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## Biodiversity: a promising area for future research

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The most challenging topic in the area of EDE is, to my point of view, the understanding of the various issues related to biodiversity and their modeling. We do not know much about the reasons why we would want to prevent ecosystem and species losses, but we suspect that preventing large-scale loss is indeed a tremendously important task we should undertake rapidly. We need tools to help us evaluate the costs of these losses and the benefits of preventing them, and to provide guiding principles for environmental policy.

The first problem is that we do not have at the present time reliable methodologies to value ecosystems and species. Even if scientists could provide robust projections of species and ecosystem losses due to human activities, which they are not able to do, we would not know how to estimate the costs of these losses. Progress has been made in recent years, but methods like contingent valuation have severe limitations.

The second question lies at the level of analysis and modeling. Let us make an analogy with the other global environmental problem humanity is facing – climate change. Economists have done a lot of work on climate change, together with other scientists, and are now equipped with large, detailed integrated assessment models that help to highlight the challenges, evaluate costs and benefits and think about solutions. We do not have anything close to this for biodiversity. The causes and consequences of global warming are relatively easy to represent formally in a model. We can write down equations linking economic activity, the burning of fossil fuels, $CO_2$ emissions, the increase of atmospheric carbon concentration,

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and damages. We can undertake sensitivity analysis to estimate the uncertainties surrounding the results – even if we are not really able to take into account tipping points and catastrophic discontinuities. We can reasonably assert that the solution is to give a price to carbon and evaluate the appropriate initial value and time profile of this price. But as far as biodiversity is concerned, we do not have the equivalent of damage functions, of abatement curves or of carbon price. The damages are not due to an almost single economic activity, but to virtually all economic activities, directly (overuse of renewable resources, habitat destruction for agriculture and infrastructures, etc.) or indirectly (climate change, acidification of oceans, etc.). The benefits of avoiding ecosystem and species losses are at present fairly difficult to evaluate. But the task of building assessment models in the spirit of what we did for climate change is undoubtedly a worthwhile undertaking.



*Sea life in a coral reef, Caribbean Sea*
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