

## Understanding values beyond carbon in the Woodland Carbon Code in Scotland

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### ABSTRACT

Many governments and organisations are encouraging carbon dioxide capture in woodlands through the creation of markets that commodify forest carbon. These schemes can connect different values in local landscapes and global environmental responses to climate change, which go beyond increasing the cost-effectiveness of carbon offsetting. In this paper we use the UK Woodland Carbon Code (WCC) to explore the values and meanings brought to the WCC by landowners, forest developers and carbon buyers, with a focus on Scotland. Our analysis presents quantitative and qualitative evidence of different values coexisting among the participants of the WCC, accommodating both conservation oriented woodland expansion projects and those driven by income diversification. The former mainly use non-commercial native broadleaf species and the latter combine commercial non-native conifer plantation with different levels of native broadleaves whilst remaining non-viable economically. WCC participants convey different values and meanings of forest carbon, transcending commodity value as tradeable offsets to encompass other environmental and social outcomes. We argue that the WCC works by encoding and enabling the exchange of different values, which for proponents is a positive feature that captures the diverse co-benefits of woodland. Critics of carbon offsets, meanwhile, may see these shifts in value as a form of greenwashing that benefits carbon buyers. We argue that research into the effects of carbon offset schemes should incorporate both material and symbolic processes that go beyond carbon itself.

### 1. Introduction

The Woodland Carbon Code (WCC) is a UK voluntary market scheme that transfers finance from organisations wishing to offset carbon dioxide (CO<sub>2</sub>) equivalent emissions to landowners who plant new woodlands. These trees will capture carbon dioxide in the atmosphere as they grow. The Code, launched in 2011 by the UK Forestry Commission and now operated across Scotland by Scottish Forestry<sup>1</sup>, allows woodland projects to be assessed in a common framework that enables carbon units – equivalent to a metric tonne of CO<sub>2</sub> sequestered in a WCC-verified woodland – to be issued by UK carbon buyers to report against UK-based emissions or used in claims of climate neutrality<sup>2</sup>. As

such it is one of an increasing number of schemes worldwide that build on the Kyoto Protocol to encourage the capture of CO<sub>2</sub> through the creation of (mainly voluntary) markets (Donofrio et al., 2021) that commodify forest carbon into individual units to trade (Mahanty et al., 2012; Dalsgaard, 2013). These schemes can transcend decisions driven narrowly by cost-effectiveness maximisation objectives to connect different forms of value in local landscapes and global environmental responses to climate change.

In this article, we use the Woodland Carbon Code to explore the ways that carbon offset schemes enable shifts in value between different forms. Examples might be from the monetary value of carbon units sequestered as agreed between the project developer and carbon buyer,

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<sup>1</sup> Scottish Forestry is an agency of the Scottish Government with responsibility for forest policy, support, and regulation (<https://forestry.gov.scot/>).

<sup>2</sup> Note that the WCC is restricted to only UK-based companies, which can make claims about carbon sequestration benefits either if they have purchased pending issuance carbon units or verified carbon units from a WCC project in the UK or have established a validated WCC project on their own land or land they control.

to the value of biodiversity, community engagement in nature, or job generation or monetary revenues, all of which may be recognised in different ways, quantified or not. From this perspective, a code is not simply a set of guidelines or rules to follow but a way of encompassing economic valuation and social values (Graeber, 2001). In this sense it is closer to a linguistic code of signs and symbols that allow for reinterpretation and shifts of meaning.

For critics of carbon offsetting, these shifts can be a problem, creating value for companies or organisations in ways not directly linked to carbon sequestration (Shrestha et al., 2022; MacAfee, 2022). This opens accusations of ‘greenwashing’, or profiting from the appearance of contributing to environmental goals. For proponents, however, such value shifts can be a source of creative opportunity to achieve multiple benefits. Assessing carbon offsetting schemes therefore depends in part upon whether and how diverse forms of value should be recognised. We argue that in our case study of Scotland correspondingly diverse landscapes are emerging from the different approaches that various participants have.

In the Woodland Carbon Code, networks are created between landowners, forest developers and carbon buyers, and sometimes these may incorporate communities in which new woods are grown too. Buyers can make choices about where they buy carbon units from, depending on what they are seeking to gain from the scheme (restricted to or going beyond carbon units). Cumulatively, the WCC is leading to changes to the landscape of the UK, and in particular in Scotland, which provides the greatest amount of carbon units in the WCC amongst UK nations. In this paper we present an empirical quantitative analysis of how WCC projects are affecting the Scottish landscape, according to the size of the project and type of trees being grown, and to describe the main characteristics of the stakeholders involved in this code. We then explore through qualitative research values and meanings brought to the scheme by participants and the ways it enables connections between participants to be made. Finally, we ‘decode’ the WCC to explore how values are created and enacted in a response to both global climate change and sustainable local landscapes challenges.

There have been few studies that combine a quantitative study of the changing landscape created by a carbon offset scheme with a qualitative assessment of the values manifested by those involved (e.g., Mahanty et al. 2012, Aggarwal 2020). Frewer (2021) usefully distinguishes between ‘up-stream’ research on the technical processes of carbon accounting and research on the livelihoods and ecologies of those involved in specific projects. He argues that both are necessary to fully understand the creation of value in carbon units, which ultimately are neither fully material nor simply social constructions, but emerge as ‘packages of technical and affective claims’ (2021:2). We also draw on Dalsgaard’s ethnographic approach to carbon valuation (Dalsgaard, 2013, 2014, 2022), which provides a focus on the actual meanings and actions created through these processes and their experience for those involved. This paper applies these insights at the scale of a national voluntary carbon market scheme that encompasses a range of subject positions, values and landscape outcomes.

### 1.1. Understanding values in carbon offsetting markets

The premise of our research is that economic valuation sits within wider values that encompass relations with society and the environment, and we need ways to understand this articulation. Exploring the embeddedness of economics within wider society has been a key concern for over a century in social anthropology. Marcel Mauss argued that forms of gift exchange create social relationships, in that when exchange happens the gift cannot be fully dissociated from the giver (Mauss, 1954). Although Mauss contrasted the tribal societies from which his examples were drawn to ‘modern’ societies based on notions of markets and individual profit maximisation, substantivist approaches to economic anthropology have continued to explore the connections between economic and cultural aspects of value, including the creation

of social relationships, in a range of societies (Otto and Willerslev, 2013). Understanding how culture, environmental values, and social relations affect economic values and decisions has been important in economics also (Granovetter, 1985; Prior, 1998).

In an attempt to reconcile different senses of value in social science, Graeber (2001: 2-3) notes that value in the sociological sense conveys what is ‘ultimately good, proper, or desirable in human life’, while in economics it refers to ‘the degree to which objects are desired’ measured by how much individuals are willing to give up for them (their ‘willingness to pay’). Drawing from structural linguistics meanwhile, value marks the ‘meaningful distinctions’ that can be made between words or objects (*ibid.*, 14). Yet Graeber argues that such differences are not neutral and the way that value entails action, in mobilising the desires of those who recognise it is important (*ibid.*, 105). This approach draws attention to the active relationships within which values emerge, including between people and between people and environments (Vergunst, 2016). For our purposes then, while valuing (as a process) and values (as an outcome) are neither intrinsic nor immutable, they do provide an entry point for exploring both meanings and the worth of carbon markets for those who take part in relationships generated by them.

Taking social and shared values into account is also an issue in discourse around ecosystem services, which organises much public policy and debate in this area (e.g. IPBES 2019). Kenter et al. (2015) point out that the Payment for Ecosystem Services (PES) paradigm tends to focus on individuals’ willingness to pay or other forms of economic analysis. Carbon markets are an instance of PES, in that finance from the carbon buyer helps landowners plant trees to store carbon dioxide from the atmosphere. What we explore here instead are the ways that schemes such as the Woodland Carbon Code act as encoding devices that take different kinds of values, including social, economic and environmental, and enable exchange between them. Making different forms of value commensurate across different material and spatial domains is a key aspect of carbon markets. From this perspective, such markets are not simply an example of environmental economic valuation in the sense of measuring the preferences of people for an environmental good or against an environmental bad’ (Pearce, 1993: 13). We argue that they can enact more complex encoding and decoding of varying value systems. Kenter et al. (2015, 87) distinguish between valuation, as the formal process of generating knowledge about the value of ecosystems, and valuing, as an informal and largely implicit process. Both are important in the way carbon markets work, through mechanisms that we go on to discuss in the example of the WCC in Scotland.

### 1.2. Additionality, quantification and verification of carbon units

A key concept in carbon markets is additionality (Valatin, 2012). This refers to the requirement within offsetting schemes for projects to demonstrate benefits beyond those which would have occurred in the scheme’s absence. As a WCC manager indicated to us in practice, this means that ‘in the absence of the carbon market, these trees would not have been planted’. Additionality functions in carbon markets in a variety of ways, however, and these are categorised by Valatin into *environmental additionality* (e.g. greenhouse gas emissions are reduced compared to a baseline level, or that trees would not otherwise have been grown or regenerated), *legal, regulatory and institutional additionality* (e.g. greenhouse gas benefits exceed those already required), and *financial and investment additionality* (e.g. the woodland project would not be financially viable without funds generated through the carbon market) (Valatin, 2012: 446-449).

The WCC contains aspects of all of these, and Valatin’s analysis can be extended by connecting the dimensions of additionality with values held amongst the various participants in the WCC. There is potential for tension in the different forms of additionality in carbon markets between environmental, legal and economic pressures. Together, these values-as-motivations, comprising cultural and ethical values in the sense of

shared norms, attitudes, beliefs and morals could be contrasted with value in the sense of quantitative monetary worth or ‘exchange value’. However, in keeping with our perspective on value, our focus is on the translation of meanings that occur in carbon markets.

Underlying additionality are two further processes that are intrinsic to the creation of carbon as a tradeable entity and the coding work done by carbon market schemes. Firstly, carbon must be quantified, which means calculating the amount of carbon units predicted to be stored through a sequestration scheme, following specific WCC standards and calculation tools (WCC, 2021). Secondly, the resulting unit of carbon must be independently verified by accredited third parties, to demonstrate that they have sequestered the carbon that was claimed. This means that there are commonly two tradable kinds of carbon offsets being transacted on the market, often known as ‘ex-ante carbon’ (Pending Issuance Units in the WCC terminology) and ‘ex-post carbon’ (Woodland Carbon Units in the WCC) (Arnoldus and Bymolt, 2013: 41-42). Ex-ante carbon refers to carbon units based on estimates of future carbon sequestration after initial quantification, whilst ex-post carbon are units that have been verified according to the standards of the scheme.

Quantification and verification function in the carbon markets by ‘sorting’ the carbon from the trees, without trees or carbon being materially moved at all. As discussed later, carbon units that are sold (before or after verification) can potentially become personalised and may link buyers and sellers together through shared values. Often, market exchange coexists with tailored or what are sometimes described as ‘charismatic’ carbon units that represent different types of values (e.g. biodiversity enhancement, environmental and social responsibility, links with the community) (Lehmann, 2019, Wang and Corson, 2015).

There is however by no means a consensus on the appropriateness of these shifts in value, and this is one of a number of grounds for criticism of carbon offset schemes that have continued to surface in recent research and wider public discourse. These include accusations of greenwashing and concerns about the ability to demonstrate additionality, the permanence of carbon sequestered, and adequate monitoring, as well as the overall morality of carbon offsetting (e.g. Shrestha et al. 2022, Dalsgaard 2022). A question to emerge is how a scheme like the WCC can hold different value positions together, and whether doing so is an adequate response to those that argue against carbon offset schemes on principle or in practice. We return to these criticisms in more detail through our findings and in our discussion.

## 2. Methodology

This research was conducted using both quantitative and qualitative methods. In so doing we recognise the importance of interdisciplinary research on interactions of human and landscape systems and the processes that influence them (Lach, 2014). To explore the scope and scale of WCC projects we present and analyse quantitative information publicly available in the UK Land Carbon Registry (IHS Markit)<sup>3</sup> for WCC projects in Scotland, and a database provided by WCC managers that summarises the main characteristics of WCC projects registered in the UK. These databases cover all WCC projects registered since the beginning of the programme in 2011 until December 2020. Our data analysis is mainly descriptive, with attention to changes in the type of woodlands, distribution of species and management patterns in Scotland. We consider the project registry general details as well as specifics including carbon calculation template spreadsheets available for 209 WCC projects. These latter include data on the specific type of trees and number of trees planted, plantation area, the species share in the woodland mix, and predicted carbon units over the project time life span.

We also examined Project Design Documents (PDDs), which are

documents that are completed by project developers when they sign up to the WCC. They include the aims and objectives of the project and expected benefits besides carbon. PDDs are uploaded to the UK Land Carbon Registry once projects have reached a validation stage, which will occur up to a maximum of two years after the project was registered. Therefore, many of the newer projects that are under development do not have a PDD available. In total, we accessed 171 PDDs representing individual projects. The information contained in the PDDs is not uniform, with some documents reflecting more information than others, and therefore this information may not be a full representation of the values that exist in the scheme. We use this information to identify the additional environmental, social and economic co-benefits that the projects expect to render in addition to carbon units.

Our qualitative research draws on 25 interviews (Table 1) and document analysis. We interviewed both key informants including WCC managers (2) and representatives of the forestry industry (1). Our strategy for recruiting other interviewees involved creating a database of landowners<sup>4</sup>, forest developers and carbon buyers based on information recorded in the UK Land Carbon Registry by December 2020. These stakeholders were classified using *ad hoc* categories that provide an idea of the type of organisations (i.e. charity, business) or named

**Table 1**  
Classification of WCC stakeholders and interviewees.

WCC stakeholder types	Number of stakeholders (N)			Interviewed	
	Identified N <sup>(1)</sup>	Contacted N	Share (%) <sup>(2)</sup>	N	Response rate (%)
<b>Landowner<sup>0</sup></b>	<b>132</b>	<b>31</b>	<b>23</b>	<b>7</b>	<b>23</b>
Charity	24	4	17	3	75
Community land	3	2	67	0	0
Individual named landowner	38	8	21	0	0
Private firm/corporation	34	16	47	3	19
Public organisation	10	1	10	1	100
<b>Forest Developer</b>	<b>37</b>	<b>35</b>	<b>95</b>	<b>7</b>	<b>20</b>
Carbon specialist	3	3	100	3	100
Charity	4	4	100	0	0
Conservationist firm	3	3	100	1	33
Landowner/manager	8	6	75	2	33
Other	2	2	100	0	0
Rural surveyor	3	3	100	0	0
Traditional forestry firm	14	14	100	1	7
<b>Carbon Buyer</b>	<b>245</b>	<b>100</b>	<b>41</b>	<b>8</b>	<b>8</b>
Large (>250 employees)	63	32	51	1	3
Medium-large (50-249 employees)	42	21	50	2	10
Small-Medium (10-49 employees)	44	22	50	4	18
Micro (1-9 employees)	39	21	54	1	5
Size unknown	57	4	7	0	0
<b>Other</b>	<b>3</b>	<b>3</b>	<b>100</b>	<b>3</b>	<b>100</b>
WCC managers	2	2	100	2	100
Forest industry representative	1	1	100	1	100
<b>Total</b>	<b>169</b>	<b>169</b>	<b>100</b>	<b>25</b>	<b>15</b>

Notes: (1) Total number of different individual stakeholders identified through the UK Land Carbon Registry up to December 2020. (2) Estimated share (in percentage) with respect to the total number of individual stakeholders identified.

<sup>3</sup> For more information, see: <https://www.woodlandcarboncode.org.uk/uk-land-carbon-registry>.

<sup>4</sup> For landowners this list only includes contact details for projects registered before the personal data protection legislation entered into force (in 2018). Our data for landowners was expanded significantly with the addition of a database provided by a WCC manager, however this data was added after conducting interviews with landowners.

individuals participating in the WCC scheme. We distinguished four types of firms participating as Forest Developers; traditional land-based firms such as Forestry businesses; Rural Surveyors; Conservationist firms; and a new category we call 'Carbon Specialist'. The latter refers to firms created to respond to woodland expansion for carbon opportunities. In the case of carbon buyers, we used additional data sources such as the UK government company information site, social media (e.g. LinkedIn), and buyers' corporate websites to retrieve contact data and to characterise the type and size of business in terms of the number of employees (Table 1).

We contacted all landowners and developers with contact details within the database, and sent a single reminder after one to two months to those stakeholders that did not respond. In the case of carbon buyers, we contacted a random selection of 100 carbon buyers, and likewise we sent a reminder within two months after they were first contacted. We acknowledge that there would be self-selection bias in those landowners, forest developers or carbon buyers who chose to participate. For example, charities had a high response rate, whilst private landowners (estates) had a lower response rate, even though we ended up with three of each (Table 1).

Amongst our key informants were those involved in WCC management (Scottish Forestry), a representative from the UK Confederation of Forest Industries (Confor), and the most significant developers, some of whom also have roles in the operation of the Code (e.g. Forest Carbon). These participants provided information on the history of the scheme and current management issues.

Our interviews were semi-structured, with an initial set of questions shared in advance with the participants. For each stakeholder group questions were slightly different to accommodate their respective positions. Landowner questions aimed to understand their interest in participating in the scheme and their values around and beyond carbon, as well as their general experiences and thoughts using the WCC, selling their carbon and their thoughts on carbon buyers. Developers occupy a middle position between landowners and buyers, and questions were designed to understand both the developers' perspectives (why they are using the WCC, their experiences of using it), as well as their experience helping landowners to join the scheme, their insights into different landowner motivations and experiences, and their interactions with buyers mainly when seeking to sell carbon. Buyer questions sought to understand their motivation for offsetting using the WCC, their additional interests beyond carbon, their experience of buying carbon and their general knowledge and experiences of using the WCC. Questions were also to some extent tailored to the specific person or organisation. For example, before an interview data derived from PDDs (e.g. the type of woodland being planted, general and specific stated goals) were consulted so that motivations and values could be better understood during the course of the interview. Interviews gave room to pursue other lines of inquiry as they arose; a common approach in social sciences (Davis, 2009). Interviews lasted one hour, with the option for the informant to ask questions before and afterwards.

Analysis took place collectively through transcription of interviews, then sharing transcripts and summaries amongst the project team, with discussions to identify key themes and shared writing. All interviews were conducted online due to COVID-19 restrictions, and explicit participation consent form was sought following ethical standards for conducting research with human participants and UK personal data protection rules.

### 3. Linking WCC forests to stakeholders' objectives and values

Although offsetting carbon is, from the point of view of Scottish Forestry, the main purpose of the WCC, the objectives and values of the various stakeholders involved can influence the types of woodlands being planted. This is intentional, and a representative of Scottish Forestry explained to us how additional values (beyond carbon) are incorporated into the scheme. Arguing that 'buyers do want to know

about these wider benefits', they explained how criteria for measuring benefits to wildlife, water, the community, and the economy are incorporated into the Project Design Document. They went on:

'Ideally, the projects would be using that to help them sell their carbon. So when buyers come to look at whether they buy from here or here, they are looking at not just is it a ton of CO<sub>2</sub>, but is it close to my factory? Is it close to my distillery, as the distilleries bought recently? Can my staff go visit it? Is it close to my customer base? Could my customers go visit it? Is it the type of woodland that accords with our values?'

(Interview, Scottish Forestry, WCC management)

In this section we explore the ways that such values become enacted in forest landscapes. Two lines of evidence are presented: first, the different types of woodland promoted by either more conservation or more income-diversification oriented stakeholders, and second, changes and trends in different tree species in the woodland mix. We discuss how the WCC is being adopted in response to different stakeholder values and interests. This is partly connected to debates about what is genuinely 'additional' new planting in the environmental and financial senses described by Valatin (2012), but also opens onto questions about forest policy more widely. Current concerns include the impacts of large-scale industrial forestry, the need to support local timber production as opposed to a reliance on imports, and the need to protect and enhance native and biodiverse woodlands - policy goals that may come into conflict with each other.

The evidence collected and presented in this section combines quantitative data for WCC projects with records in the UK Land Carbon Registry, including project characteristics (e.g. types of trees planted or management regime), location, stakeholder data, and the carbon calculation template spreadsheets as indicated in Section 2. While quantitative data provides a picture of the stakeholders participating in the scheme (see Figs. 1-3), interviews allowed us to delve deeper into the motivations of some of these participants.

#### 3.1. Forest developers and woodland types

The Woodland Carbon Code is attracting more diverse stakeholders, in particular forest developers and carbon buyers. For instance, an analysis of the projects recorded in the UK Land Carbon Registry showed

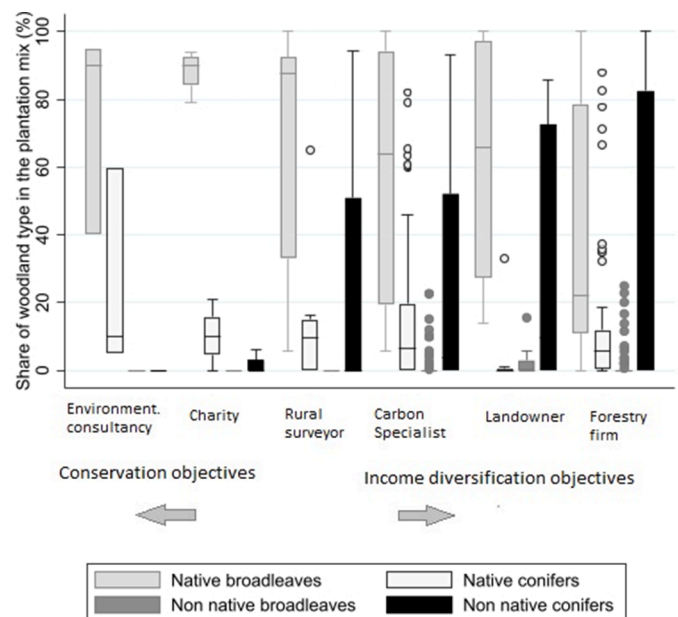


Fig. 1. Box-Plot chart showing differences in the share of type of species in the woodland plantation mix by category of forest developer. Source: Own elaboration based on 209 WCC Carbon Calculation Spreadsheets in Scotland.



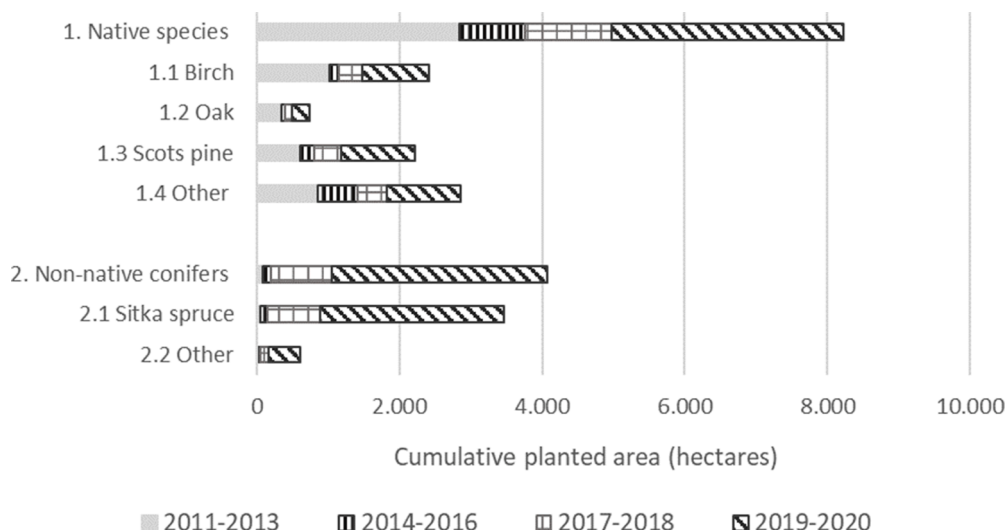


Fig. 2. Total planted area by type of species and time period in the WCC in Scotland. Source: *Own elaboration* based on Carbon Calculation Spreadsheets for 209 WCC projects in Scotland.

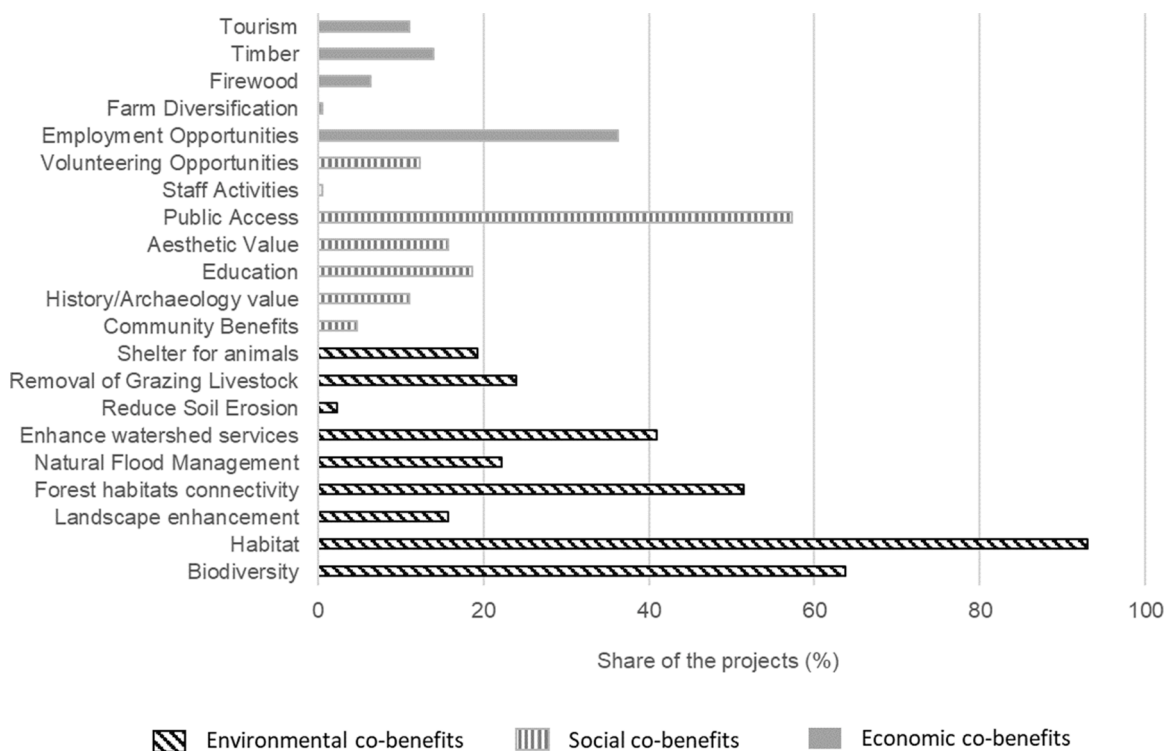


Fig. 3. Environmental, social and economic co-benefits indicated by WCC projects. Source: *Own elaboration* based on Project Design Documents (PDDs) for 171 WCC in Scotland.

that more than 70% of forest developers participating have registered a project for the first time between 2017 and 2020. By the end of 2020 there were 37 forest developers that we have classified in six main groups, ranging from more conservation to more income diversification objectives, according to the importance that native woodlands or non-native commercial plantations have in their plantation mixes (Fig. 1).

Seven forest developers fall into a primarily conservation-oriented category, comprising Charities and Environmental Consultancy who plant predominantly or exclusively native broadleaves (and were doing so before the WCC existed), with reduced or no interest in producing timber or biomass with commercial purposes. These two groups developed eight projects, which in turn account for close to 10% of the areas

of planted woodlands up to the end of 2020. According to some interviewees falling into this category, WCC funding is an important income stream for conservation-oriented woodlands. Additionally, the funding from the WCC can help these organisations to persuade other landowners to adopt similar native woodland schemes. In our interviews conservation charities argued that the financial aspects of the WCC were significant for themselves and for others interested in conservation:

‘We are doing this planting for ourselves and it’s for nature in perpetuity and it’s not an income earner from the timber point of view, so having that carbon income is really valuable to us.’

(Interview, Borders Forest Trust, Charity acting as Landowner)

‘[The WCC] is making people realise that conservation is not done for

fun or for fluffy animals. It's for producing something that will benefit their long-term financial model for most businesses.'

(Interview, Woodland Trust, Charity acting as Landowner and Developer)

The latter interviewee argues that the WCC helps provide a financial justification for nature conservation. This view is also shared by some other landowners, who see the opportunities for compensation based on the provision of ecosystem services, as an early adopter of the WCC pointed out:

'My immediate thought was: we can actually get paid for sucking in carbon. Thank the Lord for that. Somebody noticed that landowners, farmers, land managers, are providing ecosystem services that currently the market is not paying for.'

(Interview, Landowner in Scottish Borders)

Another group of forest developers, including Rural Surveyor Firms, Carbon Specialists and landowners acting as developers on their own behalf, (comprising 14 different organisations in total) seem to seek a balance between conservation and income diversification objectives. These developers still use native broadleaves widely but adding different levels of both non-native and native conifer species that are suited to produce timber (Fig. 1). Carbon Specialists comprise three organisations that have registered half of the WCC projects in Scotland between 2011 and 2020, covering 26% of the planted area. All these forest developers tend to see WCC funding as an opportunity for income from planting native woodlands. A Carbon Specialist explained how additionality calculations in the WCC mean that native woodlands are in practice favoured through the scheme over non-native commercial species with shorter land carbon storage due to harvesting:

'The only carbon score that we are interested in is the carbon that can be registered under the Woodland Carbon Code, and that is not necessarily the same thing as the total carbon that will be captured by the project, because if it's a timber producing scheme when the timber leaves the project it is lost to the project and the project can only sell up to the long term average stock on the site.'

(Interview, Forest Carbon, Developer)

Finally, a group more oriented towards income diversification is made up by Traditional Forestry companies. This group comprises 14 forestry businesses that now offer their services to landowners joining the WCC. These developers have registered 29% of the projects that also cover 29% of the total area planted in the WCC between 2017 and 2020. The relatively high share of non-native conifer woodlands, typically species of commercial interest such as Sitka spruce (*Picea sitchensis*), is key in the projects promoted by this group, with different levels of native broadleaves as accompanying species. The importance of commercial tree species within the plantation mix seems to indicate that carbon finance is being used for income-diversification purposes and extension of woodlands into less productive areas.

Risk is an important factor in decision making behind these different kinds of woodlands. Whilst carbon prices are uncertain and acknowledged by some interviewees as a risk, claiming carbon finance alongside income streams such as timber can also be a way of balancing risk. Balancing risk forms part of the current trend toward farm diversification, and some see the WCC helping to diversify farmer's income:

'The [woodland expansion] model we are looking at is where people retain their farms and diversify, putting some of their poorer grazing to woodland. This is what we ideally would like.'

(Interview, Traditional Forestry Company, Developer)

Additional opportunities that help income diversification may become relevant to the WCC in the future, such as the integration of payments for ecosystem services including carbon, biodiversity, flood control, and so on. Ideas for a Woodland Water Code or a Biodiversity Code were mentioned by some of our interviewees including WCC managers.

### 3.2. Trends in species selection and woodland management

We analysed the importance of different species in the woodland plantation mix based on the Carbon Calculation Spreadsheets for 209 projects available in the UK Land Carbon Registry by December 2020. This information has been arranged for four consecutive time periods to identify trends and changes in the type of woodlands planted. Firstly, we note a marked increase in the use of non-native commercial species such as Sitka spruce, in particular over the last two years (2019–2020)<sup>5</sup> (Fig. 2). Secondly, the area of native broadleaves has been increasing over time, though the share of this type of species has declined in the planted woodland mix over the last 4 years, from representing about 75% of the total area planted in the period 2011–2013 to about 40% of the total planted area between 2019 and 2020. Furthermore, we estimate that WCC plantations over the financial periods 2019/20 and 2020/21 as a whole represented 24% of total broadleaves and 30% of conifers newly planted in Scotland, which shows the overall significance of the WCC to forestry there.<sup>6</sup>

The largest area of native broadleaves during the early years of the WCC scheme is mainly explained by the Scottish Forest Alliance (SFA) initiative (Perks et al., 2010). SFA brought together a number of organisations, such as energy company BP (who funded the expansion), The Woodland Trust Scotland, the Royal Society for the Protection of Birds and the Forestry Commission, to pilot a large scale woodland expansion project within the WCC, which accounts for 25% of the area planted under the WCC up to the end of 2020. The scale of woodland expansion under the WCC was significantly lower in the period 2014 to 2016, nonetheless the scheme has taken a wider impulse since 2018 and is growing, increasing its contribution to the annual woodland expansion targets set by the Scottish Forestry Strategy 2019–2029 (Scottish Government, 2019). This strategy commits to increasing forest and woodland cover to 21% of the total area of Scotland by 2032 from 19% currently, with specific woodland creation targets of 12,000 ha per year from 2020/21, 14,000 ha per year from 2022/23 and 18,000 ha per year from 2024/25.

The WCC seems also to be promoting more biodiversity in woodland expansion, in terms of the number of species used in the planted woodlands. The average number of different species planted was 7.1, most of them native. Birch (*Betula pendula* and *B. pubescens*), Scots pine (*Pinus sylvestris*) and Oak (*Quercus petraea* and *Q. robur*) are part of the species mix in 76%, 72% and 67% of the projects, with average shares of 25%, 19% and 12% in the mix of projects using these species, respectively. Other native broadleaves such as Alder (*Alnus glutinosa*), Rowan (*Sorbus aucuparia*) and different species of Willow (*Salix* sp.) were used in more than half of the projects, though as accompanying species with an aggregated share lower than 4% of the tree species mix. About 42% of the WCC projects considered include Sitka spruce within the mix, with this species representing on average a 59% share of the species mix of these projects.

Another differential characteristic of WCC projects is the forest management regime (i.e., thinning and/or clear-fell, continuous cover systems, no thinning or no clear-fell (see NC State 2022 for definitions). This affects the distribution of expected carbon units and project duration. Like the observed change in species towards more commercial ones, management regimes have shifted from mainly no tree felling or

<sup>5</sup> Note that only 40% of projects with Sitka registered between 2019 and 2020 were validated by the end of 2020. The average share of Sitka spruce in the species mix of validated projects and those under development (i.e. not validated yet) is not significantly different. Therefore, we cannot assume that the projects that were under development will, in principle, not be validated because of a large share in Sitka, as projects of similar species compositions have been validated in the past.

<sup>6</sup> Estimated considering WCC UK Land Carbon Registry records and Forestry Commission (2020) statistics.

thinning regimes to continuous cover forestry (based on selective thinning) and thinning and clear-fell management regimes over the last four years. This shift was significant for conifer woodlands with more than half of the woodlands being under thinning and or thinning and clear-fell management regimes. Most of the broadleaf woodlands on the contrary are neither thinned nor felled, allowing for carbon storage in living vegetation structures for longer periods.

Despite the marked increase in commercial tree species, today WCC projects are dominated by non-commercial native species that are not felled for wood or timber, and hence are dependent on woodland expansion grants and/or carbon finance. This means that purely productive woodland (e.g. Sitka spruce monocultures) in most cases would not be able to join the scheme as the carbon units they offer are not additional (see Section 1.2). The increasing share of commercial species and more intense management regimes (e.g., thinning), suggests that some businesses might be trying to push as closely as possible to the additionality bottom line<sup>7</sup>. This may imply that some landowners and forest developers are introducing the maximum amount of productive woodland possible whilst remaining non-viable economically, in projects that include a significant share of non-commercial native species. They are therefore able to claim additionality from carbon finance and join the WCC. While the private landowners we interviewed were all motivated by wanting to diversify their businesses and improve their land as habitat, there were suggestions from others that the WCC could be used in a more direct financial way. One developer, whose company were planting a high percentage of non-native conifers through the WCC, told us:

‘We are possibly pushing a little at the boundaries of the WCC in a sense, and we’ve got to be ensuring that we are being transparent so we have to be demonstrating that we are using the Code and the potential benefits from the Code to create something that would not have otherwise been created.’

A Charity landowner also expressed concerns:

‘there is the potential for that to be abused a bit in areas where it’s not necessary to make that [planting] happen and it could just be a pocket lining exercise for people.’

It is also possible that some landowners may be leveraging WCC funding to plant more native species as a way to balance financial risk (as well as disease management, greater protection from future climatic changes, and so on), this was clearly indicated by some developers as a motivation, even though landowners did not describe their actions in these exact words. We speculate that some additional planting may reflect the values of landowners who in principle wish to plant native species, but prior to the funding of the WCC may have had to plant more commercial species to meet financial obligations, though this is speculative, and interviewees did not indicate this directly. We note below that tighter controls in this area have recently been introduced in the WCC.

#### 4. Adding value to carbon units: the multiple objectives of woodland expansion in Scotland

More than other ecosystems, woodlands (especially native woodlands) are usually seen as sources of multiple environmental benefits (Bailey et al., 2006; Keith et al., 2019), which if properly managed can deliver many benefits over time. When designing WCC projects, landowners and developers indicate expected co-benefits from their projects. Fig. 3 summarises these environmental, social, and/or economic

<sup>7</sup> Rules for the financial additionality assessment test were updated in May 2022 through simplification and standardisation of the test. These new measures may promote planting schemes that favour native and broadleaf species, along with more productive timber species, in order to justify the need for carbon payments (<https://forestry.gov.scot/news-releases/blog-new-additionality-rules-for-the-woodland-carbon-code>)

co-benefits as indicated by individual Scottish projects in their PDDs (Fig. 3).

These data demonstrate some of the values beyond carbon being considered by stakeholders. As might be expected, environmental co-benefits register strongly, for example those related to the enhancement of biodiversity and habitats are commonly mentioned (83% of PDDs), but a wide range of others including water management are mentioned by one third of projects. Social co-benefits that may be less frequently associated with woodlands are also represented. Public access approaches 60% (although this is a stipulation of new woodland creation and there is a general right of responsible non-motorised access to the outdoors in Scotland), educational opportunities in nearly 20% of projects demonstrate woodland’s association with education, and aesthetic value at around 17% shows appreciation for the attractiveness of wooded landscape. Socio-economic benefits are also well represented, such as creating jobs (close to 40%) and tourism (around 10%) as well as timber which surprisingly, given the increasing numbers of WCC woodlands producing timber, is represented in only around 17% of projects. This perhaps reflects that timber is a less attractive benefit for people to record, whilst creating jobs may be more attractive. These data show, and our informants corroborated, that carbon sequestration is an aspect of participation in the WCC, but not the whole story.

These benefits will commonly form the basis for the added value of carbon advertised to carbon buyers. Some landowners and developers are quite aware that carbon can be a ‘hook’ to attract buyers, while offering other benefits that are more difficult to measure than carbon, as this forestry consultant indicated:

‘That [tree planting] is allowing us to deliver a lot of ecological benefit on the back of that. But we do think that carbon in itself is not very exciting for them [buyers]. Carbon is really just the hook; you know [...]. We are trying to think about how we can market ourselves [...], but we do not want to be carbon salespeople. We are not really necessarily that interested in just selling carbon. What we want to sell is carbon and all the other benefits with them. But the problem is that there’s not really very good metrics for anything other than carbon. So, how do you measure the impact you are having on protected species or ancient woodland?’

(Interview, Carbon Specialist, Developer)

Our interviews with buyers demonstrated that recognition of co-benefits is certainly not limited to landowners and developers and does influence the decisions some buyers make in buying carbon. Biodiversity considerations were commonly mentioned, for instance one buyer highlighted the importance that biodiversity enhancement and ‘a good mix’ of native trees had in their company’s decision to participate in the scheme:

‘This came from our leadership team; they were quite adamant on trying to find sites that have native trees. The reasons why, I think that they just felt that it was going to be better for the land and for promoting biodiversity on the land if we could find sites that had a good mix of native trees. Trees that were obviously indigenous to the area as opposed to non-native.’

(Interview, large private company, Carbon Buyer)

Our buyer interviews sometimes conveyed an indistinct but still important sense of the benefits of native woodlands; that they were intrinsically the right thing to plant. And yet, perceptions around the added values of forest carbon offsets are not necessarily held in common. For example, not all buyers were equally interested in the value of native woodlands, and it was clear that achieving the right volume of carbon for their accounting needs was often their primary consideration. Our interviewee from CONFOR (Confederation of Forest Industries, the UK forestry trade body) also offered a contrasting view of what they described as the ‘wrapping’ of carbon within other sorts of value:

‘Wrapping is quite a good analogy because the value of the product becomes a minor part of the price, and what you are really paying for is a story about trees. Which does somewhat distort that actual carbon. [...] In theory you are paying for carbon and the amount of carbon does not

change. So if you pay five times as much for your tonne of carbon, for the story, you know you can only claim that you've offset the same amount of carbon you would have if you bought it cheap. So if your company wants to splash money on the gift wrap, they can do that.'

(Interview, CONFOR, Industry Representative)

This is an important tension in how the WCC operates and one that may resonate with wider criticisms of carbon offsetting. Participants that we interviewed on the developer and buyer sides of the scheme were interested in the possibilities of recognising the value of woodlands beyond carbon, in a variety of social, economic and environmental senses. This is linked to the discourse of 'charismatic carbon' described for example by Wang and Corson (2015), which some of our interviewees were also aware of. For the mainstream forestry industry in Scotland and the UK however, growing native trees for carbon sequestration may be inefficient because native broadleaf trees grow more slowly than timber producing conifers, and the 'wrapping' of co-benefits around carbon may feel like a distortion of the carbon market. Not including timber products as carbon sequestration could also be seen by some as a flaw of the scheme<sup>8</sup> (interview, CONFOR).

On the buyer side, supporting the sometimes hazy co-benefits of native woodlands could open up accusations of greenwashing if reputational benefits are considered more important than the core purposes of reducing carbon use and supporting sequestration. In sum, the opposing values of carbon 'hooks' and co-benefit 'wrapping' demonstrate the diverse subject positions held by people and organisations in the WCC. The encoding and recoding of values in the scheme means that carbon sequestration and woodland expansion can be understood, and indeed undertaken, in very different ways.

## 5. Relations help to structure and enable the exchange of values

In the previous sections, we have demonstrated that the WCC offers several different types of woodland expansion and shown some of the ways that these woodlands represent different objectives and values from those creating them. We now turn our discussion to some of the relations between stakeholders that are made through the WCC.

### 5.1. Connecting suppliers and buyers of carbon units

Developers have a central function in the WCC connecting landowners creating new woodlands with buyers purchasing carbon units. The way these developers function is therefore key to the overall scheme. The current largest developer in the WCC is Forest Carbon (responsible for about 73% of carbon units assigned to buyers up to December 2020 in the UK), who undertake a kind of 'matchmaking' of carbon buyers with landowners:

'[We] spend a lot of time talking to new customers about their interests and explaining to them how it all works, and they have all got different niche requirements - it's very much a bespoke business, this is not a commodity market. This is willing buyer, willing seller, project by project'

(Interview, Forest Carbon, Developer)

Through discussions with their clients, developers are able to find a match amongst a portfolio of suitable projects. This is essentially a process of matching the values of landowners and carbon buyers (expressed through the woodland), which enables their exchange. The matching process could even become embedded in the early design phase of woodlands in the future. For example, one Carbon Specialist hoped in the future to bring together landowners and buyers right at the beginning of the design process of new woodlands to make this matching of mutual interests stronger. Matchmaking does not need to be a perfect

<sup>8</sup> Note: the WCC has considered including timber and carbon stored in hedgerows in the scheme, however the problem of ensuring permanence currently makes this very difficult (interview, WCC manager).

translation of values, however. The landowner and buyer may have quite different interests in the same woodland. Nor should being connected through a shared interest in the woodland and the benefits stemming from it necessarily imply that landowners and businesses are interacting more closely.

For some developers, selling carbon is still a new concept and can be challenging. One explained that their experience in selling timber did not translate easily to selling carbon, even though they had helped several landowners joining the WCC.

'We have made some tiny tentative approaches [to buyers] but we were knocked back, and it's taking us into a world that we are totally unfamiliar with.'

(Interview, Traditional Forestry Company, Developer)

Another consideration is that landowners may not want to sell their carbon immediately, hoping for better carbon prices at some point in the future. Some developers we interviewed are also advising owners to hold on to some carbon, thus holding off the process of matchmaking. Holding onto these carbon units is not however the most common approach. For instance, by the end of March 2022, there were about 2700 verified Woodland Carbon Units and 1.64 million additional Pending Issuance Units available for buyers in the UK. Those units represent around one quarter (26%) of the total projected carbon units from verified and/or verified projects across the UK, while more than half (53%) of these units have been already sold, and the remaining 20% are allocated as a WCC buffer to cover any unanticipated losses from individual project failures (WCC, 2022). The need to recoup initial investment, along with uncertainty over future carbon prices (Coleman, 2018), seem to be relevant factors driving landowner preferences for selling carbon units in advance. Buyer perceptions and preferences regarding buying unverified carbon units need to be addressed in future research.

### 5.2. Storytelling helps create value

Part of the value generated in the WCC revolves around the telling of stories around carbon and forests. This is not unusual for offsetting schemes, especially voluntary schemes offering additional value (Lehmann, 2019). Storytelling is key in creating deeper connections by creating frameworks through which actions are understood and related to one another as part of a larger context (Cruikshank, 2000). Here, storytelling is used by private landowners and developers advertising carbon units with attractive descriptions and imagery of the additional benefits stemming from woodlands, quite often making the link to other values such as landscape improvements and social benefits. Stories for carbon buyers connect their actions to larger issues and concerns. Some of these were described by a rural surveyor:

'They are interested not just in buying the carbon itself as a commodity, They are buying into a story (...), they are investing their money back into this country so it's an investment, but it's also contributing to the revitalisation of the landscape and the maintenance and enhancement of the landscape, which is a good story (...). It's something to invest in their own landscape, the UK landscape, rather than somewhere abroad. That's not being nationalistic about it or jingoistic, it's a different sell, it's a different story to buy into.'

(Interview, Rural Surveyor, Developer)

This tangible relation to the local landscape is also relevant for businesses. For example, part of the added value attributed to carbon by some landowners and developers is the chance to spend time in the new woodland. These visits may include corporate picnics, tree planting days, team building exercises, and so on. One of the larger businesses interviewed commented on this:

'So we can actually take the train or get in the car, take staff there and take clients there and have it as - I am not going to say recreational - it's something that we could tangibly see and say that we had a meaningful impact.'

(Interview, large private company, Carbon Buyer)



This was not a shared interest for all buyers however, and for some it was sufficient that the forest existed providing benefits somewhere. Whether they choose to visit or not, woodlands may also become visually linked to businesses through physical signage (Fig. 4). This is also a way of connecting the buyer to the forest, making their contribution tangible and building upon the story of carbon offsetting. Storytelling around woodlands can also be relevant through the types of businesses involved, for example one business interviewed used a lot of paper and we were told it 'made sense' for them to offset through credits drawn from planting woodland.

Of course, not all stakeholders are equally interested or invested in stories, and some are critical of them as 'wrapping', discussed above, or even as greenwash. But the point is that storytelling is not only a way of communicating and advertising what is valuable in or beyond carbon, but is central to how value is actually created through narrative discourse as much as through material processes in carbon offsetting (Frewer, 2021).

### 5.3. Reputation and ethics play a role in making decisions

For some of our interviewees the question is not only a matter of who to sell to, or where to acquire carbon units, but also from whom. This is especially true for charities, who enjoy some unique advantages over other sellers. Charities are generally perceived to be more ethical organisations with a positive public image (Fritz and von Schnurbein, 2015), and our data suggests charities have a strong focus on environmental and social goals of WCC projects (Fig. 1). These objectives were also highlighted in interviews with several charities, for whom social projects involving local communities and schools were often at the heart of their conservation efforts. As one charity put it to us:

'Because we are a charity and our objectives are quite simple and clear I think a lot of corporations find us an attractive charity to work with [...], we are seen as being ethical and wholly conservation minded rather than profit minded.'

(Interview, Woodland Trust, Landowner and Developer)

These considerations work both ways, as the charities we interviewed also wanted to know that buyers were genuinely committed to

becoming more environmentally sustainable, and will not sell carbon to businesses that they believe are not doing so. On the other hand, some landowners, including some charities, rely totally upon their developer to facilitate selling their carbon, and might have little or no input over whom they sell to. They may also receive few offers for their carbon, and therefore may not have the luxury of turning down a buyer. Nevertheless, some private landowners also considered reputation and sought commitment in their buyers:

'Good reputation, genuine interest in the environment, and buying not just because it looks good in their environmental report but because they have a good environmental ethic as well.'

(Interview, Landowner)

One landowner who perceived a lack of interest from the buyer in their woodland told us:

'Slightly disappointingly, as far as I know the purchasers have not been to look at their woodland, so it may be that it's just a corporate social responsibility job (...). In some ways it would have been nice to know that someone was interested in the woodland in its own right.'

(Interview, Charity, Landowner)

This suggests that better connections between participants could help engagement in the scheme as a whole. At the same time, participants' own sense of ethics can be enacted through attempting to make more informed judgements, rather than simply letting purely market exchange take place. Such concerns may also be reflected in people's interest in the WCC specifically. Being a 'reputable standard' was commonly mentioned as important for landowners, developers and buyers alike and abiding by the standards of the Forestry Commission (which new woodlands in the UK have to follow) was a further reassurance. A business owner reflected on their decision to join:

'The UK carbon code appealed because I thought there would be a stronger regulatory environment around that, and less unintended consequences, and I did not want my business to invest and become associated with a scheme that became an example of bad practice.'

(Interview, Carbon Buyer)

Interviewees did not directly discuss the connections between the 'reputable standard' of the WCC and the discourse around land reform and responsible land ownership that exists in Scotland (e.g. Scottish



Fig. 4. A plaque connecting the buyer with a newly planted forest in Scotland (photo: James Koronka).

Government 2017). What they referred to instead was a belief in the integrity of the scheme itself and, for some developers, the validation and verification processes underpinning it. It could be argued that stronger links might be made between the carbon markets and land reform in future (e.g., [McMorran et al. 2022](#)), and this would be a useful topic for further research. Two of our landowner interviewees (holders of relatively large estates) for example were strongly motivated by increasing community involvement in the land, though not to the extent of changes in ownership itself.

Critical assessments of carbon offsetting have not always explored how ethical as opposed to simply practical considerations can be part of participants' own discussions, in a range of different positions (e.g. [Shrestha et al. 2022](#)). [Watt \(2021\)](#) shows how experts within carbon markets can develop authority amongst participants, leading, he argues, to a problematic 'ideological fantasy' that perpetuates a gap between the symbolism of carbon sequestration and its reality. In our case, we have argued that the WCC does indeed operate at a symbolic level, and yet its participants work with and through the scheme to develop (contested) ethical positions on carbon, biodiversity, landscape and much else. These ethics influence how participants act and how value is created and exchanged. We might think of the WCC as an encoding device that enables different and often contrasting values and ethics to be made commensurate, but these are by no means reduced to a single ideology.

Our interview material shows how connections between stakeholders inform and enable the exchange of values between them. Value is also created through stories that link stakeholders into larger narratives. These considerations can be informed by ethical and reputational considerations, both in why stakeholders decide to participate in a scheme like the WCC, and how they may make decisions whilst actively participating.

## 6. Carbon offsetting beyond carbon

Having presented our empirical material, we can consider anew the significance of forest carbon offset schemes both for and beyond carbon. Over recent years, ambitious planting initiatives have begun with the aim of restoring large areas of forest and sequestering carbon in trees and soils ([Di Sacco et al., 2021](#)). In the UK, the Committee on Climate Change recommends planting 30,000 ha or more of forest per year to achieve net zero by 2050 or earlier ([CCC, 2020](#)), while the EU has committed to plant 3 billion additional trees by 2030 to support its climate neutral targets by 2050 ([EC, 2021](#)). These European efforts mirror worldwide initiatives like the Bonn Challenge and the Trillion Trees Initiative, a joint venture of BirdLife International, The Wildlife Conservation Society and World Wide Fund for Nature – all of which signal the multiple benefits of forest expansion.

Forest carbon offset schemes were a topic of discussion at the last UN Climate Change Conference of Parties (COP26) in Glasgow, and there has been continued debate around the value of planting trees for mitigating climate change. Regarding carbon offsetting specifically, a key criticism is that it enables organisations to 'greenwash' their reputation without making a significant contribution to climate change mitigation through reduced greenhouse gas emissions ([Morgan, 2021](#)). Others maintain that tree planting can even generate undesired negative environmental consequences when not designed properly. In the particular case of Scotland, it has been suggested that planting native trees in less productive lands and carbon rich soils can lead to net emissions of carbon over decades ([Matthews et al., 2020](#); [Baggio-Compagnucci et al. 2022](#)).

The WCC has provisions against planting trees on deep peat areas to avoid carbon losses due to soil preparation disturbances. Such losses are accounted for in estimating total predicted carbon units. Yet from a pure carbon sequestration maximisation strategy, planting a large share of native species with generally slower growing rates may be less cost-effective from a financial perspective. Under the WCC, carbon offsets are conceived from initial design as having value beyond just carbon.

They are intended to help achieve other environmental goals such as enhancing biodiversity and habitats through having a significant share of native trees in the plantation mix, and they can have other social and economic effects too. How other goals are perceived and treated varies, which allows for a more complex conceptualisation of the meaning of carbon. From carbon buyer perspectives, co-benefits connected to carbon units allow for richer narratives than just offsetting carbon within climate neutrality goals.

Additional benefits accrued from creating woodlands are less easy to measure, but their central relevance within the scheme has been evidenced in this paper. Demonstrating that these co-benefits actually occur is challenging and so far in the WCC they only refer to expectations of gains. There are no standards or verification systems in place to formalise additional environmental or other gains or losses from woodland expansion. Our interviewees, however, acknowledged potential opportunities for developing incentives through biodiversity gains, or using woodlands as nature-based solutions to protect against floods. A more integrated approach to woodland expansion covering a broader set of sustainability indicators (e.g. effects on water quality or quantity, habitats and biodiversity, and potentially other social and economic effects) seems desirable. This could also open further private and public sector finance opportunities through commercial and social investment, through synergies and trade-offs in the co-production of ecosystem services would need to be looked at more carefully (e.g., [Sing et al. 2017](#)).

Environmental co-benefits are most often claimed within WCC projects, while economic and social benefits seem to be considered as a second level of co-benefits. In particular, we would argue that the role of woodland expansion in long-term carbon storage through harvested products and carbon substitution opportunities and their integration in carbon market standards ([Valatin, 2017](#)) need further consideration. This also concerns the potential to reduce dependency on timber imports and create circular bio-economic opportunities within the forestry sector<sup>9</sup>. These opportunities may create synergies and trade-offs with the provision of environmental benefits associated with biodiversity and habitats ([D'Amato et al., 2020](#)). We suggest such interactions need to be addressed more carefully including stakeholders' attitudes, values and preferences towards these forest-based opportunities ([Holmgren et al., 2020](#)).

Equity in access to land and other resources is also relevant when designing an ambitious woodland expansion programme through carbon finance, in particular when disadvantaged low income communities are involved. High rural land ownership concentration in Scotland, along with insights that a significant part of carbon sequestration (though mostly not additional) is already occurring in large private properties ([Atkinson and Ovando, 2022](#)) calls for caution in the design of policy or market-based interventions using forest-based carbon offsets. Large-scale habitat restoration and woodland expansion occurring in Scotland as part of new natural capital markets, carbon in particular, may also result in social and cultural impacts at local levels. For instance, a recent evidence review report indicates that rapid and large-scale land use transitions can negatively affect local rural communities depending on traditional land uses, such as upland livestock farming or marginal agriculture ([McMorran et al., 2022](#)). According to this report, not only carbon offsetting markets, but also competitive forestry grants and timber prices are increasing the interest in woodland expansion in Scotland, but this shows some spatial heterogeneity according to the suitability of the land to yield timber.

[McMorran et al. \(2022\)](#) offer some evidence showing that since 2019, the demand for forestry and plantable land from institutional investors and financial institutions has increased substantially. This is also backed by our research that shows a large number of new actors

<sup>9</sup> The UK is currently the world's second largest net importer of forest products ([Forestry Commission, 2020](#): 223).

entering the WCC since 2019. Though there is still uncertainty regarding the potential effect of the WCC on land markets, the observed trends may increase disparity between land values and farmland incomes, with the potential of excluding new entrants to farming, and re-concentration of land ownership (*ibid*). However, there are also opportunities for integrating local communities in woodland expansion projects for carbon and other environmental goals that could create more inclusive environmental transitional processes. [McMorran et al. \(2022\)](#) highlight opportunities to develop joint corporate-community partnerships and ventures for delivering co-benefits relating to community natural capital funds, and other policy options for reducing risks and enhancing positive impacts forest carbon offsetting in Scotland, including land market transparency and regulation.

Finally, we note that new WCC financial additionality test rules have replaced the high up-front land purchasing values used previously, with published data on income foregone as a measure of the value of land. According to a WCC manager these changes:

‘...encourage more diverse species but the reason we made the changes were simply to make the additionality tests more effective in directing carbon finance to projects that need it’.

Although the impact of these new rules on the type, size and community involvement in new WCC woodlands would need to be monitored over time. As our analysis has shown, non-native conifers have become more prominent in the WCC in recent years, which also can be connected to more favourable timber markets ([McMorran et al., 2022](#)).

## 7. Conclusions

In this paper we have explored the subject of value within a new carbon offsetting scheme the UK’s Woodland Carbon Code. Value as we have approached it is neither a purely social construct, nor fully material, but is enacted through symbolic and material relations. Values are brought to the WCC by landowners, developers and carbon buyers and are expressed in the types of woodlands planted, credits purchased, and their broader objectives and goals. The WCC itself encodes value through its additionality rules and the rules governing forestry practices in the UK. Native woodlands are predominant in the scheme, but increasingly mixed woodlands with higher proportions of commercial species are being created, responding to income diversification strategies, and likely attracting more diverse players into the scheme, but also raising questions about what is truly additional.

Carbon dioxide units removed from the atmosphere and issued by buyers to help achieve their climate neutrality goals is central to the WCC, but for many it is one amongst many values being sought. We have argued that the WCC is an ‘encoding device’ for these values, helping to enable their exchange. In some senses these are very simple exchanges, but in others they can be quite complex given that the values are often not quantified and are usually referred to potential future benefits or promises for change. These exchanges can be ‘equivalencies’ or ‘translations’ between different types of value, yet it is striking how naturally – though not always without tension – they can be exchanged without precisely measuring them. Carbon then, being quantifiable, seems to offer a way into exchanging other values that are less easily quantified.

As with other areas of economic life, we find concerns such as reputation and ethics influencing people’s decisions. This adds another layer of values that may be less obvious, but shape how these market exchanges function in practice. In an exploration of Danish discourses around offsetting, [Dalsgaard](#) argues that for some buyers, offset purchases are not simply a way of buying their way out of carbon ‘sin’ (as per the greenwashing argument), but are intended to be positive donations towards desired environmental outcomes. As such, they are ‘complicated transactions, driven by a variety of values and logics’ ([Dalsgaard, 2022](#): 63), which we also see in the WCC.

Our use of both quantitative and qualitative data has allowed us to observe some of the overall trends of the scheme, whilst adding nuance and insider perspectives. This has not been an exhaustive study, and

there is much room for further research. A representative study of stakeholders’ values would shed more light in understanding their motivations, attitudes and preferences towards different values involved in voluntary forest carbon markets. In addition, case study fieldwork (not possible because of Covid-19 during this research) could be useful for understanding stakeholder perspectives from the ground up.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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