Blue Carbon: Mind the Gap

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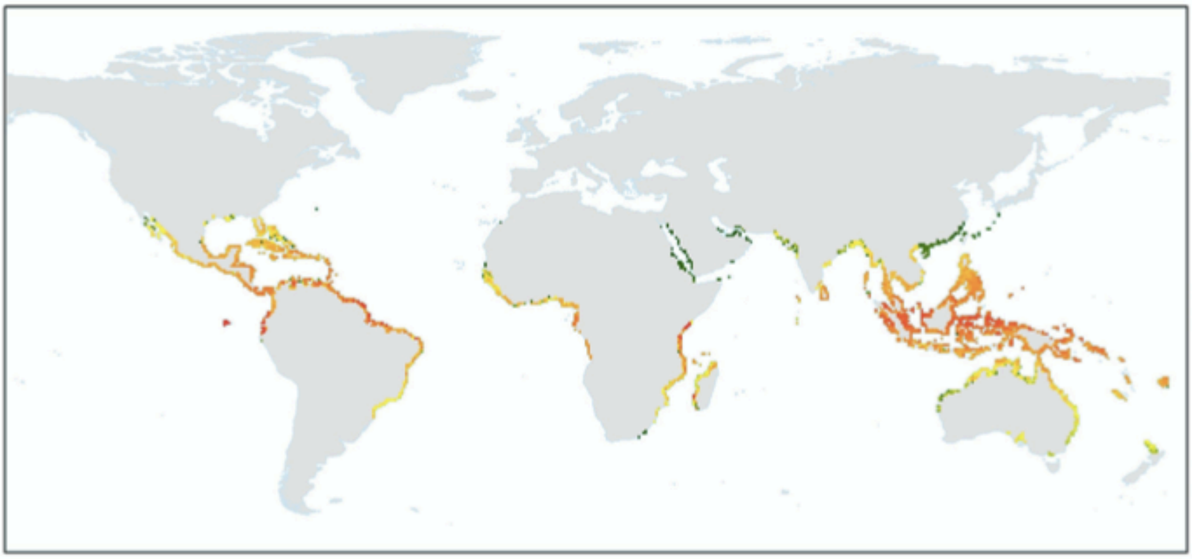
Introduction



Concentration of mangrove carbon worldwide, from Jakovac et al., 2020

There are robust scientific methods to measure carbon sequestration. There is substantial interest to invest in carbon sequestration projects for carbon offsets. Why has this not translated in more successful, on-the-ground blue carbon projects? The failure to resolve this puts too much at risk.

Why is there is a gap between supply and demand?

This paper summarises the key challenges to the development and replication of blue carbon projects and proposes specific comprehensive action. Many of the issues covered can apply equally to terrestrial carbon offset programmes and should be considered in that context.

Blue Carbon, i.e. the amount of carbon stored and sequestered in coastal habitats like mangroves, salt marshes and sea grass, is one of the most effective stores of carbon, up to five times more than terrestrial forests per hectare. There is great potential in preserving these coastal habitats and greater danger if we do not.

Mangroves offer protection against more frequent and stronger tropical storms. They support rich biodiversity in addition to being one of the most effective stores of carbon on this planet. Over a third of mangroves have been destroyed since 1980 to make charcoal, build houses, create aquaculture ponds and tourist infrastructure. This has released tens of millions of tonnes of carbon.

There is an urgent need to preserve the existing carbon stocks that would be released if the mangroves and other coastal habitats were destroyed. How can we accomplish this?

Methods

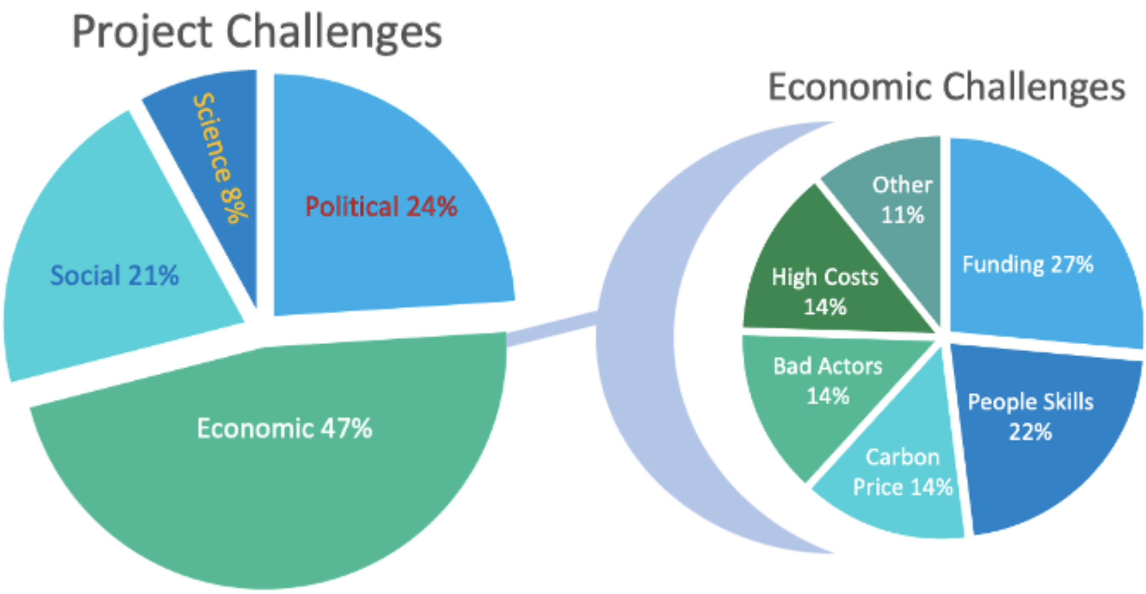
We surveyed traditional peer-reviewed publications, grey literature and deep dives into the websites of mangrove-related organisations to build a comprehensive picture of the science and policy of blue carbon and how it is communicated. To gain fine-detail insights we conducted informal one-on-one interviews with active mangrove rehabilitation practitioners, leading academics and representatives of conservation NGOs and funding bodies.

To keep the survey manageable, we focused on mangrove-related projects. In addition, many of the identified issues and suggested solutions are also relevant to terrestrial carbon projects.

To facilitate better understanding of the issues raised, we use a simple four-pillar framework to organise problems into **Political**, **Social**, **Scientific** and **Economic** areas. This aligns our results with the terminology outlined in the IUCN National Blue Carbon Policy Assessment Framework (Herr *et al.*, 2016) and can also be viewed in the context of the more in-depth Coastal Carbon Impacts Framework (Herr *et al.*,2019).

What we learned

Conversations with professionals directly active in mangrove science and conservation identified 78 issues affecting successful implementation of blue carbon projects. Individuals active in different countries from Latin American, the Caribbean, Africa to SE Asia, Bangladesh and Australia described different but similar challenges with a high level of consensus over which were most urgent to address.



Organising challenges into **Political**, **Social**, **Scientific** and **Economic** categories was very telling: 47% of factors constraining operation and expansion of blue carbon projects were financial in nature, though these were not necessarily encountered by players at all levels. Smaller organisations, despite running conservation and restoration projects which were storing carbon, did not consider selling blue carbon credits on the voluntary market as a viable funding option because the complexity and the cost of certification and ongoing assessement of carbon sequestration is too high.

Coupled with the low and fluctuating value of carbon credits, the reward was not seen to justify the extra expense and effort. Several noted that a lot of time was invested in applying for repeat grant funding every few years, and that they felt it difficult to compete with headline-generating mass planting events. Smaller organisations also lacked the business expertise required to develop or access markets for alternative livelihood products and services.

Social and Political challenges were more complex. They differed between countries, but were something experienced by all.

Blue carbon projects are complex because they do not rely on any single factor. Political will and clarity cannot succeed without the underlying science necessary to design a credible project. Available financing alone will not make a successful project without the engagement of the community and competent leadership – the social aspect.

The suggestions we propose will not be effective if implemented in isolation. We believe it is necessary to take a holistic multi-pronged approach and therefore the value of the solutions lies in bringing them together to address all four challenge areas: **Political**, **Social**, **Scientific** and **Economic**.

Challenges and Possible Solutions

The following section looks at the problems identified for each of the four pillars; **Political**, **Social**, **Scientific** and **Economic**. These came from interviews with academics and field practitioners and from the studies and papers we reviewed and include suggested solutions. Resolving these problems is central to building a more efficient, credible and scalable carbon management system.

Political Challenges

Land tenure rights - Problem

This was the key issue identified by 100% of interviewees active in South-East Asian countries. For example, large areas of disused aquaculture ponds are sited in former mangrove habitats and are theoretically available for restoration and blue carbon projects. While land use may have reverted to local people, overlapping claims to ownership, leaseholds or usage rights are common and it may be difficult to identify absentee stakeholders.

Navigating land tenure issues is not impossible, but it can be an expensive, time consuming, and complicated barrier to implementation. In one study, two sites in Indonesia, previously identified as having 100% and 81% of surveyed area physically suitable for restoration, were reduced to 2.5% and 0.4% of feasible restorable area once socio-political factors were considered (Brown, B. 2020). In contrast, mangroves in Kenya are technically nationally owned and the Mikoko Pamoja project demonstrated that management rights and ownership of carbon may be granted to legally registered local co-operatives.

Land tenure rights - Solution

In-depth analyses of policy structures already exist (eg. Slobodian *et al.*, 2019), incorporating advice for national strategies to resolve issues such as overlapping regulatory boundaries and unclear land rights, including defining where responsibility for coastal governance lies. Ultimately, the situation remains fluid, complex and varies between countries. As national policies evolve, it would be helpful if changes affecting the development of a blue carbon market could be quickly aggregated and communicated in a simple format.

The most realistic approach to resolving political roadblocks is on a country-by-country basis, preferably starting with the countries that possess the largest mangrove stocks.

For each it would be necessary to define:

- Ownership and land-use rights of coastal mangroves; national, regional, local or private
- Responsibility for policy, management and enforcement; forestry, marine or another agency
- How NDC – Nationally Defined Contributions are accounted for under COP21 Paris Agreements
- Who can earn carbon credit offset fees
- Building on the work already done by others, a simple “at a glance” checklist for each of these using a “traffic light” system to indicate the degree to which each element hinders projects: red – blocked; yellow – hindered; green – no impediment.
- A shortlist of other nations with clear “green light” working conditions or proven demonstration projects (eg. Kenya) would also increase the value of this resource to investors and project developers.

This information can then be used by other countries to evaluate their own barriers to progress. It will also be useful to capture lessons learned from countries as they navigate from red to green status. Blue carbon project managers should be encouraged to share the steps taken creating an open source knowledge base for future project managers to learn from.

The mangrove “policy gap” - Problem

Mangrove systems may be regarded as either marine or terrestrial, or neither, or both, and therefore subject to overlapping or conflicting legislation. Contradictory legal instruments may exist at national, regional and local levels and be poorly understood or communicated across levels. Similarly, there may be confusion over which government departments or other actors are responsible for the implementation and enforcement of protective measures, environmental monitoring, and allocation of user rights. Where clear legislation is present, local users may be unaware. Devolved management under the umbrella of community forestry or fishery management groups has been shown to be effective in countries where local people assign value to intact mangrove ecosystems.

The mangrove “policy gap” - Solution

Similar to land tenure rights, a country-by-country consultation could encourage governments to resolve the question of responsibility for oversight.

Social Challenges

Trust - Problem

Historically, external actors have sometimes encouraged mangrove development at the expense of communities’ rights of access to what was once a common resource. It is not unusual for mangrove sites which are visible, easily accessible, or in need of urgent attention to have had multiple failed restoration attempts due to loss of financing or inappropriate methodologies such as repeated, poorly executed mass planting. Restoration projects implemented on private land may also have excluded local people without adequate compensation or consideration of their needs. Understandably there is often mistrust in the motives or competence of exterior agencies offering to restore mangroves for community benefits.

Trust - Solution

The solution is to have a clear framework for projects that includes consideration for the needs of the community, transparency and proper governance. This is integral to any overall programme for blue carbon. The ability to offer training and employment over longer timescales can facilitate the recruitment and advancement of locals into higher skilled or management roles within the project.

Engagement - Problem

Effective stakeholder consultation is essential for successful long-term project implementation. Local communities provide knowledge of historic changes to the area, memories of site structures pre-disturbance, volunteers and/or employees for labour, monitoring and security. They understand the current economic value of construction timber, wood for charcoal, fishponds and other extractive and alternative uses. Engagement means taking all of these into account, communicating the potential of a project and then listening to and dealing with community concerns

Engagement - Solution

Drawing from the experience of successful projects it should be feasible to develop a checklist of issues that should be raised and cleared through discussions with the community. There should also be a template for how to proceed including identifying issues, key stakeholders and their concerns and an outline methodology for gaining consensus and commitment.

Complexity - Problem

Projects may be implemented by companies with concessions, outside investors, or a hybrid of local community and outsiders, and may also have NGO or government support.

Potential project locations are often shared by multiple users, while extractive activities and resource use may vary in sustainability and impact across social groups and communities. Constructing a clear picture of who holds ownership or rights to use sites may not be straightforward, especially where illegal conversion of mangroves to other uses has taken place.

Communities can be disjointed or dysfunctional, or lack clear leadership, rendering consultation time-consuming and complicated, however their participation is essential to avoid potential socially unjust impacts caused by project delivery and to maximise benefits to local inhabitants.

Providing alternative livelihoods or material resources may also be needed to compensate for changes in land use and to ensure activities do not simply shift to alternative locations, causing damage elewhere.

Complexity - Solution

Mangroves are often a valued resource in many communities; timber, charcoal for cooking and other uses provide employment. Changing this paradigm to one of conservation, sustainable use and protection is significant and requires careful stewardship.

Recognising the complexity of the human factors which overlay these projects and by investing in engagement and transparent management, investors can reduce the risk of projects and pair carbon offsetting with poverty reduction, building trust and co-operation, and empowering disadvantaged communities.

The necessity for competent project management cannot be underestimated. The issues that require attention include navigating land tenure rights and government processes, securing and managing funding, managing teams, communications with the community and overall governance. Added to this are the different social and cultural considerations. Strong leadership able to deal with a broad scope of control is essential.

Governance - Problem

Engagement is critical to starting a project but is equally critical to the ongoing success of a project. Where a project is being developed for the benefit of a community then the community needs to play a role in oversight of the project. Community representatives should be appointed or elected to serve on the project oversight committee or management board.

Pre-existing co-operative management organisations based around fishing or forestry may be male dominated, but it is women who are more likely to be engaged in daily activities based around mangroves, including collecting bivalves and crustaceans, gathering firewood and harvesting fruits and leaves for food, teas, medicines and dyes.

Governance - Solution

Drawing from the experience of successful projects, a template of governance options should be developed. These could be adapted to meet local needs. Key elements common to all include inclusive representation, open meetings, clear and accessible records of proceedings and decisions, and the ability for all to question these. The primary users of mangroves for subsistence activities tend to be women and it is important to ensure governance has a gender-balanced membership.

Transparency - Problem

One of the significant threats to the success of projects observed has been distrust of those in charge. Even the best run projects with open accounting, reporting and governance will be challenged from time to time. Without transparency projects risk not meeting their full potential.

Transparency - Solution

Publicly available records of honest and transparent consultation procedures protect projects and investors against criticism and therefore decrease risk. There should be publicly available records of all revenues, loans and obligations and expenses. There should also be a public accounting for investments made from the proceeds of the project.

Scientific Challenges

Science is available - not always accessible - Problem

The research necessary to inform coastal carbon projects is well advanced. New peer-reviewed scientific publications are relatively well-circulated among a small community of mangrove scientists and conservation biologists, but findings are often poorly communicated to a wider audience. The ability of local actors to discover, access, interpret and apply this research (which is often hidden behind paywalls or language barriers) is limited and reliant on access to training and support from scientists. This is a significant barrier to local management of blue carbon projects and perpetuates the reliance on external expertise rather than capacity building.

Science is available - not always accessible - Solution

Field projects require guidance to make informed decisions. This starts with an assessment of the current ecosystem, a prioritisation of problems to be resolved and opportunities for improvement. Some of this can be dealt with using high level templates and guides. But once this gets down to the technical level a different tool might be better. There is scope to design a decision tree model which can encompass the various elements to be considered; tidal flows, indigenous species, sediment delivery, etc.. This effectively would draw from the many existing papers and guides in a format that can be used in the field with a lower level of scientific support than is needed today. The format for delivery needs to well thought out: online, offline, digital, hard copy and languages and be open access and available for free.

Complexity of proof - Problem

Accreditation requirements demand accurate measurement of carbon stocks, models predicting carbon sequestration without intervention compared to best- and worst-case results, and the capacity for ongoing monitoring. This represents a significant workload and need for skilled staff who may have to be recruited. Assessments of methane and nitrous oxide fluxes are also mandatory, however measuring these greenhouse gases in situ is rarely technically feasible or affordable for blue carbon projects, so accepted default values are substituted in place of accurate site data.

Complexity of proof - Solution

There is broad consensus that the ecological science of mangrove restoration is well-established. Methodologies based around the restoration of site hydrology to allow natural recovery assisted by limited planting, eg. Lewis & Brown, 2014 and Primavera *et al.,* 2014, are generally considered best practice. Techniques to measure carbon in the field are well laid out in the Blue Carbon Initiative "Coastal Blue Carbon" manual while project development and management guidelines are well described by Glavan, 2013 and Crooks *et al*., 2014.

When applied appropriately these methods are generally accepted as valid by accreditation agencies. However, we have been unable to find a comprehensive resource which aims to merge guidelines to the biophysical management, sustainable development and community engagement processes with the common steps required for accreditation in a cohesive methodology specific to blue carbon projects. Fine scale technical guidance would need to be omitted due to the high geographic variance in the ecology of coastal systems, however production of a simplified project implementation model is feasible.

Accreditation also requires modelling the projected emission or storage of methane and nitrogen oxide. Several universities and other research institutions aim to increase the availability of accurate measurements of methane and nitrogen oxide fluxes which can be used as evidence to adjust the models used by blue carbon projects. There is a clear need for an increased co-ordinated and funded effort to produce region-specific data and this should be recognised as a research priority.

Unintended Consequences - Problem

Natural regeneration can require managing ecosystem stressors which are generated upstream and therefore outside the boundaries of the project. In the case of mangroves, headline-generating mass planting events with poor monitoring and high failure rates continues to divert funding from more deserving projects.

Unintended Consequences - Solution

Projects require a holistic view and consider the consequences of factors outside their direct control. For example; agricultural runoff might degrade downstream ecosystems. Solving this requires engaging the upstream farmers to find viable and acceptable solutions.

The unintended consequences of repeatedly planting seedlings in order to gain short term economic benefit could be resolved through the combination of solutions proposed in this paper. But just like the projects that fail the viability test, so too should all proposals be tested to ensure that other unintended consequences are not introduced.

Research and Communiction Gaps - Problem

Previous research is disproportionately focussed on biology and ecology. There is a shortage of up-to-date studies modelling and comparing the economic value of degraded, converted, and intact blue carbon habitats at local, regional and national levels. Improved attempts to quantify the economic and financial value of ecosystem services created by healthy coastal ecosystems, particularly regarding fisheries productivity and coastal protection, are required to aid development of alternative financial streams for blue carbon projects and inform policy decisions. There is also a lack of data matching sustainable mangrove products with potential markets, inhibiting the development of meaningful alternative livelihoods for mangrove communities. Studies of the cultural value of mangroves, traditional uses of mangrove resources and the sustainability of traditional uses have also not kept pace.

Research and Communiction Gaps - Solution

The solution here is to step aside from the pure scientific objectives of projects and take a holistic view on the impact, positive and negative, on the surrounding communities. This is a job for a social economist whose objective would be to draw together the strands of economic and social benefit that could be gained from a project that includes community development goals as project objectives.

There is a demand for refining valuations of coastal ecosystem services to fisheries production, coastal protection, biodiversity and human quality of life, and acknowledgement that, with the exception of a handful of countries (eg. Australia), the ethnobiology of coastal wetland and seagrass systems has been poorly studied. Developing models which synergise the development of competitive blue carbon economies alongside national Sustainable Development Goals should also be prioritised.

There is low public awareness of the value and diversity of mangroves, saltmarshes and seagrass habitat. Mangroves lack the obvious charismatic appeal of, for example, coral reefs, and apart from people reliant on them for food or fuel, tend to be wrongly perceived as smelly, muddy swamps of little worth. Continuing efforts are being made within the scientific and NGO communities to correct this, but struggle to access a wider audience.

Economic Challenges

Projects require seed funding - Problem

The process to design a project takes time, resources and therefore money. The income stream for most projects can take years to develop. The cost and effort to register a project is currently front-loaded and is a significant barrier to entry.

Projects require seed funding - Solution

The suggestions in this paper should make it possible to de-peak and de-risk the cost and effort required to register a project therefore lower the amount of seed-funding required.

Expectations are mismatched - Problem

Financial backers expect large projects with short timescales. Large projects are easier and less expensive to manage and naturally investors prefer a quick return on investment. The reality is that most blue carbon projects will typically be of a smaller scale; hundreds of hectares versus thousands. This is because ownership or control is usually not centrally held. The time required to restore or expand a project site is not short and can take between 20 and 30 years to mature.

Expectations are mismatched - Solution

The gap between expectations and reality is resolvable and needs to be priced into the expected returns by projects and funders. The current time lag and high cost for assessing the sequestration achieved by projects could be significantly reduced by innovative monitoring techniques with shorter intervals over longer time periods at minimal cost. Better understanding and monitoring is critical to making informed assessments and avoid mis-matched expectations.

Price of carbon too low - Problem

Current carbon income per hectare is not competitive with aquaculture or alternative land use, even given the high sequestration and storage rates of mangrove ecosystems. This is an issue of short term returns outweighing the much larger value of long-term returns. Carbon credit pricing based on monoculture forestry projects does not reflect the additional value associated with mangrove and other blue carbon initiatives, nor the wider economic value of mangrove ecosystem services.

Blue Carbon projects provide additional benefits including:

- Ecosystems that stimulate biodiversity
- Nursery habitats for commercially important fish species
- Increased food security and alleviation of poverty
- Resilience against erosion and rising sea levels
- Protection from storm damage and flooding
- Employment, directly from project management and enforcement and indirectly from sustainable exploitation of resources
- Mangroves specifically may also be linked to cultural identity, wellbeing and tourism

Price of carbon too low - Solution

A separate pricing regime and market for blue carbon is needed. This would incorporate the value of blue carbon ecosystems to fisheries, food security, biodiversity, etc. and could be developed to provide stackable payments for ecosystem services. For example, a new “credit” based on the value of the coastal protection function of intact mangroves could enter the market in the next few years. This new pricing regime would have its own unique identification (branding) similar to the Fair Trade concept and be underpinned by a robust system of controls to assure credible project results.

Price of carbon fluctuates greatly - Problem

Carbon credit pricing is not a mature or well-structured market, hence the relative values of different carbon projects are not properly reflected. Without a system of ranking these different values, lower value projects compete with high value projects which leads to volatility in pricing.

Price of carbon fluctuates greatly - Solution

It is unrealistic to expect that a unique blue carbon pricing mechanism would be immune from the real-time pressures of the broader carbon market. It is worth testing if blue carbon pricing can be tied to set time scales, not unlike bonds and other time-linked financial instruments. Therefore, blue carbon contracts could have an assured value for a specific time period.

Lack of long-term funding - Problem

Short-term funding is problematic. Ethically and ecologically sound mangrove restoration projects operate across two to three decades rather than two to three years. Carbon accreditation requires a 20 to 30-year timescale.

Any long-term solution needs to migrate to a commercially viable business model. Having to continually apply for extended funding takes time and resources better used elsewhere.

Short-term financing has encouraged misleading reporting using inappropriate measures of success, such as number of seedlings planted per year. Long-term monitoring of survival typically falls outside the project scope and seedling mortalities of up to 100% may go unreported. It should be noted that no carbon standard accepts mass planting as a valid restoration method.

The end result is unrealistic expectations from investors.

Lack of long-term funding - Solution

Blended finance should be considered until a transition to a commercially viable business model can be achieved. Much the same way that some financial instruments such as bonds are priced differently depending on their term: one year, five years, ten years and so on, this concept could also be applied to blue carbon contracts.

Accreditation Process - Problem

The accreditation process is viewed as intimidating, complex and expensive. Smaller projects lack the necessary infrastructure and are wary of the additional demands on scientific and administrative staff. Accreditation agencies need better information to validate the quality of projects and their results.

Accreditation Process - Solution

The accreditation process should be simplified and shift the burden of validation to step-by-step monitoring of both the project components as well as actual impact on the protected environment.

Human Resources Capacity - Problem

Well run carbon projects are like a business requiring governance, project and people management, financial, operational, communications, and scientific expertise. The ability of small organisations to access carbon offset funding can be restricted by a lack of capacity to navigate these issues.

Human Resources Capacity - Solution

This, in addition to adequate seed funding, could be solved by the creation of regional supporting agencies which tie multiple small blue carbon projects together under one umbrella. Such an organisation could provide shared administrative capacity, leverage experience gained from working with accreditation agencies and government bodies and facilitate sharing of expertise and training. This also enables the creation of locally specific templates for implementing blue carbon projects and facilitates market development.

Grant funding seen as more reliable - Problem

While the processes of carbon credit financing are tested and well-established for terrestrial projects, there are currently very few coastal blue carbon projects which have produced and sold carbon credits on the voluntary market. Confidence in the process remains low. Projects need to consider these risks:

- Fluctuating carbon pricing
- Failing to meet terms of accreditation and therefore expected revenue
- Ability to secure buyers for carbon offsets post-accreditation
- Loss of income from livelihoods no longer possible due to the project

Therefore, the more commercial approach of generating revenue from selling carbon offsets is seen less favourably than relying on grant funding.

Grant funding seen as more reliable - Solution

While proof of concept has been delivered, further replication is required to confirm that the sale of carbon offsets represents a realistic and reliable long-term income source. Only once there is an established commercial funding system that engenders confidence will the preference for grant funding diminish.

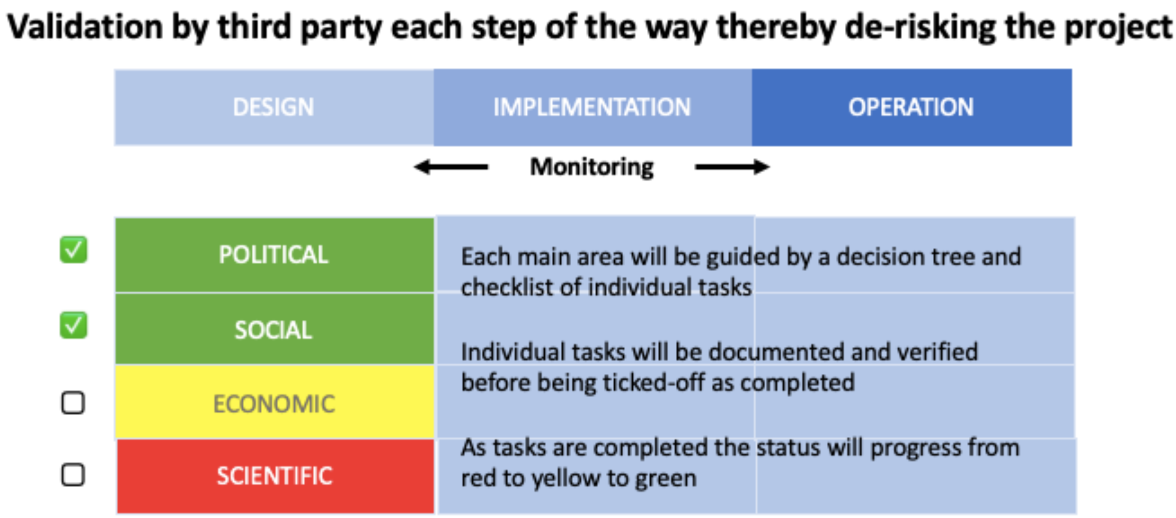
The Way Forward

As with any developing industry, it can take time for the pieces to come together and for a clear picture to emerge how to bring the industry to scale. It was not until Henry Ford rethought the automobile assembly process that the cost and time to build a car dropped and therefore the cost to buy a car ceased to be a barrier to demand. This unleashed a number of ancillary supporting industries.

Carbon offsets, based on conservation, afforestation and rehabilitation can similarly benefit and move to scale by rethinking how the component parts of the process could be better organised. The current players in this market will all benefit from a bigger pie.

There are three essential objectives to be achieved:

1. **Simplify** and improve the process of designing, registering, implementing and managing carbon projects across all four **pillars**.
2. **De-risk** projects by designing monitoring and validation into the workflow from start to finish.
3. **Scale** the number of projects creating a larger market for all stakeholders



Simplify

The way to simplify these projects is to create robust guides and checklists covering each phase of a project; designing, registering, implementing and managing. It is critical that these guides be developed to cover each of the four pillars; **Political**, **Social**, **Scientific** and **Economic** .

De-risk

The way to de-risk these projects is to create a comprehensive online monitoring system which tracks progress based on the checklists with each action supported by documented evidence of completion. Progress can be tracked by each pillar, represented by colour coding; red, yellow, green and supplemented by independent verification. This needs to also include direct and indirect environmental risks. This should now be able to be validated using satellite imagery processed using machine learning.

Scale

The single greatest barrier to scale today is a lack of credible verified projects. Working together with the financial community to create a comprehensive new system of well designed, implemented and validated projects that meet the needs of both the projects and the funders should unleash the scale we need.

What next?

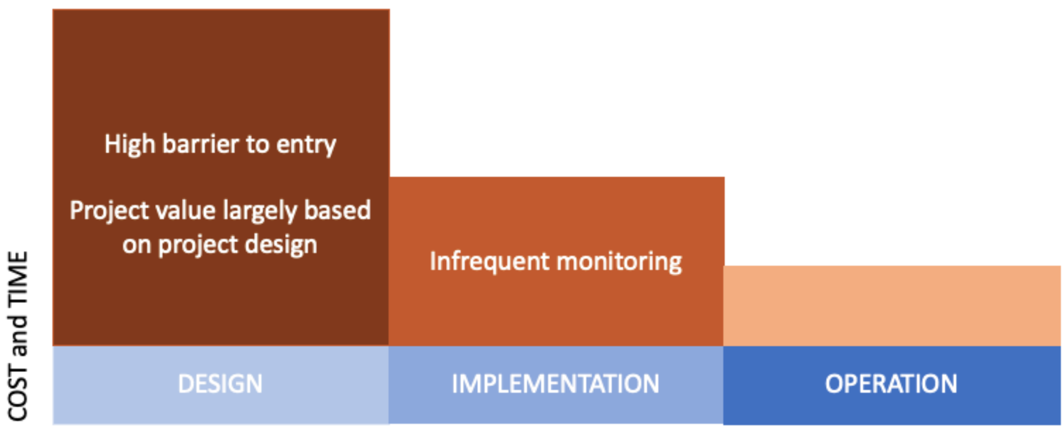
The challenge now is to consider exactly how that could best be done: what is the framework, how does this scale and can this be self-supporting long-term?

The good news is that thanks to a small handful of successful projects we have been able to see how the challenges common to all projects could be overcome. One in particular, the Mikoko Pamoja project, uniquely solved many of the four pillars or challenges covered in detail in this paper.

The bad news is that by reviewing dozens of projects all over the world it is clear the current system must be improved. As we saw with the Mikoko Pamoja project, designing and getting a project registered is very expensive and requires significant expertise and effort not easily available.

How to fix this?

Barriers to entry can be lowered. Projects can be de-risked via online monitoring of documented checklist progress. Pillar milestones can be independently verified. Levels of sequestration can be validated using satellite imagery using machine learning.



Current Accreditation Model

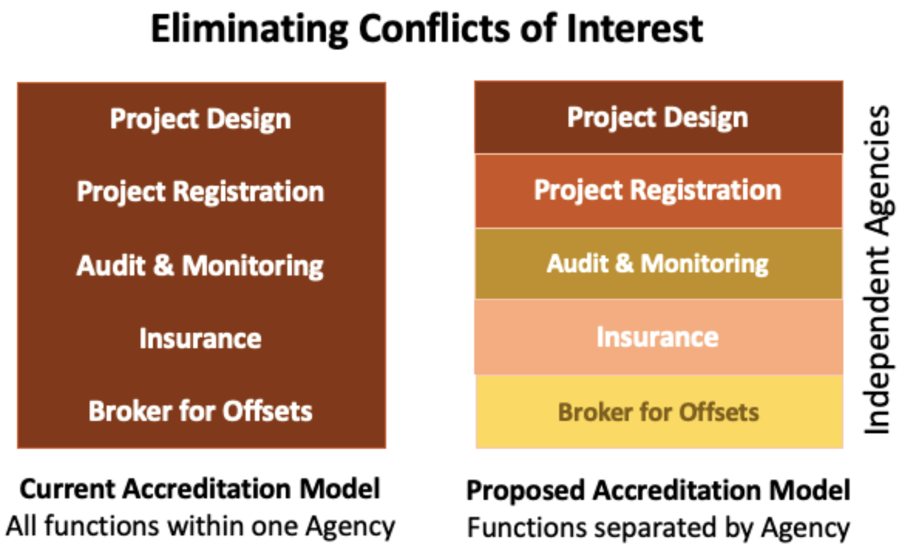
Proposed Accreditation Model

Accreditation

The carbon offset accreditation industry suffers from a lack of scale and has to cover all the requirements of the process creating inefficiencies and even conflicts of interest.

In order to scale it will be necessary to separate out some of these functions to independent agencies which in turn can generate efficiencies as each can then focus on their area of responsibility at scale. This also will prevent an inherent real or perceived conflict of interest when the accreditation agency is responsible for registering and monitoring projects that they then profit from.

De-risking projects from start to finish will mean more projects and more profitable projects – a bigger pie to share.



Benefits

- Faster project design requiring less expertise and upfront investment
- Clear roadmap for projects covering all four pillars
- Validation baked into each stage of the project
- Independent verification using remote imagery and enhanced data processing

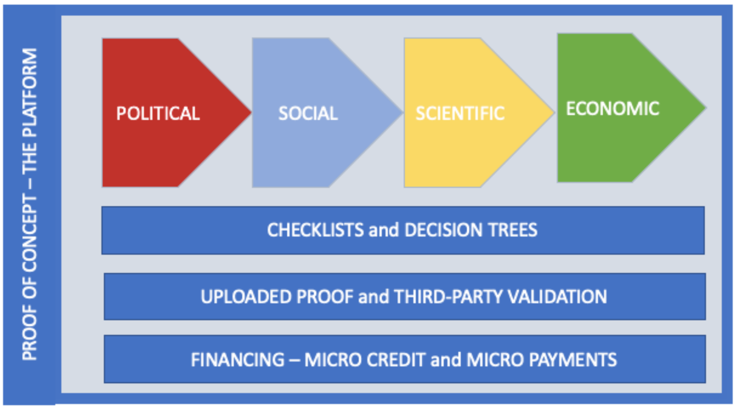
Stakeholders

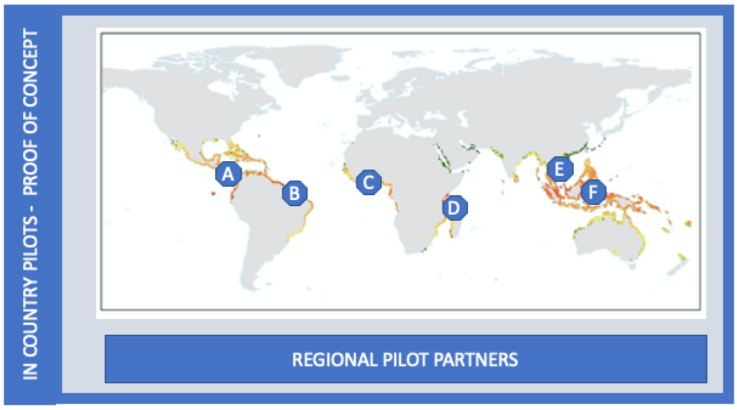
- **National Governments** – verified carbon credits towards COP obligations
- **Local Governments** – projects to earn money and improve local ecosystems
- **Landowners** – individuals or corporations
- **Residents** – local communities
- **NGOs** – working toward sustainable environmental ecosystems protection
- **Accreditation Agencies** – who can benefit from increased scale of projects
- **Validation Agencies** – who can verify project progress
- **Companies** – buyers of verified carbon offsets and investments
- **Others** -

Project Plan

Proof of Concept

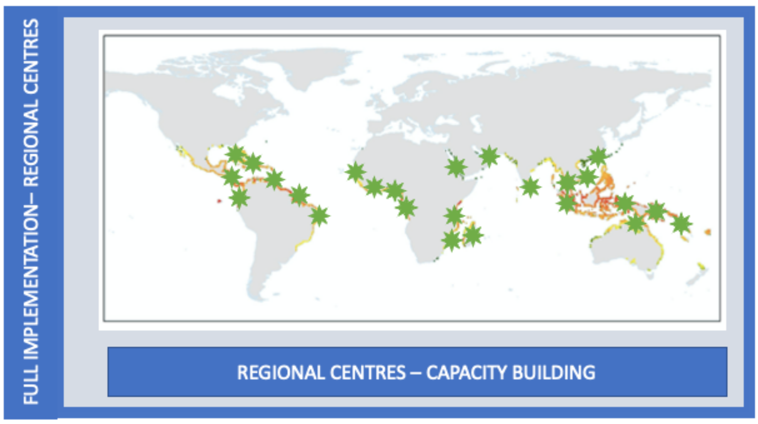
- Guides - Develop the guides and checklists for all four pillars covering the project design and registration phases
- Platform - Design the system needed to deliver the guides and checklists and collect the data validating project progress
- Pilot - Pilot the Guides and Platform in several test countries





Full Development

- Refine – the guides, checklists and platform based on Proof of Concept feedback and translate
- Capacity Building – Develop the Train the Trainer programmes for the information and skills needed to design, register, implement and manage a project
- Regional Centres - Enlist existing agencies to support projects regionally
- Transition to a self-sustaining business model



Mikoko Pamoja Project – A Blue Carbon Success Story

On the south coast of Kenya in the village of Gazi lies the Mikoko Pamoja project; 117 hectares of mangrove conservation. Mikoko Pamoja neatly ties together good science, community ownership and support from government agencies. Although initially sceptical of the carbon offset industry, Dr Mark Huxham (Napier University) and Dr James Kairo (Kenya Marine Fisheries Research Institute) decided to seek accreditation for the carbon offsets generated by their work, using the Plan Vivo standard. From submission of the original Project Idea Note to first payment took around four years.

The project is governed by a democratically elected 13 person Community Organisation. The mangrove Community Organisation liases with a steering group representing various national and international NGOs, government organisations and research institutions, who provide technical advice and support. As a Gazi resident, Dr Kairo played a critical role in building trust and providing leadership.

Conservation and rehabilitation activities carried out by Mikoko Pamoja generate around 2,000 tons of carbon benefits annually, sold for between $6 and $10 tonne for a variable yearly income of $12,000-$20,000.

After project expenses, accreditation fees, costs of all monitoring and restoration activities (including employing local project co-ordinators and fair payments for labour), around 26% of this amount remains. This is allocated to community benefit projects decided on by the Community Organisation via consultation with residents of Gazi and Makongeni villages.

Since 2014, profits from selling carbon offsets have funded hospital and pharmacy equipment, books, desks and stationery for schools, improved sanitation and the development of water infrastructure serving the needs of 73% of 4,000 residents. The project also provided wood lots for building and firewood, now that mangrove wood is off limits, and introduced sustainable aquaculture practices. All project annual reports, including financial details and minutes of consultation meetings, are freely available online.

Despite the small size of this site, Mikoko Pamoja effectively demonstrates how blue carbon offsets sold on the voluntary market can subsidise ongoing management of critical coastal ecosystem sites while simultaneously improving livelihoods of local people.

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