UK Parliament
POST

POSTnote 713

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24 January 2024

Carbon offsetting

Overview

- A carbon credit represents the reduction, removal or prevented release of greenhouse gases by natural or technological processes. Businesses and individuals can purchase credits on the voluntary carbon market and may use them to offset their own emissions.
- Ensuring that credits truly represent carbon reduction or removal is complex and uncertain. It can be difficult to determine that carbon would have been emitted otherwise and whether any carbon storage is permanent.
- Projects that generate carbon credits can raise funds and potentially benefit society and the environment by protecting and restoring natural ecosystems and increasing biodiversity. However, some projects can have adverse impacts on the environment and indigenous peoples and communities.
- There is a lack of transparency in reporting the use of carbon credits and whether the carbon offsets are used in place of direct emission reductions.
- The CCC recommended that Government publish guidance for businesses on what activities it is appropriate to 'offset' and when. A Government consultation will consider supporting the growth of high-integrity carbon and nature markets, including the role of regulation.
- Commentators suggest that regulation of both carbon crediting projects and business use of credits could improve carbon market integrity. Some emerging guidelines suggest carbon credits should not be used to offset emissions directly.

Background

A carbon credit is an instrument representing the avoidance, reduction or removal of atmospheric greenhouse gases (GHG), measured in tonnes of carbon dioxide equivalent (tCO_2e). There are three main outcomes for projects creating carbon credits:

- **Avoided** emissions, for example by preventing deforestation and forest degradation (REDD+, PN 466).
- **Reduced** emissions, for example by restoring peatlands (PN 668).
- **Removal** and storage of CO_2, for example by direct air capture[a] or restoring forests (PN 549, Table 1).[2]

There are three types of carbon markets that trade carbon credits:

- the regulated compliance market (e.g., EU or UK Emissions Trading Schemes),[3] where credits can be claimed by businesses, regions or countries as 'offsets' and count towards Nationally Determined Contributions (NDCs)[b] and national net zero targets
- the unregulated voluntary carbon market (VCM), where individuals or companies claim the credits towards their voluntary climate commitments
- the proposed Article 6 framework under the Paris Agreement, which enables countries to contribute towards other countries' NDCs

The evidence of low prices and mixed integrity of credits have led to concerns from the Climate Change Committee (CCC), the independent advisory body, that offsets might be used by businesses as a substitute to directly reducing emissions, despite their uncertainty.[5]

The VCM held a global value of $2 billion in 2021. Since January 2022, the average price of nature-based[c] carbon credits has fallen from over $18.50 to under $1.50.[6,7] Globally, there is evidence that within the system there are over-estimates (over-crediting) of the amount of emissions that are avoided or reduced.[8,9,10] Some studies conclude that many projects linked to the Kyoto Protocol's Clean Development Mechanism (CDM) would likely have happened without the carbon credit investment.[11]

[a] Direct air capture and storage (DACCS) systems aim to extract CO_2 from ambient air and permanently store the captured CO_2 in a geological storage medium.[1]

[b] Nationally Determined Contributions, or NDCs, are countries' self-defined national climate pledges under the Paris Agreement, detailing what they will do to help meet the global goal to pursue 1.5°C.[4]

[c] Nature-based credits depend on biological systems, such as conserving forests or further biological sequestration of carbon.

Types of carbon credit project

Most projects issuing carbon credits to the VCM are avoided and reduced nature-based projects, such as preventing deforestation. Globally in 2023, 99.9% of carbon dioxide removals were nature-based and 0.1% were engineered solutions (Table 1) resulting in biological[d] (PN 290, PN 636) or geological[e] sequestration of carbon.[2,15]

The World Bank stated that forestry and land use projects declined significantly between 2021 and 2022, from 36% to 23%.[7] Ocean-based approaches or blue carbon (PN 651) credits are newer. They refer to the carbon stored in marine and coastal ecosystems like mangroves, seagrasses, and salt marshes.[16–19]

Table 1: IPCC categories of land-based Carbon Dioxide Removal (CDR)

CDR METHOD	IMPLEMENTA-TION OPTIONS	STORAGE TIMESCALE	FINANCIAL COST ($ per tonne of CO2)	TRADE-OFFS and RISKS
Afforestation, Reforestation, Improved Forest Management (PN 636)	Agroforestry; tree planting, silviculture; timber in construction; bio-based products	Decades to centuries (in vegetation, buildings, soils)	Afforestation/ reforestation: $0-$240 Agroforestry and forest management: not enough data	Afforestation/ reforestation: Inappropriate deployment at large scales can increase competition for land[f] (limiting land for biodiversity conservation and food). Agroforestry: limited impacts on agricultural crop production. Forest management: if fertiliser use and introduced species are involved, risks include: reduced biodiversity, increased eutrophication[g], and upstream GHG emissions.
Soil carbon sequestration (PN 662)	Agricultural practices; pasture management	Decades to centuries (in soils, sediments)	$45-$100	Increasing carbon sequestration can occur at the expense of production. Sequestration contribution per hectare is small and hard to monitor.

[d] Biological carbon sequestration refers to the uptake and storage of atmospheric carbon in vegetation, soils and woody products.[12]

[e] Geological carbon sequestration is the process of storing carbon dioxide in underground geologic formations.[13,14]

[f] including risk of violations of customary landowners' land rights.

[g] Eutrophication is the gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in a lake or river.

Biochar[h] **(PN 358)**	Cropping and forestry residues; urban and industrial organic waste; purpose-grown biomass crops	Centuries to millennia (in soils and sediments)	$10-$345	Negative impacts from dust. Competition for biomass.
Peatland and wetland restoration (PN 668)	Rewetting; revegetation	Decades to centuries (in vegetation, soils, sediments)	Not enough data	Some peatlands are used for food production, so could result in competition for land.
Bioenergy with Carbon Capture and Storage (BECCS) (PN 618)	Cropping and forestry residues; urban and industrial organic waste; purpose-grown biomass crops	10,000+ years (in geological formations)	$50-$200	Growing energy crops increases competition for land (limiting land for biodiversity conservation and food).
Direct Air Carbon Capture and Storage (DACCS)	Solid sorbent; liquid solvent	10,000+ years (in geological formations)	$100-$300	High energy requirement could lead to growing competition for low-carbon energy or increased GHG emissions. Some DACCS processes require water.
Enhanced rock weathering	Spreading crushed silicate rock	10,000+ years (in minerals)	$50-$200	Dust emissions. Potential for increased GHG emissions from energy generation.

Source: IPCC AR6 WGIII Factsheet CDR (Note: Ocean CDR methods are explained in an additional table on the Factsheet)

Risks of carbon offsetting

When implemented carefully, climate mitigation projects potentially have environmental and societal benefits, including protecting and restoring natural ecosystems, restoring and increasing biodiversity, delaying carbon emissions and creating new green finance.[20–24] However, there are risks to the integrity of projects and achieving net zero targets.

[h] Biochar is the carbon rich remains of organic material that has been heated to decompose and remove most of the hydrogen and oxygen containing molecules.

Integrity of carbon credits

The effectiveness of carbon credits as a policy mechanism is influenced by their integrity, which is dependent on several factors.

Impacts on human rights and social safeguards

It is estimated that 250bn tonnes of carbon is stored on tropical land held and used by indigenous peoples and local communities. A study of 24 countries found that over half (52%) of this carbon is stored in community-held lands and territories that have not yet been titled as such by national governments.[25]

The UN Declaration on the Rights of Indigenous Peoples includes their collective right to be consulted on, and to give or withhold their free, prior and informed consent to any carbon credit project that might impact their lands, territories or resources. This includes territories not yet titled by national governments.[26,27] However, there are numerous reports of human rights violations relating to carbon crediting projects preventing deforestation (Box 1).[27–29]

Beyond carbon and environmental safeguards

Tree planting through revegetation, afforestation[i] and reforestation[j] projects potentially has environmental benefits.

However, research suggests focusing on carbon alone risks the wider benefits of forests.[30] International attempts to maximise biological carbon sequestration have resulted in monoculture[k] plantations.[l] These have limited benefits for restoring ecosystems or increasing biodiversity and are more susceptible to disease.

To ensure that 'net zero plus'[m] outcomes are sustainable, efficient and equitable and that ecological disbenefits are avoided,[31] the 'The Right Place for the Right Tree' should be fully understood.[32–34]

India had the sixth largest tree planting programme in the world in 2021. However, a study of 430 tree plantations in the District of Himachal Pradesh found a 0% net increase in forest cover and that the tree types planted were not beneficial to local people.[35]

Additionality – would the project happen anyway without carbon credits?

The project funding provided via carbon credits should be the deciding factor in the project going ahead.[36] Renewable energy projects are now cheaper than fossil fuels in most countries, so are likely to occur without carbon credits. The largest registries

[i] Afforestation is a process where new forests are planted across land without trees.

[j] Reforestation is the conversion of previously forested land, back to forest.

[k] Monoculture is the cultivation of a single crop in a given area.

[l] Note that monocultures are not permitted in the UK. A maximum of 65% of one species can be planted.

[m] 'Net zero plus' means a project that is sequestering carbon and creates other additional environmental or social benefits.

Verra and Gold Standard[n] no longer issue renewable energy carbon credits accordingly.[27]

Box 1: A carbon credit programme in Guyana

The Wapichan people of Guyana monitor and protect the Amazon rainforest. The South Rupununi District Council (SRDC) is the representative institution of the 21 Wapichan communities. Supported by international NGOs, including the Forest Peoples Programme,[a] the Wapichan people monitor illegal logging and mining (PB 45), water quality, and illegal border crossing (between Brazil and Guyana) in their territory.

The Wapichan people first heard through news media that the Guyanese government had sold carbon held within their land to a US oil company.[37] The Wapichan villages had not been consulted about this sale, nor had they given their consent to it. A national indigenous NGO in Guyana, the Amerindian Peoples Association, subsequently submitted a complaint to the Architecture for REDD+ Transactions (ART) for certifying credits violating indigenous peoples' land and resource rights.[38]

Indigenous villages were told by the government that 15% of the $750 million sale would benefit the 242 indigenous villages in Guyana, but they were not a part of designing this 'benefit-sharing mechanism' concerning carbon stored in their ancestral lands.

The news of the 2022 sale was reported to have caused confusion and anxiety within the indigenous communities. It also raised several questions, including: What is a carbon credit? Why am I receiving this amount of money? What is the payment for? Will I need to leave my home? What changes will be made to our land?[39,40]

The credits sold were the first high-integrity credits to be certified by ART-TREES[a]. ART-TREES credits are supported by the LEAF coalition, a public private partnership focused on halting tropical deforestation by 2030.[41,42]

The TREES standard claims to be consistent with a range of international frameworks to provide assurance of robust environmental and social safeguards. These include UN Framework Convention on Climate Change (UNFCCC) decisions, including the Paris Agreement, the Warsaw Framework and the Cancún Safeguards.[43,44]

The country or jurisdiction producing TREES credits can choose whether they want to comply with both national and international law, or just national law. The Forest Peoples Programme states that in many countries, the rights of indigenous peoples are not adequately protected in national laws and relying on national laws when defining high-integrity carbon credits entails a risk to indigenous peoples' rights.[45]

[n] Carbon offset registries track offset projects and issue offset credits for each unit of emission reduction or removal that is verified and certified.

Carbon credits issued for areas where deforestation would not have occurred risks rewarding conservation that may have happened anyway.[36,46,47]

Over-estimation (over-crediting)

The 2022 global carbon budget attributed 5 billion tCO_2[o] emissions annually to tropical deforestation, second only to fossil fuel use (35 billion tCO_2),[49] with the deforested area increasing slightly to 5.8 million hectares (Mha) worldwide.[50] Protecting tropical forests would limit the impacts of worsening climate, such as droughts.[51–53] REDD+ credits are issued where a project is deemed to have reduced deforestation relative to a baseline.[p] Unobservable and highly uncertain baselines affect the accuracy of emissions reduction estimates for these nature-based credits.[46,47,54,55]

A study of 26 REDD+ projects across 6 countries found most projects didn't substantially reduce deforestation. 18 projects were over-credited by up to three times and claiming these credits as offsets would result in a net increase in atmospheric CO_2.[47,56] The method used and results in one of these studies have been contested by other researchers and parties involved in REDD+.[57,58] However, Gold Standard no longer issues REDD+ carbon credits because of over-estimation concerns.[59]

Leakage – do emissions increase elsewhere?

Carbon offsetting projects in one area could lead to emissions increasing elsewhere. For example, if the driver of deforestation (such as land use for agriculture, PN 617) is unaddressed, protecting one area could increase deforestation elsewhere. Similarly, afforestation or reforestation could reduce the amount of land available for agriculture or conservation.[54,60,61]

Permanence and durability of nature-based projects

Carbon storage timeframes differ between biological (1 to 100 years) and geological storage (>10,000 years).[7] The storage timeframes of projects need to be understood and priced accordingly. Over 96% of credits issued (to May 2023) were for avoided or reduced emissions, which are subject to risks affecting biological storage timeframes. Most of the remaining carbon removal credits were for temporary storage.

Climate change may increase the susceptibility of some nature-based projects to pests, disease, wildfires and wind affecting biological sequestration.[32,62] Between 2001 and 2021, a timber-producing forest area equivalent to the size of Great Britain was lost to wildfire, with research suggesting increasing wildfire risks with climate change.[63] Registries attempt to address permanence risks through "buffer pools".

A portion of carbon credits generated by nature-based carbon credit projects is set aside and placed in a "buffer pool" instead of being sold. Buffer credits can be cancelled from the pool if a "reversal" takes place, with the aim to ensure the

[o] A billion tonnes of CO_2 are also referred to as a gigatonne ($GtCO_2$), $GtCO_{2e}$ is the abbreviation of billion tonnes of carbon dioxide equivalent, the unit allowing comparison of the potential warming impact of different GHGs. In 2022, global GHG emissions from all sources reached 53.8 Gt CO2eq.[48]

[p] A baseline represents what would likely have happened without the crediting program.

integrity of previously issued credits.[q] However, some evidence suggests that buffer pools could be depleted by the other risks mentioned above.[64,65]

Double counting

Double counting occurs when the seller and buyer of credits both claim the carbon offset to report lower net CO_2 emissions. This could be business-to-business, or business-to-country. Project overlap, such as the same area of forest being protected by two different schemes, also results in double counting.[66,67]

Risks to achieving net zero targets

Research published in 2023 estimates that the remaining global carbon budget (RCB)[r] for 1.5°C is less than half the previous 2020 budget estimate. It shows a 50% chance of reaching 1.5°C within 6 years, based on current emissions. Net zero would need to be achieved by 2034 instead of 2050 to keep within 1.5°C.[68,69]

Carbon Brief 2023 analysis showed that two-thirds of the world's largest companies with net-zero targets are using carbon offsets to help meet climate goals.[40] Most purchasers were from financial services, oil, gas and petrochemical and consumer goods organisations.[7,70]

There are financial incentives to exaggerate the credit integrity and increase credit supply.[9,71,72] Use of low-integrity, low-cost credits are cheaper than direct emissions reductions but they will likely cause a net increase of atmospheric CO_2.[7,67] The NGO Carbon Market Watch state the transparency and integrity of 'carbon neutrality'[s] claims remain low.[73]

The 2023 Corporate Climate Responsibility Monitor report by the Carbon Market Watch assesses the climate strategies of 24 major global companies. For 22 companies with targets for 2030, findings show that these targets translate to a median absolute emission reduction commitment of 15% of the full value chain emissions between 2019 and 2030.[73] The report states that global planned reliance on forestry- and land-related offsetting outstrips the technical potential of these natural resources as well as highlighting the non-permanence of biological storage.

A report supported by bodies that include carbon credit certifiers suggest that companies investing in offsets are reducing their own emissions quicker than their peers.[74] However, the CCC 2023 report on Progress in Reducing UK Emissions states that there are insufficient mitigation plans from industry to meet the 2030 UK NDC.[75]

[q] The UK Woodland Carbon Code applies a 20% downward adjustment to initial carbon sequestration estimates and places a further 20% in a buffer pool to replenish any verified credits that may be lost in later years.

[r] The remaining carbon budget (RCB) is the net amount of carbon dioxide (CO_2) humans can still emit while keeping global warming below a given limit with a given probability.

[s] Carbon neutrality means having a balance between emitting carbon and absorbing carbon from the atmosphere in carbon sinks.

Policy

International policy

In 2021 at COP-26 countries agreed UNFCCC rules to govern and implement international carbon market mechanisms. There are two market mechanisms, which are still being operationalised:

- **Article 6.2** allows countries to bilaterally trade emission reductions and removals known as Internationally Transferred Mitigation Outcomes (ITMOs)[t]
- **Article 6.4** introduced a new concept of "mitigation contribution A6.4ERs",[7] which are approved in each country and by a supervisory body and could be traded as instruments in a market administered by the UNFCCC.[77,78]

Negotiators were unable to agree on the terms of Article 6 at COP-28, and negotiations will roll into 2024.[79,80]

The UN's aviation offsetting scheme (CORSIA)[81] aims to offset rises in international aviation emissions above 2020 levels (PN 615, PN 616), allowing participants to purchase from an approved subset of voluntary credits to meet compliance targets.[82,83]

A UN High Level Expert Group has recommended that high-integrity credits should not be counted toward interim emissions targets on a net zero-aligned pathway by large corporations, financial institutions, cities and regions, but rather used only to compensate when all reasonable efforts to reduce emissions have been exhausted.[84]

Carbon Market Watch have stated "a coalition of companies for climate contributions is necessary to create a critical mass for the transition to this more constructive approach."[73]

Other VCM regulation

The EU has proposed a new Carbon Removal Certification Framework to regulate and scale up carbon removal activities.[85,86] Criticisms include misleading language, as it covers emission reductions and a range of project types from reforestation to technological removals, with other concerns from commentators over double counting between private and public registries.[87–89]

In October 2023, California approved the Climate Corporate Data Accountability Act that mandates annual, full-scope[u] GHG emissions data reporting for large companies.[90] In addition, the Voluntary Carbon Market Disclosures Act was approved

[t] In 2024, Switzerland has bought from Thailand the first batch of carbon offsets under the 6.2 mechanism.[76]

[u] Full-scope emissions include all scope 1, 2 and 3 GHG emissions. Scope 1 covers direct emissions by companies. Scope 2 covers indirect emissions associated with their activities such as the electricity bought to heat buildings. Scope 3 emissions means indirect upstream and downstream GHG emissions from sources that the company does not own or directly control.

that requires companies both selling and purchasing carbon credits to disclose project details.[91]

The proposed Californian Carbon Dioxide Removal Market Development Act would require companies emitting more than 25,000 tCO_2e per year to purchase durable[v] (permanence>1000 years) negative emissions credits[w] equal to a portion of their GHG emissions. The portion would increase from 1% in 2030 to 100% in 2045.[92]

National policy

Currently, the purchase and use of carbon credits from the VCM is permitted and un-regulated in the UK. Since April 2019, large UK companies[x] must report their global energy use and GHG emissions (Scope 1&2) annually.[93]

In their 2023 Annual Progress Report to Parliament, the CCC recommended that Government should:

- "Publish guidance for businesses on what activities it is appropriate to 'offset' and when. Including confirmation that a business can only accurately use carbon credits to claim to be 'net zero' once nearly all emissions are reduced, and the remainder are neutralised by high-quality permanent removals."
- "Formalise this by: establishing 'net zero' as a statutory definition; drawing on consumer protection law or advertising standards rules to ensure businesses don't claim 'net zero' based on an inappropriate reliance on 'offsetting'; setting out in UK Environmental Reporting Guidelines and the Net Zero Transition Plan Standard a requirement for businesses to disclose why carbon credits are used rather than direct emissions reduction in net emissions claims."[75]

In response, the Government acknowledged that the use of credits for offsets should:

- be in addition to direct action by businesses to reduce emissions and in addition to science-aligned action, consistent with a net zero pathway
- reflect actual additional removal and/or GHG emission reductions

The Government committed to consult by late 2023 on supporting the growth of high-integrity carbon and nature markets, including the role of regulation.[94]

In 2023, the British Standards Institute in partnership with Defra published the high-integrity standards framework for UK nature markets.[95] The framework presents

[v] Durable carbon sequestration method means a method of carbon sequestration that can reasonably be projected to retain a large majority of the carbon atoms out of the atmosphere for 1,000 years and for which the responsible entity provides a guarantee period of at least 100 years.

[w] Negative emissions credit means a tradeable environmental attribute representing one metric tonne of net carbon dioxide removed by a carbon dioxide removal process (PN 618).

[x] Large companies are any that exceeds at least 2 of the following thresholds in a financial year: 1) £36m turnover. 2) £18m on balance sheet. 3) 250 employees. Scope 1 covers direct emissions by companies. Scope 2 covers indirect emissions associated with their activities such as the electricity bought to heat buildings.

overarching high integrity principles for all nature markets and specific standards for carbon.

In October 2023, the UK Transition Plan Taskforce (TPT) published its finalised Disclosure Framework.[96] This is intended to help companies develop, disclose, and deliver climate transition plans. The report includes disclosure recommendations for carbon credits purchased, such as the type (nature-based or technological, and reduction or removal), use (reliance towards achieving transition plan), third-party verifier/certifier and the methodologies used.

The Government consultation will consider the role of policy and regulation regarding the role of carbon credits in net zero claims.

Suggested reforms to the VCM

There are several initiatives, such as introducing regulation, seeking to address issues relating to the integrity of carbon crediting projects.

Raising project integrity

The international Integrity Council for the Voluntary Carbon Market (IC-VCM) is an independent governance body that aims to create a global benchmark for "high-quality" carbon credits.[97] Programmes will be evaluated by a new assessment framework against ten Core Carbon Principles (Figure 2).[y] These cover credit quality, governance of credit use and sustainable development including social and environmental safeguards.[98]

Historically, credit buyers relied on carbon crediting mechanisms and standards (including independent verifications) to assess credit quality with a binary pass or fail outcome. Specialised carbon credit rating agencies now offer ratings for individual projects using assessments across several criteria, including the likelihood of additionality and risk of carbon leakage, using advances in machine learning and geospatial data acquisition from satellites.[7]

New technologies such as satellite data could increase the robustness of monitoring, reporting and verification (MRV) of carbon crediting projects.[99] In a few cases, Allied Offsets have detected overlaps in project areas, which may result in double-counting of credits.[100] A prototype global emission monitoring system is under development by the Copernicus CoCO2 project utilising global GHG models and assimilating[z] satellite data.[101,102]

In 2023, the Grantham Research Institute proposed a new conceptual framework on an alternative, conservative approach to address leakage 'by design'.[103] The Carbon Market Watch and indigenous peoples organisations recommend that certifiers include in their standard the UN Declaration on the Rights of Indigenous Peoples[26]

[y] The IC-VCM state that carbon-crediting programs with a 98% share of the market have now applied for assessment against the CCPs.

[z] Data assimilation combines imperfect model information and imperfect observations.[101]

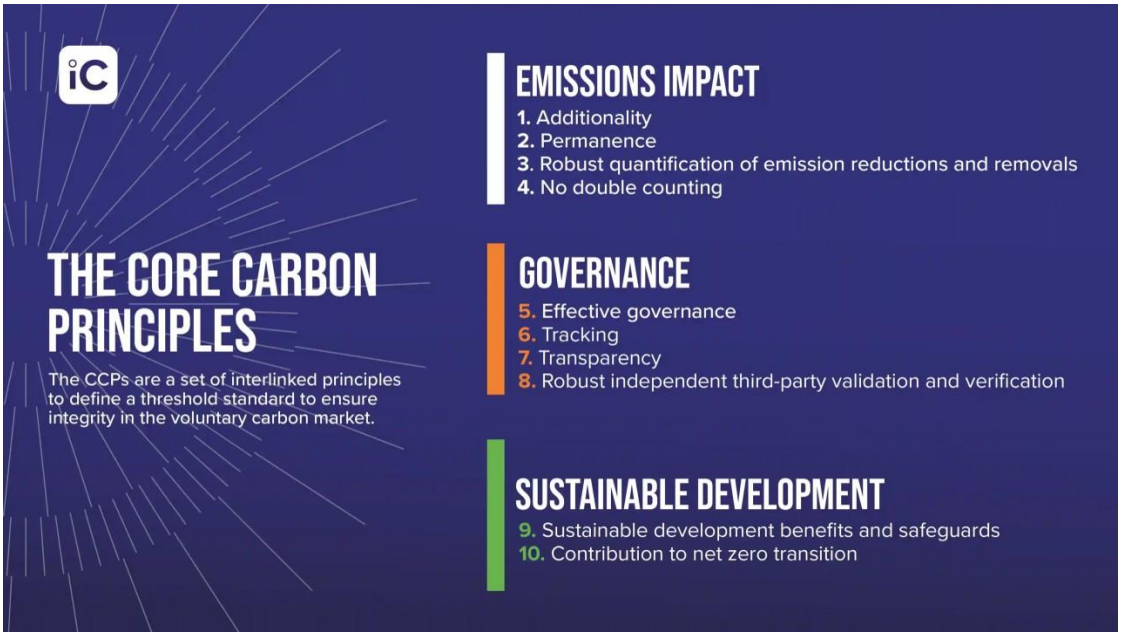
with a specific requirement to obtain free, prior and informed consent from Indigenous Peoples and local communities.[77,104]

High-integrity UK projects

The UK Woodland Carbon Code (WCC)[105] and Peatland Code (PC)[106] are internationally recognised for high standards of sustainable forest and carbon management. The WCC is endorsed by International Carbon Reduction and Offsetting Accreditation (ICROA).[aa,107] Future UK codes under research and development include the Saltmarsh Code and the Soil Code.[17,108]

The Wildlife Trusts have developed a new approach for climate action and habitat restoration that will restore Atlantic rainforests across western Britain. The full benefits to biodiversity, climate resilience, communities and carbon are being valued in the programme. The project is financed directly, with the company retiring the carbon credits that are verified after 2040, but only when they have met their own emissions reduction targets.[109]

Figure 1 : IC-VCM Core Carbon Principles



Source: IC-VCM Core Carbon Principles infographic

Business use of carbon credits

The 2020 Oxford Offsetting Principles outline how offsetting needs to be approached to help achieve a net zero society (revised principles being developed in 2024).[110] In summary:

- Principle 1: Cut emissions, use high quality offsets, and regularly revise offsetting strategy as best practice evolves.

[aa] ICROA is the global umbrella body for carbon reduction and offset providers in the voluntary market.

- Principle 2: Shift to carbon removal offsetting.
- Principle 3: Shift to long-lived storage.
- Principle 4: Support the development of net zero aligned offsetting.

Since late 2022, the Science Based Targets initiative (SBTi) has been encouraging a mitigation or contribution approach to be claimed separately by businesses rather than using carbon credits to offset emissions.[59,111] In 2023, the Voluntary Carbon Markets Integrity Initiative (VCMI) developed an international business Claims Code of Practice.[112]

The code provides guidance on when and how companies should use carbon credits in line with the contribution approach. The business claims depend on the carbon credit use and quality thresholds met. The VCMI expands on requirements of other climate change initiatives (Box 2).[bb,111]

The Gold Standard impact-related claims guidelines states that all "carbon credits issued or labelled by Gold Standard may be used, following their retirement, towards claims that reflect or describe the climate change mitigation impact represented by the credit."

Illustrative examples of impact-related claims reference the MRV and certification process.[59] A Guide to Climate Contributions produced by the New Climate Institute in 2023 sets out a framework for companies to take responsibility for emissions without offsetting.[113]

[bb] At COP-28, Mark Carney and representatives from SBTi, GHG Protocol, VCMI, and IC-VCM outlined the 'end-to-end integrity framework' constituted by their standards and policies, reinforcing their mutual recognition and coordination to assure the VCM operates with maximum integrity.

Box 2: Science Based Targets initiative

The **SBTi** Net-Zero Standard defines four key elements for companies in order of a 'mitigation hierarchy':[114]

1. **Near-term science-based target** are 5-10 year GHG mitigation targets in line with 1.5°C pathways.
2. **Long-term science-based target** show companies how much they must reduce value chain emissions to align with reaching net-zero at the global or sector level in eligible 1.5°C pathways by 2050 or sooner.
3. **Neutralisation of any residual emissions** are measures companies take to remove carbon from the atmosphere and permanently store it, counterbalancing the impact of emissions that remain unabated.[cc]
4. **Beyond value chain mitigation (BVCM)** are actions or investments that fall outside of a company's value chain. This includes activities that avoid or reduce GHG emissions, and those that remove and store GHGs from the atmosphere.

The focus of **SBTi** are elements 1 to 3. However, SBTi encourages companies to go further and invest in mitigation outside their value chains to contribute towards reaching societal net zero. This includes 90% emission reductions (including scope 3).

BVCM aims to accelerate the global transition, these actions do not count towards achieving science-based targets:[115]

- **In the near-term**, prioritise securing and enhancing carbon sinks (terrestrial, coastal and marine etc.) to avoid emissions arising from their degradation. There is also a critical need to invest in nascent GHG removal technologies (such as direct air capture and storage).
- **In the long-term**, when the net zero target date is reached, companies must neutralise any residual emissions that cannot be abated through permanent emission removals. Companies must continue to neutralise any remaining emissions.

[cc] Unabated means without any reduction.

References

1. Terlouw, T. *et al.* (2021). Life Cycle Assessment of Direct Air Carbon Capture and Storage with Low-Carbon Energy Sources. *Environmental Science & Technology*, American Chemical Society.
2. IPCC (2022). Factsheet CDR :WGIII 6AR I Carbon dioxide removal.
3. Understanding the Compliance and Voluntary Carbon Trading Markets. *Deloitte United Kingdom*.
4. (2023). What are NDCs and how do they drive climate action? *UNDP Climate Promise*.
5. Dooks, T. (CCC) (2022). Voluntary Carbon Markets and Offsetting October 2022.
6. Carbon Credits (2023). Live Carbon Prices Today, Carbon Price Charts • Carbon Credits. *Carbon Credits*.
7. World Bank Group (2023). State and Trends of Carbon Pricing 2023.
8. Calel, R. *et al.* (2021). Do Carbon Offsets Offset Carbon? *SSRN Journal*,
9. Romm, J. (2023). Are carbon offsets unscalable, unjust, and unfixable—and a threat to the Paris Climate Agreement?
10. Gill-Wiehl, A. *et al.* (2024). Pervasive over-crediting from cookstove offset methodologies. *Nat Sustain*, 1–12. Nature Publishing Group.
11. Cames, D. M. *et al.* (2016). How additional is the Clean Development Mechanism?
12. Gayathri, R. *et al* (2021). A review on biological carbon sequestration: A sustainable solution for a cleaner air environment, less pollution and lower health risks. *Journal of King Saud University - Science*, Vol 33, 101282. Elsevier.
13. Duncan, D. W. *et al.* (2011). *The Concept of Geologic Carbon Sequestration*. U.S. Geological Survey.
14. Kelemen, P. *et al.* (2019). An Overview of the Status and Challenges of CO2 Storage in Minerals and Geological Formations. *Front. Clim.*, Vol 1, 482595. Frontiers.
15. Smith, S. M. *et al.* (2023). The State of Carbon Dioxide Removal - 1st Edition. The State of Carbon Dioxide Removal.
16. Mason, V. G. *et al.* (2023). Blue carbon benefits from global saltmarsh restoration. *Global Change Biology*, gcb.16943.
17. CEH (2023). UK Saltmarsh Code | UK Centre for Ecology & Hydrology.
18. Carbon Credits.com (2021). The Importance of Blue Carbon Credits. *Carbon Credits*.
19. Filbee-Dexter, K. *et al.* (2020). Substantial blue carbon in overlooked Australian kelp forests. *Sci Rep*, Vol 10, 1–6. Nature Publishing Group.
20. Cohen, B, *et al*. (2021). Co-benefits and trade-offs of climate change mitigation actions and the Sustainable Development Goals. *Sustainable Production and Consumption*, Vol 26, 805–813. Elsevier.
21. Lou, J. *et al.* (2022). Integrating sustainability into climate finance by quantifying the co-benefits and market impact of carbon projects. *Commun Earth Environ*, Vol 3, 1–11. Nature Publishing Group.
22. Smith, P. *et al.* (2019). Land-Management Options for Greenhouse Gas Removal and Their Impacts on Ecosystem Services and the Sustainable Development Goals. *https://doi.org/10.1146/annurev-environ-101718-033129*. Annual Reviews.
23. Balmford, A. *et al.* (2023). Realizing the social value of impermanent carbon credits. *Nat. Clim. Chang.*, Vol 13, 1172–1178. Nature Publishing Group.
24. Groom, B. *et al.* (2023). The social value of offsets. *Nature*, Vol 619, 768–773. Nature Publishing Group.

25. Rights and Resources Initiative *et al.* (2021). Significance of Community-Held Territories in 24 Countries to Global Climate. Rights and Resources Initiative.
26. United Nations (2007). United Nations Declaration on the Rights of Indigenous Peoples.
27. Tom Prater, J. G., Daisy Dunne, Aruna Chandrasekhar, Orla Dwyer, Molly Lempriere, Yanine Quiroz, Ayesha Tandon, Dr Giuliana Viglione, Joe Goodman, Tom Pearson (2023). In-depth Q&A: Can 'carbon offsets' help to tackle climate change? *Carbon Brief*.
28. Lejano, R. P. *et al.* (2020). The Hidden Disequities of Carbon Trading: Carbon Emissions, Air Toxics, and Environmental Justice. *Front. Environ. Sci.*, Vol 8, 593014. Frontiers.
29. AP News (2022). In Peru, Kichwa tribe wants compensation for carbon credits. *AP News*.
30. Aguirre-Gutiérrez, J. *et al.* (2023). Valuing the functionality of tropical ecosystems beyond carbon. *Trends in Ecology & Evolution*, Vol 0, Elsevier.
31. Plant-for-the-Planet – Trillion Trees for Climate Justice. *Plant-for-the-Planet*.
32. Bateman, I. J. *et al.* (2023). A review of planting principles to identify the right place for the right tree for 'net zero plus' woodlands: Applying a place-based natural capital framework for sustainable, efficient and equitable (SEE) decisions. *People and Nature*, Vol 5, 271–301. John Wiley & Sons, Ltd.
33. Gamon, J. A. (2023). Revisiting the carbon–biodiversity connection. *Global Change Biology*, Vol 29, 5117–5119. John Wiley & Sons, Ltd.
34. Nature-based Solutions Initiative (2019). Afforestation for climate change mitigation: Potentials, risks and trade-offs. *Nature-based Solutions Initiative*.
35. Coleman, E. A. *et al.* (2021). Limited effects of tree planting on forest canopy cover and rural livelihoods in Northern India. *Nat Sustain*, Vol 4, 997–1004. Nature Publishing Group.
36. Haya, B. K. *et al.* (2023). Comprehensive review of carbon quantification by improved forest management offset protocols. *Front. For. Glob. Change*, Vol 6, 958879. Frontiers.
37. News Room Guyana (2022). BREAKING: Oil giant Hess paying Guyana US$750M for saving forests. *News Room Guyana*.
38. Street, C. AMERINDIAN PEOPLES ASSOCIATION.
39. Lang, C. (2023). "The sale by the Government of Guyana of forest-based carbon credits was fraudulent".
40. Eisen, J. (2023). As Guyana shows, carbon offsets will not save the Amazon rainforest. *Climate Home News*.
41. ART REDD (2023). TREES. *ART Architecture for REDD+ Transactions*.
42. LEAF Coalition (2023). LEAF Coalition. *LEAF Coalition*.
43. UNFCCC (2023). Safeguards / REDD+.
44. UNFCCC (2013). Warsaw Framework for REDD+ / REDD+.
45. Forest Peoples Programme (2022). Preventing human rights violations Preventing human rights violations associated with deforestation: why reliance on local laws is not enough.
46. Haya, B. K. *et al.* (2023). Quality Assessment of REDD+ Carbon Credit Projects. Berkeley Public Policy, The Goldman School.
47. West, T. A. P. *et al.* (2023). Action needed to make carbon offsets from forest conservation work for climate change mitigation. *Science*, American Association for the Advancement of Science.
48. European Commission. Joint Research Centre. (2023). GHG emissions of all world countries: 2023. Publications Office.

49. Friedlingstein, P, *et al.* (2022). Global Carbon Budget 2022. *Earth System Science Data*, Vol 14, 4811–4900. Copernicus Publications.
50. Boehm, S. *et al.* (2023). State of Climate Action 2023.
51. Girardin, C. A. J. *et al.* (2021). Nature-based solutions can help cool the planet — if we act now. *Nature*, Vol 593, 191–194.
52. Rodrigues, M. (2023). The Amazon's record-setting drought: how bad will it be? *Nature*.
53. Ware, G. (2023). Unprecedented drought in the Amazon threatens to release huge stores of carbon – podcast. *The Conversation*.
54. Balmford, A. *et al.* (2023). Credit credibility threatens forests. *Science*, American Association for the Advancement of Science.
55. Jones, J. P. G. *et al.* (2023). Forest carbon offsets are failing. *Science*, American Association for the Advancement of Science.
56. West, T. A. P. *et al.* (2020). Overstated carbon emission reductions from voluntary REDD+ projects in the Brazilian Amazon. *Proceedings of the National Academy of Sciences*, Vol 117, 24188–24194.
57. Mitchard, E. *et al.* (2023). Serious errors impair an assessment of forest carbon projects: A rebuttal of West et al. (2023).
58. Everland (2023). Science vs West: When experts buy bad science. *Everland*.
59. Gold Standard (2022). Gold Standard claims guidlines 2022.
60. Villoria, N. *et al.* (2022). Leakage does not fully offset soy supply-chain efforts to reduce deforestation in Brazil. *Nat Commun*, Vol 13, 1–10. Nature Publishing Group.
61. Streck, C. (2021). REDD+ and leakage: debunking myths and promoting integrated solutions. *Climate Policy*, Taylor & Francis.
62. IPCC (2022). Climate Change 2022: Mitigation of Climate Change.
63. Bousfield, C. G. *et al.* (2023). Substantial and increasing global losses of timber-producing forest due to wildfires. *Nat. Geosci.*, 1–6. Nature Publishing Group.
64. Fritsch, L. (2023). The Shortcomings of the Buffer Pool As a Risk-Mitigation Mechanism. *Oka, The Carbon Insurance Company*.
65. Badgley, G. *et al.* (2022). California's forest carbon offsets buffer pool is severely undercapitalized. *Front. For. Glob. Change*, Vol 5, 930426. Frontiers.
66. Tom Prater, J. G., Daisy Dunne, Aruna Chandrasekhar, Orla Dwyer, Molly Lempriere, Yanine Quiroz, Ayesha Tandon, Dr Giuliana Viglione, Joe Goodman, Tom Pearson (2023). In-depth Q&A: Can 'carbon offsets' help to tackle climate change? *Carbon Brief*.
67. Cullenward, D, *et al*. (2023). Carbon offsets are incompatible with the Paris Agreement. *One Earth*, Vol 6, 1085–1088. Cell Press.
68. HM Government (2021). Achieving Net Zero carbon emissions: a review of the evidence behind carbon offsetting. *GOV.UK*.
69. Michael Le Page (2023). We can now only stay under 1.5°C target if we achieve net zero by 2034. *New Scientist*.
70. Pearson, J. G., Tom (2023). Analysis: How some of the world's largest companies rely on carbon offsets to 'reach net-zero'. *Carbon Brief*.
71. Prater, D. D., Josh Gabbatiss, Joe Goodman, Tom (2023). Infographic: How are carbon offsets supposed to work? *Carbon Brief*.
72. Carbon Market Watch (2023). Secretive intermediaries: Are carbon markets really financing climate action? *Carbon Market Watch*.
73. Carbon Market Watch (2023). Corporate Climate Responsibility Monitor 2023: ASSESSING THE TRANSPARENCY AND INTEGRITY OF COMPANIES' EMISSION REDUCTION

AND NET-ZERO TARGETS February 2023.
74. New research: Carbon credits are associated with businesses decarbonizing faster. *Ecosystem Marketplace*.
75. Climate Change Committee (2023). Progress in reducing UK emissions - 2023 Report to Parliament.
76. Civillini, M. (2024). First ever Paris Agreement offsets face integrity questions. *Climate Home News*.
77. Crook, J. (2022). COP27 FAQ: Article 6 of the Paris Agreement explained. *Carbon Market Watch*.
78. (2022). The Mitigation Contribution under Article 6: key understandings and what it means for the VCM | The Gold Standard.
79. Marcos, M. V. (2023). COP28: Article 6 failure avoids a worse outcome. *Carbon Market Watch*.
80. Civillini, M. (2023). Four questions for Cop28 to settle about a global carbon market. *Climate Home News*.
81. CORSIA (2023). CORSIA Eligible Emissions Units Nov2023.pdf.
82. Prater, T. (2019). Corsia: The UN's plan to 'offset' growth in aviation emissions. *Carbon Brief*.
83. Transport & Environment (2021). Corsia: worst option for the climate. Briefing on assessment of ICAO's offsetting scheme.
84. United Nations (2023). INTEGRITY MATTERS: NET ZERO COMMITMENTS BY BUSINESSES, FINANCIAL INSTITUTIONS, CITIES AND REGIONS. FROM HIGH-LEVEL EXPERT GROUP ON THE NET ZERO EMISSIONS COMMITMENTS OF NON-STATE ENTITIES.
85. EU (2023). Proposal for a Regulation on an EU certification for carbon removals.
86. EU (2023). Carbon Removal Certification.
87. Diab, K. (2023). European Parliament inches towards improving Carbon Removal Certification Framework (CRCF). *Carbon Market Watch*.
88. Dooley, K. M., Kate (2023). Failed climate solution is about to be revived by the EU. *Climate Home News*.
89. EEB (2023). Joint open letter on the proposed Regulation on CRCF. *EEB - The European Environmental Bureau*.
90. California Legislative Information (2023). Bill Text - SB-253 Climate Corporate Data Accountability Act.
91. California Legislative Information (2023). Bill Text - AB-1305 Voluntary carbon market disclosures.
92. California Legislative Information (2023). Bill Text - SB-308 Carbon Dioxide Removal Market Development Act.
93. HM Government (2019). Environmental Reporting Guidelines.
94. HM Government (2023). Responding to the Climate Change Committee's (CCC) 2023 Annual Progress Report to Parliament.
95. BSI (2023). A high-integrity standards framework for UK nature markets.
96. TPT (2023). Transition Plan Taskforce Disclosure Framework 2023.
97. ICVCM (2023). ICVCM - Build integrity and scale will follow. *ICVCM*.
98. ICVCM (2023). Core Carbon Principles. *ICVCM*.
99. ESA (2023). Space and carbon markets: harnessing the power of space technologies and carbon markets for a sustainable planet.
100. Allied offsets (2023). Home - AlliedOffsets.
101. Bannister, R. (2023). Shedding some light on DARC. *DARC*.
102. CoCO2 (2023). | CoCO2: Prototype system for a Copernicus CO2 service.
103. Filewod, B. *et al.* (2023). Avoiding leakage from nature-based offsets by design. One Earth, 6 (7), 790-802
104. TFCI. *TFCI Guide*.

105. Woodland Carbon Code (2023). Home - UK Woodland Carbon Code.
106. IUCN (2023). Peatland Code | IUCN UK Peatland Programme. *IUCN Peatland Programme*.
107. ICROA (2023). ICROA | Accrediting Best Practice in Carbon Offsetting. *ICROA*.
108. Sustainable Soils Alliance (2023). Soil Carbon Code | About the Code.
109. Wildlife Trusts (2023). British rainforests – a new approach for climate action, communities and nature | The Wildlife Trusts.
110. Allen, M. *et al.* (2020). The Oxford Principles for Net Zero Aligned Carbon Offsetting 2020.
111. SBTi (2023). SBTi Corporate Net Zero Standard. Version 1.1. April 2023.
112. VCMI Claims Code of Practice.
113. New Climate Institute (2023). A guide to climate contributions.
114. Beyond Value Chain Mitigation. *Science Based Targets*.
115. Net-Zero: Urgent Beyond Value Chain Mitigation Is Essential. *Science Based Targets*.

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POST is grateful to Helen Hooker for researching this briefing, to SCENARIO NERC DTP for funding their parliamentary fellowship, and to all contributors and reviewers. For further information on this subject, please contact the co-author, Dr Jonathan Wentworth.

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DOI: https://doi.org/10.58248/PN713

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