CE Delft

Committed to the Environment

Biodiversity Policy Indicators

Key Message

In a project commissioned by the Dutch Ministry of Infrastructure and Environment, the consultancy CE Delft explored whether indicators that link m^2 land used for economic activities with biodiversity are available and whether they could be applied in the various areas of policy-making in which biodiversity is an important issue.

CE Delft selected three indicators to examine in more detail:

- The Mean Species Abundance indicator (MSA), developed under the TEEB program.
- ReCiPe LCA methodology.
- The biodiversity impact indicator developed by TNO.

All three indicators employ the relative reduction in biodiversity compared with the pristine situation to describe the impact of different kinds of land use on biodiversity.

Each of the identified indicators has its strengths, limitations and specific features. For application in policies, the ReCiPe indicator would be the most suitable methodology in the current situation, mainly because of its integration in LCA methodology. Its value and that of the other two indicators would be improved by improving the extensiveness and level of detail of the underlying datasets. Combining the different methodological features of the three identified indicators, would improve their value in policy applications.

The Need for a Uniform Biodiversity Impact Indicator for Land Use

Biodiversity is a **key natural resource** that is strongly linked with the ability of an ecosystem to provide ecosystem services, e.g.:

- Provisioning: food, fuel, fibres, biochemicals.
- Regulating: air quality, regional and local climate, erosion, water regulation (for example, flood protection), carbon sequestration, etc.
- Cultural: spiritual and religious values, aesthetic values, recreation and ecotourism.

Retaining adequate biodiversity in an ecosystem is necessary for retaining ecosystem productivity and stability. As the well-being of the human population is fundamentally and directly dependent on ecosystem services (see Figure 1), biodiversity decline is undesirable.

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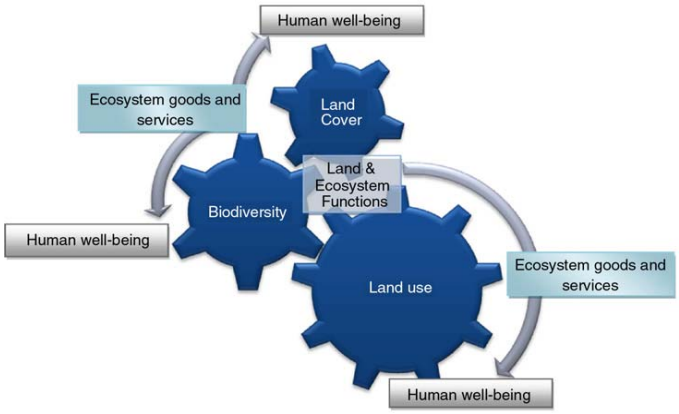
Figure 1 The relationships between land use, land cover, biodiversity and the output of ecosystem services



Source: Haines-Young, 2009.

The main impact on biodiversity is land use for economic activities which leads to the degradation and conversion of pristine areas. In the past decades, the increasing use of land for production of biotic raw materials (food, feed, wood, biofuels, biomass for heat and power) has resulted in a strong decline in pristine areas and biodiversity.

In view of the importance of land use and biodiversity and the link between these, efforts are made to include land use and biodiversity in policies.

Land use and its impact on biodiversity is a cross-cutting issue, touching several areas of policy-making such as:

- Policies concerning incentives for the bio-based economy to stimulate the implementation of biofuels, biomass for heat and power and biomass for other applications in which it substitutes fossil fuels.
- Waste treatment and recycling policies, especially waste paper and waste wood related policies and associated packaging taxes.
- Global food consumption – especially global protein consumption – and the relationship between biodiversity and agricultural productivity.
- Deforestation and sustainable wood/timber policies.
- Nature conservation policies.
- Economic development/development aid.

Unfortunately, land use and biodiversity are not yet included as a tangible or quantitative aspect in some of these policy themes. In other policy themes, different methodologies have been developed, employing different indicators for quantifying land use, but often not quantifying biodiversity.

In this context, the Dutch government asked CE Delft to investigate if indicators could be identified that could be applied within the various policy themes and would allow the inclusion of a quantitative measure of biodiversity. The main objective was exploring whether indicators are available that link m^2 land used for economic activities with biodiversity. In addition, such indicators were examined in order to determine whether they would have specifications that would be useful for policy development, such as a sound scientific basis, and to be relatively simple and applicable in scenario analyses.

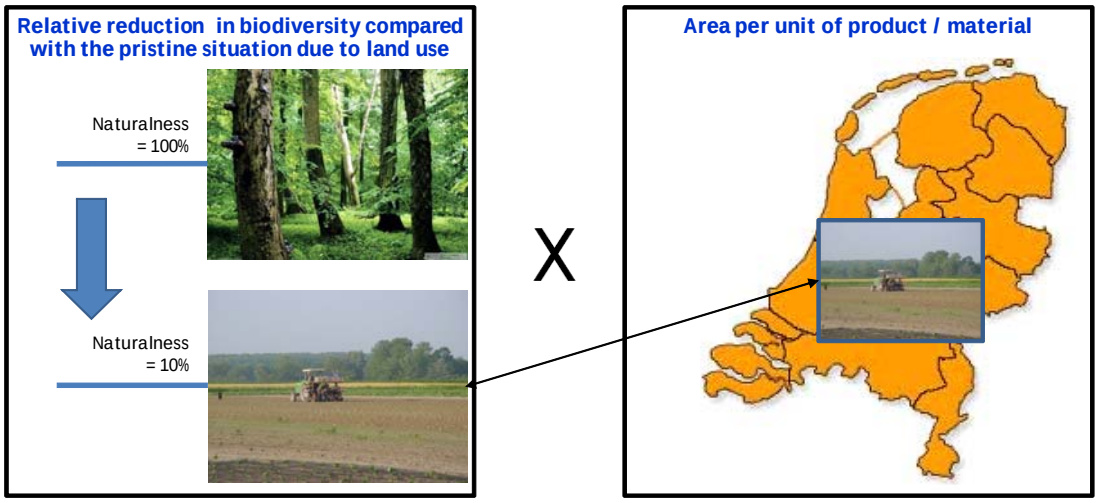
Relevant Indicators, a Selection and Specification

CE Delft selected three indicators to examine in more detail:

- The Mean Species Abundance indicator (MSA), developed under the TEEB program.
- ReCiPe LCA methodology.
- The biodiversity impact indicator developed by TNO.

All three indicators employ the relative reduction in biodiversity compared with the pristine situation, to describe the impact of different kinds of land use on biodiversity. Loss of biodiversity is expressed as loss of species per m^2. By combining loss of biodiversity per m^2 with land use in m^2 for a specific activity or product, the indicators can be linked to economic activities.

Figure 2 **The two parameters determining biodiversity impact per unit of product or material: relative decline in biodiversity and area used**



The main differences between the three indicators are illustrated in Table 1. The differences concern methodological issues and differences in the extensiveness and level of detail of the underlying datasets that describe biodiversity impacts of different kinds of land use data.
An important methodological difference is the treatment of land use change (LUC) in ReCiPe. For LUC, ReCiPe takes into account the degradation of pristine areas or how the conversion

into arable land or plantation will cause a decrease in biodiversity for a long time, at least the time required for the natural vegetation to fully recover (restoration time).

The differences are mainly related to the aim the indicators were developed for.
The MSA methodology is designed for scenario analyses, the ReCiPe land use indicator for LCA and product analyses.

Table 1 Overview of match of the considered methodologies with desired specification (X=Yes)

	MSA	ReCiPe	TNO
Methodological differences			
– Applicable in LCA?	**Theoretically**	**X**	**X**
– Considers impact of land use on surrounding area?		**X**	
– Accounts for long-term decrease of biodiversity for land use change?		**X**	
– Weighing factors for representing uniqueness and remaining area?			**X**
– Considers fragmentation, impacts of roads?	**X**		
Data set issues, applied dataset allows for considering:			
– Differences in land use intensity	**X**	**X**	**X**
– Differences in landscape design			**Partly**
– Differences in affected biomes			**Partly**
– Ecosystems outside EU?	**X**		

As illustrated in the Table each of the identified indicator has its strengths, limitations and specific features.
For application in policies, the ReCiPe indicator would be the most suitable methodology in the current situation, mainly because of its integration in LCA methodology. This would allow weighing biodiversity impacts with other environmental issues, e.g. climate change.
Its value – and that of the other two indicators - would be improved by improving extensiveness and level of detail of the underlying datasets. Combining the different methodological features of the three identified indicators would improve their value in policy applications.
For example, combining:

- The restoration factor of the Recipe indicator.
- A modified factor for scarcity of biomes from the TNO indicator would result in an indicator that would discourage land use change, especially in unique ecosystems of which little of the original area has remained.

Questions and Answers

For which policy issues is biodiversity important?
Biodiversity is an important aspect for all policies which are directed either at protection of nature, or at agriculture and other land-based production. The production of products like wood, biofuels, meat, coffee or milk all have an impact on biodiversity; and policies for these bio-materials have to take into account biodiversity effects.

What role can a biodiversity indicator have in biodiversity policies?
It can be used for estimating impacts of policies and economic developments on biodiversity by conducting scenario studies for land use and land use intensity and translate these into levels of biodiversity.
It can also be applied in determining the impact on biodiversity of production chains and material chains, and for analyzing how this impact could be reduced.

How can a biodiversity indicator help biodiversity?
In many cases different products and materials can deliver the same service. Information on the biodiversity effect of these products makes a more biodiversity-friendly choice possible. Government can also introduce policies to steer to these biodiversity-friendly options.

Can I choose better materials/resources with a biodiversity indicator?
With ReCiPe or with the indicator proposed in this report, it is possible to determine the impact of the production materials or products or the use of resources on biodiversity, allowing stakeholders to choose on the basis of this impact.

Biodiversity and Land Use:
A Search for Suitable Indicators for Policy Use
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The full report of this project will be available in June at **www.cedelft.eu**