



## **Feedbacks between climate change and biosphere integrity**

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The terrestrial and marine biospheres sink substantial fractions of human fossil fuel emissions. How the biosphere's capacity to sink carbon depends on biodiversity and other measures of biosphere integrity is however poorly understood. Here, we (1) review assumptions from literature regarding the relationships between the carbon cycle and the terrestrial and marine biospheres; and (2) explore the consequences of these different assumptions for climate feedbacks using the stylised carbon cycle model PB-INT. We find that: terrestrial biodiversity loss could significantly dampen climate-carbon cycle feedbacks; direct biodiversity effects, if they exist, could rival temperature increases from low-emission trajectories; and the response of the marine biosphere is critical for longer term climate change. Simple, low-dimensional climate models such as PB-INT can help assess the importance of still unknown or controversial earth system processes such as biodiversity loss for climate feedbacks. This study constitutes the first detailed study of the interactions between climate change and biosphere integrity, two of the 'planetary boundaries'.