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Habitat equivalency analysis reveals highest priority projects for damaged ecosystems

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Adapted habitat equivalency analysis (HEA) may help decision makers select projects to restore damaged ecosystems under a limited budget. HEA, used to assess damages to natural resources, can help to clarify objectives and compare trade-offs between projects to choose the most cost-effective among them, according to this study's authors.

There is growing recognition of the value of goods and services provided by nature, and subsequently a need to restore damaged ecosystems. But with limited resources, not all restoration projects can be tackled at once. Prioritising those that deliver the greatest benefits can be challenging, particularly when alternative projects are implemented within different types of institutions (e.g. conservation bodies or harbour control authorities) and have different aims.

Cost-effectiveness analysis can be used to compare restoration alternatives. This requires a comparison unit for effectiveness, the choice of which is not always obvious when it comes to biodiversity, which varies between sites and projects. A monetary unit can be used, but is costly to implement and raises technical, ethical and practical issues. The use of discounted services units, measured in biophysical terms, can be a valuable alternative, especially when it comes to assessment of non-use values or non-market values.

This study explored how HEA can be modified to compare the costs of different restoration projects with different objectives and institutional contexts.

HEA was originally developed by the American National Oceanic and Atmospheric Administration (NOAA) as a tool to provide compensation for the ecosystem services lost through pollution accidents. The cost the polluter is required to pay is based on the cost of restoration and compensation for lost ecosystem services. This typically requires improvements to replacement ecosystems or the creation of a new site to provide equivalent ecosystem services until restoration is complete. HEA is a legally binding method under the Environmental Liability Directive.

The costs are based on when the damage occurred, when restoration begins, for how many years losses occur, for how many years gains are made (at a replacement site for example), the total value of an acre of the damaged ecosystem, the level of ecosystem services lost, the potential ecosystem services from the restored ecosystem, and when the ecosystem returns to a previous reference state. The losses from impacts and gains from compensation are calculated using units called 'discounted services per acre and per year', or DSAYs. DSAYs have no real value and are only used to compare alternative actions.

The researchers modified the HEA framework by expanding it to fit a broader range of legal or social contexts, such as the Water Framework Directive[1] or Marine Strategy Framework Directive[2]. A number of bodies, such as private investors and NGOs, and not just those responsible for damaging the ecosystem, could assume responsibility for restoration. Furthermore, the level of restoration could be set to different environmental or legal standards rather than to a reference state. Finally, indicators used to assess the ecosystem services produced by the restored ecosystem can be chosen to meet the objectives of the restoration project, unlike the original HEA.

The ratio of the cost of a project to the DSAYs can be calculated to give a cost-effectiveness ratio between different projects, as well as different actions within a project.

The researchers emphasise that it is important to choose the most suitable indicator to determine losses from damage and gains from restoration. Typically, the best measure is one that characterises the damaged habitat or ecosystem service, for example, the surface of a coral reef.

Continued on next page.

1. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060
2. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

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3. Our life insurance, our natural capital: an EU biodiversity strategy to 2020: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0244

4. Study on specific design elements of biodiversity offsets: http://ec.europa.eu/environment/nature/biodiversity/nnl/pdf/Biodiversity%20offsets%20metrics%20and%20mechanisms.pdf

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Habitat equivalency analysis reveals highest priority projects for damaged ecosystem *(continued)*

According to the researchers, the modified HEA is a useful tool to evaluate the success of a restoration project. Their method can estimate the action needed to produce the adequate level of ecosystem services before a project starts, thus helping to clarify project objectives; compare different projects to choose the most cost-effective among them; and assess the effectiveness of an action within a project after its completion.

The methodology described by the authors is also relevant to the EU Biodiversity Strategy[3] and in particular Target 2 of the Strategy which includes "the restoration of 15% of degraded ecosystems by 2020". In addition, effective methodologies for establishing equivalence are a pre-requisite for the development of compensation/offsetting schemes[4].