

Report on Economics of Biodiversity Synthesis grant 'Assigning economic value to biodiversity: the promise and perils of biodiversity credits' (NERC Reference: NE/W007401/1)

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One of our main objectives was to address a key question specified in the funding call, "To what extent can the measured complexity of biodiversity be reduced or simplified and still provide usable, robust and meaningful outcomes for informing management?". Specifically, we have synthesised the existing literature on ways of quantifying biodiversity, focusing on the extent to which the methods are fit for the purpose of developing biodiversity credits. Among other things, fitness for this purpose requires measuring biodiversity change in a way that is transferable between very different ecosystems around the world.

There is massive potential for private finance of biodiversity, which is currently being stimulated in Britain and around the world by new regulatory and reporting requirements for no net loss / net gain of biodiversity, nature positive future, etc. Biodiversity credits can help unlock this potential. They would work similarly to carbon credits; however biodiversity is much more complex than carbon. With carbon credits and carbon finance more generally, it is relatively easy to estimate changes in a standardised way (usually CO₂ equivalent) because the carbon-containing molecules vary little through space and time in their effects on climate, and carbon stocks are relatively easy to estimate. In contrast, there is not even a standard unit of biodiversity – the number of species is the most commonly used measure, but the units can be genes or habitats, for example. Only a small fraction of species have been scientifically described, and for many that are described we know little about where they are found. For mobile species like many animals, even the notion of presence at a site is not straightforward: a species may be there one day and not the next. No species is found everywhere in the world, and most are very geographically restricted. What counts as 'high' biodiversity varies by at least an order of magnitude around the world. There is a non-linear relationship between the size of sites and the number of species found in them. And so on. In short, biodiversity is a very context- and scale-specific phenomenon. Measuring it in a way that allows investors to compare, say, the biodiversity change over 5 years in a coral reef site in Indonesia with the biodiversity change over the same 5 years in former arable land in Britain, exemplifies the challenge we face. Lack of a standard, accepted way of doing this has been identified as the main reason why private investment in biodiversity, globally, is not happening much faster.

Investors are rarely biodiversity experts, but do require confidence in the measurement system adopted. The synthesis we undertook was highlighted as a key need by stakeholders involved in developing the massive potential for private finance of biodiversity. Indeed, our research was co-designed with a group of stakeholders led by the project's Consultant, Dr Tim Coles OBE (CEO, rePLANET www.replanet.org.uk; Chair and Founder, Operation Wallacea www.opwall.com and now CEO of the newly formed Biodiversity Credit Company <http://biocred.org/>).

Our synthesis project has produced two main outputs, currently in the form of complete drafts of two papers to be submitted to academic journals in 2022, as follows:

Paper 1 reviews methods for quantifying biodiversity, focusing on their potential for a transferable measure of biodiversity change through time, as outlined above. The key message is that, of the approaches currently being used by businesses to quantify biodiversity, none satisfies all, and few satisfy more than one, of the following criteria that are important for developing biodiversity credits:

- Quantify a unit of biodiversity to allow biodiversity accounting within ESG reports
- Apply across all the world's 1300 ecoregions (or other biogeographic regionalization classes)
- Allow independent validation and verification (important for certification bodies)
- Enable biodiversity credits that use the same architecture as carbon credits

Paper 2 reviews potential technical solutions available for collecting biodiversity data at any given project site. This recognizes the need for independent validation and verification of biodiversity metrics, and the variability in expertise for identifying species around the world. To measure biodiversity change at a project site, on-site field data collection is necessary and the ability to automate this will be in great demand in the new biodiversity market. The paper looks at current strengths and weaknesses, for this purpose, of methods such as:

- Satellite and aerial remote sensing
- In-situ camera technology
- Passive acoustic monitoring
- Environmental DNA collection and DNA metabarcoding of bulk samples

We find that, while such technology does not always provide appropriate solutions, it often does, and offers advantages including scalability as well as relative objectivity. As the technology improves and the prices reduce, such solutions are expected to play an increasing role in biodiversity credit and valuation schemes.

The project thus delivers not only on the question from the funding call that is quoted at the start of this report, but also on the following key themes specified in the call, in descending order of match to topic:

- “development of new decision support tools and management approaches, co-designed by academics and decision makers.”
- “improved understanding of the full suite of values of biodiversity, which will be standardly incorporated into the valuation of biodiversity within conventional economic analyses and put into practice by decision makers.”
- “provide new evidence and data to support changed practice and improved environmental performance reporting of natural assets in the private sector.”

We have integrated this project into our work with our stakeholder group. In particular, it is informing the development of a biodiversity credit standard by a collaboration between two of our key stakeholder partner organisations: the Wallacea Trust (<https://wallaceatrust.org/>) and Plan Vivo (<https://www.planvivo.org/>). A central part of this scheme is measuring biodiversity via a ‘basket of metrics’ approach. Such an approach emerges from paper 1 as the most promising. Metrics derived from technological solutions, as reviewed in paper 2, will typically form a least some of any given ‘basket’.

Finally, with an expanded interdisciplinary team, we have successfully bid to field- and user-test the Wallacea Trust–Plan Vivo ‘basket of metrics’ and the associated prototype credit standard, via a NERC–ESRC “Improve Understanding of the Economics of Biodiversity” grant. This starts in August 2022. On the basis of the two projects, and an associated NERC Fellowship to help develop the biodiversity credit standard (starting September 2022), the PI of the project has now (late July 2022) been invited to join the World Economic Forum’s Biodiversity Credit Working Group.