

Governing high-integrity ecosystem markets

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Abstract

There is growing global interest in the potential for ecosystem markets to facilitate climate and nature recovery. Yet, poorly designed and operated markets are prone to corporate “greenwashing” and negative consequences for nature and local communities.

To date, there has been no systematic analysis of ecosystem market governance principles, nor the practical steps needed to implement these principles at a national scale across multiple ecosystem markets. National policy oversight is essential to ensure these markets deliver wider public benefits appropriate to the jurisdictions in which they operate. Moreover, international voluntary initiatives alone are unlikely to prevent the operation of low-integrity schemes. UK national nature markets are among the most developed globally, with governments in Scotland and England actively developing options for governing these markets. This paper shows how high-integrity ecosystem markets are being facilitated in the UK, a country with well-developed and rapidly proliferating domestic markets that is actively seeking to increase their integrity, to derive lessons that could be applied to other comparable countries. To do this, the paper:

1. Provides the first comprehensive overview of UK compliance and voluntary carbon and other ecosystem markets alongside the first analysis of relevant ecosystem market actors;
2. Conducts a comparative analysis of existing national and international principles, identifying 14 core principles for governance, measurement, reporting and verification, and delivering wider benefits of high-integrity ecosystem markets that could be applied by relevant market actors to the range of ecosystem markets identified in the UK;
3. Proposes how these principles could be applied in an ecosystem markets governance hierarchy, showing policy, governance and market mechanisms and infrastructure that are being developed to implement the proposed principles in the UK; and
4. Highlights remaining issues which could cause negative ecological and social consequences, if not addressed.

Taken together, the proposed core market principles and governance hierarchy could be used to ensure the development of high-integrity ecosystem markets across the UK and internationally, helping national governments to responsibly build and scale these markets.

1 Introduction

Climate change and the degradation of global ecosystems are taking us to the brink of ecosystem collapse (Rockström et al., 2009; Steffen et al., 2015; Nash et al., 2017). The increasingly dangerous impacts of these changes for humans and nature disproportionately affect those who have contributed least to climate change (IPCC, 2023). Keeping global warming within 1.5°C of pre-industrial levels (Article 2, Paris Agreement, 2015; IPCC, 2018) requires social, economic and technological transformations on an unprecedented scale. In addition to reducing emissions at source, nature-based solutions to climate change have been proposed. These sequester and store carbon or reduce emissions, whilst facilitating nature recovery and reducing risks from climate change for vulnerable communities. Such solutions can also reduce climate risks for companies, providing a rationale for private investment. Such private investment is needed to supplement limited public funding in many countries. The United Nations Environment Programme (UNEP) estimates that finance for nature-based solutions is currently USD133 billion per year, but needs to at least triple by 2030 and increase fourfold by 2050 to meet international climate, biodiversity and land degradation targets (UNEP, 2021; Deutz et al., 2020). However, as compliance and voluntary carbon markets grow rapidly (Ecosystem Marketplace, 2022), and markets for biodiversity, water quality, water supply, flood risk alleviation and ocean recovery begin to proliferate (Reed et al., 2021), the integrity of these ecosystem markets is an increasingly urgent concern (e.g., Committee on Climate Change, 2022).

Critiques have tended to focus on carbon markets, but often apply more widely across other ecosystem markets. These include:

- The concern that companies will use low-integrity ecosystem market units to make unsubstantiated claims to green credentials or achievement such as achieving 'net zero';
- Selling of units that are not robustly verified and so may not represent real climate or other benefits from nature; double-counting and selling of units or the sale of units from projects that would have happened anyway, and so are not additional;
- Challenges securing or demonstrating the permanence of nature-based solutions, which if reversed may not be reported or compensated for;
- Allowing companies to invest in offsets to meet net zero targets without first cutting their avoidable emissions or having long-term net zero commitments consistent with limiting global temperature increases to 1.5 degrees Celsius above pre-industrial levels; and
- Concerns that projects that focus on single outcomes, such as carbon, may have negative unintended outcomes for other ecosystem services or local communities, for example in some cases leading to their displacement.

As such, there are now calls for ecosystem markets to go beyond ensuring that there is “no net harm”, to delivering net benefits for local communities and/or other ecosystem services (Scottish Government, 2022a). As investment in nature-based solutions grows, alongside the potential climate and nature benefits, there is a growing risk of greenwashing and negative unintended consequences that could harm the climate, nature and local communities. As a result, the UK’s Committee on Climate Change (CCC, 2022) recommended that any expansion of carbon markets into new land uses and habitats should be limited until carbon credit integrity and the integrity of claims could be ensured.

There is therefore an urgent need to identify policy and governance options that could facilitate the design and operation of high-integrity ecosystem markets that generate real, verifiable, additional and effectively permanent nature and societal benefits. The International Council for Voluntary Carbon Markets have proposed core carbon principles (ICVCM, 2023), alongside a range of other international initiatives to increase the integrity of ecosystem markets (e.g. high level biodiversity principles proposed by Plan Vivo, 2022). These are now being implemented on a voluntary basis by a number of international voluntary market players, but it is not clear how national governments can ensure such guidance is used within domestic markets. UK domestic markets are among the most developed internationally, and both Scottish and English governments are actively exploring options for governing these markets. Scottish Government published Interim Principles for Responsible Investment in Natural Capital Markets (Scottish Government, 2022a) and Defra published a nature markets policy framework (Defra, 2023), which initiated work with the British Standards Institute (BSI) to create a set of independent standards against which codes and standards can be evaluated. Both of these initiatives contain market governance principles, but neither go as far as many of the international initiatives upon which they build. To date, there has been no systematic analysis of market governance principles that have been proposed, nor is there any consideration of the wider policy and governance needed to implement these principles at a national scale. This is important, because without national policy oversight, international voluntary initiatives alone are unlikely to prevent the operation of low-integrity schemes, or ensure these markets deliver wider public benefits appropriate to the jurisdictions in which they operate. This paper therefore:

1. Provides the first comprehensive overview of UK compliance and voluntary carbon and other ecosystem markets alongside the first analysis of relevant ecosystem market actors;
2. Conducts a comparative analysis of existing national and international principles, identifying 14 core principles for governance, measurement, reporting and verification, and delivering wider benefits of high-integrity ecosystem markets that could be applied by relevant market actors to the range of ecosystem markets identified in the UK;
3. Proposes how these principles could be applied in an ecosystem markets governance hierarchy, showing policy, governance and market mechanisms

and infrastructure that are being developed to implement the proposed principles in the UK; and

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2 Methods

Research was conducted over a two year period from 2021-2023 to support ecosystem markets policy development across the UK, using a mixed methods approach that combined comparative analysis of ecosystem market documentation and a professionally facilitated workshop to collect primary data on market actors. The research started with a narrative review of ecosystem markets currently operating in the UK, to provide an overview of the market context, prior to identifying and analysing relevant market actors. This context is then used to discuss a comparative analysis of international and national market principles, and how they could be applied to develop high-integrity ecosystem markets in the UK and similar countries.

2.1 Identifying UK ecosystem markets

A narrative review of grey literature was conducted to identify compliance and voluntary carbon markets, and other ecosystem markets currently operating in the UK. Narrative reviews are scholarly summaries that combine interpretation and critique (Petticrew et al., 2013; Greenhalgh et al., 2018). Narrative reviews are better suited than systematic reviews for topics or questions where it is not possible to identify specific interventions or outcomes (Greenhalgh et al. 2018). Moreover, it is difficult to conduct a systematic review of peer-reviewed literature on ecosystem markets as they have been proliferating rapidly in recent years and are currently under-represented in the literature. For the purposes of this review, ecosystem markets were defined after Wunder (2015) as codes, standards or schemes where ecosystem services are bought and sold in voluntary transactions, providing assurance of the delivery of services.

Peer-reviewed literature on UK ecosystem markets was sought via the following searches, performed via Google Scholar, sorting for relevance: "ecosystem market*" AND UK; "nature market*" AND UK; "natural capital market*" AND UK; "payment* for ecosystem services" AND UK; "carbon market*" AND UK; and "biodiversity market*" AND UK. However, other than our former work on UK ecosystem markets (Reed et al., 2022), there were no other peer-reviewed papers about voluntary carbon, biodiversity or other ecosystem markets operating in the UK. Instead, papers tended to be general or global in scope and did not contain information specific to UK

ecosystem markets (e.g. Kroeger and Casey, 2007; Hein et al., [2013](#); Teytelboym, 2019), about privatisation of ecosystem services rather than ecosystem markets (e.g. Bakker, 2005), about pilot programmes and feasibility studies rather than operational markets (e.g. Ferreira, 2017; van den Burg et al., 2022), about. The exception was peer-reviewed literature on the compliance market, Biodiversity Net Gain in England, this literature and was included in the review.

For this reason, grey literature from Google Scholar searches was supplemented with literature from projects funded in two investment readiness schemes by the English (the Environment Agency's Natural Environment Investment Readiness Fund) and Scottish governments (NatureScot's Investment Ready Nature Scotland fund), as these were designed to stimulate the development of new markets across the UK. A "snowball sampling" method was then used to identify missing markets from investment readiness project teams and relevant policy teams in Scotland and England, until no new markets were found. Despite reaching this saturation point, it is however possible that some markets may have been missed.

2.2 Analysis of UK ecosystem market actors

Based on the range of UK ecosystem markets identified in the first stage of the review, the second goal was to identify relevant actors who could stand to win or lose from, shape or facilitate these markets. An online workshop was facilitated in May 2022 to collect data with Scottish Government officials and researchers familiar with the range of interested actors interacting with ecosystem markets in Scotland and across the UK. The workshop lasted for one hour, with participants writing comments simultaneously into a shared spreadsheet. It started with an introduction to the method by the facilitator, followed by a discussion to establish the boundaries of the analysis. This included the range of ecosystem markets to be included (which was based on the analysis in 2.1 above) and the geographical focus. The geographical focus was the whole of the UK, given the scale that these markets operate at, despite the fact that the workshop was funded by Scottish Government (hence the inclusion of only Scottish policy officials). To correct this bias, the four officials were supplemented with four researchers from Scottish institutions who had experience working across UK ecosystem markets.

For each market actor identified, participants could also add additional information they felt might be relevant, using Reed et al's (in prep.) interest-influence-impact method for analysing relevant parties. Participants were invited to check each other's work, filling gaps in knowledge and offering alternative perspectives where relevant. They were also asked specifically to consider 'hard-to-reach' groups that may have been missed from the analysis. They were also invited to suggest categories within which individual organisations could be grouped. Where organisations had more than one interest in high-integrity ecosystem markets, their primary interest was

used, for example RSPB develops nature-based solutions projects, some of which supply carbon offsets, but given the breadth of their interests across the natural capital policy agenda and their primary functions, they were classified as an environmental NGO, rather than a project developer/offset provider. Participants then continued to input to the analysis online, filling gaps where possible, completing the data collection phase within two weeks of the workshop.

2.3 Identifying ecosystem market principles relevant to the UK

Next, we sought to identify principles for the development and operation of high-integrity ecosystem markets that could be applied to the UK, and help guide the development of policy and governance mechanisms. Previously published UK and international ecosystem market principles were identified using a “snowball” sampling method with policy officials in Scotland and England, and the British Standards Institute, until saturation was reached and no new documents containing market principles could be identified. The following sources were identified as being relevant to the UK:

- UK sources:
 - Defra’s Nature Markets Policy Framework (Defra, 2023);
 - Scottish Government’s Interim Principles for Responsible Investment in Natural Capital (Scottish Government, 2022a); and
 - The design of the UK’s two most mature voluntary carbon markets, the Peatland Code version 2.0 (IUCN UK Peatland Programme, 2023) and the Woodland Carbon Code version 2.2 (Scottish Forestry, 2022).
- International sources:
 - Integrity Council for the Voluntary Carbon Market (ICVCM)’s Core carbon principles consultation document (ICVCM, 2022);
 - Voluntary Carbon Markets Integrity (VCMI) Initiative’s Provisional Claims Code of Conduct (VCMI, 2022);
 - Science-Based Targets Initiative (SBTi)’s Corporate Net-Zero Standard Version 1.0 (SBTi, 2021);
 - Greenhouse Gas Protocol’s Corporate Accounting and Reporting Standard (GHG Protocol, 2023);
 - An international comparative analysis of 12 agricultural soil carbon codes and standards (Black et al., 2022);
 - Unpublished international comparative analyses (based on Black et al.’s (2022) analytical framework) of three agroforestry and six saltmarsh codes and standards, funded by the Environment Agency’s Natural Environment Investment Readiness Fund; and
 - An unpublished international comparative analysis of approaches to measuring biodiversity in 25 biodiversity codes and standards, funded by NatureScot’s Investment Readiness for Nature Scotland scheme.

The analysis was conducted by the lead author and proceeded via the following steps:

1. Principles were extracted from each document and analysed thematically, grouping similar principles together;
2. Principles were screened for relevance to the UK context, removing principles that were not applicable in terms of their biophysical or cultural context e.g. around working with first nations or indigenous groups;
3. Thematically grouped principles were then assessed qualitatively to identify each of the different concepts they contained, creating one point per concept (the bullet lists in Table 2). These individual points were then aggregated into a single summary point, which was then further condensed to form a single principle per thematic group, in the left-hand column of Table 2.

3 Results

3.1 UK ecosystem markets overview

The UK has a compliance carbon market, the UK Emissions Trading Scheme, regulated by law that requires participants to comply with emissions reduction requirements. The UK can also engage with international voluntary carbon markets to meet its obligations under the Paris Agreement (the rule book for this was agreed under Article 6 at COP26). England operates a number of other compliance markets for biodiversity and water pollution (Figure 1). Although compliance carbon markets are reserved, Scottish Government and the UK's two other nations, can develop their own compliance biodiversity markets and have jurisdiction over voluntary carbon and other voluntary ecosystem markets operating in their jurisdictions. However, although regulatory oversight of these markets is devolved, requiring projects to be developed in line with regulations in each UK jurisdiction, they operate as national markets accepting investment from companies based anywhere in the UK (some of the emerging markets also accept overseas investment).

It is therefore important to recognise the potential for regulatory divergence between different nations within the UK, where legislation from each country may make unique demands on these markets. Concerns have been raised about the potential for new taxes on ecosystem markets to distort the market (e.g. favouring investment in parts of the UK with lower taxes), and discussions are ongoing with HMRC and UK Treasury on taxes that may apply to landowners, project developers and retail aggregators who buy and sell on carbon credits, as well as companies who 'hold' credits on their books and how this is viewed in tax terms. Market distorting effects may also arise from mechanisms being considered to protect or share benefits with communities from natural capital markets in Scotland, if not adopted elsewhere in the UK. These are outlined in the recent "land reform in a net zero nation" consultation paper, in preparation for a future Land Reform Bill and a Community Wealth Building Bill, and include public interest tests for transfers of large-scale land holdings and community wealth funds (Scottish Government, 2022b).

The majority of voluntary carbon market transactions in the UK take place via the Woodland Carbon Code and the Peatland Code. Version 2.0 of the Peatland Code extends operation to lowland fens and wetland agriculture on lowland peats, and projects funded by NatureScot's Investment Ready Nature Scotland fund are currently exploring the integration of biodiversity and community benefits with the Peatland Code (NatureScot, 2022b). In addition to this, a number of initiatives are underway to develop new carbon codes to expand the domestic voluntary carbon market in the UK, including:

- The Wilder Carbon Standards were developed by Kent Wildlife Trust to enable the generation of carbon credits from rewilding activities including woodland creation via natural regeneration, peatland restoration, pond

creation and saltmarsh creation. Funded by the Environment Agency's Natural Environment Investment Readiness Fund (NEIRF), the standards contain no standardised approach to measurement, reporting and verification (MRV), with MRV for individual projects reviewed on a case-by-case basis, and requiring the collection of biodiversity data using Defra's biodiversity offsetting metric. In contrast to other UK domestic carbon markets, Wilder Carbon requires buyer checks to ensure those investing in projects have done everything possible to reduce emissions at source before offsetting their residual emissions. It also has unusually long minimum contract lengths of 100 years, or 50 years with conservation covenants that would ensure projects are effectively permanent;

- Recommendations for a UK Saltmarsh Code were made by a recent NEIRF funded project. An initial feasibility study assessed whether Verra's VM0033 Methodology for Tidal Wetland and Seagrass Restoration could be applied in the UK. This concluded that although VM0033 could be applied to saltmarsh restoration via managed realignment in the UK, it would not be commercially viable due to high upfront costs compared to the costs of developing projects under existing UK Codes for peatlands and woodlands. For this reason, the project made detailed recommendations for a UK Saltmarsh Code, focussed purely on managed realignment and aligned with existing domestic voluntary carbon markets and forthcoming UK market principles and governance;
- The development of a Hedgerow Code is being led by the Game and Wildlife Conservation Trust's Allerton Project, funded by NEIRF. While its initial development will focus on carbon in above ground biomass and soils, projects will also monitor biodiversity benefits;
- An Agroforestry Code is being developed by the Soil Association in collaboration with the Woodland Carbon Code and others, funded by NEIRF, for integration with the Woodland Carbon Code. It will include both above and below-ground carbon sequestration. Given that hedgerows are a form of agroforestry and the existing market penetration of the Woodland Carbon Code, this may also be an important route to market for hedgerow carbon;
- Adur District & Worthing Borough Councils were also awarded NEIRF funding to explore carbon market opportunities for sea kelp restoration and Plymouth City Council are exploring carbon markets for sea grass, which may lead to the development new domestic market blue carbon markets;
- There are a number of carbon capture technologies now coming to market, with the European Biochar Certificate available for UK projects and new biochar and enhanced weathering credits being developed by Puro Earth;
- Although not immediately identifiable as Codes, there are a number of new companies now competing with the two established Codes for woodland and peatland carbon. Each of these have the governance and MRV components you would expect to see in a Code, although they are not all fully transparent, and some companies combine project development, standards and registries

within the same operation instead of using independent verification and registries;

- Finally, there are a large number of companies now offering agricultural soil carbon credits. These too are not always full transparent and sometimes integrate functions that are traditionally separated to avoid conflicts of interest. However, a number of these companies are planning to use Verra's VM0042 Methodology for Improved Agricultural Land Management. Another NEIRF project proposed minimum requirements for agricultural soil carbon codes, which if adopted by BSI could bring more consistency and rigour to the agricultural soil carbon market.

In addition to the voluntary carbon market, there are several other ecosystem markets at different stages of development in the UK, for example:

- Biodiversity net gain is a compliance market that mandates a 10% net gain in biodiversity from development under the Town and Country Planning Act 1990 in England (Defra, 2023b). Developers must first try to avoid habitat loss, but if this is not possible then they must create habitat either on-site or off-site. If neither of these options are possible, they must purchase statutory credits from the government, generated from habitat creation elsewhere in England. The introduction of the scheme was controversial, as it attempted to balance the simplicity and certainty demanded by the market with the complexity of the ecology and the need to ensure the ecological integrity of offsets (Gordon et al., 2015; Lockhard, 2015; Sobkowiak, 2020), leading to multiple revisions of the biodiversity metric in the years since its launch. There are plans for a similar system in Scotland and Defra are also developing Marine Net Gain that will work in a similar way to Biodiversity Net Gain, and require all in-scope developments to leave the environment in a better state than before (Defra, 2022);
- Nutrient neutrality is another compliance market operating in England in which developers must ensure that any increase in pollution arising from a development is offset by a reduction in pollution in the same area, for example through the creation of new wetlands or woodlands to capture nutrients (Natural England, 2022);
- Plan Vivo are a UK-based company operating in the voluntary biodiversity market, and consulting on the introduction of a biodiversity standard, "PV Nature" that could operate in the UK (Plan Vivo, 2023a). They have already piloted the code in seven sites, including one in the UK to restore and improve management of saltmarsh, seagrass, oyster habitat and seabird nesting habitat. There are a number of other companies offering voluntary biodiversity credits in the UK, but without transparent standards;
- The Forestry Commission is exploring the potential to introduce a Woodland Water Code, which would provide a standard and new market for water-related benefits from woodland creation, including pollution mitigation, reducing flood risk and maintaining river flows (Defra, 2023a);

- Water quality markets tend to be regional rather than focus, based on payments for catchment management by water companies to farmers to change management to reduce diffuse water pollution, leading to reduced water treatment costs. For example, EnTrade is a Wessex Water business that pays for catchment management solutions that provide biodiversity gain, carbon sequestration and natural flood management, alongside nutrient mitigation (EnTrade, 2023);
- Landscape Enterprise Networks (LENs) can integrate payments from multiple voluntary ecosystem markets alongside other benefits sought by regional investors, such as reducing climate risks to infrastructure or supply chains, for example via natural flood management. Existing LENs have included payments for animal welfare and sustainable land management to protect the quality of milk supplies and payments from water companies for catchment management (Reed et al., 2021).

3.2 UK ecosystem market actors

Over 200 stakeholder organisations and groups were identified across 11 main categories in the analysis (Figure 2). Table 1 provides an overview of each category including examples of organisations and groups in each category and sub-category. Due to the sensitivity of some of the information collected about some stakeholder organisations, only summary information is presented here. The examples in Table 1 reflect the Scottish focus of the analysis (see methods). Categories with significant numbers of different organisations included (in descending order):

- Nature-based solutions project developers and offset/inset providers;
- Environmental/sustainability NGOs, thinktanks and representative organisations; and
- Landowner/manager NGOs, thinktanks and representative organisations.

Although fewer than ten organisations or groups were identified in a number of categories, these included important market actors, for example government departments and agencies (of which only a limited number have direct interests in natural capital and ecosystem markets). Some categories with apparently limited numbers of different actors were groups rather than organisations, where there are a limited number of representative organisations (e.g., tenant farmers).

3.4 Principles for the design and operation of high-integrity nature markets

A range of sources were identified that proposed principles that could be used to define and/or govern high-integrity nature markets. These were systematically analysed to identify themes, which were summarised to generate synthetic

principles. Table 2 lists each of the principles that emerged from this analysis in three categories:

1. Governance principles;
2. Measurement, reporting and verification principles; and
3. Wider benefits principles.

In each case, the principle, is followed by a summary of more detailed points drawn from across the sources. Although the majority of the principles apply to the design and operation of codes and standards, a number of them also require engagement from other market actors. As such, the principles are aimed at:

- Governments and their agencies;
- Other governance bodies and mechanisms such as the UK Accreditation Service and the British Standards Institute;
- Codes and standards operating across multiple nature markets, including carbon, biodiversity, water quality and flood risk among others;
- Project owners and developers; and
- Investors.

To apply these principles, these different market actors will need to develop a range of policy, governance and market mechanisms, and these are discussed next.