

Science for Environment Policy

Biodiversity scenarios should focus on land use as well as climate change

Biodiversity scenarios are a useful tool to help policymakers predict how flora and fauna will likely respond to future environmental conditions.

Although changes to land use are a major driver of biodiversity loss, scenarios focus overwhelmingly on climate change, a new study shows. The researchers say this imbalance makes scenarios less credible, and make recommendations for developing more plausible projections.

Driven by human lifestyles, biodiversity is in decline worldwide. Recent extinction rates are 100 to 1 000 times their pre-human levels across a wide range of environments¹, causing environmental policymakers great concern.

Critical to preventing further biodiversity loss are plausible scenarios of future environmental conditions. A forward-looking approach is particularly important when it comes to biodiversity as the causes of its decline and the impact of those causes change over time. Furthermore, the later action is taken, the more costly and time consuming it is for it to be effective, and the less likely it is to prevent damage.

Scenarios therefore feature prominently on the agenda of international initiatives to conserve biodiversity, such as the [Convention on Biological Diversity](#) and [Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services](#) (IPBES). To help platforms such as these to develop biodiversity scenarios, a range of ecological models have been proposed, which predict how organisms will adapt to changes in environmental conditions.

There are a number of factors which result in biodiversity decline, including loss of habitat. Habitat destruction and degradation result from changes in the types of vegetation and infrastructure that are on the land (*land cover*) and changes to the way humans manage the land (*land use*). These changes can occur for various reasons, including residential and commercial building, agriculture, energy production and building roads. The [Millennium Ecosystem Assessment](#) reports that land use/cover change is the most important direct cause of changes to biodiversity in the last 50 years. Climate change is also a major driver of biodiversity loss.

To assess the extent to which biodiversity scenarios account for these changes, researchers from across Europe (funded by two EU projects²) reviewed biodiversity scenarios from the past 25 years. Using academic literature published between 1990 and 2014, they estimated the number of studies that developed scenarios based on climate change projections, land use/cover change projections, or a combination of both. A total of 2 313 articles were identified, from which they randomly sampled 300³.

The results showed that many fewer studies included the expected impacts of future changes to land than to climate. Over 85% used climate change projections alone, while only 4% used projections of land use/cover change alone. The two were combined in only 10% of the studies. The researchers found that the imbalance towards climate change increased sharply over time, reaching a maximum in 2014.

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1. <http://science.sciencemag.org/content/269/5222/347>

2. EU BON (Building the European Biodiversity Observation Network) and TRUSTEE (Towards Rural Synergies and Trade-offs between Economic development and Ecosystem services) are funded by the European Commission, under the 7th Framework Programme and the Coordination and support action, respectively. See: <http://www.eubon.eu> and <https://www.trustee-project.eu>

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They say this is a likely reflection of the increasing attention given to climate change as an environmental sustainability issue over recent years, due to the availability of climate observations and projections, which have inspired studies focusing on the impacts of climate change. The researchers also cite practical reasons for the neglect of land use/cover change in biodiversity scenarios, including the fact that representations of these changes are often considered unreliable or irrelevant.

The researchers say this limits the credibility of biodiversity scenarios and make two key recommendations to develop more plausible scenarios: first, they say local and global models of land use/cover should be combined, through new down- and upscaling methods for example; second, they say ecological processes — which provide essential functions such as pollination and water cycling — should be included in the models.

They also discuss the importance of open access data on land use/cover and of an independent intergovernmental body to focus on the issue; just as the [IPCC](#) has raised awareness of climate change as a threat to ecosystems, they say a similar independent body is needed to mobilise stakeholders on the problem of land use and cover change. They reference the [IPBES](#) as an independent body able to take up this challenge, and encourage the platform to invest in projections of environmental change including changes to land, which could more accurately predict future biodiversity.



3. A sensitivity analysis was carried out by the researchers and indicates that the number of articles for which titles and abstracts were checked was sufficient to reflect the results in a reliable way.