Steps 3 and 4 in the Mitigation Hierarchy: Restore and Offset

Best practice in restoration and offsetting, and limits to what they can achieve

Impact Mitigation and Ecological Compensation
Thematic Group

The mitigation hierarchy requires that any impacts that remain after avoidance and minimisation are addressed through restoration and, if necessary, offsetting. These latter two steps are remedial and are riskier than the preventive steps. Restoration, the third step of the mitigation hierarchy, involves repair of damage caused by a project or activity. Biodiversity offsetting is the last step in the mitigation hierarchy. Its purpose is to counterbalance any negative impacts on biodiversity that remain after all other mitigation measures have been rigorously applied. Offsetting involves efforts to generate a biodiversity gain that is at least equivalent to the loss caused by the negative impact. To ensure high-quality outcomes, the design, location and implementation of restoration efforts and offsets must follow best-practice principles. The ultimate goal of applying the full mitigation hierarchy is to achieve at least no net loss and preferably net gain outcomes for affected biodiversity and ecosystem services.

Step three: Restoration of biodiversity following temporary impacts

The third step in the mitigation hierarchy is variously referred to as restoration or rehabilitation of affected biodiversity and associated ecosystem services, or remediation of impacts. All these terms have different but related meanings, but in the context of the mitigation hierarchy, they all refer to the on-site repair of damage done to biodiversity by the relevant development project or activity. Here, we refer to these various reparative actions as 'restoration'.

Restoration should be done wherever there is potential to repair or partially repair damage to biodiversity caused by a project or activity. Examples of opportunities to restore biodiversity and ecosystem services affected by temporary impacts include:

- Revegetation of access roads or storage sites that are required only during the construction phase of the development project.
- Restoration of hydrological flows that are temporarily diverted during construction.
- Rehabilitation of areas temporarily disturbed by the development project.

The approach to, and methodology for, measures intended to restore damage caused by a project or activity, should follow the advice of one or more specialists in that field. It is essential to set measurable outcomes with appropriate indicators and clear timeframes for restoration, and to define roles and responsibilities for implementing these mitigation actions. Only by so doing can restoration be effectively monitored and enforced.

Estimating residual impacts after the third step of the mitigation hierarchy

While it is important to plan for the restoration of biodiversity at disturbed and damaged sites to the extent feasible, it is important to recognise that not all impacted areas may be able to be restored to the same condition or quality as they were pre-impact. This means that even in areas subject to restoration efforts, there is likely to be some residual impact. When the outcomes of restoration actions for biodiversity are uncertain, a precautionary approach is needed when calculating residual impacts, such as assuming a worst-case scenario.

Some types of impacts, such as from mining, require longer-term restoration or rehabilitation, which might be scheduled for many years or even decades after the initial impact. While these long-term efforts are crucial, there is an inherently long time lag before the process of repair can commence, and associated uncertainty over outcomes. In addition, restored habitats or ecological communities that are achieved through mine site rehabilitation are often quite different to the original, disturbed habitats, due to altered landform, drainage and soil qualities as well as the time needed for ecosystem processes to play out (e.g. succession or natural recolonization by locally extinct species). For these reasons, planned long-term rehabilitation of a mine site or dismantling of industrial facilities, although necessary, is generally not considered to reduce the residual impacts of a project for the purposes of implementing the mitigation hierarchy.

All biodiversity impacts that are expected to persist in the medium or long term need to be fully offset.

Step four: offsetting

Biodiversity offsets aim to address the residual impacts of project development. They are defined as *measurable conservation outcomes resulting from actions designed to compensate for the residual adverse biodiversity impacts arising from project development after appropriate avoidance, minimisation and restoration measures have been taken*. The goal of these combined interventions is to achieve ‘no net loss’ and preferably a ‘net gain’ of biodiversity on the ground. Offsets should be targeted to counterbalance fully any residual impacts on affected species and their habitats, affected ecosystems, and ecosystem services.

Offsets do not always succeed, even when best practice is followed, and so carry much higher risks to affected biodiversity than the earlier steps in the mitigation hierarchy. They are thus considered a 'last resort' form of mitigation. For this reason, evidence of the application of earlier steps in the mitigation hierarchy is crucial before offsets are investigated. Importantly, many types of impact cannot be offset adequately. Identification and prevention of such ‘non-offsetable’ impacts at an early stage are crucial (see *Brief 5: Steps 1 and 2 in the Mitigation Hierarchy: Avoid and Minimise*).

Best practice principles for offsetting

Core principles of biodiversity offsets include equivalence or a 'like for like' exchange, the need for conservation gains to be above and beyond results that would have occurred without the offset (see *Brief 8: Metrics for Quantifying Biodiversity*), outcomes for the offset to be long term, preferably in-perpetuity, an acknowledgment of the limits to what can be offset (see *Brief 5: Steps 1 and 2 in the Mitigation Hierarchy: Avoid and Minimise*) and to be planned with a landscape-scale perspective. Engagement with stakeholders, considering science and traditional knowledge, and the need for transparency and equity in offset design and implementation, are also crucial (see also *Brief 7: Considering People as well as Biodiversity*).

The design and implementation of biodiversity offsets are guided by a set of ten core principles

1. Adhere to the mitigation hierarchy, with offsets considered only after appropriate avoidance, minimisation and on-site restoration measures have been taken;

2. Respect limits to what can be offset, as some residual impacts cannot be fully compensated;

3. Consider the landscape context and take an ecosystem approach in biodiversity offset design and implementation;

4. Achieve at least no net loss and preferably a net gain of biodiversity;

5. Ensure offset gains are additional: above and beyond what would have occurred if the offset had not taken place;

6. Ensure effective stakeholder participation in areas affected by the project and its offset;

7. Ensure equity - the fair and balanced sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset;

8. Provide assurance of long-term outcomes that last at least as long as the development project's impacts, and preferably in perpetuity;

9. Ensure transparency in offset design and implementation;

10. Consider science and traditional knowledge in offset design and implementation.

Like for like

An offset must provide gains that are at least equivalent to the residual biodiversity loss. That means that the gains must be of the same type, and amount, of biodiversity as was impacted, and persist for the duration of the loss. In situations where an impact is on a common species or ecosystem, an exception to a like-for-like exchange may be permissible, whereby biodiversity of higher conservation priority is the target for the offset. This is known as 'trading up' and must be considered with caution.

To help ensure like-for-like outcomes, the affected biodiversity is usually broken down into components (see *Brief 8: Metrics for Quantifying Biodiversity*). They might include species of interest, a particular community of species, a type of habitat or ecosystem, or a specific ecosystem service to a particular group of people. These components are typically identified during a project's Environmental and Social Impact Assessment (ESIA), through baseline data collection, stakeholder engagement, and specialist studies. However, it is key to consider that nature is more complex than the sum of these individual components, and always consider important interactions and flows (i.e. take an ecosystems approach).

No net Loss/net gain

Biodiversity offsets are designed to achieve at least 'no net loss' or, preferably, 'net gain' outcomes. To achieve this, we need a reliable measure of the residual impacts on, and likely benefits for, each biodiversity component that is impacted, in the context of affected ecosystems. Importantly, the frame of reference used in calculating losses and gains must be explicit, as this determines what the terms 'no net loss' and 'net gain' mean ('no net loss relative to what?') and whether gains will be absolute or relative to a counterfactual scenario (*see Brief 2: Aligning Mitigation Outcomes with Biodiversity Goals and Targets*).

If the goal of compensatory actions falls short of no net loss, then such actions may not strictly be termed an offset. A broader term such as 'ecological compensation' may be more appropriate. In the case of ecosystem services, compensation packages for affected parties may not fall within the definition of an 'offset'.

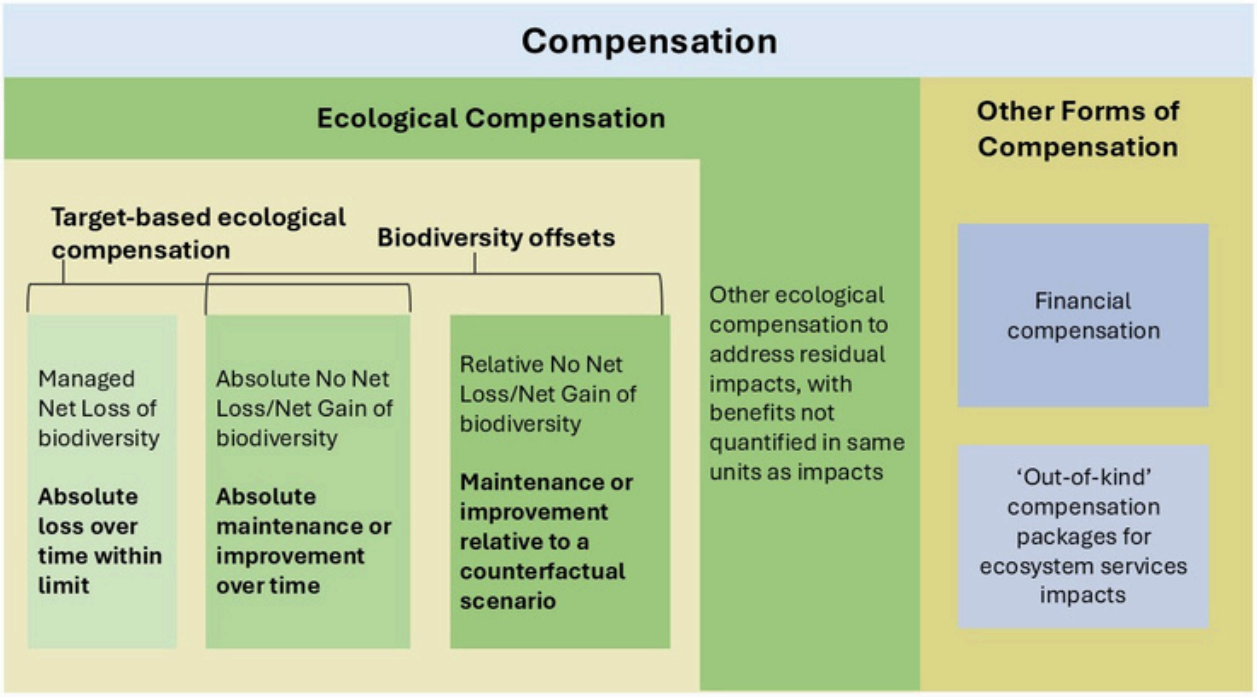

Figure 1. Relationship between offsets and compensation

Offset actions

The main ways in which offset gains can be generated are: 'improvement', in which the condition and/or extent of the relevant biodiversity components at a site increase over time; and 'maintenance', in which actions prevent an otherwise predicted decline in the condition or extent of the area ('averted loss'). Achieving enduring outcomes for biodiversity from both improvement and maintenance requires some form of legal security (e.g. a protected area designation), continued management, and ongoing financial support.

Activities like restoration and threat management in offset locations can achieve both maintenance of current biodiversity condition (e.g. by preventing invasive species incursions) and improvement (e.g. enabling wildlife populations to increase through the reduction or removal of pressures like illegal hunting or harvesting, or the reintroduction of native species).

The re-creation of habitats or ecosystems from very degraded states can also generate improvement gains. However, such re-created ecosystems are often quite simplified, and so relying on this action is not usually a suitable approach for offsetting losses of complex ecosystems or biodiversity components.

Offset delivery

The design and delivery of an offset requires tackling many issues—not only ecological, but also technical, social, financial, legal and institutional. The party responsible for impacts on biodiversity and ecosystem services (the developer) is also responsible for the full mitigation of these impacts, including any offsets, in accordance with the 'polluter pays' principle. The developer can, however, contract third parties with the necessary skills and experience to undertake the implementation of the mitigation measures. In this case, it is important to ensure that it is clear whether liability for the delivery of the offset outcomes passes to the third party or remains with the developer.

For example, conservation commitments or agreements to deliver an offset can be drawn up between communities, conservation agencies and developers requiring offsets, setting out the respective roles, rights and responsibilities of parties. They enable local communities to act as stewards and to benefit from resources and long-term support associated with offsets. The involvement of Conservation Trust Funds can help with the necessary financial arrangements. Offset sites must endure in the long term and preferably in perpetuity, so some form of recognised protection is needed.

People and offsets

The involvement of key stakeholders, especially affected local communities, is crucial in identifying and assessing possible offset options. Some jurisdictions require separate environmental permits for the planned offset actions, which may involve public engagement. Obtaining free, prior and informed consent, and respecting indigenous and customary rights, should form part of the offset design process, and can inform the best strategy to ensure long-term outcomes. There are now good guidelines on how to go about designing and implementing mitigation measures including biodiversity offsets (and see *Brief 7: Considering People as well as Biodiversity*).

Locating offsets

Plans or maps showing priority areas for the conservation and restoration of biodiversity and ecosystem services, including climate change adaptation and ecological corridors, provide a strong basis for directing offsets to optimum locations. Locating offsets widely can enhance their outcomes. For example, the benefits of biodiversity offsets can be enhanced if they can be located close to other areas important for biodiversity. Identified priority areas for offsets can function as 'aggregated offset' areas to cater for the offset needs of multiple projects in a region.

Offsets and protected areas

The declaration of an offset site as a formal protected area may be necessary for its long-term security. However, a reliance on offsetting to achieve protected area targets risks perverse outcomes. Further, offsetting inside existing protected areas is controversial, as there is a high risk of failing to meet a core principle of offsets: additional conservation outcomes (see *Brief 9: Measuring Loss and Gain: Additionality*). For offsets to be located validly within protected areas, it should be demonstrated that resources and/or capacity allocated for conservation management are inadequate and that the outcomes would be over and above formal commitments already made (e.g. by the government). There is also a risk of 'cost shifting', where offset funds over time replace funding from government or philanthropic budgets for conservation, resulting in no overall additional outcomes for conservation.

About COMBO+ and IMEC

From 2016 – 2025 AFD and FFEM financed the **Conservation, Mitigation and Biodiversity Offsets Programme (COMBO+)**, as part of which technical briefs 1 -10 were drafted, in collaboration with the IUCN Thematic Group Impact Mitigation and Ecological Compensation. COMBO has been implemented across six countries in Africa and Asia, together with government, private sector and civil society, to help reconcile economic development and biodiversity conservation through application of the mitigation hierarchy in policy and practice to achieve no net loss or net gain of biodiversity and contribute to national biodiversity targets aligned with the Kunming-Montreal Global Biodiversity Framework. The initiative was led by the Wildlife Conservation Society in partnership with Biotope, BIOFUND, Guinée Ecologie, Myanmar Biodiversity Fund and the University of Queensland.

The **Impact Mitigation and Ecological Compensation (IMEC)** Thematic Group of the IUCN's Commission on Ecosystem Management (CEM) serves as an international community of practice, guiding best practice application of the mitigation hierarchy and improving alignment of impact mitigation and ecological compensation with biodiversity targets.

Useful resources

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IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry of Foreign Affairs, Denmark; Ministry for Foreign Affairs, Finland; Government of France and the French Development Agency (AFD); Ministry of Environment, Republic of Korea; Ministry of the Environment, Climate and Sustainable Development, Grand Duchy of Luxembourg; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

This technical brief has been made possible in part by funding from the Agence Française de Développement (AFD) and the Fonds Français pour l'Environnement Mondial (FFEM).

Published by: IUCN, Gland, Switzerland

Produced by: Impact Mitigation and Ecological Compensation (IMEC) Working Group of the IUCN Commission on Ecosystem Management (CEM)

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Recommended citation: COMBO and IMEC. (2025). Steps 3 and 4 in the Mitigation Hierarchy: Restore and Offset: *Best practice in restoration and offsetting, and limits to what they can achieve.* Technical briefs on the mitigation hierarchy: No. 6. Gland, Switzerland: IUCN.

Layout by: Kataryna McMillan