SUSTAINABILITY IMPLEMENTATION GROUP

A review of emissions offsetting services

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About

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Sustainability Implementation Group

This report forms part of the work of the University of Southampton's Sustainability Implementation Group (SIG), an independent group formulated to oversee the implementation of the University of Southampton's *Strategic Plan – Sustainability*.

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Executive summary

Given the ambition of the University Strategic Plan – Sustainability's Goal 1 to *reduce Scope 1 and 2 emissions to net zero by 2030*, the University may need to offset residual Scope 1 and 2 emissions. The aim of this study was therefore to review the voluntary carbon market, asses the positives and negatives of carbon offsetting, review a range of carbon offset providers and outline a pathway for the university to use offsetting in a way that avoids 'greenwashing'.

A country, business or individual can offset their residual emissions by paying for the removal of carbon dioxide from the atmosphere. There are two markets for such carbon credits: the Compliance Carbon Market and the Voluntary Carbon Market (VCM). Through the compliance market, usually implemented as part of an Emissions Trading Scheme (ETS), emissions are either offset or emission permits obtained or surrendered to meet predetermined regulatory requirements. In contrast, there is no legal obligation to purchase credits from the VCM, but purchased credits can go towards an organisation's net zero targets.

Concerns about carbon offsetting include the misuse of offsets to avoid emissions reductions (*greenwashing*) and double-counting of credits. Nevertheless, offsetting is seen as a necessary tool for reducing the impact of climate change through carbon removal. It is hoped that with improved legislation and standardisation, carbon offsetting could become a multifaceted tool providing multiple co-benefits in addition to carbon removal.

To do so, credits will need to be verified as complying with 'accepted' carbon offset standards before they can be sold via the VCM. While there are currently no mandatory standards, a number of emerging standards provide criteria a carbon offset project must meet to ensure they can be verified. Some also stipulate that buyers must prove they are actively reducing their emissions **before** they can purchase carbon credits to ensure offsetting is not being used to avoid carbon reduction.

A review of a selection of carbon offset services found a range of suitable UK based standards, which provide examples of high integrity offset providers. A higher education coalition (EAUC Carbon Coalition) for offsetting has also been reviewed, which would reduce the due diligence overhead to the University and should reduce the risk of accidentally investing in unethical or insufficiently accredited offsets. An alternative would be for the University to invest in and manage its own nature-based services portfolio by adding to its estate or by working with local partners to do so.

Even if the University does pursue one of these options, emphasis must be put on *reducing emissions first* and then considering offsetting. In the future, the university could then use properly validated offsetting to *become emissions negative*.

Contents

1 Introduction

Carbon offsetting occurs when a country, organisation or person compensates for the release of greenhouse gas (GHG) emissions by paying for the removal of carbon dioxide from the atmosphere.

Measured in carbon dioxide equivalent (CO_2e), offsets can be bought as a carbon credit, whereby each credit is worth one tonne carbon dioxide equivalent (tCO_2e) (Climate Change Committee 2022). In theory, the buyer of a credit has then offset one tonne of emissions emitted. Credits can be purchased from domestic or international projects which sequester carbon dioxide (see Trewick & Anderson, 2022). Credits can come from carbon removal projects which includes removing carbon from the atmosphere through nature-based removals or carbon removal technologies. There are also credits for emission avoidance projects, for example, renewable energy sources or avoiding deforestation although these do not comply with the accepted requirement to remove *additional* emissions rather than pay to avoid emissions (see Allen et al, 2020).

Carbon offset projects and carbon credit providers should be certified through international or national standards. The aim of these standards is to ensure carbon offset projects do not have a negative environmental or social impact and measurably deliver on the carbon removal promised (Allen et al. 2020).

The carbon offset market is divided into two areas, the compliance market and the Voluntary Carbon Market (VCM). Through the compliance market, organisations can use or trade government granted emissions permits, allowing a certain amount of GHGs to be emitted by an organisation (Grantham Research Institute on Climate Change and the Environment 2022). The VCM is a market for buying carbon credits on a voluntary basis; there is no legal requirement for organisations or individuals to buy carbon credits on the VCM. The VCM differs from compliance markets such as the UK Emissions Trading Scheme (ETS) in which there is a legal obligation to meet offset requirements.

There are many different views around carbon offsetting, due to a variety of issues with the current VCM such as greenwashing where organisations simply pay to continue polluting. However, investment in carbon offset projects can also have co-benefits such as increased biodiversity, greater climate resilience and improved job opportunities for local communities.

The aim of this study to is assess the current voluntary carbon offset market, looking at local, national and international options for offsetting that the University could consider in the future to complement emission reductions plans.

2 Why do we need carbon offsetting

2.1 Meeting net zero targets

Many countries and organisations aim to reach net zero by 2050 or earlier, while these are necessary targets, they will not be simple to achieve. The major issue with net zero is the technology is not currently available to completely decarbonise all sectors, there are going to be areas where residual emissions continue to be emitted and those emissions will need to be offset if net zero targets are to be met.

In the case of the University, the University Strategic Plan – Sustainability's Goal 1 to *reduce Scope 1 and 2 emissions to net zero by 2030* means that the University may need to offset residual Scope 1 and 2 emissions which are difficult to reduce from 2030.

2.2 Combatting global temperature rise

The Intergovernmental Panel on Climate Change (IPCC) stated that carbon offsetting must be used if we are to stay within the 1.5°C and 2°C temperature rise pathways (IPCC 2022). Without offsetting,

global climate targets will probably not be met.

2.3 Investment opportunities

Carbon offsetting also enables the movement of financial capital to carbon offset projects, many of which are historically underfunded such as ecosystem restoration (Climate Change Committee 2022).

3 The Voluntary Carbon Market: Reviewing the sector

The sector is still relatively small but growing rapidly. According to Ecosystem Marketplace, 104 million tonnes of CO_2e, or roughly 20% of the UK's emissions in 2021[1], was offset through the global VCM in 2019, considerably more than in previous years (Zwick 2020).

3.1 Standards and verification

It is increasingly accepted that carbon offset projects need to be verified before they can sell carbon credits on the VCM. Currently, there is no universal standard for all carbon offset projects, however there are multiple international and UK-based standard providers that cover many different types of carbon removal projects. Standards used to verify offsets are viewed as necessary to ensure the carbon is being sequestered as promised, that reduction benefits are not being inflated and double-counting is avoided (Allen et al. 2020). Standards also ensure that carbon offsets are measurable and the methodology for measurement is replicable and transparent (Climate Change Committee 2022).

There are many different types of international standards for standardising carbon offset projects, but two of the most widely used international standards are Verra and Gold Standard. Within the UK, The Woodland Carbon Code and The Peatland Code are two of the most well-established standards, which are discussed in more detail below.

In order to create a more standardised voluntary carbon market, ensuring all standards result in the production of high integrity offsets, an international taskforce known as the Taskforce for Scaling the Voluntary Carbon Market was initiated by Mark Carney, UN Special Envoy for Climate Action and Finance. The Taskforce is a private-sector initiative "working to scale an effective and efficient voluntary carbon market to help meet the goals of the Paris Agreement."[2] At the current time the initiative reports over 250 members representing "buyers and sellers of carbon credits, standard setters, the financial sector, market infrastructure providers, civil society, international organizations and academics". However, some have questioned the ability of the Taskforce to create a more responsible, standardised VCM (Compensate 2022).

Despite having a number of emerging standards in place, there are still many issues surrounding carbon offsetting, limiting the success of the carbon offset market. These issues are discussed in more detail in Section 4 below (Carbon offsetting: the negatives).

3.2 Types of carbon offset

The VCM is made up of many different types of carbon offset projects including biological removal such as forestry or carbon removal technology such as carbon capture and storage (CCS). For a more detailed discussion see Trewick & Anderson (2022).

Biological carbon removal, which can also come under the term nature-based solutions, usually involve the restoration of certain habitats which results in the sequestration of carbon from the atmosphere. Both terrestrial and marine habitats can be used for nature-based carbon removal, but

[1] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/greenhousegasintensityprovisionalestimatesuk/2021

[2] https://www.iif.com/tsvcm

at present terrestrial habitats make up the majority of biological removal projects on the global VCM, with over 40% of the VCM made up of forestry projects in the last few years (World Bank 2020).

Carbon removal technology is an emerging field in carbon offsetting. Carbon capture and storage (CCS) is the most established form of carbon removal technology. Compared to biological carbon removal, carbon removal technologies are still being applied on smaller scales than biological carbon removal due to the high set up and maintenance costs. It is believed as more investment is channelled into carbon removal technologies through voluntary carbon offsets, the initial costs of setting up such technology will decrease over time (Allen et al. 2021).

Carbon removed from that atmosphere can either be stored biologically or geologically. Biological storage includes the storing of carbon in natural habitats such as in soils, plant matter and marine sediments. Geological storage is when carbon removed via carbon removal technologies is stored in natural or man-made geological formations, such as former oil or gas fields (Newell and Ilgen 2019) or as carbonated minerals. As discussed below, the permanence of such storage is obviously crucial to the efficacy of the sequestration potential of the process.

3.3 High integrity offsetting

Good quality offsets consider the environmental, biodiversity and social implications of projects. In an ideal scenario, carbon offset projects should improve the environmental, biodiversity and social aspects of the area in which the project has been undertaken.

According to the Climate Change Committee (2022)[3] good quality, high integrity carbon credits meet the following criteria:

- Not overestimated
- Not claimed by another country or business (double counted)
- Additional
- Long-lived
- Measurable and verifiable
- Not associated with environmental or social harm

4 Carbon offsetting: the negatives

4.1 Avoiding emissions reductions

Carbon offsetting could be used as a way for companies to avoid reducing their emissions. In this case, carbon offsetting perpetuates the continued emissions of greenhouse gases (Climate Change Committee 2022). For example, many of the predictions around the growth of the carbon offset market come from the assumption that demand will be driven by high emitting industries such as aviation and oil and gas, who do not have the technology nor drive to decarbonise (Climate Change Committee 2022)

4.2 Pricing

The pricing of carbon offsets on the VCM is a major issue. Firstly, there is a lack of transparency around how carbon offsets are priced. Under current legislations and international standards there is no requirement for carbon credit providers to explain how they determine the pricing of carbon credits. Many carbon credits on the VCM are currently very low priced considering the importance of carbon removal, which many in the sector believe is discrediting the VCM (Compensate 2022).

In addition, low pricing may mean that off-setting is more cost effective for companies than reducing

[3] See also: https://theconversation.com/climate-change-carbon-offsetting-isnt-working-heres-how-to-fix-it-192131

their emissions. As there is little legislation in place to prevent organisation from offsetting before they reduce their emissions, this could discredit the urgency of emission reductions. However, many carbon credit providers will now only allow an organisation to purchase credits if the organisation has committed to reducing emissions and aligning to the Paris agreement by becoming net zero by 2050 or earlier.

4.3 Non-additionality

When an offset project is additional, the carbon removal is occurring relative to the baseline carbon that may have been sequestered without the input of the offsetting project (Allen et al. 2020). Additionality is very difficult to measure and will involve some degree of uncertainty, especially for nature-based offsets that have many compounding factors.

As an example, recent research on 37 improved forest management projects in California has shown that "the carbon accumulated in offset projects to date has generally not been additional to what might have otherwise occurred" (Coffield et al, 2022). This suggests that current protocols used by some providers may not be sufficient to incentivise the required additionality.

4.4 Permanence and leakage

The carbon removed via sequestration can be stored in a physical reservoir which can be biological such as forests or geological such as old oil fields or as carbonated rocks. One of the issues with the physical storage of carbon sequestered from the atmosphere is that the carbon may escape, meaning that the storage is not permanent (Allen et al. 2020; Miltenberger et al. 2021). For example, if a reforested habitat is destroyed, the carbon stored in that habitat could be re-emitted to the atmosphere. Another example is the escape of emissions from geological storage if the area is not properly secured.

It has been argued that geological storage is the only type of storage with true permanence, because biological storage cannot last for the same time span and is at greater risk of disturbance or destruction (Alcalde et al. 2018).

Mainly an issue for nature-based carbon offset projects, leakage can result in inaccurate understanding of how much carbon is sequestered (Climate Change Committee 2022). A study by Albers and Robinson (2011) found that significant emissions were occurring from forestry restoration projects in tropical regions due to the removal of trees. Damage and improper management of restored habitats are major risks for nature-based carbon removal, accurate monitoring and strong governance is needed to minimise the risk of leakage (Climate Change Committee 2022).

4.5 Inaccuracy

One common issue is that non-CO_2 greenhouse gases are not always accurately converted to CO_2e, resulting in the removal of one tonne of carbon through a carbon offset project not being equal to the emissions being offset (Allen et al. 2020).

Overestimation and measurement uncertainties can lead to an inaccurate understanding of carbon removal. Some offset providers are trying to compensate for this by providing a 'buffer' at each purchase, which accounts for small errors in carbon removal measurements (Woodland Carbon Code 2022). However, there is emerging evidence of systematic and substantial (~30%) over-crediting by offsetting service providers (Badgley et al, 2021) therefore seriously undermining the assumption that purchased offsets reflect equivalent climate benefits achieved in the funded projects.

Finally establishing accurate assessments of carbon stocks and sequestration rates over time for different habitats remains a significant challenge. High levels of uncertainty in Land Use, Land Use Change and Forestry (LULUCF) reporting results in considerable uncertainty regarding potential mitigation-driven activities and their effects and has made it difficult for decision-makers and investors

to support sustainable soil and vegetation management. Recent research caried out at the University suggests that local land-use change models using detailed land cover classifications should be used to optimise carbon sequestration storage via land cover protection and change at a local/regional landscape-scale (Fryer & Williams, 2021).

4.6 Double counting

Double counting occurs when a carbon credit is claimed by two different bodies; such as two businesses, a business and a country or two countries. This issue is most common when an organisation or country is buying carbon credits from another host/seller country and the host /seller does not make a corresponding upward adjustment to its emissions. While the final decisions at COP27 moved closer to ensuring such adjustments 'should' be made, detailed procedures and mandatory requirements are still under discussion.

A Corresponding Adjustment is when the country the carbon credit originates from cannot claim the carbon offset for their own Nationally Determine Contributions (NDC) (Climate Change Committee 2022). Corresponding Adjustments are not applied to UK-based carbon offset projects for credits being bought by UK-based businesses, however this raises the issue that UK-based credits are not truly additional (Climate Change Committee 2022).

4.7 Greenwashing and negative impacts

Research has shown that some carbon offsets may actually be having a negative impact, despite being marketed as a climate positive mechanism (Miltenberger et al. 2021). This negative impact may be on the environment, biodiversity or the local community (Dooley et al. 2022). For example:

- land being used for carbon offset projects may cause Indigenous Peoples to lose access to their land, or could result in the loss of sustainable food production if good quality farmland is used.
- The planting of monoculture forests can have a negative impact on biodiversity, because the low-diversity of single species plantations can only support a small amount of biodiversity.
- When landscape scale impacts are not considered, carbon offset projects may have a negative impact on hydrological and nutrient cycles due to landscape scale habitat changes (Allen et al. 2020). The impact of landscape scale habitat changes can affect local communities as well as those further downstream.

However, it is important to note that many offset providers outline criteria to ensure projects meet certain ethical standards in order to be able to sell credits. This is intended to ensure that projects with negative environmental or social impacts are not progressed.

4.8 Forward selling

Forward selling has also become an issue whereby carbon credits are sold well before emission removal is actually taking place (Allen et al. 2020). This makes the additionality of the offset much harder to establish and the increases the risks of impermanence and leakage since the offset buyer has to trust to the future permanent sequestration of the current emissions. Some carbon offset verifiers are actively trying to avoid this issue by making sure projects meet strict 'within-year sequestration' criteria before credits can be sold.

4.9 Fungibility

The issue of fungibility arises from the assumption that one tonne CO_2e removed from the atmosphere is equitable to one tonne CO_2e emitted. For example, the removal of carbon via reforestation is assumed equal to that emitted by fossil fuels (Dooley et al. 2022). However, some argue that a tonne of sequestered CO_2e is not equitable to a tonne of CO_2e emitted by major polluters, due to the effects the emission may have on the climate, environment and subsequently society (Friends of the Earth

2021).

4.10 Land use change and land use values

Growing demand for carbon credits are likely to increase land use change, both globally and within the UK. To make land use change for carbon removal viable for offset projects and carbon credit buyers, large areas of terrestrial land may be required. This could result in the land being locked into being a carbon store for multiple decades and also significantly increasing in value prior to that lock-in (McMorran et al. 2022; Climate Change Committee 2022).

5 Carbon offsetting: the positives

5.1 Removal of carbon emissions

The IPCC (2021) has determined that carbon removal is necessary if we are to meet 1.5°C and 2.0°C global temperature rise pathways. Although there are issues around offsetting, it is seen as a necessary and useful tool in combating GHG emissions once all efforts to reduce or avoid emissions have been made.

Going further, additional 'offsetting' which permanently captures and stores atmospheric carbon at a rate that exceeds residual global emissions is likely to be the only pathway to reducing global atmospheric CO_2 concentrations. It is therefore the only way we are likely to become net negative and restore atmospheric carbon dioxide levels to close to pre-industrial levels.

5.2 Improving biodiversity, environment and social

Sustainably and responsibly managed carbon offset projects can have a range of positive environmental, biodiversity and social impacts, for example:

- providing new income for local people (Climate Change Committee 2022) or safeguarding community rights by working with local communities and protecting land from unsustainable development (Dooley et al. 2022).
- Increase in resilience of a local area to climate change as the result of habitat restoration (Dooley et al. 2022). For example, coastal zones where mangroves have been restored for carbon sequestration have also seen increased flood resilience.
- When degraded habitats are restored for the carbon removal benefits, a common co-benefit is the increase in biodiversity in that area.

5.3 Investment in underfunded areas

Investment in carbon offset projects could also help increase financial flow into areas in need of funding such as ecosystem restoration and the scale up of carbon capture and storage technology (CCS) (Allen et al. 2020; Climate Change Committee 2022). This includes the financial flow of investment from developed to developing countries (Climate Change Committee 2022).

6 Available services: a review

This section reviews a selection of available UK and international carbon offset providers.

6.1 LEAF

The Lowering Emissions by Accelerating Forest Finance (LEAF) Coalition is an international coalition aimed at investing in large scale tropical forest restoration and protection.

In order to purchase credits through LEAF, an organisation must demonstrate they are on track to meet science-based emission reduction targets (LEAF Coalition 2022).

Investments through LEAF supports tropical and subtropical forest governments or jurisdictions

protecting and restoring tropical forests.

LEAF is independently verified by the ART/ TREES standard to ensure that the projects invested in through leaf do not have a negative environmental or social impact. The credits purchased through LEAF are known as TREES credits, with each TREES credit representing one tonne CO_2e. These credits are for voluntary offsets. The emission reductions from a project must be verified by ART/ TREES before they can be purchased on the VCM.

One of LEAF's positives is the commitment to protecting the rights of Indigenous Peoples and Local Communities. LEAF states it is committed to ensuring that the rights of Indigenous Peoples and Local Communities is upheld through the ART/ TREEs verification which ensure all projects must meet a strict criterion of social safeguards to become verified (LEAF Coalition 2022). Indigenous Peoples and Local Communities will have the power to terminate LEAF purchase agreements if the government or jurisdiction in charge of the project is believed to be violating certain safeguards, such as breaking anti-corruption laws.

A possible issue with LEAF is that many of the founding companies are some of the world greatest polluters. This in itself is not inherently negative, because it is better these companies are doing something than nothing at all. The issue lies in the association that could be made between an organisation that offsets through LEAF and these large polluters[4].

6.2 Wilder Carbon

Wilder Carbon[5], a private company controlled by the Kent Wildlife Trust[6], restores large areas of habitat across the UK for the joint benefit of biodiversity enhancement and carbon removal. These projects are delivered by a number of local Wildlife Trusts

Wilder carbon carried out a pilot stage through 'pathfinder' projects across the UK.

In order to buy credits through Wilder Carbon, the buyer must follow the emission hierarchy set out by Wilder Carbon (Wilder Carbon 2021):

- Avoidance – halt activities that produce GHG emissions
- Reduction – reduce emissions that cannot be avoided
- Removals – offset residual emissions if avoidance and reduction are not feasible

Wilder Carbon provide Estimated Issuance Units (EIUs), which buyers can purchase before the credit is verified. Once verified by a Monitoring and Verification partner the EIUs will be retired and converted to Wilder Carbon Credits (Wilder Carbon 2021).

Wilder carbon includes a buffer to all credit purchases to compensate for potential emission leakage or inaccuracies in estimating carbon removal.

Projects Wilder Carbon's delivery partners will carry out for the joint benefit of biodiversity enhancement and carbon removal include:

- Woodland creation
- Reversion of arable land to rich semi-natural grassland
- Rewetting coastal or riverine floodplains
- Rewetting drained peatland
- Restoring upland peat bogs
- Pond creation

[4] See e.g. https://www.science.org/doi/10.1126/science.abk0063

[5] https://www.wildercarbon.com/

[6] https://opencorporates.com/statements/1042679315

- Creation of new coastal saltmarsh and mudflats

Wilder Carbon requires that projects are additional and aims to ensure that restored habitats are managed and maintained for 99 years to allow for permanence and to avoid leakage (Wilder Carbon 2021).

6.3 The Woodland Carbon Code

The Woodland Carbon Code is a UK based voluntary standard for establishing emissions from forestry projects and woodland afforestation and restoration, established in 2011 (Climate Change Committee 2022). Projects verified by the Woodland Carbon Code are sustainably managed, can provide accurate estimates of the amount of sequestered carbon from afforestation or reforestation projects and meet transparency criteria to ensure carbon removal is actually delivered (The Woodland Carbon Code 2022). The projects verified must also be independently verified by another source and publicly registered for transparency (The Woodland Carbon Code 2022).

There are two types of units that can be purchased under the Woodland Carbon Code by an organisation wishing to offset their emissions. The Woodland Carbon Units (WCUs) and the Pending Issuance Units (PIUs) (The Woodland Carbon Code 2022).

A WCU represent one tonne of sequestered CO_2e by a WCC-verified project. Whereas a PIU represents a 'promise to deliver' carbon sequestration in the future. Every ten years, projects that provide PIUs by the WCC are checked and if they meet sequestration rates, the PIUs can be converted to WCU. Until PIUs are converted to WCU, they cannot be counted towards offsetting emissions (Climate Change Committee 2022). There are currently many more PIUs available on the UK Land Registry then WCU. PIUs sell for between £10 - £20 per tCO_2e. Insufficient data on the price of WCU is available as only a small number have been sold (The Woodland Carbon Code 2022).

WCU can only be bought on a voluntary basis and can only be used to offset UK based emissions.

The Woodland Carbon Code withholds credits which cannot be claimed to buffer against potential emission losses or leakages (Climate Change Committee 2022).

One example of a project which has been accredited by the Woodland Carbon Code is Trees for Life[7], a reforestation programme based in Scotland, in which more than 250,000 trees have already been planted. Trees for Life estimates that their project site could offset more than 50 kT CO_2 (Trees for Life 2022), equivalent to roughly twice the University's current Scope 1 and 2 emissions (~ 23 kT CO_2e).

6.4 The Peatland Code

The Peatland Code (PC) was established in 2018 and is similar to the WCC, but specific for peatland restoration projects (IUCN Peatland Programme 2022).

As with the WCC, carbon credits are only available on the VCM and cannot be used for compliance schemes such as the UK ETS. The credits can also only be used to offset emission from within the UK.

Once a peatland restoration project has commenced, it takes five years to become a Pending Issuance Unit (PIU). Projects are assessed by the Peatland Code every ten years and if they meet the criteria PIUs can be converted to Peatland Carbon Units which can be used to offset residual emissions (IUCN Peatland Programme 2022).

PC PIUs sell for around £15 per tonne of CO2e. However, there is little data on PCU, and it is believed they sell for more than PIUs (Climate Change Committee 2022; IUCN Peatland Programme 2022).

Similarly, to the Woodland Carbon Code, the Peatland Code includes unclaimed carbon credits to buffer projects in case of leakage of emissions (Climate Change Committee 2022).

[7] https://treesforlife.org.uk/

6.5 EAUC Carbon Coalition

An alternative to directly purchasing credits from individual projects is to purchase through a 'portfolio manager'. One relevant example is he EAUC Carbon Coalition, a coalition of higher education institutions looking to offset their residual emissions[8]. This was recently piloted across seven different universities in the UK and is now open to new members.

As part of the EAUC Carbon Coalition, higher education institutions can choose from a suggested carbon offset portfolio, which includes a majority of nature-based offset projects with a small percentage of carbon removal technologies. Alternatively, institutions can choose from a selection of offsetting projects which have been assessed by the EAUC Carbon Coalition and an outside verification body. This allows institutions to align their offsetting portfolio with their aims. As the coalition is currently in the pilot phase, the creation of an individual portfolio per institution will be available in the future (EAUC 2021).

However, it is also important to note that as with most other 'high quality' offset providers, the EUAC Carbon Coalition will require applicants to demonstrate progress towards overall emissions targets as a joining criteria.

There are a range of benefits to joining a sector wide carbon offsetting coalition including university specific support and guidance, confidence in investment, expert knowledge from academics, transparency, reduced costs to due diligence and group purchasing power (EAUC 2021). It would also reduce the risk of investing in an unethical carbon offset project.

In this context it is worth noting that the London Universities Purchasing Consortium has recently tendered for a contract for the procurement of Carbon Offsetting and Validation Services[9] under:

- Lot 1 – Carbon Offsetting Services
- Lot 2 – Voluntary Carbon Removals
- Lot 3 – Carbon Compliance Markets-UK ETS Allowance Purchasing

7 The future of carbon offsets

The services reviewed above are largely dependent on forestry or reforestation as the method of carbon sequestration. However, this is only one option amongst many (see Trewick & Anderson, 2022).

7.1 Soil-based

One area of carbon sequestration that is being increasingly researched is carbon removal by agricultural soils due to sustainable farming practices. Currently, there is no way of buying verifiable carbon credits in this area. This may change in the future, if the UK Government implements the Environmental Land Management Scheme.

Research is currently underway to develop a soil carbon code, similar to that of the Woodland Carbon Code and Peatland Code (Climate Change Committee 2022). Regenerative farming is the key area of focus within the potential soil carbon code, as this would allow farmers to continue to make an income from working the land without having to change the land's use (Gregg et al. 2021).

7.2 Marine-based

A consortium has been formed to research and develop a Saltmarsh Carbon Code, similar to that of the Woodland Carbon Code and Peatland Code, in the hope that it will become a standard for

[8] https://www.eauc.org.uk/carbon_coalition

[9] https://yourtenderteam.co.uk/contracts/carbon-offsetting-and-validation-services/

saltmarsh restoration projects in the UK (Mason et al. 2022)

The development of a voluntary blue carbon market is in progress, in which carbon credits from the restoration of marine habitats such as kelp forests and seagrass could be purchased (Norris et al. 2021). This would allow verified and standardised carbon credits for marine restoration to be purchasable in the future.

More specifically, research is being carried out to develop a pilot Seagrass Carbon Code to be able to encourage investment in seagrass beds for carbon storage (DEFRA 2022).

7.3 Mineral based

Research at the University has contributed to at least two emerging start-ups who have patented methods for accelerating the rate at which captured carbon dioxide can be permanently stored as carbonated rocks[10]. Whilst in the early stages of development these approaches have the potential to permanently store significant levels of emissions albeit at costs that are currently at least 10 times higher than those reported above for the Woodland Code. These companies are explicitly partnering with large emitters at point sources but they are also expecting to provide more widely available, accredited and verified carbon offsetting services as the technology matures[11].

8 Current cost summary

Table 1 summarises the known offsetting prices per T CO2e. Clearly further research would need to be conducted on likely future prices to support modelling the potential cost to the University of offsetting residual Scope 1,2 or certain categories of Scope 3 emissions.

As an extreme and unlikely example, if Scope 1 and 2 emissions remain unchanged from their 2020-21 level of 22,600 T CO_2, this would cost £565,000 to offset at the EAUC Carbon Coalition's £25 rate.

Table 1: Current estimates of offsetting services

Method	Indicative cost pet T CO_2 offset	Source
LEAF	Unknown	
Wilder Carbon	Unknown	
Woodland Code	£10 - £20	Section 6.3
Peatland Code	Pending Issuance Unit: £15	Section 6.4
EAUC Carbon Coalition	£25	EAUC network discussions
Soil-based	Unknown	
Marine-based	Unknown	
Mineral-based	~ £250	Section 7.3

9 Carbon emission offsetting: a possible road map for the University

9.1 Reduction first, removal second

The priority should be to reduce emissions across Scope 1, 2 and 3; only then should high integrity

[10] See https://www.southampton.ac.uk/blog/sussed-news/2022/12/05/university-scientist-helps-company-win-earthshot-prize/ (Carbfix; 40.01)

[11] See e.g. https://climeworks.com/

carbon offsets be used as a way to offset residual emissions to reach net zero targets. A report by Wildlife and Countryside Link (2021) recommended that offsets should only be used for the residual emissions that are very difficult and very expensive to abate. Given the likelihood that offsetting prices will increase substantially as demand increases, there are also clear future cost-reduction rationales for prioritising reduction (see Section 8 - Current cost summary).

The university could choose to follow the Oxford Offsetting Principles, a set of principles which outlines a sustainable pathway to achieve net zero (Allen et al. 2020). The Principles can be broken into four main stages:

- Focus on reduction first, use high integrity offsets and be transparent about what is being offset, how it is being offset and why it is being offset
- Focus offsetting on carbon removal not carbon reduction
- Progress towards long lived carbon storage options, with a focus on permanent storage
- Assist the progression of a net-zero aligned offsetting market

As recommended by the CCC, offsetting should focus on nature-based carbon removal for around the next decade, before moving to a more permanent based removal and storage such as carbon capture and storage (CCS) via geological processes (Climate Change Committee 2022). The university could look to follow this trend.

9.2 Varied portfolio

The university could consider different types of carbon removal for the offsetting portfolio. A report by Roe et al. (2021) found that land-based biological carbon removal would only be able to mitigate 20-30% of global emissions. Therefore, it could be sensible for the university to include a mixture of land-based and marine-based carbon removal, as well as considering investing a small percentage of the offsetting portfolio into emergent long term carbon storage such as via 40.01.

9.3 Transparency

The Climate Change Committee (CCC) highlighted in a recent report that lack of transparency from businesses around which processes are being offset diminishes the integrity of the VCM and carbon offsetting (Climate Change Committee 2022). The university could consider producing accessible documentation explaining why certain emissions are being offset and not reduced, so that the entire process is clear and transparent (Allen et al. 2020).

9.4 Location

The university could aim to focus its nature-based offsetting portfolio within the Solent region and UK, as this could help to support underfunded projects in the local and national area. One possibility would be for the University to follow Edinburgh's example[12] and invest in and manage its own nature-based services portfolio by adding marginal land to its estate or by working with local partners to do so. This would provide the opportunity to ensure that robust and transparent assessment of true additionality is carried out by the scientific community.

Non-nature based offsetting, such as through geological processes, may not be available either in the Solent region or in the UK more generally.

9.5 Negative carbon

In the future, carbon removal could be used to create a negative emissions future. If the university reaches its net zero goals, it could choose to become a negative emitter by continuing to invest in

[12] See https://www.ed.ac.uk/sustainability/programmes-and-projects/climate-strategy/carbon-sequestration/partner-with-us

carbon offset projects.

9.6 Future prospects

Research and development of new carbon codes across different UK habitats is growing, the university could benefit from following this research as the development of new UK-based carbon codes would allow further investment in local and national projects.

10 Conclusion

Despite the issues around carbon offsetting, it is considered a necessary tool in achieving global climate targets. If the issues that reduce the integrity of carbon offsets can be overcome, it could be a great force for good, as many carbon offsetting projects have biodiversity, economic/social/cultural well-being and other co-benefits when established and managed responsibly.

There are many different standards and offset providers, however those with strict criteria for both the offset project and the offset buyer tend to sell higher integrity credits, which are more likely to be additional and provide co-benefits.

Credits could be bought through high integrity standards and offset providers from international or national projects. The UK has multiple good quality offset providers, which the Climate Change Committee highlights as providers of high integrity carbon credits. The creation of the EAUC Carbon Coalition could provide an excellent pathway into offsetting for the university to consider, as the evaluation of quality offsetting is carried out on behalf of the universities. In this context the recent tender by the London Universities Purchasing Consortium ("LUPC") for the establishment of 'a framework agreement for the procurement of Carbon Offsetting and Validation Services' should be noted[13]. However, it is also important to note that as with most other 'high quality' offset providers, the EUAC Carbon Coalition will require applicants to demonstrate progress towards meeting their overall emissions targets as a joining criteria. It is therefore crucial the University can meet this condition of entry.

Although the negatives around offsetting highlighted in this report are reasonably extensive compared to the positives, they are issues which could be eliminated with appropriate policy, legislation , guidance and robust appropriately audited practices. Nevertheless, on the basis of evidence such as that described in this report, UKRI have recently stated that "the benefits of different offsetting activities are variable and there is lack of evidence of genuine long-term additionality (permanent capture and storage of carbon)"[14]. UKRI have committed to reviewing this evidence and their policy by 2024/5 but for the time being "carbon offsetting is not a permitted UKRI grant expenditure", including for emissions as a result of business travel.

Despite the current uncertain situation, the future prospects for the voluntary carbon market, especially in the UK, are promising. Further research to develop new carbon codes similar to that of the Woodland Carbon Code and Peatland Code is underway, including codes for marine habitats and agriculture. With the growth in UK-based carbon offset providers, the university could focus its offset portfolio within the UK. This could include the University building on its participation in the EAUC carbon for land project which will use areas of the estate to plant trees and generate carbon credits. The University could therefore consider whether it should be using its own estate and/or purchasing land to expand its estate to generate carbon credits with forestry or other appropriate land-cover

[13] https://yourtenderteam.co.uk/contracts/carbon-offsetting-and-validation-services/

[14] https://www.ukri.org/about-us/policies-standards-and-data/corporate-policies-and-standards/environmental-sustainability/ukri-position-statement-on-carbon-offsetting/

change.

Above all, the priority should be to reduce emissions across Scope 1, 2 and 3 before using high integrity carbon offsets as a way to offset residual emissions to reach net zero targets. Given the likelihood that offsetting prices will increase substantially as demand increases, there are also clear rationales for prioritising reduction to save future offsetting costs.

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