THE DEVELOPMENT OF BLUE CARBON PROJECTS

A GUIDE FOR COMMUNITIES

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EXECUTIVE SUMMARY

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

2. Blue carbon ecosystems provide a wide range of benefits. One of these is carbon sequestration, and this may be something that the owners, stewards or managers of the ecosystem can sell on the voluntary carbon market, or Payments for Ecosystem Services, to earn revenue for conservation and local communities.

3. The voluntary carbon market (VCM) is established and expanding with increased interest in sustainability and net-zero commitments. To sell credits on this market, projects need to follow a number of processes and achieve accreditation with a carbon standard.

4. Achieving accreditation under a carbon standard usually takes at least two years, requires significant up-front funding, and must meet requirements for community benefit, additionality, enhancement of biodiversity, the avoidance of leakage and proof of permanence

5. Selling credits, once a project achieves accreditation, requires people dedicated to marketing and sales and the administration and running of the project. Therefore, community engagement is key to a successful project.

6. Buyers usually purchase carbon credits to 'offset' their emissions. This can be a useful contribution towards achieving a net-zero, sustainable world, but could also act as an excuse to avoid cutting emissions. Sellers should be wary of 'greenwash' and work with carbon standards to avoid it.

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 (SF6).

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

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.

NGOs
Non-Governmental Organisation

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, this is 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 document describing the project's context.

Permanence
The idea that sequestered carbon remains in carbon stores, such as the soil, for many years (usually centuries to millennia).

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 preliminary document defining the project's main elements.

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

S.O.C
Soil organic carbon, the organic carbon that is found in soils, which may constitute a large proportion of all organic carbon in blue carbon ecosystems.

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

1.0 INTRODUCTION

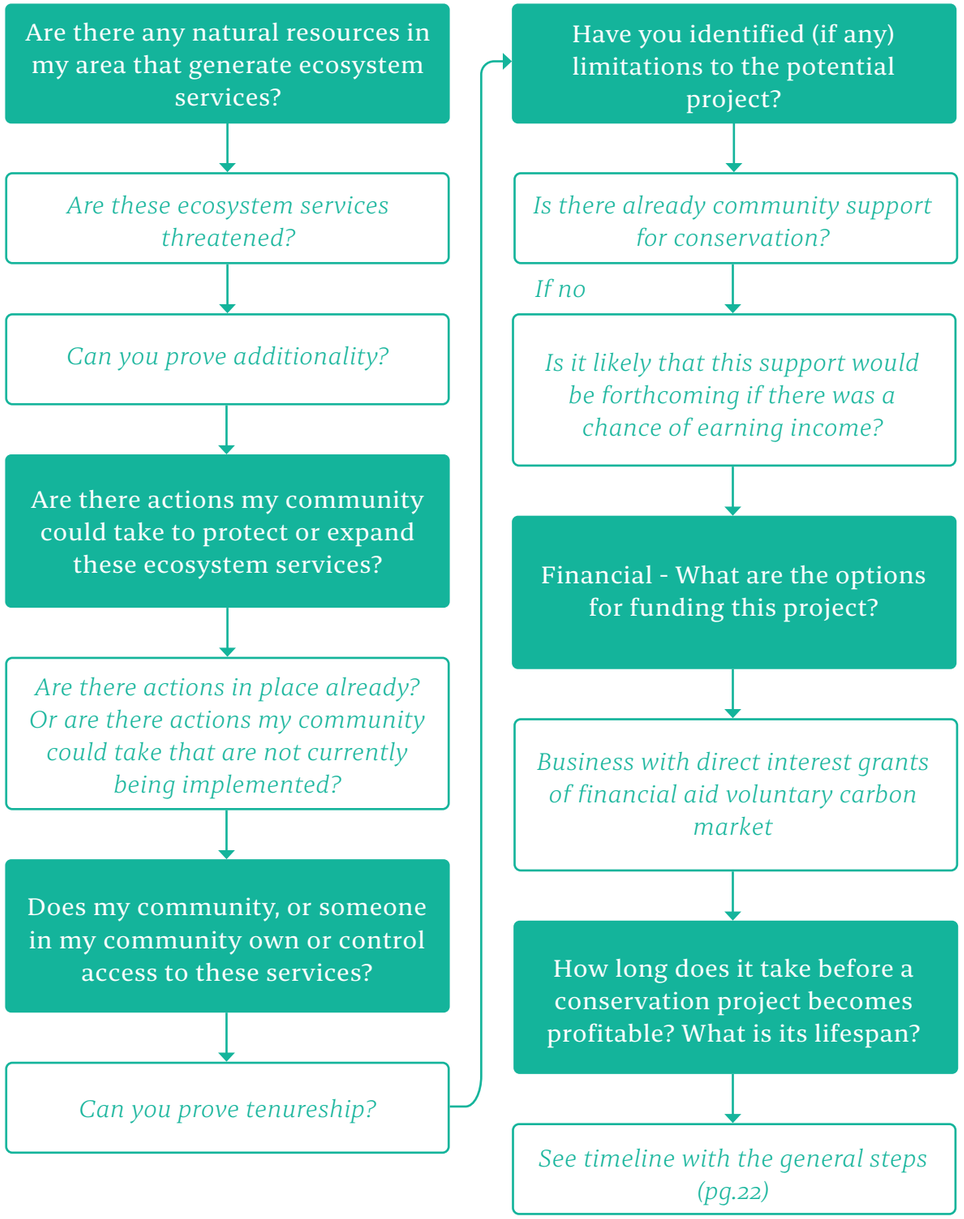
This guide is for people interested in developing a community-led blue carbon project.

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, and this service to the global community may be something that communities are able to sell on the voluntary carbon market (VCM). They may be funded, at least in part, by the sale of carbon credits. However, carbon capture and storage 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 processes that will need to be followed to establish a community-led blue carbon project, with Scottish and international examples.

2.0 OVERVIEW OF MAIN PROCESSES

To create or develop a project there are a number of processes that need to take place to ensure governance and management of the project, which are summarised (into questions) below:



3.0 BLUE CARBON SYSTEMS

The success of the project heavily depend on the ecosystem involved. The interest in blue carbon ecosystems is growing and therefore it is important to understand the different ecosystems and their capacities in blue carbon sequestration.

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 you plan 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 inter-tidally on coastlines. 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 terrestrial tropical forests (6-8 tonnes of CO2e/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 dwarf 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.

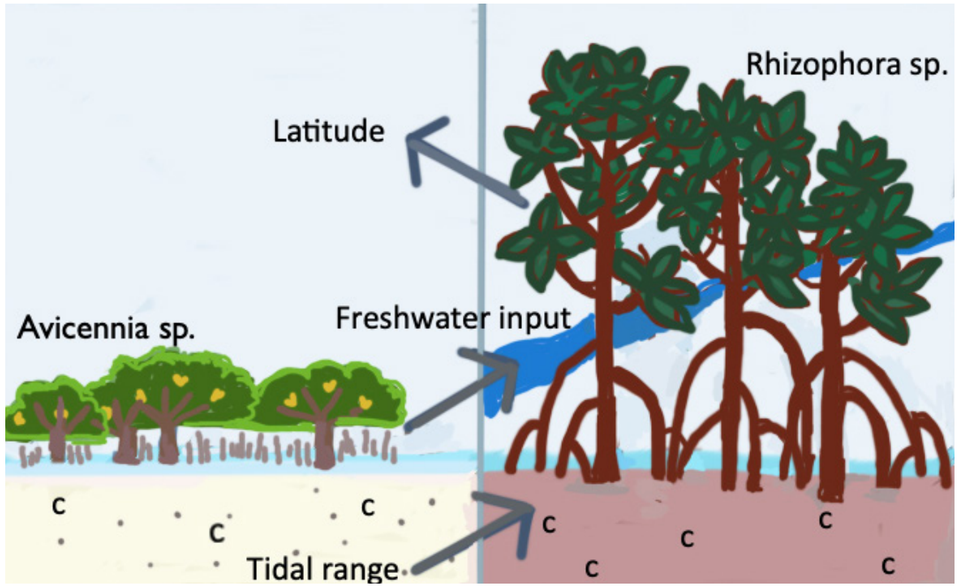


Fig. 1 - Potential differences in below-ground carbon stocks between scrub low-lying mangroves growing in mineralised sediments, e.g Avicennia sp. (less carbon, lower tidal range, less freshwater input and higher latitudes) and established mangrove forests growing in muddier sediments e.g Rhizophora 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 sub tidal 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. These plants are often damaged by fishing gear and pollution.

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

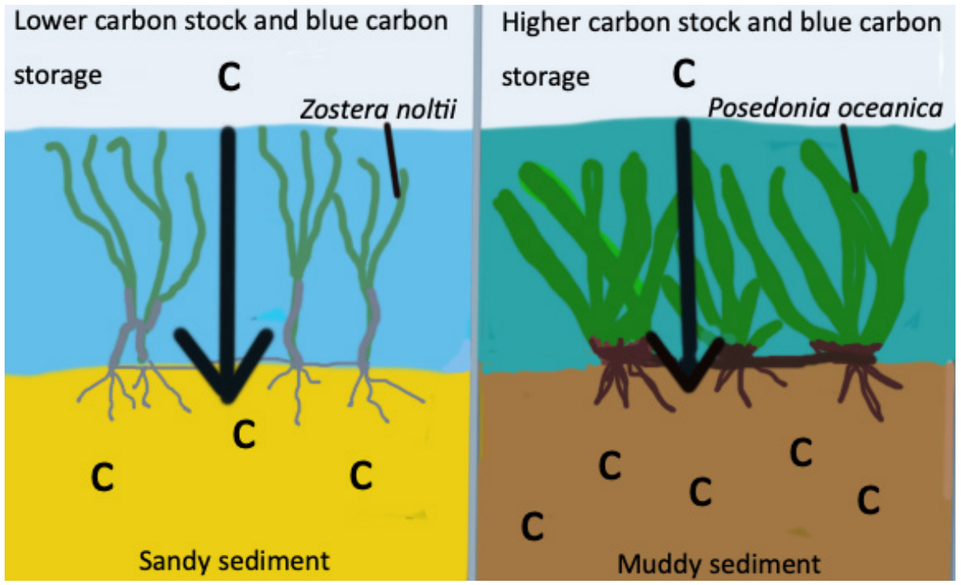


Fig. 2 - Seagrass stores carbon in the sediment in which it grows, but again the amount stored, and the speed in which it is sequestered (storage rate per year) varies widely. For example the species common in the Mediterranean, Posidonea oceanica, may store three or four times more carbon than found 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.

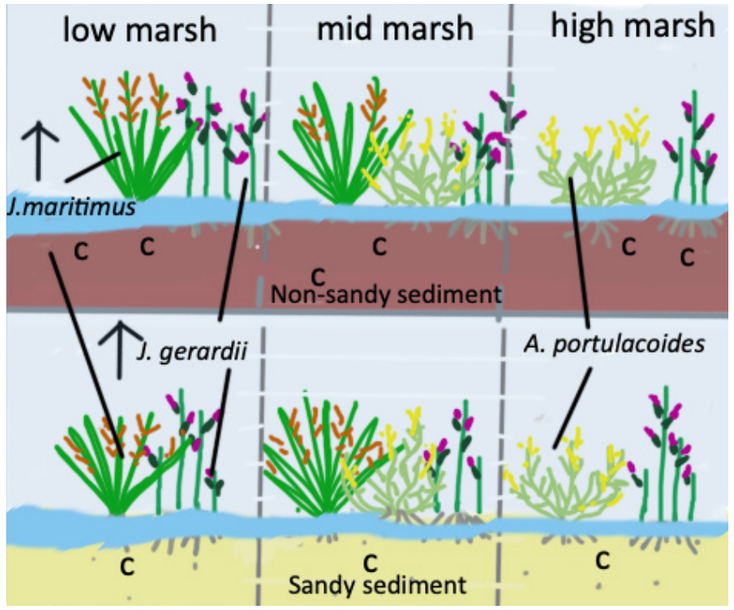


Fig. 3 - Saltmarsh blue carbon stocks vary by type of sediment (non-sandy having higher stocks than sandy) and vegetation type (with J. gerardii and J. maritimus often having greater SOC than other species (down to 10cm)). Adapted from data in Ford et al., 2019: Ford, H., Garbutt, A., Duggan-Edwards, 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.

3.5 Other potential candidates

Mangroves, seagrass and saltmarshes are currently the main focus of blue carbon projects because they are relatively well understood systems and there is sufficient scientific certainty about their abilities to capture and store carbon. However, kelp, coastal sediments and megafauna are also 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 would 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.

"Tang", by Magnus Hagdorn is licensed under CC BY-SA 2.0.

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 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.

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

4.0 ADDITIONALITY & LEAKAGE

Once suitable ecosystems have been identified, the next step is to determine that these ecosystems are indeed threatened and that the project will provide additionality and avoid leakage.

4.1 Providing Additionality

Additionality means that your project will bring carbon benefits in addition to those likely to happen without the project. Proving additionality involves examining relevant ecological, economic, social and political factors, such as whether existing protection is in place and is effective, and providing information to allow an informed judgement on what is likely to happen in the absence of a proposed project. Data on, for example, historic rates of ecosystem loss or current rates of legal or illegal damage to a project area may be needed. Projects cannot claim carbon from activities that do not improve on current levels of degradation or deforestation.

If a resource is effectively protected already, such as through existing laws that are well enforced, a project cannot claim that its interventions are 'additional' in this area. However, legal protection on its own does not rule out additionality - if the laws are not enforced or complied with and damage to the ecosystems is still taking place, then a project may be able to claim additionality even within protected areas. Projects that increase the area of the ecosystem, through tree planting or seagrass restoration for example, will usually be additional.

4.2 Leakage

Leakage is the term used to explain the displacement of damaging activity (such as tree cutting) from one time or place to another, because of a project intervention. For example, protecting an area of forest may simply result in people taking more wood from other, unprotected, areas of the forest. Most carbon PES projects need to show how they avoid or compensate for leakage.

Avoiding leakage will often require finding compromises or replacing damaging activities with sustainable alternatives. For example, if a seagrass meadow is protected from damage by fishing gear, boat propellers and anchors then it may be necessary to establish permanent anchorage sites outside the meadow, or to fund non-destructive fishing gear. Or if the removal of mangrove trees for firewood if prevented, then new sources of wood from sustainable woodlots may be required.

Another way to avoid leakage is through the generation of profit and employment opportunities from the project itself if this new income can be shown to allow the replacement of damaging activities with more sustainable alternatives.

4.3 Scientific Principles

A project must be able to demonstrate scientifically that the interventions it is taking result in more carbon sequestered and stored than would have occurred under the baseline scenario. In many cases, existing data from elsewhere can be used for calculating project-level carbon benefits; for example, the Intergovernmental Panel for Climate Change (IPCC), publishes 'Tier 1' data (*www.climate-policy-watcher.org/emission-factors/tiers.html*) for many ecosystems that are based on averages for regions and countries and can be adopted at sites within those countries. However, such averages will be less accurate than site-specific data and may not be appropriate (if, for example, your site contains different species). Hence if you have the resources then collecting your own data, from your own site, may be preferable or necessary; this can be discussed with the carbon standard.

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

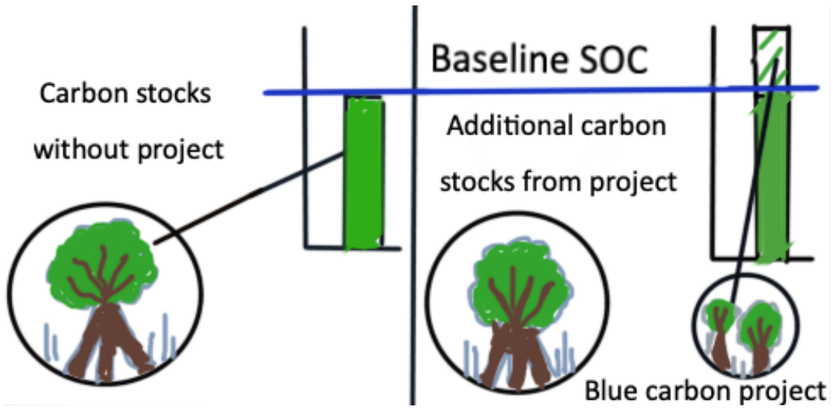


Fig. 4 - Additionality refers to the carbon benefits achieved by a carbon project, that are over and above what would have happened, for example as a result of new legislation or technology, in the absence of the project.

Fig. 5 Illustrated by Dr. Imi Dencer-Brown.

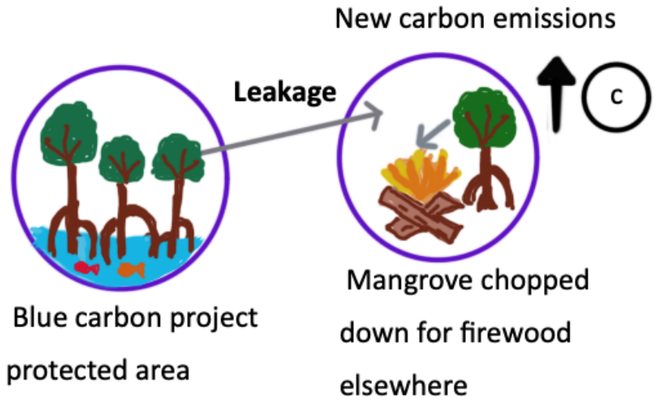


Fig. 5 - Leakage occurs when the activities of a carbon project result in enhanced emissions (or reduced sequestration) outside of the project area, reducing or negating the carbon benefits of the project. For example, protecting an area of forest from cutting may result in trees being cut outside of the protected area.

5.0 POSSIBLE COMMUNITY ACTIONS

Ensuring community buy-in is crucial to community-led projects – only by understanding people's interest in the possible actions which can benefit both them and the ecosystem will a long term project be successful.

5.1 Are there actions my community could take to protect or expand these ecosystem services?

Project interventions are actions that those running the project can take to increase how much carbon is captured and stored by the ecosystems within their project area. These actions may lead to the avoidance of emissions from the ecosystem, such as avoiding deforestation or forest degradation that would otherwise have occurred, or the sequestration of more carbon than would have been sequestered under the baseline scenario, such as the planting of new seagrass meadows. Some interventions will do both: preventing mangroves from being cut down will not only prevent the emissions caused by their loss, but also leads to more sequestration as they continue to grow and capture below-ground carbon.

5.2 Possible Project Activities

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

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

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

- **Afforestation:** the creation of new areas of forest where they did not previously exist (this is not usually recommended for mangrove forests).

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.

5.3 Are there actions in place already?

If there are already actions in place, the additionality of the project needs to be considered. This could be by evaluating the effectiveness of the actions already in place, and determining if there is room for improvement. If there is room for improvement then how this can be actioned by the community needs to be considered to avoid any duplication of efforts and confusion or conflict.

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

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

6.0 TENURESHIP & OTHER POSSIBLE GOVERNANCE

There are a number of different steps before the beginning of the project. Ensuring management rights, community support are indeed key to project success, the involvement of carbon standards can help guide and assure good governance for VCM projects.

6.1 Tenureship

To gain certification for a blue carbon project, those managing the project need to have proof of some form of tenureship –land ownership, use or legal access to benefits such as carbon - for an extended period of time (usually at least 20 years).

What forms ownership or tenureship takes varies between countries and jurisdictions, and carbon standards are open to considering different forms of legal rights to management.

For example, in the UK, the Crown Estate (and Crown Estate Scotland - *www.crownestatescotland.com*) owns most intertidal and sub tidal areas. Therefore, formal consent from The Crown Estate to access tenureship rights will be required before beginning a project in UK waters. Management of an asset (the term used for terrestrial land, seabed and half of Scotland's foreshore) can be transferred to communities through an application process with the Independent Framework for Transfer and Delegation (*www.crownestatescotland.com/how-we-help/communities/transfer-and-delegation*). Successful transfer applications result in the asset's management becoming the responsibility of the new manager with no involvement from the Crown Estate.

Successful delegation applications result in continued involvement of the Crown Estate who would guide the new manager.

Both applications are significant processes, requiring extensive stakeholder engagement. Applications for Scottish assets can be made through Marine Scotland (*marine.gov.scot/content/transfer-and-delegation-application-hub* which also features a timeline).

Many countries have national legislation to encourage and facilitate community management of forests. For example in Kenya, community management rights can be established under a co-management agreement between the community and the Kenya Forest Service. The explicit aims of these co-management agreements are, under the Kenyan Forests Act, to increase efficiency in mangrove management, facilitate community participation in forest governance, and ensure the flow of benefits to the community. This last aim is not prescriptive and does not specify how benefits should be allocated or shared but does ensure that community benefit is at the heart of this devolved management framework.

6.2 Community Support

Community support is crucial to successful long-term projects. Before beginning the other processes needed to develop a blue carbon project it is essential that project developers seek out clear, informed and transparent support for the project from the local community; indeed, the best projects usually originate from the community themselves. There are many reasons why local people may initially not want to support projects; if this is the case, project developers need to find out whether support would be forthcoming if there was the chance of earning additional income through carbon sales (which may, for example, allow the compensation of anyone losing out in the proposed management interventions). Genuine community consultation can take time and patience and needs to consider all relevant groups (e.g. women, youth and indigenous people), not only those with the resources and confidence to attend events and respond to calls for comment.

A critical issue is how to maintain a project once any initial money (e.g. from a grant) is used up; a central part of community consultation involves a full and honest discussion about the opportunities and challenges involved in sustained generation of income or financing, for example from the VCM. Developers should strive not to raise expectations unreasonably. Encouraging community members to learn from (and ideally visit) established projects can be very helpful.

"CBEMR Workshop in Tanzania" by Mangrove Action Project.

6.3 Certification by a carbon standard

If you intend to generate and sell carbon credits, your project will probably require certification by a recognized carbon standard; this ensures scientific and social credibility and provides the market with evidence that your project is well designed and reliable. Standards offer detailed 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 Non-Governmental Organisations (WFF, ICUN) and requires social and environmental benefits from the projects it certifies to support the UN SDGs. This standard does not have a minimum project size and has a number of projects from low and middle-income developing countries. This standard has stringent criteria with clear rules around additionality, the requirement of third-party auditing and an approval body.

- **Verified Carbon Standard (VCS)**

www.verra.org

The VCS is run by non-profit VERRA. It 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. There are regular updates to the requirements for projects and the types of activities that can be included, with an emphasis on the scientific precision of claimed carbon benefits that can be traded as Verified Carbon Units. Approved third-party accreditors are required to validate and verify the projects.

- **Plan Vivo Standard**

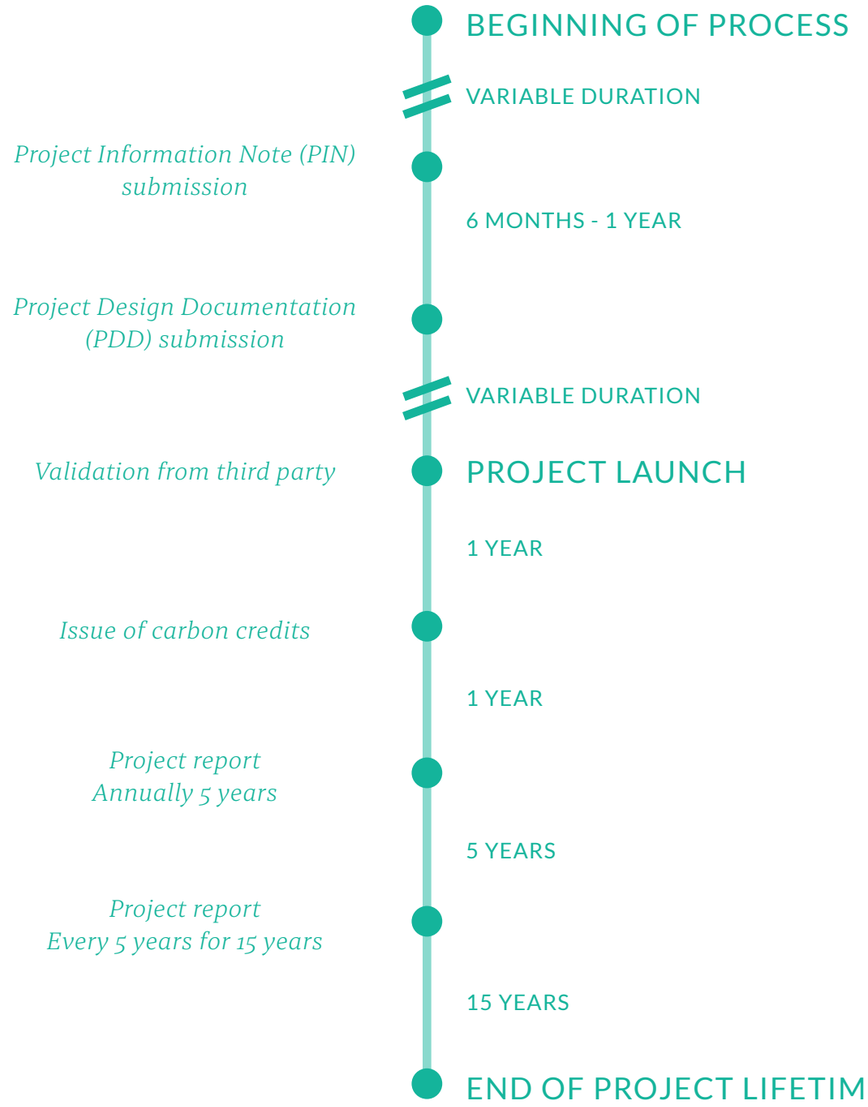
www.planvivo.org

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 five year intervals during the project's lifetime as well as for initial registration.

6.4 Project Timeline

A project designed to sell to the VCM using credits certified by a carbon standard will typically follow a process and timeline as depicted below (although durations can be very variable, particularly in the time taken to establish projects).



7.0 PROJECT FUNDING

A wide range of options exist for project funding. Some of these – such as selling credits - are only feasible once projects are established. Others, such as short-term grants, do not ensure long term sustainability. Others, such as encouraging ecotourism, may involve large financial risks or uncertainty. Successful projects often include a range of funding sources and are careful to make conservative assumptions about income.

7.1 Grants

There are many sources of grant funding for community conservation, from major international NGOs, such as the World Wide Fund for Nature and The Nature Conservancy, or funders such as the World Bank and from Government development agencies. Obtaining grant funding can help meet the costs of project establishment.

7.2 Businesses with direct interests in the ecosystem services

Some conservation projects are directly funded by local or international businesses, especially if they have particular interests in the ecosystem services involved. For example, tourism businesses that rely on attracting tourists to swim and dive in an area may fund activities that help to conserve seagrass and other marine habitats.

7.3 Insetting

Some businesses choose to directly support projects that can help to address their own carbon emissions. They do this instead of purchasing carbon credits on the open market and effectively generate their own credits. This is sometimes called 'insetting'. It may involve, for example, purchasing land for tree planting. 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.

7.4 The voluntary carbon market

The voluntary carbon market (VCM) is a mechanism to enable carbon offsetting by people and organizations. Carbon offsetting is used to compensate for carbon pollution caused through various actions; interest in the VCM is growing due to the increased demand for corporate responsibility and individual awareness of carbon footprints. For example, a person may want to compensate for the carbon emissions of a flight that they take, or a business may want to compensate for the carbon emissions caused by the manufacturing of their product.

Carbon credits can be bought from certified projects that take action to reduce or remove the carbon emissions in the atmosphere, for example by

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

planting or protecting mangrove forests. These carbon credits, and the projects that generate them, should be certified by a third-party carbon standard that ensures that the emissions reductions do indeed take place.

Carbon sequestration and storage is one 'ecosystem service' that blue carbon ecosystems provide to people living both locally and further afield. For that reason, payments for carbon credits are one type of PES. The market for carbon credits is the best developed form of PES. However many organizations, including some carbon standards, are considering how to encourage markets for other ecosystem services, such as coastal protection and the enhancement of biodiversity, so projects may be able to use these new markets for income in the future. One important idea is that of Biodiversity Net Gain (BNG). There are growing requirements on businesses in a range of sectors and countries to demonstrate BNG, and this may stimulate opportunities for blue carbon projects to obtain funding through biodiversity credits.

7.5 Investment For Profit

Interest in the VCM, and demand for carbon credits, is growing, along with the prices at which credits can be sold. Projects that can demonstrate evidence of supporting the UN SDGs, along with other 'co-benefits', often command higher prices for their carbon credits.

Many financial institutions and companies are now looking at opportunities to fund climate initiatives, including blue carbon projects, to generate profits. They may be willing to provide funds that cover project scoping and establishment, in return for a proportion of the anticipated returns from the sale of credits; these types of arrangements are usually called offtake deals. Project developers and communities need to consider the financial and political risks carefully before committing to such agreements; professional advice is recommended.

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

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

8.0 CONCLUSIONS

1. Blue carbon ecosystems – mangroves, seagrass and saltmarshes, and potentially other carbon-rich marine ecosystems such as coastal shelves – provide a wide range of benefits to people and nature; their protection and restoration is an important part of the global response to the climate crisis.

2. These ecosystems are found around the world and, when managed by local people, can provide community benefits including income from the VCM and potentially from other PES markets such as for biodiversity.

3. Scientific evidence is needed for the development of a blue carbon project, which must show carbon benefits (increased carbon storage or reduced carbon loss or both), additionality, the avoidance of leakage and no ecological or social harms.

4. Community support is essential for successful projects. This must be established and demonstrated right at the start of project initiation and maintained throughout the project's lifetime.

5. Accreditation by carbon standards and third-party auditing ensure credibility and are usually necessary if the goal is to sell carbon credits; most standards provide explicit guidance on community involvement and benefits.

6. There are multiple sources of funding for blue carbon projects. It is common to combine sources. If the intention is to use the VCM, project developers need to consider how to cover the large costs of project initiation, before credits are generated, and how the marketing and sale of credits will be organised.

7. There is a growing demand for high-quality, ethical offsets. 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.

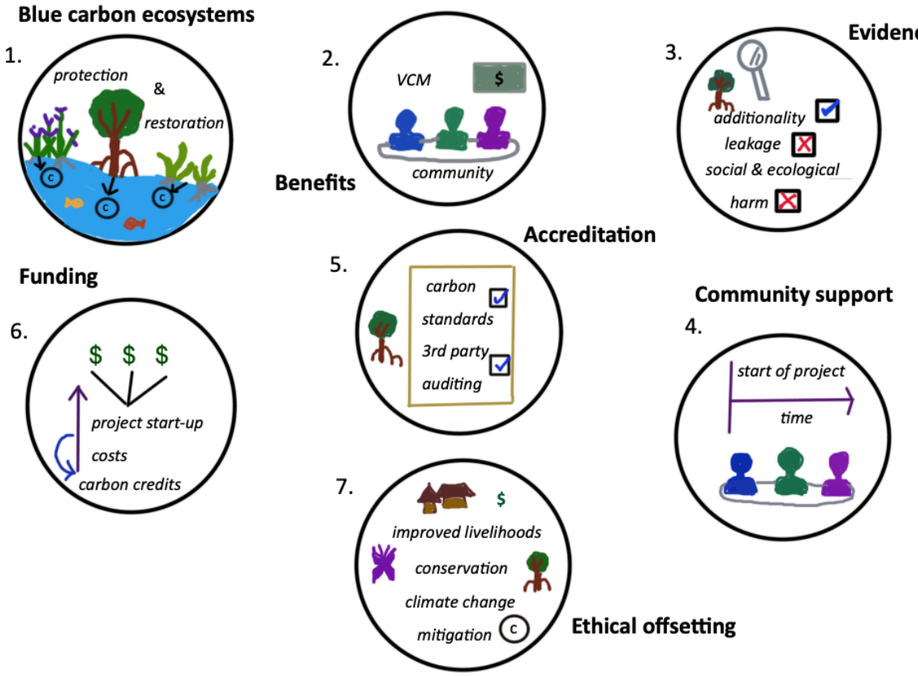


Fig. 6 Illustrated by Dr. Imi Dencer-Brown.

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), e0000061.

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

9.2 Further reading

For potential grants:

www.wwf.org.uk

www.nature.org/en-us

https://projects.worldbank.org/en/projects-operations/project-detail/P094335

www.nature.scot/funding-and-projects

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

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

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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
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