991:

- interconnection (or ecological continuity) is an important criterion as it can strongly influence a site's ecological value: some offsets, particularly in the agricultural sector, consist of connecting sites with each other;
- the size of the biotope;
- its importance for rare species;
- its age: for example, biotopes over 200 years old are considered to be irreplaceable and cannot be affected.

The offsets implemented in Switzerland do not just concern protected habitats and species. Riparian zones, fenlands and marshes, rare forest communities, hedgerows, thickets, dry grasslands and other sites that play a role in preserving the ecological balance or which provide especially favourable conditions for biocoenosis are also concerned (Art. 18 al. 1bis, NCHA). The NCHA does not authorise financial transfers for the provision of offsets. However, when sites are difficult to access (e.g. mountainous landscape), some cantons resort to this to finance a fund used to conduct offsets elsewhere, according to a pool of priority measures.

Sanctions are foreseen if the execution of the offsets is not complied with. A petition can be lodged with the Administrative Court. It can be referred to the Federal Administrative Court and then the Federal Court; the application is then transmitted to the FOEN¹¹⁹ for expert opinion. At canton level, sanctions are applied in line with the provisions of the legislation applicable to the project or procedure concerned (for example, the Forest Act). Usage authorisation can be refused and subsidies reduced, refused or their repayment demanded. Fines can also be imposed in serious cases.

The Swiss authorities have been considering the implementation of a compensation bank system for a year, but there are several obstacles to this: federalism, which gives considerable legal power to the cantons, and the absence of metrics to define credits for biodiversity (unlike for the climate). The avenues of reflection at the FOEN in terms of market mechanisms relate to nitrogen emissions, which have a direct impact on biodiversity, and overdevelopment (with satellite surveillance enabling the urban network to be assessed).

For information, a study conducted by the Swiss Federal Office for Spatial Development assessed the external costs of transport in terms of habitats and biodiversity, within the framework of the introduction of charges. It concluded that in 2007 road and rail transport engendered total external costs of 9 billion Swiss francs, including 850 million in the field of biodiversity (costs linked to habitat losses caused by the construction of infrastructure and the fragmentation of habitats).

2. Countries equipped only with legislation on environmental assessment or the management of natural resources

Argentina

No law requiring offsets to be implemented has been promulgated at federal level. The management and protection of natural resources are powers assigned to the provinces. At this level, offsets can be implemented within the framework of impact assessments, on a case by case basis.

¹¹⁸ There is a certain degree of convergence between Switzerland and the EU in terms of the environment. Switzerland belongs to the European Environment Agency, the Upper Rhine Conference and the Binational Conference for the Doubs.

¹¹⁹ Federal Office of the Environment of the Department of the Environment, Transport, Energy and Communication.

Chile

Although there is no specific law relating to biodiversity offsets, law No. 19300 (framework law) of 1997, modified by law No. 20417 in January 2010 and regulation DS 9501 of 2001, sets out certain requirements in terms of compensating for biodiversity losses. This law governs the execution of all projects and activities affecting biodiversity conservation in Chile and provides for an environmental impact assessment system. The assessment must include a programme of "compromise", repair and offset measures in accordance with article 12 of the law. It also stipulates three types of sanction: admonishment, fines and revocation of the permit for the project.

Chilean law targets all types of biodiversity but places the emphasis on threatened species and protected areas, and offsets are mainly conducted "in-kind". Major industrialists, particularly the multinationals, fairly often apply initiatives to conserve biodiversity that are not required by Chilean law (2011 survey of economic services on offsetting).

China

The Environmental Impact Assessment Law of 2003 requires the environmental impacts of all construction projects to be assessed in advance. The Ministry of Environmental Protection (MEP) establishes procedures for approving the impact assessments and, for large development projects, accredits the bodies that conduct these studies. For smaller scale projects, the impact assessments are conducted by local representative offices of the MEP.

Within this framework, the MEP can request modifications to the development project with the aim of minimising the environmental impacts. The notion of offsets is, however, not used at this stage and is only implemented experimentally at local level.

The authorities are focusing on the concept of "eco-compensation", which is similar to the polluter/user pays principle. The Asian Development Bank defines eco-compensation as "a system of incentives and disincentives by both users and producers of ecological services". Incentives refer to rewards or compensation for the relinquishment of a right with the objective of maintaining an ecological service, and are therefore similar to PES. "Disincentives refer to charges for the loss of or damage to ecosystems and natural resources". Eco-compensation measures primarily concern natural reserves and areas with ecological functions, such as basin areas and forests. They are based on the amounts negotiated between councils and not on a principle of ecological equivalence; the MEP is working with universities on a system of monetarily assessing the value of ecosystem services. It is difficult for the private sector to be involved in eco-compensation due to the absence of a legal framework regarding the right of ownership and usage rights.

Ethiopia

Although there is no biodiversity offset mechanism in Ethiopia, before granting investment licences the Ethiopian Investment Agency requires impact assessments for every request for investment affecting the environment in general and biodiversity specifically. However, biodiversity is not a government priority and there is a lack of awareness-raising in society as well as amongst local and foreign investors.

Japan

The Environmental Impact Assessment Law of 12 June 1999 (*kankyô eikyô hyôka hô*) requires project developers to submit an environmental impact assessment to the competent authority. The file must present the measures taken by the project developer to avoid, reduce and "possibly" offset the project's impact on biodiversity and the environment more generally.

The offsets implemented in Japan are measures in-kind essentially relating to protected species, in particular species included on the Japanese red list, based on that of the IUCN.

The Japanese government is currently considering the introduction of restrictive offsets and appears to favour the American example. A draft law could soon be presented to the Diet (2011 survey of economic services on offsetting).

Kenya

The National Environment Management Authority (NEMA) was established by the Environment Management and Coordination Act (EMCA) of 1999. When a private or public entity is in charge of a development project that may have an environmental impact, it must obtain an "environmental impact certificate" from the NEMA, awarded based on an environmental impact assessment conducted by an agency accredited by the NEMA. However, there is no offset mechanism as the NEMA perceives this to be a "right to destroy".

Norway

The Nature Diversity Act, a central law relating to impacts on biodiversity in Norway, came into force on 1 July 2009. It has only recently been implemented and the interpretation of certain aspects relating to offsets is the subject of discussions. For

example, the Ministry of the Environment is unsure of when an exemption to the conservation of protected species can be granted to guarantee an equivalent protected area is established in another location.

In sections 8 to 12, the law sets the principles applicable to official decision-making. The decision to authorise a development project must notably take into consideration the objectives of managing the habitat types and ecosystems as well as the objectives of managing species as presented in sections 4 and 5 of the law. However, offsetting residual impacts on biodiversity is not automatic. The public authority authorising the project must decide, when granting the permit, whether or not an offset will be required. For example, at project level, the project developer may be asked to bear reasonable costs linked to the maintenance, establishment or development of a targeted habitat type. At plan and programme level, when the decision is made in compliance with the law on planning and construction to classify a parcel of land as an industrial area, the decision may require part of the area concerned to be reclassified as a protected area¹²⁰ and clear criteria to promote biodiversity to be included in the planning decision.

The decision-making process is based on the user pays principle as described in section 11 of the Nature Diversity Act. This principle means that any costs associated with preventing or limiting the impact caused by a project must be borne by the project developer, unless this is unreasonable in view of the nature of the project and its impacts.

Offsets apply equally to protected spaces and species, within the framework of requests to waive their protection, and unprotected biodiversity under the user pays principle. They can be provided both via ecological measures ("in-kind") and financial transfers.

In the event of an infraction, in addition to other possible sanctions such as a fine, the project developer may be required to pay environmental compensation, the amount of which is calculated based on a global assessment of the value of the environmental components, and the extent and duration of the environmental impacts.

New Zealand

New Zealand has no law relating to offsets, but according to an assessment of the Ministry for the Environment they have been implemented in certain situations in accordance with the New Zealand Resource Management Act 1991. The objective of this act is to ensure sustainable management¹²¹ "of natural and physical resources", including by offsetting any adverse effect of activities on the environment.

Other acts can target biodiversity offsets without them being the main objective:

- the Conservation Act of 1987 for land concessions and exchanges;
- the Crown Minerals Act of 1991 for developments relating to the mining sector.

Environmental protection pays particular attention to native biodiversity: biodiversity offsets thus always implicitly apply to impacts on native biodiversity.

When implemented, offsets more often take the form of measures in-kind than financial transfers. Note that some of the population do not understand offsetting, deeming the mechanism to be biased and incomplete.

Peru

Peru is highly protective of its natural resources and regulations forbid any investment project in protected areas (over 15% of the territory), although exceptions are made on a case by case basis.

Law No. 27446 relating to the national environmental impact assessment system, adopted in April 2001 and updated by decree in June 2008 subsequent to the creation of the Ministry of Environment, requires the obtention of a certificate and the execution of environmental assessments for public and private investment projects. This law notably applies to the protection of biodiversity and its components: ecosystems, species and genes, as well as environmental assets and services; the ecosystem approach is favoured. The Ministry of Environment acts as coordinator and monitors the application of this law, but the sector-specific Ministries have the power to grant the certificates. Each application must specify the planned measures in terms of prevention, reduction or environmental corrections and include a management plan, which, according to the scenario, can take the form of a "compensation plan". However, the concept of net loss or residual impact is not mentioned in the law. Furthermore, the content of the compensation plan is not specified and it appears to be just one of several possible measures for executing the management plan.

A draft law on environmental services should have been approved in 2011. It provides for the introduction of a payment for environmental services mechanism from the users (State, industrialist or society) to the providers (State, private owners, agricultural or indigenous communities). This mechanism could apply in particular to public or private infrastructure projects with a high environmental impact, in addition to reduction and conservation measures. Compensation could take the form of

¹²⁰ In France, such a measure within the framework of plans and programmes is related to avoidance and not offsetting.

¹²¹ Sustainable management is defined as "managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while avoiding, remedying, or mitigating any adverse effects of activities on the environment" (Norton 2009).

payments, financing of sustainable development projects in favour of the populations concerned, or the provision of assets to reduce pollution and improve the quality of life of people. The Ministry of Environment is studying the introduction of pilot projects in the electrical energy sector.

However, the application of this compensation mechanism, which is essentially voluntary, is expected to be limited due to a lack of scientific data, a lack of institutional capacity, and the difficulty in applying this mechanism with private owners and communities generally suspicious of the central State and multinational industrialists.

Vietnam

The Vietnamese legislative framework is based on the Biodiversity Law, which came into force in 2009, and the impact assessments required for investment projects. Biodiversity offsets are still at discussion stage. The Ministry of Agriculture and Rural Development and the Ministry of Natural Resources and Environment have sought the aid of the Business and Biodiversity Offsets Program in developing suitable offset policies.

APPENDIX II: COUNTRY QUESTIONNAIRE

Questions in red: priority questions

Legal framework

Q1/- Do regulations in your country oblige development project owners to offset their residual effects on biodiversity, after having avoided and reduced their impacts? If yes, please specify the regulatory framework (type of regulations, dates they came into force, type of biodiversity targeted, possible sanctions, planned legislative changes, etc.).

Q2/- Who are the main stakeholders involved in offsetting (e.g. competent authorities, project developers, civil society, etc.)?

Status of offset provision

Q3/- What is the status of the provision of biodiversity offsets in your country:

a- What are the positive points of the provision?

b- What problems are you currently encountering?

c- What proportion of projects envisage offsets (expressed as a percentage of all development projects over one year) vs. the proportion of projects for which offsets are effectively implemented (expressed as a percentage of all development projects requiring offsets over one year)?

Q4/- What means have been introduced in your country to monitor and audit the offsets provided (examples: field visits by local environmental authorities, reports by the project developer, online databases, etc.)?

Q5/- Do the offsets provided in your country relate purely to protected habitats and species or also to unprotected biodiversity (e.g. hedgerows, thickets, common species)? In what proportion?

Q6/- Are the offsets in your country provided via ecological measures ("in-kind") or via financial transfers?

a- If the offsets are provided *via ecological measures*, which types of measure are the most common:

- habitat creation
- habitat restoration (returning the site to its initial condition)
- habitat rehabilitation (repairing the site's condition)
- threatened habitat preservation?

Please rank these measures in order of importance where applicable.

b- If the offsets are provided *via financial transfers*, how is the financial amount calculated?

Q7/- What is the main tool used to guarantee the sustainability of the offsets:

- land acquisition?
- alternative tools to land acquisition (e.g. contracts between the project developer and the owner or manager of the land on which the offsets are implemented – private landowners, farmers, etc.)?
- other (e.g. regulatory protection)?

Please rank these measures in order of importance where applicable.

Q8/- What is the average period over which the competent authorities require developers to commit to their offsets?

Impact and equivalence assessment methods

Q9/- In your country, have you developed, at national or regional level, standardised methods or guidelines to assess ecological losses (impacts of the development project) and gains (benefits generated by the offset)? If yes, please specify.

Q10/- On what basis (e.g. species, environments, services, functions, etc.) are equivalences¹²² between ecological impacts and gains generally assessed?

Market mechanisms (compensation banks)

Q11/- Does your country have market mechanisms (such as compensation banks) to offset projects' impacts on biodiversity? If yes, please specify (if no, this is the end of the questionnaire).

Q12/- What lessons have you drawn from the experience of market mechanisms in your country:

- Have you observed any advantages (e.g. ecological coherence, economies of scale, etc.)?

- Have you observed any risks associated with these mechanisms (e.g. risk that the project developers no longer seek to reduce their impacts as far as possible before resorting to offsets¹²³, disconnection between ecological impact and gain, pressure on the land property market)?

Q13/- What advice would you give to countries planning to introduce compensation banks to provide biodiversity offsets?

¹²² Equivalence criteria and methods aim to ensure the type and scale of offset projects are sufficient to guarantee no overall loss of biodiversity. In other words, it is a question of reaching at least equality between the gain and the ecological damage expressed in the same unit of measurement.

¹²³ The logic of anticipating impacts, specific to market mechanisms, highlights the risk of the "right to destroy". This is the risk either of approving projects that should never have been implemented (impacts too high or even irreversible), or of leading project developers to decrease their efforts to avoid and reduce their impacts (it could become easier to offset than to integrate environmental considerations into the development project itself).



APPENDIX III: FRENCH SITUATION

In France, offsetting projects' impacts on the environment and biodiversity is a duty imposed by the Law on the Protection of Nature of 10 July 1976 and by European Community law.

Regulations: environmental impact assessment and thematic evaluations

<p>1976</p> <p>Decree 1977 L.122-1 to 3 EC¹²⁴ R.122-3 EC</p>	<p>Impact assessment Contributions of the Grenelle II law</p> <p>Subject: environment and health</p>	<p>The law of 1976 introduces the impact assessment regulation for works and development projects as well as activities (e.g. sports events) liable to threaten the natural environment: the impact assessment must include "the measures envisaged to eliminate, minimise and, if possible, compensate for harmful consequences on the environment and health" as well as the estimate of the corresponding expenditure. Offsets must be introduced when residual impacts persist.</p>
<p>1979 / 1992</p> <p>Decree 2001 L.414-4 EC R.414-19 to 26 EC</p>	<p>Assessment of Natura 2000 impacts</p> <p>Subject: protected biodiversity (habitats and species of Community interest)</p>	<p>This regulation specifies that when an assessment concludes that there is a threat to the conservation status of a Natura 2000 site, in the absence of alternative solutions "the competent authority can give its permission for reasons of overriding public interest. In this case, it will check that compensatory measures are taken to maintain the overall consistency of the Natura 2000 network".</p>
<p>1992</p> <p>Decree 1993 R.214-6 EC</p>	<p>Law on Water</p> <p>Subject: water courses and wetlands</p>	<p>The project developer must submit a document specifying, where applicable, the envisaged corrective or compensatory measures with the request to the Prefect of the department in which the installation subject to authorisation is executed.</p>
<p>2001</p> <p>L.311-4 of the Forest Code (FC) L.131-2 FC</p>	<p>Forest Code</p> <p>Subject: forest</p>	<p>The administrative authority can apply the following conditions to its clearing authorisation: the execution of reforestation works on the land concerned or afforestation or reforestation on other land, over an area corresponding to the area cleared, accompanied where applicable by a multiplier of between 2 and 5, determined according to the ecological or social role of the woods targeted for clearing. Where applicable, the State representative in the department may impose that the compensatory reforestation be conducted in the same forest region or in an ecologically or socially comparable sector. The project developer can propose to fulfil its obligations either by paying the State compensation corresponding to the amount of the State's purchase of woodland or land to be afforested, under the conditions stated in article L.131-2 of the Forest Code, or by ceding woodland or land to be afforested liable to play the same ecological and social role to the State or a regional council.</p> <p>Ratios: at least 1:1, between 1:2 and 1:5 depending on the ecological or social role of the woods.</p>
<p>2004</p> <p>Decree 2005 L.122-4 to 11 EC R.122-17 to 24 EC</p>	<p>Plans, programmes and other planning documents</p> <p>Subject: environment</p>	<p>The environmental assessment report must present the measures envisaged to avoid, reduce and, if possible, offset the harmful consequences of the planning document on the environment and ensure they are monitored.</p>
<p>2007</p> <p>L.411-1 and 2 EC</p>	<p>Procedure for waiving the strict protection of protected species</p> <p>Subject: protected biodiversity</p>	<p>If a project has a significant impact on a protected species, an exemption can be 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". To do this, the project developer must implement measures to eliminate, reduce and, as a last resort, offset its impacts.</p>

¹²⁴ The Environment Code.

Stakeholders involved in offsetting

The implementation of offsets in France generally involves three types of stakeholder:

- The project developer and its service providers

To define and implement the offset, the project developer can refer to design offices, environmental associations, scientists and/or an offset operator within the framework of the offset supply trial.

- The decision-making administrative authority and the instructing service

In France, the administrative authority (the Prefect, or the Ministry of Sustainable Development for large projects) and, where applicable, the consulting bodies called upon (for example, the National Council for the Protection of Nature) check, during the enquiry into an administrative authorisation request linked to a project, that the planned offset fully satisfies the requirements for re-establishing the ecological situation (for example, with regard to protected species, maintaining the local populations of species affected by the project in a favourable state of conservation).

The instructing service involved depends on the procedure concerned: for example, it may be the DDT(M)¹²⁵ for assessments of impacts on the Law on Water, or the DREAL¹²⁶ for waiving the strict protection of protected species.

- The independent environmental authority (created by the decree of 30 April 2009)

The environmental authority, referred to by the instructing service on behalf of the decision-making authority, formulates an opinion on the impact assessment file and transmits it to the instructing service and project developer. This opinion, attached to the file submitted for public enquiry, relates, among others, to compliance with the "avoid, reduce, offset" sequence and the quality of the proposed offsets.

Offset terms

Choice of measures

No one measure is recommended over another. The choice of measure must enable an ecological gain to be generated and be in addition to the actions already planned as part of public policy.

Only ecological measures are eligible for offsets, which must be provided "in-kind" and not via financial transfers to the State. Such transfers by the project developer, for example in the form of voluntarily financing conservation programmes, can in practice represent supporting measures, but not offsets as required by regulations, except within the framework of clearing (Forest Code).

Equivalence

An offset's equivalence is assessed in ecological (priority aspect), geographic, temporal and societal terms. Offsets must be of the same type as the habitats, species or functions affected and be located in functional proximity to the impact area.

Sustainability and monitoring of the measures

The nature of the property and/or management measures implemented for the offset varies by region. In the event of land acquisition, protective regulatory measures (e.g. protection orders) can also be taken to increase the sustainability of the offset.

There is no regulatory minimum period. In practice, project developers' commitment periods can extend from 5 years (e.g. contract with a farmer) to 60 years (e.g. duration of a concession). Within the framework of the compensation bank trial, the minimum management period is 30 years and a solution must then be planned to guarantee the site's ecological vocation.

Implementation difficulties

Experience shows that the current implementation of the "avoid, reduce, offset" sequence relating to biodiversity does not enable challenges to be anticipated in advance and that the planned offsets are not always implemented in entirety or in a sustainable manner.

The main problems encountered are as follows:

- the fact that the project developer's offset commitments are not always transposed into the authorisation acts (this will no longer be the case due to recent regulatory evolution, cf. *infra*);
- the difficulty in understanding from the start the coherence of the measures defined when there are several enquiries for the same project (multiplicity of enquiries induced by the multiplicity of regulatory frameworks);
- the availability of land: there is often a lack of sites suitable for offsetting near to the affected locations;

¹²⁵ Departmental Territorial Directorate - of the Sea.

¹²⁶ Regional Directorates of the Environment, Development and Housing.

■ the methodological difficulties relating to the lack of uniform guidelines on the assessment of ecological losses and gains: however, existing methodological guides (national guides, thematic guides for each regulation and regional guides) do give fairly precise instructions for characterising the site baseline and determining the impacts using matrices and tables.

Impacts are generally defined and quantified based on the following criteria: type of impact, quality, quantity, location, period in which they occur and duration. Based on this initial list of impacts, it is mandatory to apply avoidance and reduction measures to determine the "residual" effect to be addressed by the offset.

There is no standardised method of determining equivalence between ecological losses and gains. Existing regulatory frameworks provide certain equivalence criteria relating to the scale (e.g. the biogeographic region for Natura 2000), the subject of the equivalence (e.g. the biodiversity and function of wetlands according to the SDAGE (Water development and management guidelines)) and ratios (e.g. Forest Code). However, the concrete application of these criteria when preparing development projects encounters certain difficulties, due to:

- the lack of precise knowledge of certain species or environments, which prevents an exhaustive initial inventory being taken;
- the difficulty in quantifying the biodiversity gain generated by the offset;
- the difficulty in defining the offset ratio: the ratios used are not always based on a scientific argument and do not result from reasoning relating to ecological losses and gains.

- the short duration of project developers' commitments;
- the lack of monitoring of the measures engaged, although this varies by region, scale of project (establishment of monitoring committees, monitoring tables, etc. for key projects), and type of procedure.

Grenelle contributions and discussions in progress to address the difficulties

The *Grenelle de l'environnement* has set the objective of "stopping the loss of biodiversity", reaffirmed by programming law No. 2009-967 of 3 August 2009 relating to the implementation of the *Grenelle de l'environnement* (Grenelle I law).

Law No. 2010-788 of 12 July 2010, setting national commitment to the environment (Grenelle II law) has strengthened current regulations relating to the scope, monitoring and audit of avoidance, reduction and offset measures. It widens the scope of offsets to include impacts on ecological continuities, thus leading to better consideration of biodiversity by concentrating on the functions and relationships between ecosystems (introduction of green and blue infrastructure¹²⁷).

Article 86 of the law proposes provisions aiming to ensure the efficacy and audit of the offsets planned in the impact assessments. Since the modification of article L.122-1 of the Environment Code, the transposition of offsets and the terms of monitoring them into authorisation or approval acts is now mandatory and systematic, addressing one of the shortfalls of the regulations.

The modification of article L.122-3 of the Environment Code completes the mandatory content of the items that must appear in the impact assessment and in the authorisation act by presenting the mechanism to monitor the measures and their effects on the environment. This leads the project developer to undertake a more detailed technical design of the proposed offsets but above all to consider and define indicators to assess the efficacy of the measure(s) *a posteriori*.

In the event of non-compliance with the offsets ordered in the authorisation, article L.122-3-4 of the Environment Code now provides the administrative authority several possibilities for intervening, from formal notice to the person responsible for implementing the measures, to execution of the measures instead and in place of the interested party. In that case, the administrative authority therefore replaces the project developer that has not implemented the planned offsets (with the financing coming from the project developer).

To support this regulatory change, discussions were launched in 2010 around a programme of actions relating to the entire "avoid, reduce, offset" sequence. This programme is coordinated by a National steering committee which includes the State, associations, industrialists and councils.

The Committee adopted in May 2012 a doctrine setting the major principles of the implementation of the "avoid, reduce, offset" sequence based on existing law, and is planning to introduce national methodological guidelines by 2013. A tool to monitor avoidance, reduction and offset measures for impacts on environment is also being developed to ensure better traceability of the measures, guarantee their implementation and promote experience feedback.

Compensation bank mechanism trial

To facilitate the provision of offsets, the Ministry of Sustainable Development is currently trialling a compensation bank-style market mechanism called "offset supply". The offset supply trial consists, for an operator, of anticipating the potential demand

¹²⁷ Article L.371-1 (Environment Code): green infrastructure and blue infrastructure have the objective of curbing biodiversity loss by contributing to the preservation, management and repair of the environments necessary to ecological continuities, whilst taking account of human, and particularly agricultural, activities in a rural environment.

for offsets in regions where the expected pressure on sites is high. The operator secures the land via land acquisition or sustainable use contracts. It restores the land through long term actions generating an ecological additionality with a view to subsequently promoting them as offsets, via the sale of units to several project developers required to implement compensatory measures. Units are sold through contracts between the operator and each project developer.

The logic of anticipating the offset supply is part of an approach to consider biodiversity as far as possible in advance of procedures. The potential advantages of this mechanism include the implementation of large scale offset projects linked to the pooling of compensatory measures for small projects (ecological coherence and synergy), the effective provision of the offset before the impact occurs and its increased sustainability.

The project developers remain liable for the regulatory requirements of nature conservation applicable to their development project, in particular the sequence of avoiding and reducing impacts, and only using offsets as a last resort.

The project developers remain free to choose the way in which they fulfil their obligation to provide offsets: the trial operations are just one of many options, examined in comparison with other realistic compensation possibilities. When using a trial operation, the project developers remain responsible to the State for the commitments made to offsets in the contract with the operator.

The offset supply, like every compensatory measure, complies with the following principles:

- Compliance with the sequence of avoiding and reducing impacts, including in particular the analysis of alternative solutions, must remain imperative in spite of the availability of offsets;
- The principle of ecological and territorial equivalence between a project's residual effects and the gains arising from the compensatory measures must be based on robust criteria and methods, so that the offset supply targets impacts on the same species or habitats and takes account of the environment's functions;
- The offset supply must be additional in terms of ecological added value and complement public action.

An initial trial operation was launched in May 2008 in the Crau plain, with the CDC Biodiversité bank. This consists of rehabilitating a steppes ecosystem over a terrain of 357 hectares, followed by management through traditional pastoral activity for a period of 30 years. The trial will be assessed with regard to the added value generated in terms of the state of conservation of the species and their habitats, and the viability of the financial mechanism relating to the sale of credits.

To test the offset supply mechanism on other sites, habitats and species, the Ministry of Sustainable Development launched a call for proposals in June 2011 to conduct up to 4 new trial operations. These operations will be conducted by the selected operators, under the coordination of the Ministry (central services and regional directorates/DREAL) and in collaboration with the relevant national (National Council for the Protection of Nature, environmental authority) and local stakeholders.

APPENDIX IV: SUMMARY TABLES BY COUNTRY

European Union

FRANCE	Offset Environmental and sector-specific assessment	Specific challenges -	
Ecological measures - Restoration - Rehabilitation - Creation - Preservation	Sustainability - Land acquisition - Contract with landowner or manager - Possibility of regulatory measures to protect or transfer offset sites to public utility bodies Monitoring - Obligation to describe the mechanism to monitor the compensation measures in the authorisation act - Reports - Monitoring committees - Field visits	Financial transfer Only possible within the framework of the Forest Code and rarely applied in practice	
Equivalence Targets: species / habitats / functions		Methodology -	
Special features Compensation bank system trial with several operators National doctrine on the "avoid, reduce, offset" sequence for natural environments (May 2012) Member of the Business and Biodiversity Offsets Program (BBOP)			

GERMANY	Offset Environmental and sector-specific assessment	Specific challenges -	
Ecological measures - Restoration - Rehabilitation - Creation	Sustainability Land acquisition Monitoring - Reports - Control by civil society	Financial transfer <i>Not regulated (equivalence)</i> As a last resort	
Equivalence Targets: species / habitats / functions / services		Methodology Yes: by valuating biotopes (eco-points) or by restoration costs	
Special features Compensation banks, mainly held by municipalities to offset their own impacts Offsets implemented at plan and programme level			

AUSTRIA	Offset Environmental and sector-specific assessment	Specific challenges -	
Ecological measures - Restoration - Rehabilitation - Creation	Sustainability - Land acquisition - Easements Monitoring - Field visits	Financial transfer <i>Not regulated</i> As a last resort	
Equivalence Targets: species / habitats / functions		Methodology -	
Special feature -			

DENMARK	Offset Environmental and sector-specific assessment	Specific challenges -	
Ecological measures - Creation	Sustainability - Land acquisition - Amicable agreements Monitoring - Field visits	Financial transfer -	
Equivalence Targets: species / habitats		Methodology -	
Special feature -			

SPAIN	Offset Environmental and sector-specific assessment	Specific challenges -	
Ecological measures - Rehabilitation - Restoration - Creation - Preservation	Sustainability - Land acquisition - Management contracts - Designation of new Natura 2000 sites Monitoring -	Financial transfer -	
Equivalence Main target: species / habitats		Methodology -	
Special feature -			

NETHERLANDS	Offset Environmental and sector-specific assessment	Specific challenges -
Ecological measures - Restoration - Rehabilitation - Creation - Preservation	Sustainability - Land acquisition - Contracts between project developer and farmers Monitoring - Field visits - Audit by civil society	Financial transfer Possible but not applied in practice Envisaged as part of the bank trial
Equivalence Targets: species / habitats		Methodology Research project in progress, in relation to the "no net loss initiative" project
Special feature Compensation bank system trial Member of the Business and Biodiversity Offsets Program (BBOP)		

POLAND	Offset Environmental and sector-specific assessment	Specific challenges -
Ecological measures - Rehabilitation - Restoration - Creation - Preservation	Sustainability - Monitoring Reports	Financial transfer -
Equivalence -		Methodology -
Special feature -		

CZECH REPUBLIC	Offset Environmental and sector-specific assessment	Specific challenges -
Ecological measures - Rehabilitation - Restoration - Creation - Preservation	Sustainability - Monitoring Reports	Financial transfer -
Equivalence -		Methodology -
Special feature Biology experts accredited by the Ministry of the Environment		

SLOVENIA	Offset Environmental and sector-specific assessment		Specific challenges -
	Ecological measures - Restoration - Rehabilitation - Creation - Preservation	Sustainability - Land acquisition - Regulatory protection Monitoring - Field visits	Financial transfer Possible but not recommended by the Ministry of the Environment
Equivalence Targets: species / habitats		Methodology -	
Special feature -			

SWEDEN	Offset Environmental and sector-specific assessment		Specific challenges -
	Ecological measures - Preservation - Creation - Restoration - Rehabilitation	Sustainability - Land acquisition - Contracts between project developer and landowner Monitoring -	Financial transfer -
Equivalence Targets: species / habitats / functions		Methodology -	
Special feature -			

UNITED KINGDOM	Offset Environmental and sector-specific assessment		Specific challenges -
	Ecological measures - Restoration - Preservation - Creation	Sustainability Alternative tools to land acquisition (not specified) Monitoring -	Financial transfer -
Equivalence Targets: species / habitats		Methodology Yes (trial): multi-criteria matrix and standard multipliers	
Special feature Pilot projects starting in 2012 on a voluntary approach to offsetting Accredited experts Member of the Business and Biodiversity Offsets Program (BBOP)			

Outside the European Union

ARGENTINA

The management and protection of natural resources are powers assigned to the provinces. No law requiring offsets to be implemented has been promulgated at federal level but they can be introduced within the framework of impact assessments.

AUSTRALIA	Offset Environmental and sector-specific assessment	Specific challenges Native vegetation and threatened species
	Ecological measures <ul style="list-style-type: none"> - Preservation - Restoration - Rehabilitation 	Sustainability <ul style="list-style-type: none"> - Contract recorded on the property title - Designation as a reserve Monitoring <ul style="list-style-type: none"> - Reports - Field visits
Equivalence Targets: species / habitats / functions / services		Methodology Yes: using the habitat hectares method and the BioBanking assessment methodology (benchmarking)
Special features Compensation banks (private land): BushBroker & BioBanking Government and private brokers providing the interface between project developer and landowner Member of the Business and Biodiversity Offsets Program (BBOP) – state of Victoria		

BRAZIL	Offset Environmental and sector-specific assessment	Specific challenge Forest
	Ecological measures <ul style="list-style-type: none"> - Tree planting 	Sustainability <ul style="list-style-type: none"> - For financial transfers, financing of conservation units managed by the public authorities Monitoring <ul style="list-style-type: none"> - Reports - Field visits - Control by civil society
Equivalence -		Methodology Yes: financial transfer calculation
Special feature Accredited design offices Offsets provided through the intermediary of public authorities (conservation units)		

CANADA (Quebec)	Offset Environmental and sector-specific assessment		Specific challenges -
Ecological measures - Creation - Rehabilitation - Preservation	Sustainability - Agreement between developer and landowner or conservation NGO - Land acquisition - Regulatory protection Monitoring - Reports - Field visits		Financial transfer <i>Not regulated</i> Hierarchy in favour of measures in-kind
Equivalence -		Methodology -	
Special feature Hybrid compensation bank for fish habitats			

CHILE	Offset Environmental assessment		Specific challenges -
Ecological measures - Relocation of species	Sustainability - Monitoring - Reports - Field visits		Financial transfer -
Equivalence Main target: species / habitats		Methodology -	
Special feature -			

CHINA
<p>Chinese legislation on environmental assessment does not provide for biodiversity offsets.</p> <p>China is working on the concept of eco-compensation, defined as a system of incentives (rewards in exchange for conserving a service) and disincentives (payments and sanctions) intended for the users and producers of ecological services, based on principles similar to the payments for environmental services mechanism.</p>

UNITED STATES	Offset Environmental and sector-specific assessment		Specific challenges Wetlands and threatened species
	Ecological measures - Restoration - Rehabilitation - Creation - Preservation	Sustainability - Conservation easements Monitoring - Reports - Field visits - Audit by civil society	Financial transfer <i>Regulated</i> Hierarchy in favour of compensation banks ("in-kind")
Equivalence Targets: functions / services		Methodology Yes: according to acreage or functions (HEP, WET, HGM); standard ratios	
Special features Compensation banks: Mitigation banks & Conservation Banks			

ETHIOPIA
<p>There are no biodiversity offset mechanisms in Ethiopia. However, the Ethiopian Investment Authority, the agency responsible for issuing investment licences, requires impact assessments for every request for investment affecting the environment in general and biodiversity specifically.</p> <p>Furthermore, the Biodiversity Conservation Institute (ICB) is mandated to ensure the preservation of biodiversity, although its resources are very limited.</p>

INDIA	Offset Environmental and sector-specific assessment		Specific challenges Forest and medicinal plants
	Ecological measures - Creation - Preservation	Sustainability - Monitoring - Reports - Field visits - Audit by civil society	Financial transfer <i>Regulated</i> Alternative option
Equivalence -		Methodology Yes: financial transfer calculation (economic assessment of ecosystem services)	
Special feature Major role of civil society Importance of local populations and their link with biodiversity (traditional knowledge)			

JAPAN	Offset Environmental assessment		Specific challenges -	
	Ecological measures - Relocation of individuals - Restoration Rehabilitation - Creation - Preservation	Sustainability -	Monitoring -	Financial transfer -
Equivalence -			Methodology -	
Special feature -				

KENYA

When a private or public entity is in charge of a development project that may have an impact on the environment, it must obtain an "environmental impact certificate" from the National Environment Management Authority (NEMA). This is issued based on an environmental impact assessment conducted by an agency accredited by the NEMA.

There is no offset mechanism as the NEMA perceives this to be a "right to destroy".

MOROCCO	Offset Environmental and sector-specific assessment		Specific challenges -	
	Ecological measures -	Sustainability -	Monitoring -	Financial transfer -
Equivalence -			Methodology -	
Special feature -				

MEXICO	Offset Environmental and sector-specific assessment	Specific challenges -
Ecological measures - Relocation of species	Sustainability - Monitoring - Reports - Field visits - Audit by civil society	Financial transfer -
Equivalence Targets: species / habitats / functions	Methodology -	
Special feature Deposit system Member of the Business and Biodiversity Offsets Program (BBOP)		

NORWAY	Offset Environmental assessment	Specific challenges -
Ecological measures - Creation - Restoration - Preservation	Sustainability - Regulatory protection - Contracts between project developer and landowner Monitoring -	Financial transfer <i>Regulated</i> Alternative option
Equivalence Targets: species / habitats / ecosystems	Methodology -	
Special feature Recent implementation of the Nature Diversity Act Affirmation of the user pays principle		

NEW ZEALAND	Offset Management of natural resources	Specific challenges -
Ecological measures - Creation - Restoration - Preservation - Rehabilitation	Sustainability - Land acquisition - Contracts Monitoring -	Financial transfer <i>Not regulated</i> Alternative option
Equivalence Targets: species / habitats		Methodology Research programme in progress
Special feature Member of the Business and Biodiversity Offsets Program (BBOP) Priority given to native biodiversity		

PERU	Offset Environmental assessment	Specific challenges -
Ecological measures -	Sustainability - Monitoring -	Financial transfer <i>Not regulated</i> Payment, fund to promote the environment
Equivalence Ecosystem approach preferred		Methodology -
Special feature Combination of offsets and payments for environmental services		

RUSSIA	Offset Environmental and sector-specific assessment	Specific challenges -
Ecological measures - Rehabilitation - Restoration - Preservation	Sustainability - Monitoring -	Financial transfer <i>Not regulated</i> Alternative option
Equivalence Target: species		Methodology -
Special feature -		

SWITZERLAND	Offset Environmental and sector-specific assessment	Specific challenges -
Ecological measures - Rehabilitation - Restoration - Creation - Preservation	Sustainability - Contract with management clause Monitoring - Field visits - Audited by civil society - Database project at federal level	Financial transfer <i>Regulated</i> As a last resort
Equivalence Targets: species / habitats / functions		Methodology Yes: multi-criteria approach; the criterion of ecological connectivity is important
Special feature Two cantons have created a database of areas which may be used to offset (anticipation)		

VIETNAM

The Vietnamese legislative framework is based on the Biodiversity Law which came into force in 2009 and the impact assessments stipulated in the context of investment projects. The biodiversity offset mechanism is still at discussion stage. The Ministry of Agriculture and Rural Development and the Ministry of Natural Resources and Environment have sought the aid of the Business and Biodiversity Offsets Program in developing suitable offset policies.

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Abstract

Biodiversity offsets are ecological actions, for example the remediation of ponds or meadows, to counterbalance the ecological losses caused by development projects (motorways, wind farms, housing estates, etc.), in cases where impacts remain in spite of the efforts of the developer to avoid and reduce them.

In France, the provision of offsets is deemed insufficient, notably due to a lack of methodology and monitoring. To support the current strengthening of the French regulatory and methodological framework on offsetting, a consultation of 29 countries was conducted in 2011 to learn their offset practices, and identify the obstacles and the solutions applied.

The responses provided were combined with the existing bibliography. They were used to establish an overview of the legal and institutional frameworks, offset terms, market mechanisms and methods established to assess ecological losses and gains in the countries studied.

Although the degree of maturity varies widely by country, common ground is revealed in terms of the assessment methods and economic, financial and legal tools that could be considered for introduction or adaptation to the French context.



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