SUPPORTING BLUE CARBON PROJECTS

AN INTRODUCTORY GUIDE FOR BUYERS, INVESTORS & FUNDERS

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EXECUTIVE SUMMARY

1. Blue carbon ecosystems are those – such as mangroves, seagrasses and saltmarshes – that are able to capture organic carbon from the atmosphere, burying it in sediments that can form long term carbon sinks.

2. The conservation or restoration of blue carbon ecosystems can contribute to net-zero and other sustainability strategies as they provide a wide range of benefits, including carbon capture and storage.

3. Investments can range from grants, funding the development of a project, to the purchase of carbon credits from an established project to offset emissions.

4. The voluntary carbon market (VCM) is established and expanding. Prices for credits are expected to increase with demand expanding ten-fold by 2030 as net-zero targets are adopted.

5. There are a number of risks that may be associated with blue carbon projects during their development and lifetime. Investors should be aware of the financial risk of high capital costs and long lead times during the development of credible projects destined for the VCM or ethical insetting.

6. There are reputational risks associated with investment in blue carbon projects. Investors and buyers need to ensure their actions are credible and are not greenwashing. They should follow the mitigation hierarchy (reducing emissions first, before offsetting) and work with carbon standards.

7. The investment in national and international blue carbon projects can unlock significant additional benefits, from profitability through PES, to cultural value and climate justice.

GLOSSARY

Additionality
The idea that the benefits, including of carbon sequestration, of a project are in addition to those that would have occurred anyway even if the project had not happened.

CO2e
Carbon equivalents, term to encompass the six greenhouse gases included in the Kyoto Protocol, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the so-called F-gases (hydrofluorocarbons and perfluorocarbons) and sulphur hexafluoride (SF_6).

Carbon negative
The state when more carbon emissions have been removed from the atmosphere than released (which can be done by offsetting).

Carbon neutral
The state when released carbon emissions have been balanced by their removal e.g. by offsetting.

Carbon sequestration
The process by which carbon dioxide is fixed, from the atmosphere, into non-gaseous forms of carbon, such as organic carbon in wood and soil, which removes this carbon from the atmosphere.

Carbon sink
A natural resource that absorbs and stores more carbon than it releases, these sinks can emit high quantities of carbon if damaged (e.g peatlands).

Carbon Standard
A third party, independent body that assesses and validates carbon projects to certify they are operated without fraud and in accordance with science.

ESG
Coined from ESG investing, ESG covers metrics in Environmental (e.g. Biodiversity Net Gain) Social (e.g. Gender Equality) and Governance (e.g. Legal Compliance).

Greenwashing
Conveying false, misleading or exaggerated information that suggests a company is doing more to protect the environment than is reality.

Insetting
The use of a carbon project developed by an organisation (or within its value chain) to compensate for emissions.

Leakage
The displacement of damaging activity (such as tree cutting) from one time or place to another, because of a project intervention.

Managed retreat
A coastal restoration strategy that allows the shoreline to move inwards.

Net zero
The state when the amount of released GHG emissions is balanced with emission removals, through offsetting or the services provided by carbon projects.

NGOs
Non-Governmental Organisations, usually non-profit organisations.

Offsetting
The process by which emissions of carbon at one place or time are compensated for by equivalent sequestration, or avoided emissions, at another place or time.

OC
Organic carbon bound up into compounds coming from living things, such as trees. It is different from inorganic carbon, such as CO_2.

PDD
Project Design Document, a preliminary document describing the project's context.

PES
Payments for Ecosystem Services. The idea that the custodians of an ecosystem, such as a local community, should be paid for maintaining or enhancing the delivery of a service that the ecosystem provides, such as carbon sequestration.

PIN
Project Information Note, a document defining the project's main elements.

SDGs
Sustainable Development Goals, the United Nations 17 goals to be achieved by 2030 for a healthy and sustainable planet.

VCM
Voluntary Carbon Market, the (virtual) market in which people or institutions choose to buy carbon credits.

1.0 INTRODUCTION

This guide is for people interested in investing in a blue carbon project, whether that be through grants or the purchase of carbon credits on the VCM.

Blue carbon is defined as carbon that is captured and stored by coastal and marine ecosystems (blue carbon ecosystems). Blue carbon projects are initiatives that protect and/or restore 'blue carbon' ecosystems – particularly mangrove forests, seagrass meadows or saltmarshes. By capturing and storing carbon, blue carbon ecosystems can make an important contribution towards slowing global climate change, a service to the global community while supporting local communities. However, carbon sequestration is only one of the wide range of benefits that these ecosystems provide to people and to nature, and there are many other ways to fund their conservation and restoration.

This guide provides an introductory overview of the science of blue carbon and the risks associated with the development of a project with Scottish and international examples. This guide also explains the different types of possible investments (e.g. offsetting), and key risks investors should be aware

"Mangrove trees and roots" by ACES.

2.0 BLUE CARBON IS NATURE BASED SOLUTION

Conservation and restoration of blue carbon ecosystems through community led projects have the potential to mitigate large amounts of anthropogenic emissions.

Conservation of existing blue carbon ecosystems could mitigate around 300 million metric tonnes of carbon dioxide equivalents per year (304 Tg CO_2e pa; Macreadie et al. (2021)). Large scale restoration of mangroves, seagrass and saltmarsh could mitigate around 841 Tg of CO_2e pa as quickly as by 2030. The capture of 841 Tg CO_2e pa would offset the equivalent of 2.5% of total global anthropogenic emissions (the equivalent of all the CO_2 emissions from the aviation industry in 2018 - not CO_2e or including the effective radiative forcing emissions.)

"Thrift covered saltmarsh at Northton, Isle of Harris, Wetern Isles Area" by Lorne Gill, licensed by NatureScot.

3.0 BLUE CARBON SYSTEMS

Whilst blue carbon ecosystems in general are characterized by high carbon stocks and fast sequestration rates, there can be large differences between sites and there are also differences in the relevant scientific information available for different habitats. Hence the potential risks and benefits can vary widely.

3.1 Are there blue carbon ecosystems in the area?

To develop a project, there needs to be at least one blue carbon ecosystem present, or there must be opportunities to establish a new system or restore an area where an ecosystem has been completely removed.

The protection and restoration of existing but threatened and degraded systems is likely to be easier than establishing entirely new ones. In many cases, sites that used to support a particular ecosystem will no longer do so – for example because of changes in tidal currents or soil salinity. If there are plans to establish a blue carbon ecosystem where one did not occur before (for example by using 'managed retreat' to turn coastal land into saltmarsh), great care must be taken not to threaten biodiversity on the site and to assess whether the ecological transformation will be possible.

All sites are different, with some containing far more carbon than others. The greater the actual or potential carbon density (i.e. carbon per hectare) at the designated site, the higher the potential revenue that can be expected from the VCM; some blue carbon habitats may have carbon densities that are too low to support carbon projects destined for the VCM.

Image licensed under Creative Commons CC0.

"Remnant Salt Marsh", by Andrew is licensed under CC BY 2.0.

3.2 Mangroves

Mangroves are salt-tolerant trees found on coastlines where their complex root systems are permanently or periodically submerged. There are 70-100 species of mangroves, present in sub-tropical and tropical regions, so the conditions in which they grow can vary. Mature mangroves can sequester on average four times more than mature tropical forests (6-8 tonnes of CO_2e/ha/yr; with larger amounts for rapidly growing young forests). They store the carbon in the vegetation and sediment, which can be released when mangroves are damaged or destroyed through logging or other activities.

In hot-arid climates Avicennia species dominate, forming dense but stunted forests. Often growing on sandy sediment, with small above ground biomass, such shrubby forests may have a fraction of the carbon found in large, productive, multi-species mangrove forests at wetter sites. So far, mangrove forests have been the focus of blue carbon projects due to their additional community and biodiversity benefits, and the easy adoption of carbon project methods developed for terrestrial forests. The world's first community-led blue carbon project, Mikoko Pamoja (Swahili for "Mangroves together"), was developed in a mangrove system on Kenya's southeast coast.

Fig. 1 Illustrated by Dr. Imi Dencer-Brown.

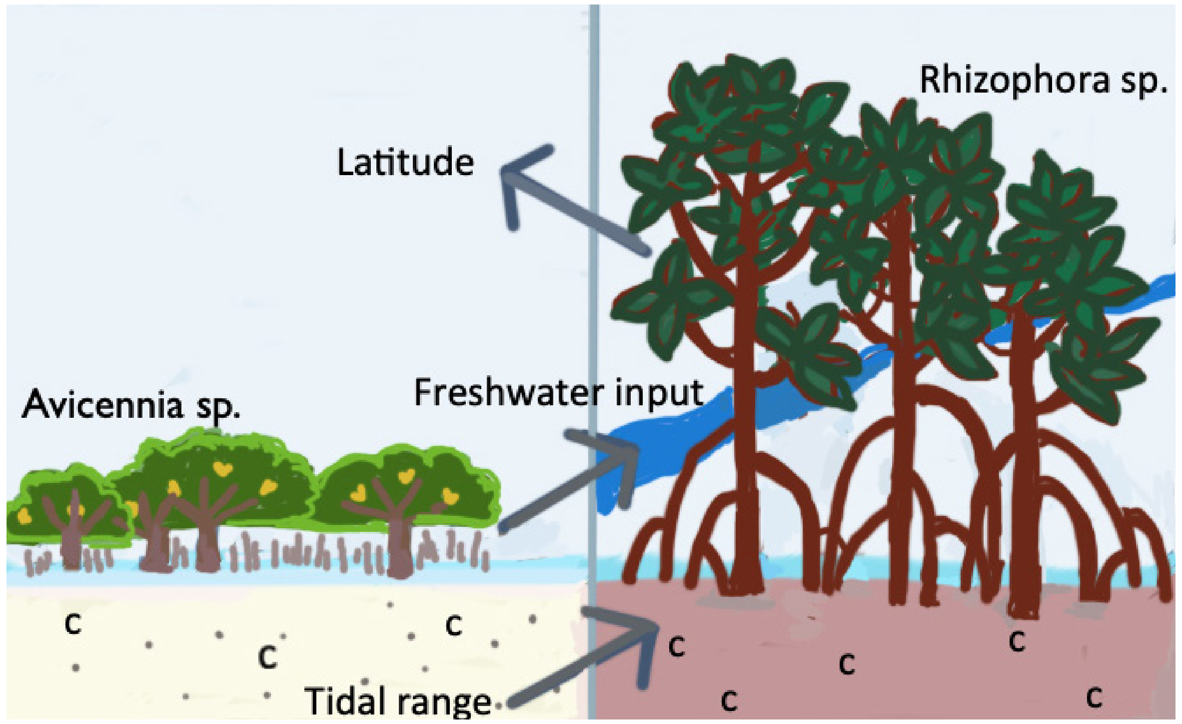


Fig. 1 - Potential differences in below-ground carbon stocks between scrub low-lying mangroves growing in mineralised sediments, e.g Avicennia sp. (less carbon, lower tidal range, less freshwater input and higher latitudes) and established mangrove forests growing in muddier sediments e.g Rhizophora sp. (more carbon, greater tidal range, more freshwater input with lower latitudes).

"Mikoko Pamoja, Kenya, Gazi Bay" by ACES.

Mikoko Pamoja is a pioneering community-led blue carbon project, generating the world's first carbon credits for the conservation of mangroves and seagrass.

3.3 Seagrass

Seagrasses are submerged flowering plants with deep roots that grow in sheltered areas in the shallow lower inter- to subtidal zones along coastlines in tropical, subtropical and temperate regions (e.g. Scotland). More similar to terrestrial grass than seaweed, these plants occupy 0.1% of the ocean floor but are responsible for 11% of the carbon sequestered in the ocean floor. These plants are often damaged by fishing gear and pollution.

Fig. 2 Illustrated by Dr. Imi Dencer-Brown.

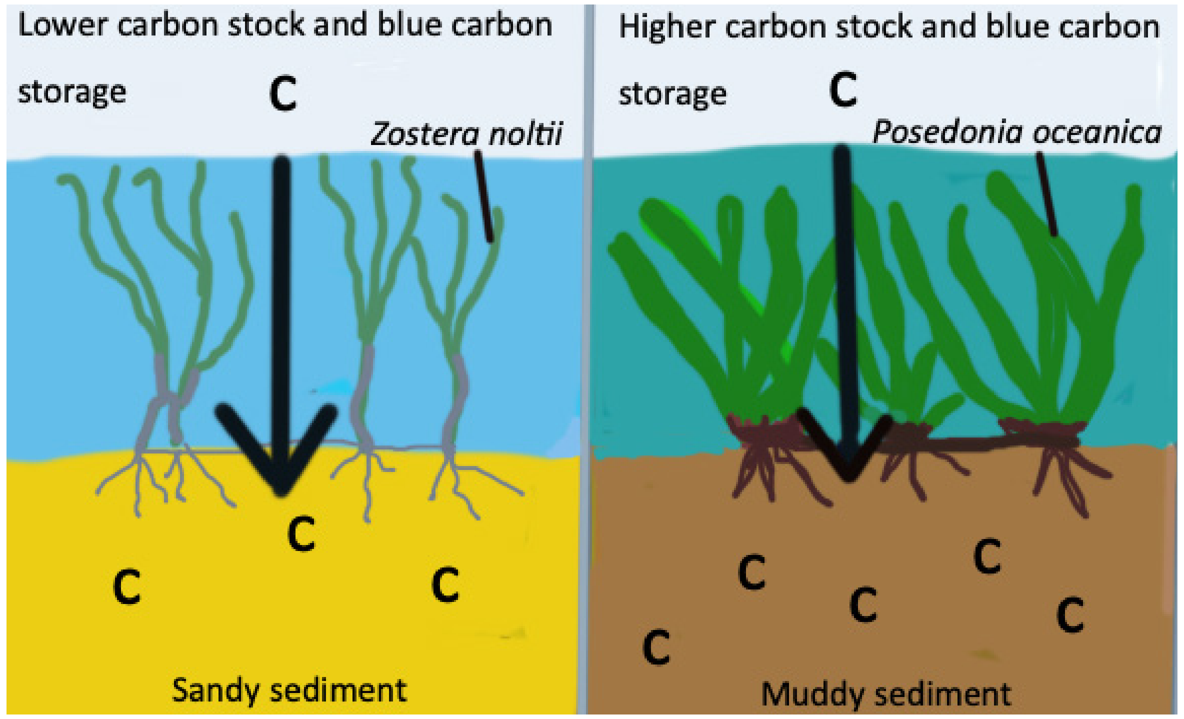


Fig. 2 - Seagrass stores carbon in the sediment in which it grows, but again the amount stored, and the speed in which it is sequestered (storage rate per year) varies widely. For example the species common in the Mediterranean, Posidonea oceanica, may store three or four times more carbon than found in a terrestrial forest, whilst species in northern Europe, Common eelgrass (Zostera marina) and Dwarf eelgrass (Zostera noltii), generally store less than in terrestrial forests.

"Sea Lions in Seagrass", by Jeff Hester / Ocean Image Bank.

"Enhalus Acoroides, Bali, Indoneisa", by Project Seagrass.

3.4 Saltmarshes

Saltmarshes are coastal wetland ecosystems that contain salt-tolerant plants including grasses (especially Spartina sp.) and succulents (such as glasswort, Salicornia sp.) that are submerged and drained by the tides. Saltmarshes are primarily found in temperate regions (e.g. Scotland) as well as tropical and subtropical regions.

Currently, no projects have financed the protection or restoration of saltmarshes through the sale of carbon credits, but the development of a Saltmarsh Carbon Code is underway in the UK.

Fig. 3 Illustrated by Dr. Imi Dencer-Brown.

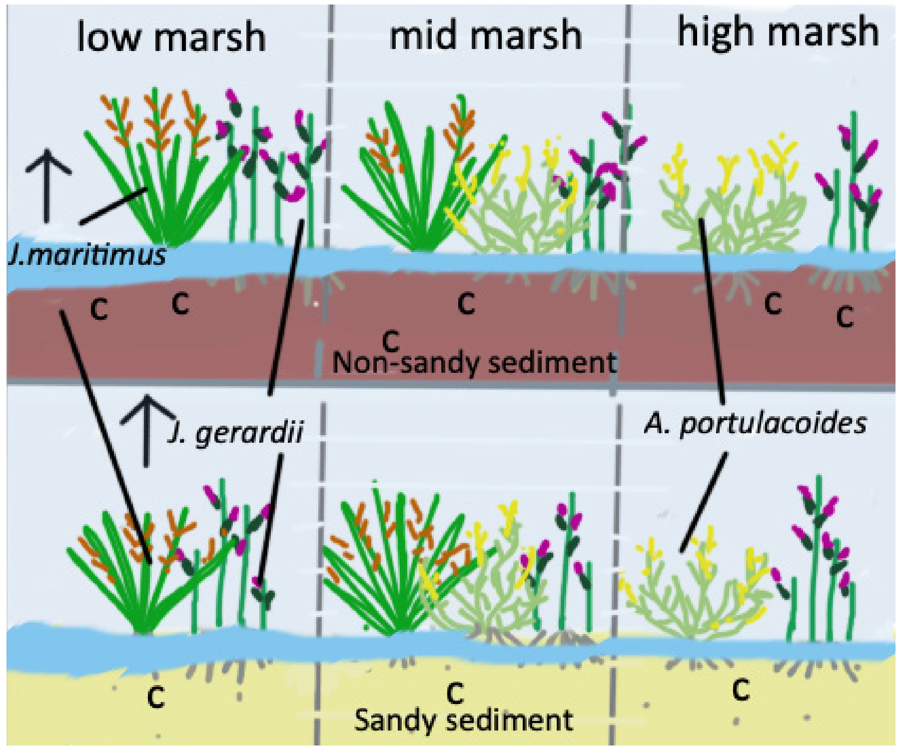


Fig. 3 - Saltmarsh blue carbon stocks vary by type of sediment (non-sandy having higher stocks than sandy) and vegetation type (with J. gerardii and J. maritimus often having greater SOC than other species (down to 10cm)). Adapted from data in Ford et al., 2019: Ford, H., Garbutt, A., Duggan-Edwards, M., Pagès, J. F., Harvey, R., Ladd, C., and Skov, M. W.: Large-scale predictions of salt-marsh carbon stock based on simple observations of plant community and soil type, Biogeosciences, 16, 425–436, https://doi.org/10.5194/bg-16-425-2019, 2019.

"Northton Salt Marsh", by Chris Golightly is licensed under CC BY-NC-SA 2.0.

"Sheep grazing Northton saltmarsh" by Lorne Gill / NatureScot.

"Tang", by Magnus Hagdorn is licensed under [CC BY-SA 2.0.](CC BY-SA 2.0.)

3.5 Other potential candidates

Mangroves, seagrass and saltmarshes are currently the main focus of blue carbon projects due to them being well understood systems and the scientific certainty of their carbon capture and storage capacities. However, kelp, coastal sediments and megafauna are gaining interest for their capacity to sequester carbon.

Kelp, large brown seaweeds, can be found worldwide and - unlike mangroves, seagrass, and saltmarshes - grow on solid rather than soft substrates. The conservation and restoration of kelp forests can provide numerous co-benefits, such as supporting biodiversity, providing a source of food and providing buffers to the coastlines. However, most of the carbon captured by kelp and other seaweeds is released back into the water when they are eaten or degraded. Whilst some carbon may be transported to other sites and buried in sediment (thus achieving long term sequestration) demonstrating this for any particular site is often difficult or impossible.

Other coastal and marine sediments, such as mudflats, are also considered as possible long term carbon stores and sites for blue carbon management. Marine sediments without vegetation may still contain very high densities of carbon. This carbon can be released back into the water column and eventually the atmosphere if it is disturbed, for example by trawling. Hence sites with carbon rich marine sediment – such as sea lochs – may prove suitable for blue carbon management and intervention. However, there are large scientific uncertainties at most such sites, and they are generally less open to management and control by local communities than vegetated coastal sites.

Around one third of all marine megafauna – such as whales and large fish - are threatened with extinction. This decline and loss undermine the health and functioning of the oceans and the delivery of a wide range of benefits to people. One benefit may be carbon sequestration. Through the sinking of excrement and carcasses to the ocean floor, some of the carbon

"Humpback whales, Mo'orea, French Polynesia", by Toby Matthews / Ocean Image Bank.

originating from megafauna becomes buried in ocean sediment and therefore contributes to the oceanic carbon sink. However, there are very large uncertainties about the scale of this sink and the fate of any individual organism.

4.0 TYPES OF BLUE CARBON INVESTMENT

This section explains four different ways of investing in blue carbon projects highlighting the benefits and limitations of each.

4.1 Philanthropic grants /Charitable giving

Monetary or other charitable giving can be significant ways of supporting a project. There are many benefits of grants and charitable giving both to the investor and the investee; these can include providing immediate and flexible support for a project. Funds not limited to a specific action or service can benefit the project in many ways.

Most blue carbon projects require significant seed funding and support for the development of the project as well as ongoing costs such as the administration and marketing of credits once the project is established. This funding is difficult or impossible to secure from selling credits alone. There is growing interest in offtake deals in which investors provide up-front funding by entering into an agreement with the project developer for future credits at an agreed price (as demand and prices are set to increase significantly in coming years, such an arrangement can ensure high quality credits as part of net zero planning).

4.2 Contributions in kind

Contributions in kind are also useful to projects; offering or volunteering time and services allow for an immediate benefit. Moreover, the person offering the contribution in kind would be directly involved, contrary to a monetary donation which can be sent anonymously. However, volunteering involves a time commitment from both parties and must include meaningful contributions. NGOs such as Earthwatch Institute have used citizen science volunteering approaches – recruiting individuals, teachers, students and corporate employees - for many years and have shown how they can increase employee satisfaction and retention.

4.3 Insetting

Some organisations have the resources to invest in their own projects that generate carbon benefits to directly offset their emissions (rather than to buy credits from other projects). This process is called "insetting". It may involve, for example, purchasing land for tree planting – this will require time, expertise and significant initial funding. Also, in the context of blue carbon, full ownership is unlikely (since coastal waters are usually owned by governments e.g. The Crown Estate in the UK) although various tenureship agreements are possible. The resultant project may or may not be fully accredited through a carbon standard. Since the resulting carbon benefits are not for sale as credits on the open market, accreditation my not be required, although it ensures good practice and helps avoid accusations of greenwash.

4.4 Offsetting

The term offsetting refers to the compensation of emissions generated at one place or time through activities, such as the expansion of natural carbon sinks, elsewhere; this can be mediated through the purchase of carbon credits through the VCM. In the hierarchy of responses to the climate emergency, offsetting should come after emissions reductions and leadership on system and political change (www.aces-org.co.uk/tackling-the-climate-crisis-the-3-ps/).

"CBEMR Workshop in Tanzania" by Mangrove Action Project.

Those wanting to offset should calculate the amount of emissions they need to offset. Current best practice to measure the quantity of emissions for each different activity is to use the Greenhouse Gas (GHG) Protocol methodology (www.ghgprotocol.org/guidance-0) and relevant conversion (or emission) factors (e.g. DEFRA conversion factors).

The GHG protocol defines and classifies different emission-causing / releasing activities in three scopes.

These scopes are defined as:

- **Scope 1**
Direct emissions (e.g. owned vehicles, gas consumption)

- **Scope 2**
Indirect emissions (e.g. purchased electricity)

- **Scope 3**
Other indirect emissions (including water, waste, transportation of goods, use of goods etc)

Offsets are usually bought through the VCM which enables the sale and purchase of carbon credits. The VCM is different from the compliance market, in which large organisations in carbon-intense sectors (e.g. cement manufacture) in some jurisdictions (such as the EU) are required to buy offsets. A carbon credit is often equivalent to 1 tonne of CO2eq that has been avoided or sequestered from a specific and verified project. Purchasing carbon credits equivalent to the volume of calculated emissions means the emitting activity can be considered as carbon neutral (although good practice always involves emissions reductions first and often includes precautionary spending on more credits than calculated, to help account for uncertainties in the calculations).

5.0 CARBON CREDITS & PROJECT TYPES

The prices charged for one credit vary widely between project type. This reflects the large differences in the difficulties and benefits associated with different project approaches . The strong growing interest in the VCM and demand for credits suggests prices will increase substantially in the next few years.

5.1 Carbon credit market trends and emissions reductions

Interest and activity in the VCM has been growing rapidly with 65% of the total annual credits sold through this market in 2019, a four-fold increase since 2015 (World Bank). As a result, the prices of carbon credits are set to increase. The competition for companies to buy high-quality credits for their ESG performance and net-zero objectives is driving this growing market and could rapidly require more than can be supplied – for example, it would require the same amount of land as all of the farmland on the planet (90m ha) to meet current net zero pledges through tree planting activities (Oxfam). With this surge, the cost of carbon credits is set to increase from the current world average of $3-5 to $30-50 per credit by 2030 (Greenbiz, Sylvera).

> *"[...] it is mathematically impossible to plant enough trees to meet the combined net zero targets announced by governments and corporations as there is simply not enough land to do this."*
>
> *Oxfam, Tightening the Net 2021, page 7*

This will unlock significant investment into these projects and – in the case of nature based solutions – the conservation and restoration of natural resources. Additionally, these higher prices should help encourage accelerating emission reduction strategies (which must entail the elimination of all avoidable emissions by 2050 to remain aligned with the IPCC's 1.5°C scenario). Yet, even in this (best case) scenario, there remains a requirement for increased investment in, and expansion of, nature-based solutions. For example, the IPCC estimates that achieving the goal of restraining temperature rise to 1.5°C may require up to 9.5 million km2 of additional forest area by mid-century. These new forests will contribute to a global carbon balance that must be carbon negative by mid-century; sequestration should exceed emission in order to stabilise the climate.

Carbon credits are likely to remain an important source of income and support for nature-based solutions projects for many decades, even if funding shifts from compensation for current emissions towards addressing legacy carbon.

"Mangrove Restoration in Mexico", by USAID Biodiversity & Forestry is licensed under CC BY-NC 2.0.

"Thalassodendron ciliatum, parrotfish silloute, Zanzibar, Tanzania", by Project Seagrass.

5.2 Possible Carbon projects

Carbon projects, operating and anticipated, use a wide range of approaches and technologies. There are projects that enable the avoidance or reduction of emissions, the capture and sequestration through natural processes (e.g. nature based solutions, blue and green carbon) and more recently, direct air capture and permanent storage technologies (Table 1).

Carbon projects involving forests (including mangrove forests) normally include one or more of the following interventions:

- **Reforestation / restoration:**
the planting of trees where trees have previously been cut down (either in a completely deforested site or degraded forest).

- **Avoided deforestation / avoided degradation/forest protection:**
preventing forests from being cut down or degraded.

- **Afforestation:**
the creation of new areas of forest where they did not previously exist.

The equivalent actions with seagrass and saltmarsh habitats would involve reseeding and/or allowing natural recovery in degraded areas, protecting areas from encroaching degradation or destruction and planting/establishing entirely new areas (for example during 'managed retreat' in which new intertidal habitat is created). and/or allowing natural recovery in degraded areas, protecting areas from encroaching degradation or destruction and planting/establishing entirely new areas, for example during 'managed retreat' in which new intertidal habitat is created.

Table 1: Summary of different types of carbon projects

	Example	Additionality	Co-benefits	Science	Cost
Direct air	*In-situ mineralism*	✓✓✓	✓	✓	✓
Renewables technology	*Replacing coal with solar/wind*	✓	✓	✓✓✓	✓✓
Fuel efficient stoves	*Replacing solid fuel with solar*	✓✓	✓✓✓	✓	✓✓
Agricultural	*Improving soils through extensive livestock*	✓	✓✓	✓	✓
Methane capture	*Capping methane leaks from mines*	✓	✓	✓✓✓	✓✓
Ecosystem Protection	*Protection of natural mangrove forests*	✓✓	✓✓✓	✓✓✓	✓✓✓
Ecosystem expansion	*Planting new seagrass meadows*	✓✓	✓✓	✓✓	✓✓

Table 1: key

Key	Additionality	Co-benefits	Science	Cost
✓	*Most progress in area is already mandated or planned*	*Small likelihood of additional benefits to livelihoods, biodiversity or climate justice*	*Either untested or not demonstrated at scale*	*High costs*
✓✓	*A mix of mandated and additional progress*	*Some examples of co-benefits in some projects*	*Sound basis in science but uncertainties at scale*	*Average costs*
✓✓✓	*Progress likely to need significant additional voluntary investment*	*Progress highly likely to bring co-benefits to people and/or nature*	*Well founded on accepted science*	*Generally good value for money*

6.0 PROJECT DEVELOPMENT PROCESSES & RISKS

The development of projects is subject to a number of financial, political and force majeur risks, including long lead times associated with the main processes (project development can take up to 5 years before the sale of credits) and credibility of the project itself.

6.1 Main processes

Establishing a community-based blue carbon project requires careful consideration of governance, tenureship and equitable management; typical steps and questions are summarised on teh next page.

Image by Andrea Bonetti / Mangrove Action Project.

Are there any natural resources in the area that generate ecosystem services?

Are these ecosystem services threatened?

Can you prove additionality?

Are there actions a local community could take to protect or expand these ecosystem services?

Are there actions in place already? Or are there actions a local community could take that are not currently being implemented?

Who currently owns or controls access to these services? Is there possible tenureship?

Can you prove tenureship?

Have you identified (if any) limitations to the potential project?

Is there already community support for conservation?

If no

Is it likely that this support would be forthcoming if there was a chance of earning income?

What are the options for funding this project?

Business with direct interest grants of financial aid voluntary carbon market

How long does it take before a conservation project becomes profitable? What is its lifespan?

See timeline with the general steps

6.2 Ensuring credibility

Projects certified by a recognized carbon standard will have undergone third-party audits during establishment and are subject to on-going scrutiny and reporting to ensure good governance and scientific credibility. Different carbon standards have different emphases (for example, on the requirements for community benefit, poverty alleviation, degrees of scientific precision and biodiversity enhancement) but all mandate scientifically robust demonstration of carbon benefits. Most standards offer guidance and the required documentation on their websites to assist those going through the certification process.

Some internationally recognized standards are:

- **Gold Standard**

www.goldstandard.org

Gold Standard

This standard is supported by a number of NGO's (WFF, ICUN, Fairtrade) and requires social and environmental benefits from the projects it certifies to support the SDGs. This standard does not have a minimum project size and has a number of projects from low and middle-income developing countries. It has stringent criteria with clear rules around additionality, the requirement of third-party auditing and an approval body.

- **Verified Carbon Standard**

www.verra.org

The VCS is run by non-profit VERRA, this standard focuses on emissions reductions and does not require additional social or environmental benefits. This standard covers a diverse range of sectors, including renewables and forestry. This standard has regularly updated its program materials and the rules a project must follow, these updates ensure the updated quality of their Verified Carbon Units. Accredited third-party auditors are required to validate and verify the projects.

- **Plan Vivo Standard**

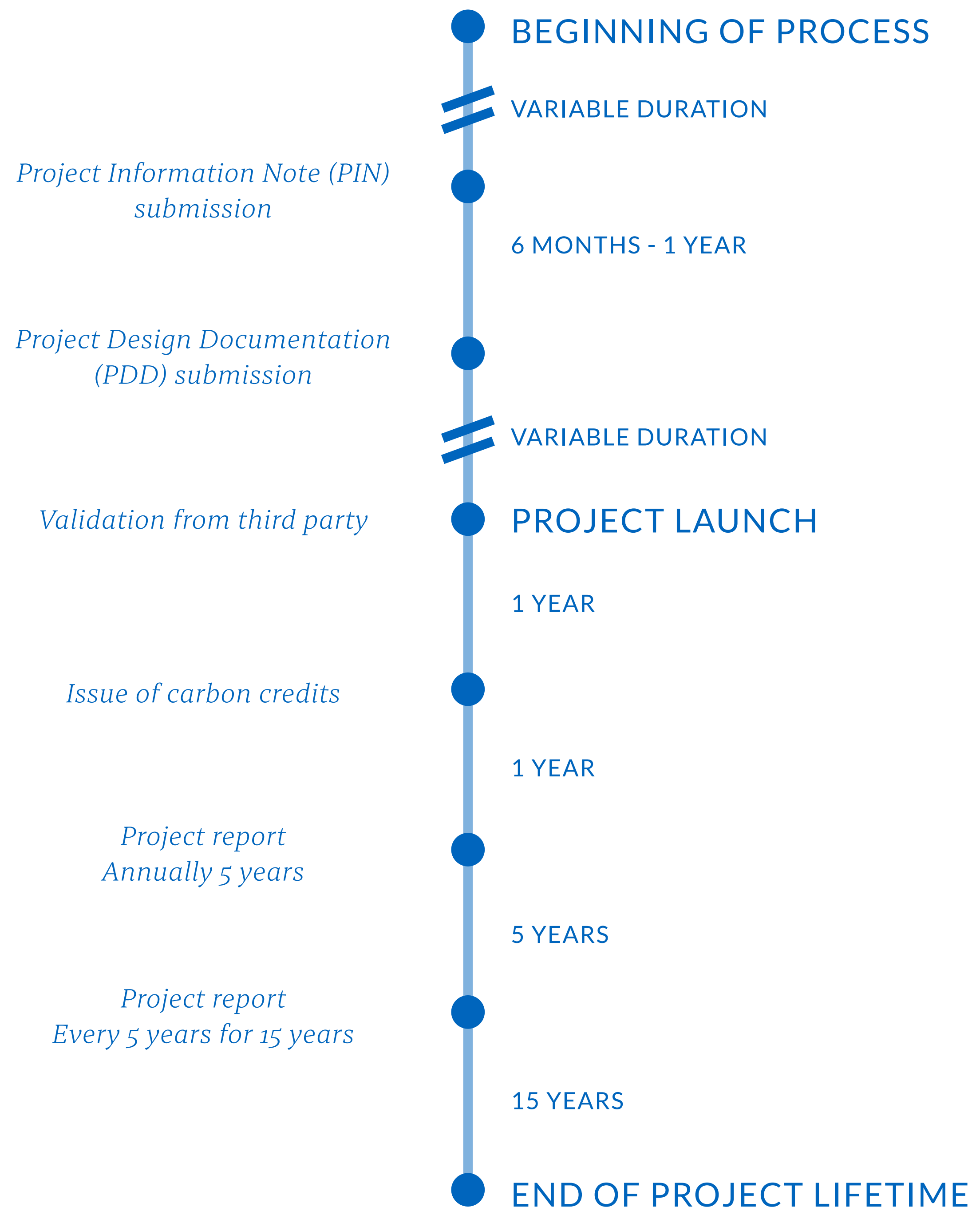
www.planvivo.org

PLAN VIVO
For nature, climate and communities

Developed over 25 years ago to generate the world's first carbon credits, and run by registered Scottish charity Plan Vivo Foundation, this standard covers forestry, agricultural and other land use projects. This standard focuses on supporting rural livelihoods, sustainable development, and ecosystem services. The standard has been regularly updated to increase accessibility and certified the world's first blue carbon project (Mikoko Pamoja). Independent third-party audits are required at regular intervals during the project's lifetime as well as for initial registration.

6.3 Project timeline

Another risk is the potential for delays before becoming profitable as projects designed to sell to the VCM using credits certified by a carbon standard will typically follow a lengthy process involving steps of variable duration as illustrated on the next page.



7.0 REPUTATIONAL RISKS

Those looking to invest in (or fund) blue carbon projects, or purchase offsets, can help promote an enabling environment for ethical blue carbon projects. This means avoiding actions that could limit the development of high quality projects and cause wider reputational damage to offsetting and the VCM while supporting credible and ethical developments.

7.1 Greenwashing

Greenwashing involves insincere promotion of environmental credentials. It is often signalled through vague terminology or pledges, for example the pledge to achieve net zero emissions by 2050 without a real plan to reduce emissions, or simply through the complete reliance on offsets to appear carbon neutral. The most egregious examples of greenwashing involve deliberate and concerted efforts to mislead the public.

Greenwashing involving carbon credits damages the VCM as a whole and brings very high reputational risks to the company responsible; customers, employers and regulators are increasingly sceptical of green claims and may not forgive insincerity.

Greenwashing can be avoided by:

- transparency and honesty about the scale of the challenges and the measures used to move towards sustainability;
- clear demonstration of emissions reductions and target-based plans to achieve net zero;
- openness to dialogue and criticism from informed outsider groups.

7.2 Carbon colonialism

Carbon colonialism describes how wealthy and powerful individuals, corporations and countries are responding to the climate crisis at the expense of poorer countries and people. For example, purchasing land (especially in the global south) for tree schemes, and then excluding the current occupants from rights and benefits, is an affront to justice.

Corporations that displace communities to meet their climate goals are guilty of carbon colonialism. Investments in nature-based solutions, including in blue carbon, may bring real and lasting benefits to local people and can help to redress global climate injustice; the fact that those least responsible for the climate crisis are generally also most exposed to its emerging impacts. There is a strong climate justice argument for much greater investment in nature-based solutions, especially in developing countries. However, such investments must take great care to respect local wishes and agency and to work with local communities and stakeholders.

"Saltmarsh at the head of Loch Slapin, Isle of Skye" by Lorne Gill, licensed by NatureScot.

"Mangrove", by Sekundo is licensed under CC BY-NC-ND 2.0.

8.0 CONCLUSIONS

1. Blue carbon ecosystems – mangroves, seagrass and saltmarshes, and potentially other carbon-rich marine ecosystems such as coastal shelves – can help address important environmental and social issues and impacts stemming from the climate crisis.

2. These ecosystems can be found around the world and when managed by local communities, can provide benefits to the community such as profits through the VCM, supporting biodiversity and livelihoods while contributing to sustainability targets.

3. Robust evidence of additional carbon benefits, and careful analysis of social and biodiversity risks and benefits, are required for the successful development of a blue carbon project. This usually requires significant initiation funding .

4. The VCM and carbon credits are experiencing increased demand with limited supply. There will be competition for high-quality credits and prices are likely to increase by 50-100% over the next five to ten years.

5. There are financial and reputational risks involved with the development and financial support of carbon projects. These come from uncertainties inherent in project development, a process that can take years. Investors and supporters must avoid greenwashing and carbon colonialism to ensure ethical project and offsets – this can be facilitated by carbon standards.

6. Accreditation by carbon standards involving third-party auditing ensures credibility and is usually necessary if the goal is to sell carbon credits; many standards provide guidance to communities on their websites.

7. Investment in community-led projects can empower local people, enabling the stewardship and management of natural resources and bringing a range of benefits, including conservation of biodiversity, mitigation of climate change and improved local livelihoods.

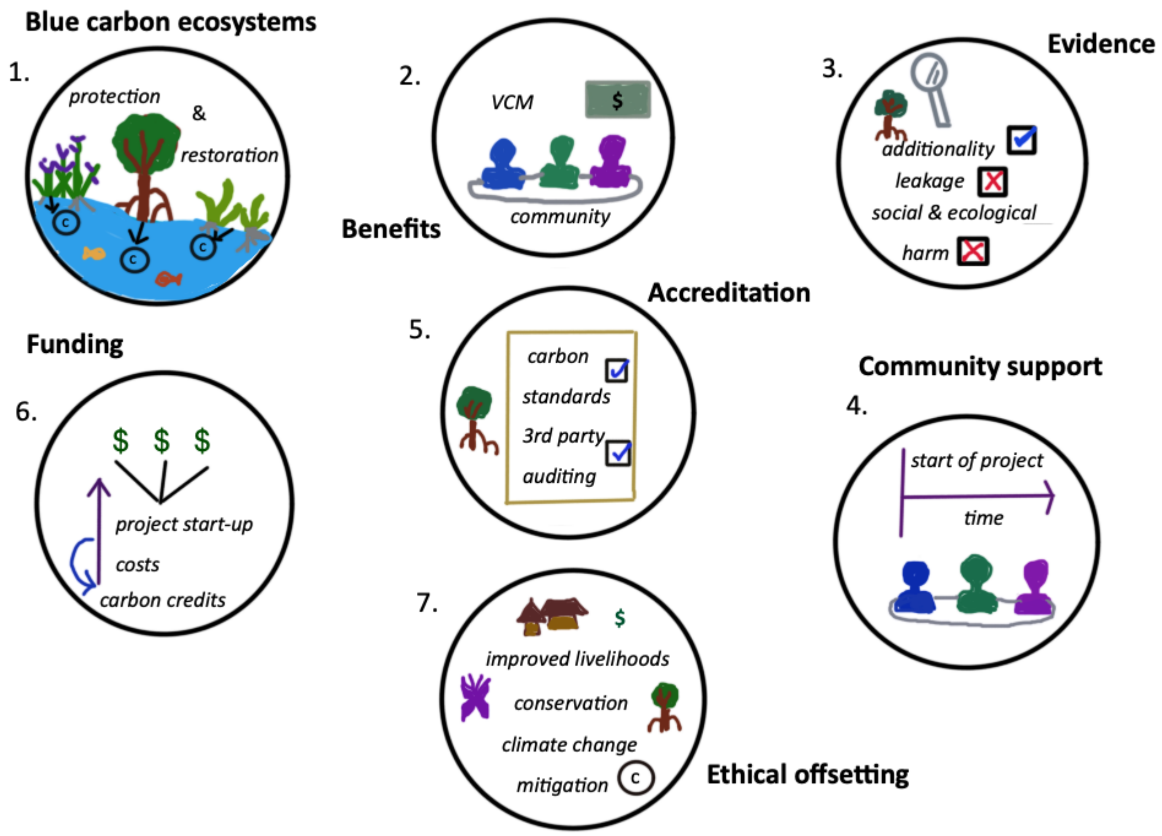


Fig. 4 Illustrated by Dr. Imi Dencer-Brown.

9.0 RESOURCES

9.1 Bibliography

Austin, W.; Smeaton, C.; Riegel, S.; Ruranska, P. & Miller, L. 2021. Blue carbon stock in Scottish saltmarsh soils. Scottish Marine and Freshwater Science Vol 12 No 13, 37pp. DOI: 10.7489/12372-1. *https://data.marine.gov.scot/dataset/blue-carbon-stock-scottish-saltmarsh-soils*

Friess, D. A., Howard, J., Huxham, M., Macreadie, P. I., & Ross, F. (2022). Capitalizing on the global financial interest in blue carbon. PLOS Climate, 1(8)

IPCC. (2018). Special Report on Global Warming of 1.5°C. *www.ipcc.ch/sr15*

Li M, Trencher G, Asuka J (2022) The clean energy claims of BP, Chevron, ExxonMobil and Shell: A mismatch between discourse, actions and investments. PLoS ONE 17(2): e0263596. *https://doi.org/10.1371/journal.pone.0263596*

Macreadie, P. I., Costa, M. D., Atwood, T. B., Friess, D. A., Kelleway, J. J., Kennedy, H., ... & Duarte, C. M. (2021). Blue carbon as a natural climate solution. Nature Reviews Earth & Environment, 2(12), 826-839.)

Managed retreat *https://www.e-education.psu.edu/earth107/node/701*

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Carbon credit market trends:

Greenbiz
www.greenbiz.com/tag/carbon-credits

Sylvera
www.sylvera.com/resources/carbon-credit-crunch-report page 10

Worldbank
www.openknowledge.worldbank.org/handle/10986/33809 page 56

Oxfam
www.oxfamamerica.org/explore/research-publications/tightening-the-net specifically pages 7, 16-20

Volunteering for staff retention
www.earthwatch.org

9.2 Further reading

ACES 3 P's to offsetting
www.aces-org.co.uk/tackling-the-climate-crisis-the-3-ps

Carbon credits and ESG goals
www.greenbiz.com/article/carbon-markets-how-realize-climate-and-esg-goals

Corporate action example: Max Burger
www.maxburgers.com/climate-positive/sustainability

Eco Act – climate consultant
www.eco-act.com

Greenhouse Gas (GHG) Protocol methodology
www.ghgprotocol.org/guidance-0

Voluntary Carbon Markets Integrity Initiative
www.vcmintegrity.org/vcmi-claims-code-of-practice

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More information can be found on the resources sections of the websites of the organisations involved in this work – the links are the following:

www.aces-org.co.uk/resources

www.mangroveactionproject.org/resources

www.projectseagrass.org/publications

ACES

MANGROVE ACTION PROJECT

PROJECT SEAGRASS

Scottish Government
Riaghaltas na h-Alba
gov.scot