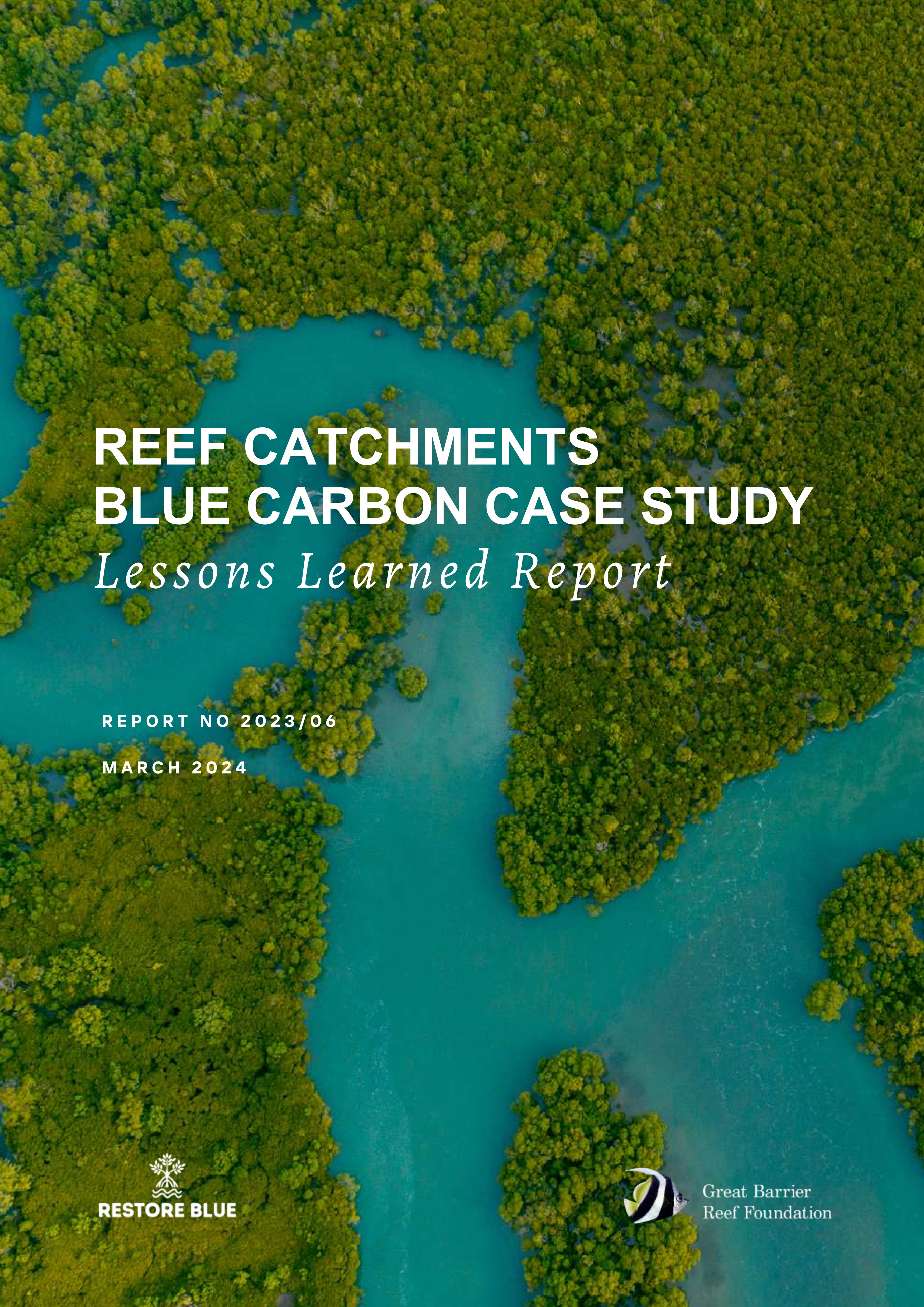

REEF CATCHMENTS BLUE CARBON CASE STUDY

Lessons Learned Report

REPORT NO 2023/06

MARCH 2024

RESTORE BLUE

Great Barrier Reef Foundation

Document Control

PROJECT DETAILS

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Restore Blue is bringing together individuals, communities and landholders to turn degraded landscapes into thriving blue carbon wetland ecosystems. Our goal is to restore 10,000 hectares of blue carbon wetlands by 2030.

Important Information

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This report is a guide only, is not to be construed as legal advice and does not replace the need for professional legal advice in individual cases.

Acknowledgements

This report was made possible through funding from the Great Barrier Reef Foundation (GBRF). Restore Blue would like to thank the Great Barrier Reef Foundation (GBRF) staff for their support and contributions to this project. Additionally, we express our gratitude to the landholder for their cooperation and generosity in providing access to their property for this study.

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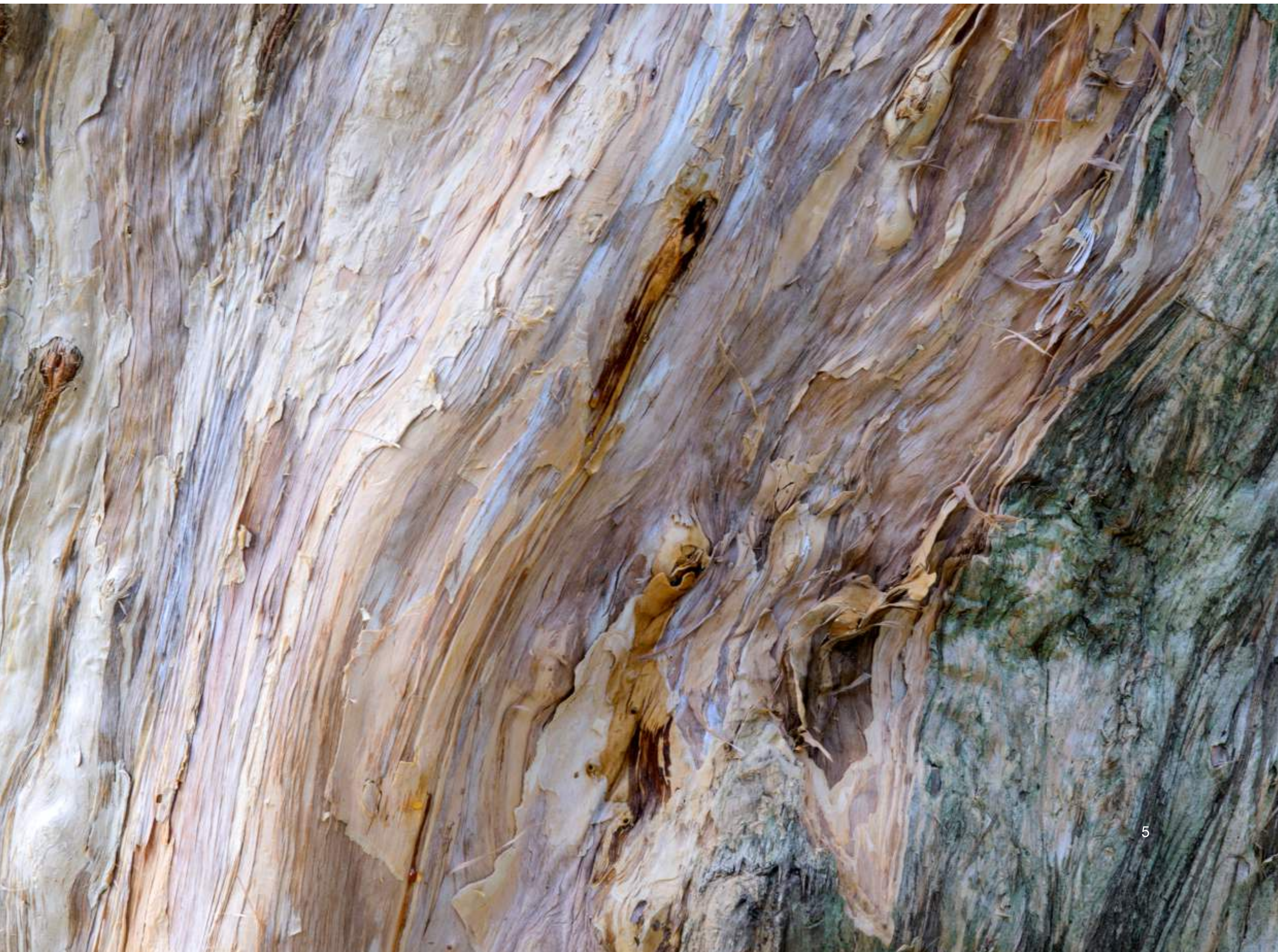
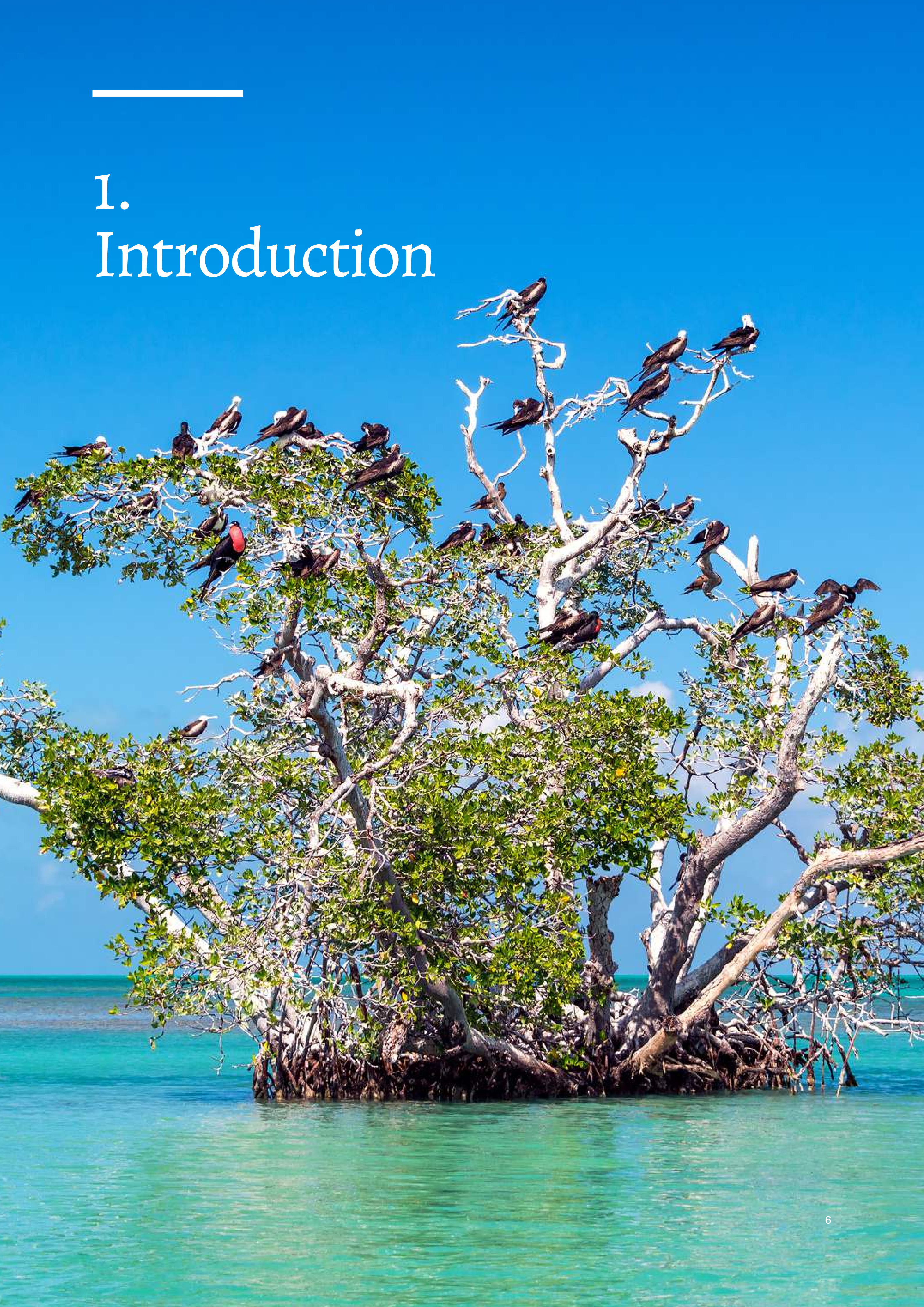


1.
Introduction



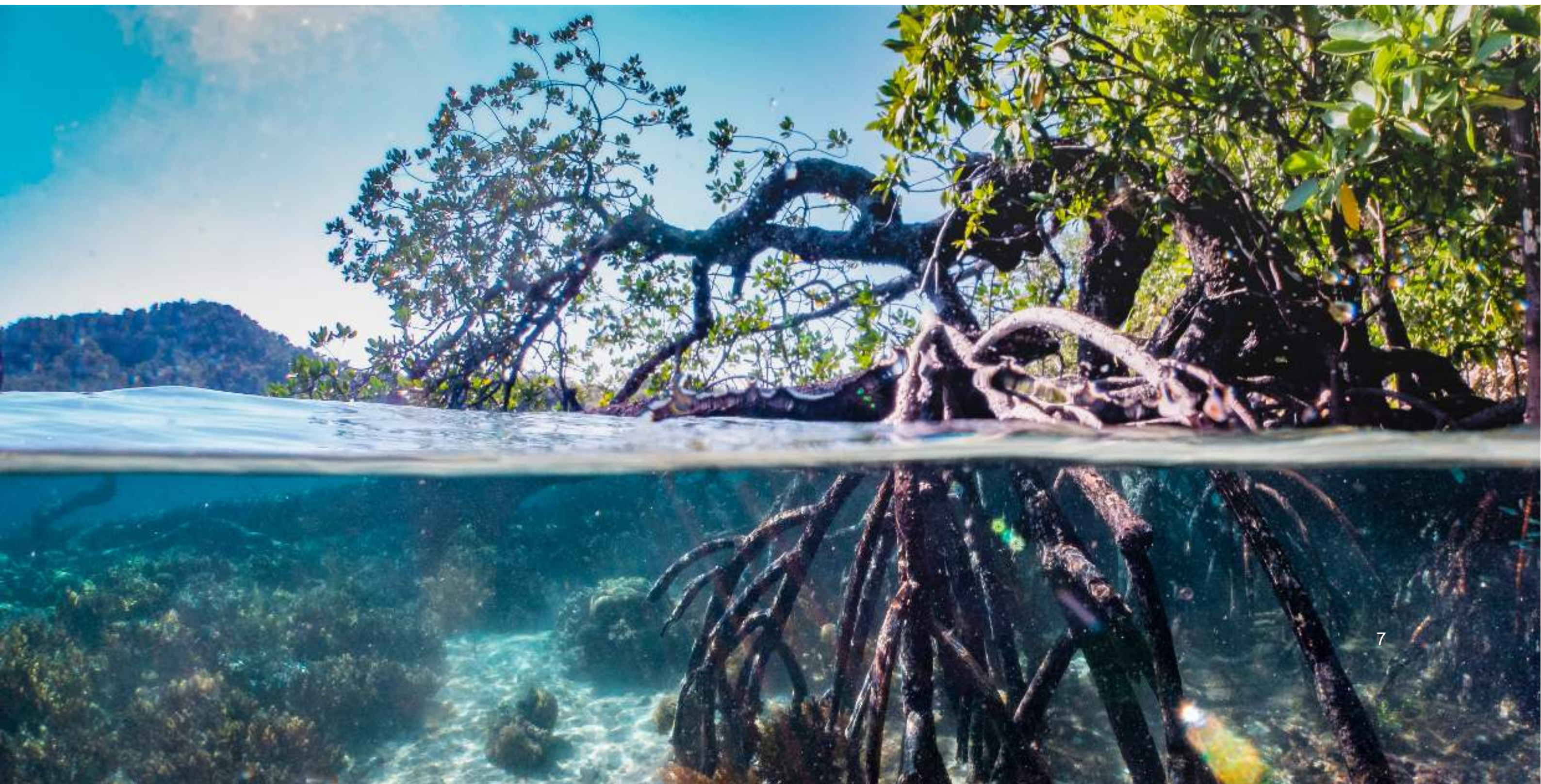
The Great Barrier Reef Foundation (GBRF) engaged Restore Blue Advisory Services Pty Ltd (Restore Blue) to undertake a bio-physical, planning, legal, and financial feasibility assessment of the opportunity to develop a blue carbon project on the lowest portion of a coastal property in the Great Barrier Reef catchments. This feasibility assessment was undertaken with the overarching aim of progressing the site towards project registration under the Clean Energy Regulator's (CER) Tidal Restoration of Blue Carbon Ecosystems Method (Blue Carbon Method).

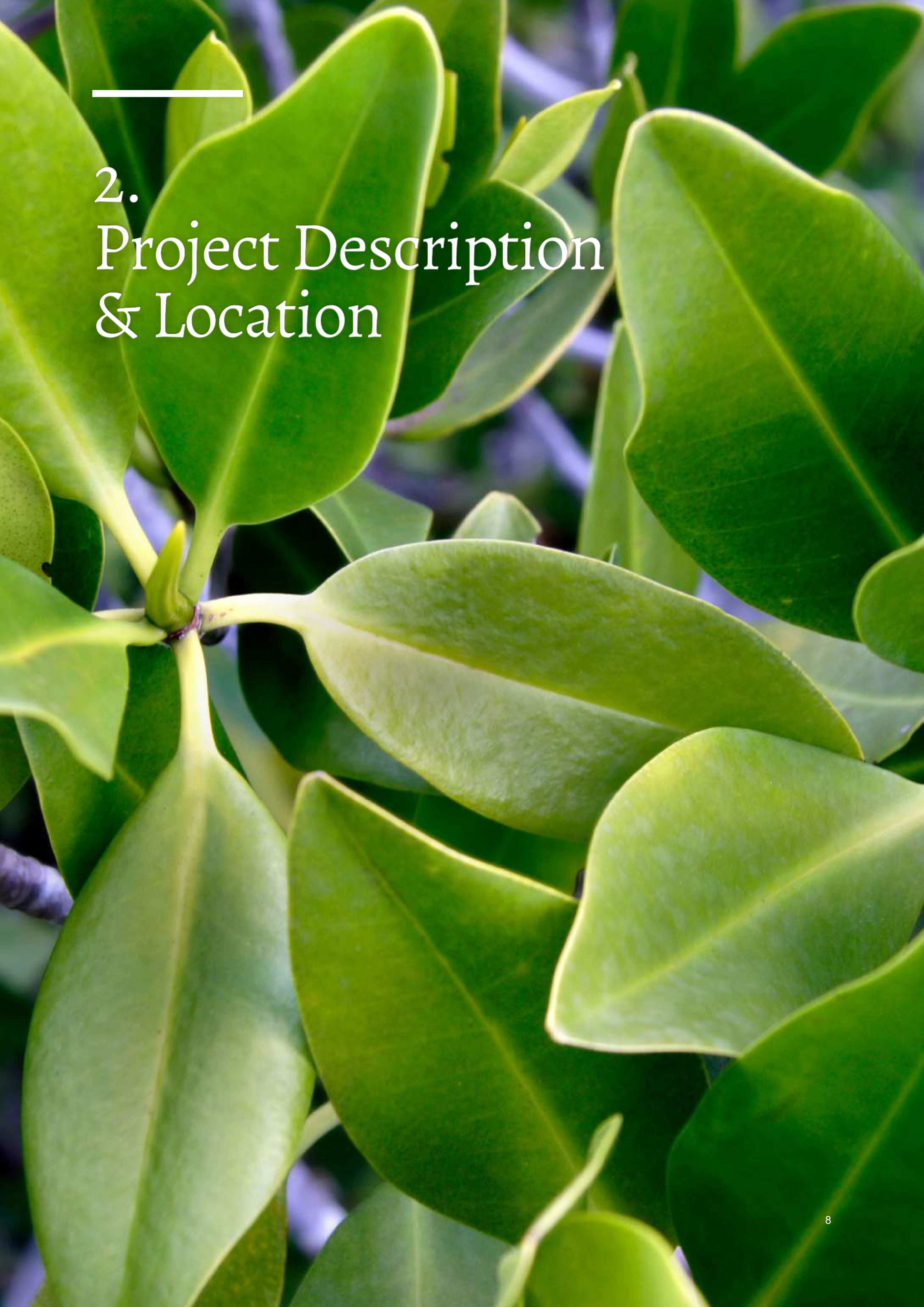
Restore Blue has progressed the blue carbon site feasibility assessment via a range of detailed investigations. This report provides a summary of important lessons learned through this process, which may assist organisations seeking to develop blue carbon projects in the future. Further, implementation of these recommendations may help to de-risk future projects and/or potentially reduce project costs by progressing through project feasibility assessment processes in a more timely and efficient manner.

To help focus recommendations into various disciplines, this report is divided into the following sections, namely:

- Project Description and Location
- Blue Carbon Feasibility Assessment
- Landholder Relations
- Hydrology
- Planning and Legal
- Financial

Note that for privacy purposes, the specific details of the project have been omitted. Nonetheless, many of the lessons learned from this study are relevant to other potential blue carbon sites in Australia.





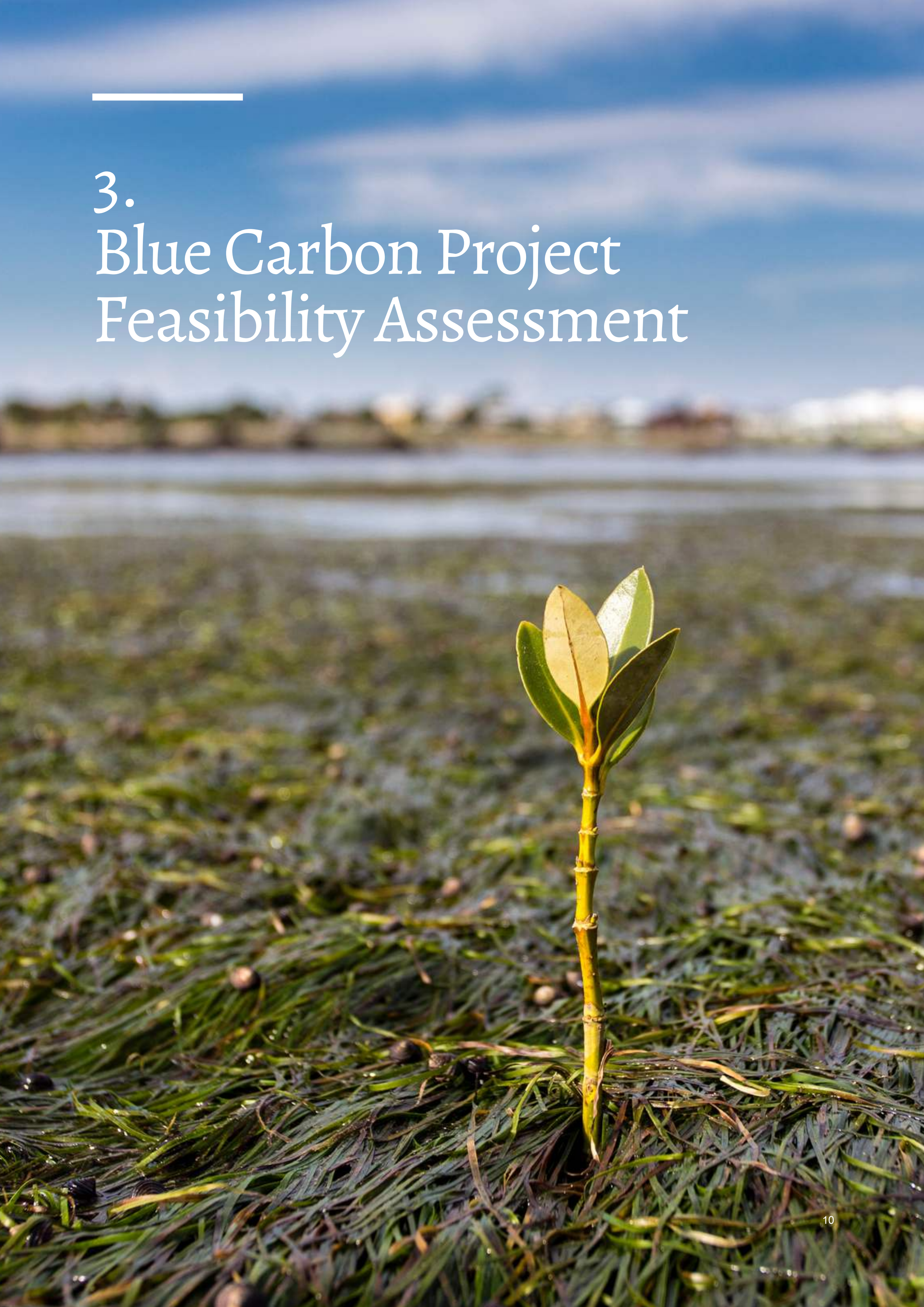
2. Project Description & Location

The project is located on the coastal floodplain of a tidal creek estuary in northern Queensland in the Great Barrier Reef catchments. The approximate project location is shown in Figure 2-1. Based on the Natural Resource Management (NRM) clusters used in the Blue Carbon Accounting Model (BlueCAM), the site is located in the East Coast NRM cluster.

FIGURE 2-1 PROJECT LOCATION

The project is located on a working farm that is primarily used for grazing, with some areas under cultivation. The project area is approximately 300 hectares and is currently producing revenue for the landholders. The total farm aggregation is significantly larger than the proposed blue carbon project area. A blue carbon project would provide the opportunity to diversify farm revenue streams, with the remaining farm areas operating on a ‘business as usual’ basis.

3.
Blue Carbon Project Feasibility Assessment



THE BROAD AIMS OF THE BLUE CARBON PROJECT FEASIBILITY ASSESSMENT WERE TO:

1. Understand how the project area currently functions in order to consider how the proposed blue carbon project might align with the farm's operations.
2. Collate and analyse relevant biophysical datasets to understand the site's hydrology and to determine how a blue carbon project might work within the physical constraints of the site.
3. Review and document planning and environment legislation relevant to the site and investigate a planning approvals pathway for the proposed blue carbon project.
4. Estimate the carbon abatement potential of the site based on the Blue Carbon Method.
5. Undertake financial modelling for the proposed blue carbon project to assess its economic viability.

THE PROJECT WAS UNDERTAKEN IN TWO STAGES:

Stage 1: a first pass due diligence assessment; and
Stage 2: more detailed investigations aiming to produce:

- A project concept design describing the necessary infrastructure interventions to enable reintroduction of tidal flows to the site.
- A description of the planning approvals pathway for the project.
- Outcomes from the application of the Blue Carbon Method including estimates of carbon sequestered onsite based on local hydrologic conditions.
- Financial modelling of suitable detail to estimate key financial outcomes for the project including predicted timing and quantum of revenue streams from the sale of Australian Carbon Credit Units (ACCUs), profit sharing arrangements, projected landholder income, project costs, and required project financing.

A key financial outcome of these investigations was an estimate of the required sale price range for a Blue Carbon ACCU necessary to make the project financially viable for the landholder.

The following sections of the report highlights key lessons learned while undertaking the project.

4.
Landholder Relations

4.1 UNDERSTANDING A BLUE CARBON PROJECT

Lesson learned: *Landholder understanding of carbon projects, and particularly blue carbon projects, is important.*

The landholders are actively seeking ways to improve and diversify farm revenue. With existing carbon projects already registered over other parts of the property, they were already familiar with carbon projects. The landholders had also been collaborating with a university's wetland research program and liaising with the GBRF on a potential blue carbon project prior to Restore Blue becoming involved. From this perspective, they already had a background knowledge of blue carbon projects.

More generally, and from the point of view of free prior and informed consent (FPIC), it’s important that landholders understand the fundamentals behind blue carbon projects and can make informed decisions regarding a proposed project. Against this backdrop, it’s important to note that carbon projects generally, and blue carbon projects more specifically, can be very technical. Further, they do not typically form part of a landholder’s core business. As such, it is important to find a way to clearly communicate important information about the project (including information about how it will affect their farming practices) without becoming unnecessarily focussed on granular, scientific details. The project site, like many Australian farms, is an owned and operated family business. The gravity of the decision to explore and possibly commit to a blue carbon project with a legal requirement of at least 25 years and with material impact on the current operations, and future generations, should not be underestimated. The time required to effectively work through this communication process to ensure the landholder is in a position to grant FPIC should not be underestimated.

4.2 TRUST

Lesson learned: *Earning the trust of the landholder and collaborators is important.*

Clearly having a relationship of openness and trust with the landholder will enable the project to progress in a more timely manner. In this instance, the relationship that the landholders had already established with university staff and the GBRF representative helped Restore Blue quickly develop a positive and open business relationship with them. Restore Blue's commitment to transparent and open communication and the provision of information assisted in this regard.

Lesson Learned: *There is no substitute for seeing the site and meeting people.*

The landholders rely on trusted local networks to support their operations. With stakeholders and funders involved in this blue carbon project from inter-city and inter-state locations it has not been possible for all parties to visit the site and establish connections. This has potentially prevented relationships from being fully explored and leveraged. The value in visiting the farm to earn and build mutually beneficially relationships should not be underestimated.

4.3 WHOLESALE CLIENT TEST

Lesson Learned: *Paperwork can take time to complete and requires focus to progress in a timely manner.*

ACCUs are classified as a financial product under the Corporations Act 2001.

Advising about, or dealing in, a financial product requires an appropriately conditioned Australian Financial Services Licence (AFSL). Restore Blue is a Corporate Authorised Representative on an AFSL with the required attributes to advise about, and deal in, ACCUs. In order to conduct discussions, Restore Blue's AFSL requires that the landholder provide evidence that they meet the wholesale client test. While meeting the wholesale client test was not an issue in this instance, there was nonetheless a process that had to be followed to ensure that the landholders and their financial advisors understood first, why the test had to be met, and second, the paperwork required to satisfy this test. The time and effort required to work through this process should not be underestimated.

4.4 EXCLUSIVITY AGREEMENT

Lesson learned: *Paperwork can take time to complete and requires focus to progress in a timely manner.*

Restore Blue sought to have the landholder sign an Exclusivity Agreement for the project. The exclusivity agreement outlines terms for the early progression of the project through the feasibility stage to a decision point when the landholder decides to proceed with the project or not. The Exclusivity Agreement protects both the landholder's and Restore Blue's interests.

While the key tenets of the agreement are easy to understand, legal documents may be unclear to the lay-person. As such, it may take time for landholders to work through these documents and to seek independent legal advice. The amount of time and effort required to work through this process should not be underestimated.

4.5 LANDHOLDER FINANCIAL EXPECTATIONS

Lesson learned: *For a blue carbon project to be an attractive alternative for a landholder, a site with low onsite productivity is preferred versus a site that is consistently productive.*

In this circumstance, the landholders are actively grazing the area identified as a potential blue carbon project. As a result, the landholders have relatively high revenue expectations for the site. In contrast, many potential blue carbon sites are low-lying and the onsite productivity is limited due to waterlogging, acid sulfate soils, etc. In this regard, blue carbon wetlands will be more feasible in areas where the existing returns are lower. This is especially important when the current market price for blue carbon ACCUs remains unclear.

4.6 LANDHOLDER PERSPECTIVES

Lesson Learned: *Blue carbon projects offer a range of opportunities and potential challenges that need to be considered by a landholder when determining whether to go ahead with a blue carbon project.*

OPPORTUNITIES

Key Point 1: Blue carbon projects can be lower maintenance than traditional farming operations.

Once activated, blue carbon projects are low overhead and low impact farming practices compared to other farming methods. Blue carbon projects typically do not involve high infrastructure maintenance overheads, the application of fertiliser or herbicides/pesticides, planting, milking, or harvesting, handling or shipping of product; cattle transport or mustering; or animal health services, etc. Further, carbon service providers, such as Restore Blue, can offer a full project management service where all project feasibility, design, planning approvals, CER registration, monitoring, evaluation and reporting (MER), ACCU reporting, auditing and credit sales are managed for the landholder. In this model, landholder human resource commitments to the project are minimised, freeing up time for the landholder to focus on other tasks on- or off-farm.

Key Point 2: Blue carbon projects can potentially provide more reliable income.

Once a blue carbon project is active, the revenue projections are (within bounds) set and the timing is more or less known. Since the wetland vegetation growth is stimulated and maintained by regular tidal inundation, seasonal effects such as drought and flood have potentially less impact on blue carbon income compared to other farming endeavours.

Key Point 3: Blue carbon projects can diversify farm income.

A blue carbon project can provide the opportunity to diversify farm revenue streams when the project is part of a larger landholding and the remainder of the farm operates business as usual.

Key Point 4: Blue carbon projects are good for the environment both on and off farm.

Blue carbon projects provide a range of co-benefits both onsite and beyond the project area (that is, both on and off farm). A blue carbon project provides native habitat that supports fisheries and other flora and fauna. These projects also slow flood flows and capture sediments. The re-introduction of tidal flows to the floodplain has been shown to reduce nutrient runoff, ameliorate acid sulfate soil affected lands and improve anoxic waters both onsite (where relevant) and in the wider estuary.

POTENTIAL CHALLENGES

Key Point 5: Blue carbon projects are a long-term, potentially intergenerational commitment.

Floodplain areas eligible for project development using the Blue Carbon Method have been modified from their original state and over decades have transformed into predominantly freshwater environments. Re-introducing tidal flows to these areas will establish a blue carbon wetland comprising predominantly saltwater vegetation species such as mangroves, saltmarsh and supratidal forest. A 100-year permanence period constitutes an inter-generational commitment to maintain the site as a coastal wetland.

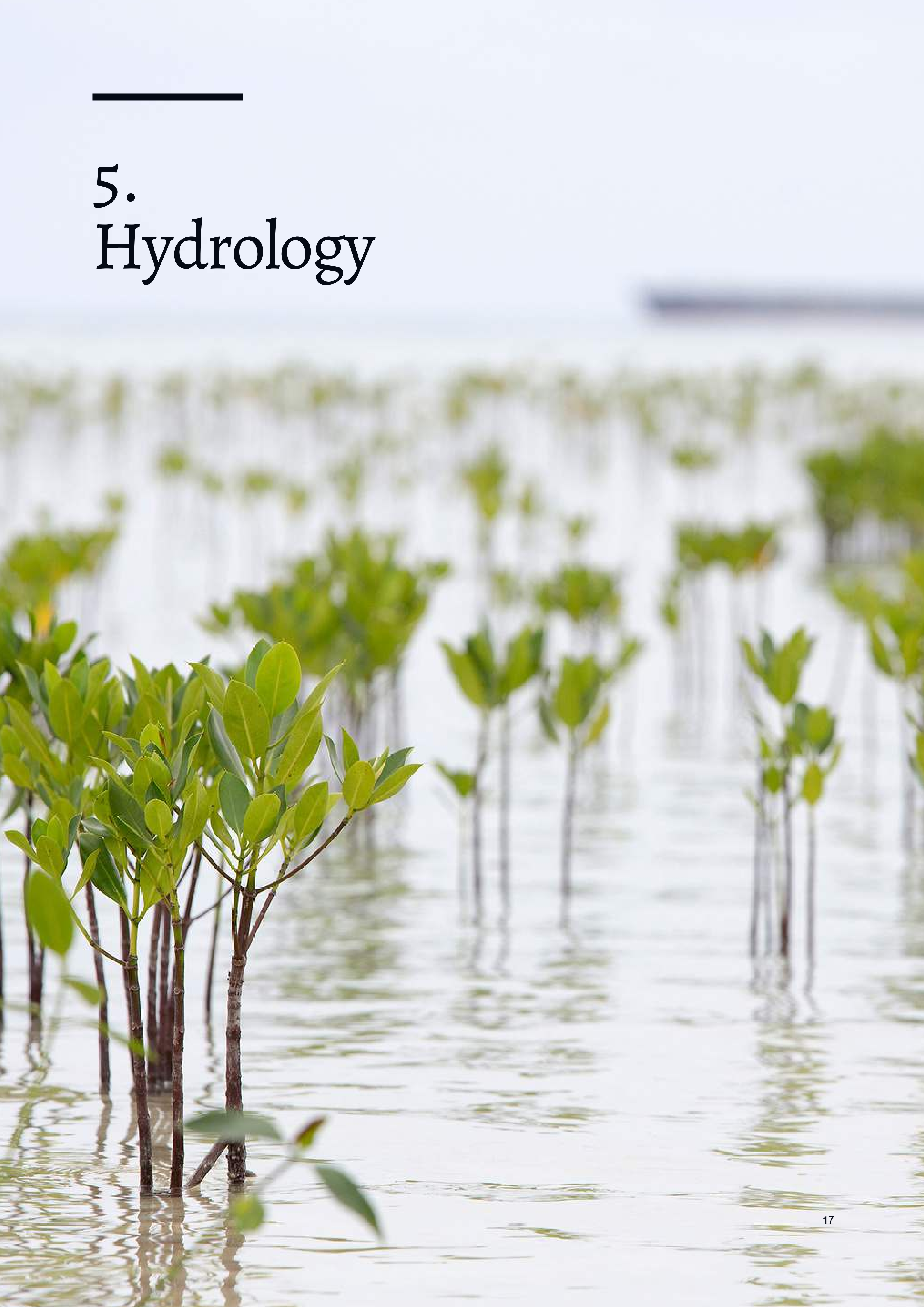
Key Point 6: A blue carbon project might affect a farm's operations.

In some cases, bund walls and levee banks that have been installed to separate the floodplain from the main river channel have a dual purpose, providing a vehicle access track across and around sometimes waterlogged areas. Re-engineering or decommissioning of the levee or bund may affect access to some parts of a landholding beyond the blue carbon project area. It is important to discuss these matters with the landholder and to consider them when designing a project.

Key Point 7: The income generating potential of a blue carbon project is currently uncertain.

Blue carbon projects are in their infancy in Australia and, while registration of the first projects to produce ACCUs is imminent, there are no blue carbon ACCU sale transactions to use as a benchmark in financial modelling. While there are market precedents for ACCUs with verified co-benefits selling at a premium (which can be used as a guide), until a blue carbon ACCU is sold, the revenue generating potential of a blue carbon project remains unverified. This uncertainty is a major consideration for landholders.

5. Hydrology



5.1 BEST PRACTICE

Hydrological best practice for blue carbon projects is provided in the recently launched report, Restoring Blue Carbon Ecosystems: A Best Practice Guideline for Hydrologic Assessments.[1]

5.2 DATA

Lesson Learned: *There are fundamental datasets required to assess the viability of a blue carbon project. Poor quality data affects the accuracy of these assessments, resulting in uncertainties that need to be managed.*

Input data includes tidal water levels and digital elevation models (i.e., topographic data).

Challenges and lessons learnt from managing this data onsite are detailed below.

TIDAL WATER LEVELS

Lesson Learned: *Locally measured tidal water level data reduces project uncertainty.*

Tidal dynamics can be complex, especially in estuarine areas in the Great Barrier Reef Catchments where tidal planes vary rapidly along the coast. Fortunately, at this site there was a measured tidal water level data set developed specifically for the blue carbon project assessment which included measured water levels at three representative locations around the site. This dataset demonstrated that there were significant differences between the locally measured data and the nearest official tide gauges.

For this project, the locally measured data was highly valuable and was applied to assess tidal inundation.

Tidal plane statistics are a fundamental dataset for the Blue Carbon Method. If a project site does not have an official tide gauge nearby, then the local tidal dynamics may be a significant unknown. Inaccuracies or unknowns in local tide data can manifest in uncertain estimates of tidal inundation area, inundation depth, and inundation duration. These variables influence the ability to accurately predict blue carbon wetland vegetation, as per the BlueCAM model. It is important to note, however, that this does not affect the accuracy of ACCUs issued once the project is registered. This is because ACCUs are issued on the basis of actual, not predicted, vegetation growth.

DIGITAL ELEVATION MODEL (DEM)

Lesson Learned: *Good quality Digital Elevation Model data is difficult to acquire in wetlands. Wherever feasible, DEMs should be corrected via on-ground surveying.*

Similarly, the accuracy of DEM data can affect predictions of tidal inundation area, inundation depth and inundation duration, which all impact on the accurate prediction of blue carbon wetland vegetation used in the BlueCAM model. The Australian Government provides free DEM data at a range of spatial resolutions over a large proportion of the Australian coastal floodplain. Much of this dataset has been gathered using remote sensing techniques, the most commonly used of which involves the use of aircraft-mounted lasers called Light Detection and Ranging (LiDaR).

1 UNSW (2023), 'Restoring Blue Carbon Ecosystems: A Best Practice Guideline for Hydrologic Assessments'.

While LiDaR is a cost-effective method to collect large datasets over wide areas, it can result in some inaccurate representations of the ground surface where the laser has been unable to penetrate heavy vegetation or water. Unfortunately, coastal floodplains often have these attributes which means that available DEMs may not be entirely accurate, resulting in uncertainties when predicting inundation areas and water depths in project areas. This may in turn affect vegetation growth predictions and carbon sequestration estimates in the BlueCAM calculator. DEMs for blue carbon project areas can be corrected by undertaking targeted ground site surveys, where feasible. Where a DEM cannot, for various reasons be corrected, uncertainties in the carbon abatement predictions can be addressed via alternative techniques such as sensitivity analyses as described below.

Lesson Learned: *Where ground-truthing is not possible, sensitivity analysis will help to address issues with DEM quality.*

The unknown presence of saltwater crocodiles in potential blue carbon areas in North Queensland makes measuring the ground surface using more accurate techniques dangerous. As a result, uncertainties in the prediction of tidal inundation may persist. In these cases, uncertainties in the carbon abatement predictions need to be addressed via alternative techniques such as sensitivity analyses. As noted above, these issues do not affect the accuracy of ACCUs issued once the project is registered as ACCUs are issued on the basis of actual, not predicted, vegetation growth.

5.3 TIDAL INUNDATION

Lesson Learned: *A poor quality DEM makes predicting tidal inundation area less accurate. Issues with predicting tidal inundation area can be addressed by undertaking sensitivity analysis.*

Carbon sequestration estimation using the BlueCAM model requires mapping of tidal inundation extent and depth over the project area. Two primary methods exist to generate these maps:

- ‘Bathtub’ modelling using a Geographical Information System (GIS)
- Hydrodynamic modelling using commercial software such as HECRAS, TUFLOW, Delft3D, MIKE, RMA, etc.

Based on the potential limitations of the DEM, both of the above methods were applied in this project. At the most fundamental level, the combination of these approaches provided confidence that the project area could be inundated, but considerable uncertainty (+/- 0.5m) was associated with the inundation depth mapping across the site. This was managed by undertaking sensitivity analyses of carbon sequestration estimates using the BlueCAM model. In other locations, inaccuracies in the tidal inundation area might also be an issue if there was a neighbouring property that could be inundated by the project. Methods to mitigate the risk of inundating neighbours, such as building secondary levee banks or installing upstream floodgates, would need to be assessed on a site-by-site basis by a suitably qualified and experienced engineer.

5.4 STANDARD TIDAL PREDICTION INDEX (STPI) MAPPING

***Lesson Learned:** The NRM Cluster definition of Standard Tidal Position Index might not suit the project site.*

As mentioned in Section 2, the site is located in the East Coast NRM cluster. The BlueCAM Technical Overview Report assigns 'Subtropical' STPIs in this region. The Subtropical STPI classifications include depth ranges for seagrass, tall mangrove, scrub mangrove, tall hinterland mangrove, saltmarsh, and supratidal forest. However, a visit to the project site revealed that the local estuary adjacent to the project area contained large areas of salt pan, which is a feature of the 'Tropical Monsoon' STPIs. As such, these STPIs were adopted for the BlueCAM model. Overall, it should be noted that the STPI classifications are approximate guides and not exact classifications of vegetation distribution.

***Lesson Learned:** Without accurate depth predictions in inundation mapping the representativeness of STPI vegetation mapping needs to be carefully considered.*

Since the STPI mapping relies on classifying the project inundation area against local tidal planes, the accuracy of the STPI mapping is affected by the inaccuracies in the DEM and tidal measurements, as identified in Sections 5.2 and 5.3 above. Ultimately in the study project, a combined analysis using the GIS mapping informed by the hydrodynamic model benchmarked against the native vegetation types in the areas in the natural estuarine floodplain adjacent to the site were used to estimate a future blue carbon wetland vegetation mosaic.

5.5 BLUECAM

***Lesson Learned:** Uncertainties in projected carbon sequestration volumes manifesting from the STPI mapping process can be managed through sensitivity analysis.*

The wetland vegetation mosaic generated using the techniques described in Section 5.4 was adopted as a best estimate base case for a future transitioned blue carbon wetland. This was also used to generate a carbon sequestration estimate using the BlueCAM model. Acknowledging the limitations in the base case, a series of scenarios were tested to determine a possible range for carbon sequestration volumes. Scenarios tested are outlined in Table 5.1 and Table 5.2.

TABLE 5.1 BLUECAM SENSITIVITY SCENARIOS

SCENARIO	DESCRIPTION
BC1: Base case - 25 year permanence period	Tide is re-introduced to the site. The vegetation transitions over 25 years to a mosaic of mangroves, salt pan, salt marsh and supratidal forest. The project has a 25 year crediting period and a 25 year permanence period.
BC2: Base case - 100 year permanence period	Tide is re-introduced to the site. The vegetation transitions over 25 years to a mosaic of mangroves, salt pan, salt marsh and supratidal. The project has a 25 year crediting period and a 100 year permanence period.
BC3: Low sequestration	Tide is re-introduced to the site. The vegetation transitions over 25 years but the vegetation growth is limited to mangroves in the channels and salt pan elsewhere so the sequestration via vegetation growth is minimised. The project has a 25 year crediting period and a 25 year permanence period.
BC4: High sequestration	Tide is re-introduced to the site. The vegetation transitions over 25 years and the vegetation growth is maximised with mangroves predicted to grow in the channels and supratidal forest predicted to grow elsewhere. The project has a 25 year crediting period and a 25 year permanence period.

TABLE 5.2: SUMMARY OF BLUECAM CALCULATIONS

SCENARIO	PERMANENCE PERIOD (YEARS)	CARBON ABATEMENT RATE (TONNES PER HECTARE)	% CHANGE TO BASE CASE CARBON ABATEMENT VOLUME
BC1: Base case vegetation	25	276	0.0%
BC2: Base case vegetation	100	296	+7.2%
BC3: Low sequestration	25	250	-9.1%
BC4: High sequestration	25	456	+65.2%

While the sensitivities are unique to the project site assessed, the minimum volume sequestered is within ±10% of the base case. The maximum sequestration estimate, while likely unrealistic, indicates that the base case sequestration estimate is at the lower end of the scale. Also note that because of the predominance of salt pan predicted for the transitioned site, the carbon abatement rates at this site are lower than might be expected in other climatic zones where salt pan areas are less prevalent.

Lesson Learned: *BlueCAM has an error when estimating soil carbon sequestration*

While due diligence testing the BlueCAM model, an error in the calculation of the soil carbon sequestration component was discovered. The error is specifically for ‘avoided soil carbon losses’ and only manifests when either the ‘grazing land’ or ‘sugar cane land’ options are selected as the CEA baseline land type. In these cases the avoided soil carbon losses are not multiplied by the CEA area typically resulting in an underestimation of carbon sequestration (i.e. an underestimation when the CEA area is greater than one hectare).

Lesson Learned: *BlueCAM might have an omission.*

When reviewing the BlueCAM calculations it became apparent that the existing supratidal forest vegetation in a particular CEA was predicted to persist as supratidal forest and not transition to another vegetation type. However, the BlueCAM calculator does not appear to account for existing blue carbon habitats which remain, and assumes all CEAs transition from one baseline land type to a different land type. This resulted in a calculated net decrease in carbon abatement for avoided emissions. This is because it assumed that the existing (freshwater) vegetation type transitioned to a blue carbon wetland, thereby resulting in emissions due to vegetation transition (die off). As the existing supratidal forest in the CEA does not transition, this vegetation die off and subsequent emissions would, in fact, not occur. This implies that BlueCAM does not account for existing blue carbon vegetation which persists from pre-project conditions and continues to age and sequester carbon during the project period. At face value this appears to be an omission in the BlueCAM calculator which we will report to and discuss with the CER.

Lesson Learned: *Selecting a Baseline land type classification is subjective and guidance on how to choose the most appropriate baseline land type is required, particularly for land that is regularly wet. Modelled BlueCAM abatement estimates are highly sensitive to the CEA baseline land type selected for the Carbon Estimation Area (CEA)*

In some of the potential project areas that have been assessed to date, the hydrological and vegetation characteristics of the site are such that it is difficult to assign a specific baseline land type to the CEA, and could be reasonably assigned to multiple different land types. An example case is a situation where drainage of fallow sugar cane land has not been maintained, the land has become water logged and freshwater vegetation, both native vegetation and water tolerant weeds have become established. Arguably a baseline land type of 'sugar cane land' is no longer applicable since the land is wet and transitioning away from its former use. In this case a baseline land type of 'tidally restricted freshwater wetland' might be more appropriate, which provides for a higher volume of sequestered carbon in BlueCAM. It is also unclear which land uses/land types might qualify as 'Flooded agricultural land' which provides for the highest volume of sequestered carbon in BlueCAM. Some guidance from the BlueCAM authors would be useful in this regard.

Lesson Learned: *BlueCAM modelled abatement is overly conservative.*

Initial comparisons of BlueCAM to terrestrial carbon project sequestration volumes (e.g. FullCAM) indicates that similar carbon abatement estimates are achieved in both BlueCAM and FullCam for a similar project area. BlueCAM estimates for example projects that might be anticipated to have higher carbon sequestration volumes compared to a terrestrial carbon project of an equivalent area (e.g. environmental plantings vs a Blue Carbon wetland of flooded agricultural land transitioning to mangroves) have similar carbon abatement volumes.

This is inconsistent with data for international projects where carbon sequestration concentrations have been measured at much higher rates than terrestrial carbon projects. A review of BlueCAM sequestration rates is recommended.

5.6 INFRASTRUCTURE

Lesson Learned: *Projects need to be designed with landholder input. Landholder expectations can influence infrastructure costs.*

As noted above, levee banks and bund walls can provide vehicle access across farm areas that would otherwise be waterlogged from time-to-time and difficult to traverse. In the assessed blue carbon project, farm access along the existing levee banks is an important factor for the landholder. If access was not an issue, the existing levee bank infrastructure could be completely decommissioned to allow tidal inundation at a small cost to the project. Providing infrastructure upgrades that allow tidal inundation, but maintain farm access, are a considerable cost for the proposed project. The landholders are particularly conscious of their need to maintain access to discharge their various legal obligations, conduct future monitoring and to remain good custodians of the land. The significant infrastructure costs to allow this to happen have affected project financials.

6.
Planning & Legal

6.1 LAND TENURE

Lesson Learned: *Reinstating tidal flows for a blue carbon restoration project does not alter land tenure or ownership.*

External legal advice was sought from a leading expert in a top tier law firm as to whether reinstating tidal flows to the site for the purposes of a blue carbon project could alter its tenure and beneficial ownership. The advice provided was detailed and indicated that reinstating the tide would in no circumstances alter either the tenure or ownership of the site in question. It was further noted that this this would also (very likely) be the case for all other blue carbon restoration projects in QLD.

It is worth noting that the advice was sought due to the perception that all land in the tidal zone is the property of the state. The advice made it clear that this assumption did not hold in a number of circumstances, notably where property in the tidal zone had been granted by the Crown to a third party and registered as private freehold land. While tidal boundaries could be ambulatory (as opposed to right line boundaries, which do not change), the encroachment of state waters onto private property could only alter its tenure and ownership in favour of the state where this occurred gradually and imperceptibly (as per the doctrine of accretion and erosion). This is manifestly not the case with a blue carbon restoration project, where tidal reintroduction is relatively fast and most certainly perceptible.

6.2 PLANNING AND ENVIRONMENT LAWS

6.2.1 ONLINE TOOLS

Lesson Learned: *There are a range of useful online tools that landholders and their partners can use to undertake a first-pass assessment of relevant laws. However, certain information will still need to be verified/ground-truthed.*

A first pass legal assessment of the site was undertaken using four online tools: Titles QLD’s Online Title and Images Searches (OTIS); QLD Globe; the QLD Government’s Development Assessment Mapping System (DAMS); and the Commonwealth Government’s Protected Matters Search Tool (PMST).

DAMS contains a number of useful layers that can help to identify QLD environmental laws that could apply to a blue carbon project on a given site. This includes native vegetation categories, the presence of essential habitat and the location of coastal management districts. However, it is important to note that the information provided can be general (and even inaccurate) and to that extent on-site surveying may be required to verify data/the specific location of a particular species, community or population.

This is also true of PMST, which generates lists matters that are protected under the Environment Planning and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) and which may be found in the local area. Indeed, some of the species that were listed for the relevant lots and dps clearly did not exist on the site (e.g. four different species of whale).

In summary, whilst these tools are very useful when undertaking a first-pass assessment of potentially applicable environmental laws, it will generally be necessary to supplement this analysis with on-site surveying undertaken by suitably qualified experts (e.g. ecological surveying).

6.2.2 NO NATURE-RESTORATION SPECIFIC LAWS IN QLD

Lesson Learned: *There are no restoration-specific laws in QLD.*

There are currently no restoration-specific laws in QLD, which renders the overall process of identifying and applying relevant environment and planning laws somewhat complex. Agencies and local councils may be uncertain as to which of the suite of potentially applicable laws apply. This reinforces the need for expert guidance from suitably qualified and experienced individuals, as well as early pre-lodgement dialogue with, and advice from, the State Assessment and Referral Agency (SARA).

6.2.3 PLANNING LAWS

Lesson Learned: *Navigating QLD planning and environment plans is a complex exercise and requires expert advice and guidance.*

At the time of writing, work was still being done to determine the appropriate planning and environment approvals pathway for the site and proposed project. This part of the report will therefore provide an overview of the planning framework potentially applicable to a blue carbon restoration project.

The place to start with any proposed blue carbon project in QLD is the Planning Act 2016 (Planning Act). Broadly speaking, the Planning Act provides for three categories of development: prohibited, accepted or assessable.[2]

Accepted development does not require development approval and is not subject to assessment benchmarks. Rather, it must comply with acceptable outcomes known as acceptable development requirements (ADRs). There are a number of different ADRs which could apply to blue carbon restoration projects. These are set out in Table 6.1, below.

Assessable development is development that does not satisfy ADRs. It is divided into two categories: code-based assessment and impact assessment.[3] To determine if a particular development is classified as code-based or impact assessment, it is necessary to look at the Planning Regulation[4] and the relevant local planning scheme. If parts of a blue carbon restoration do not clearly fit into any category of development covered by an ADR or code,[5] those parts could be subject to impact assessment.

2 Planning Act, ss.43, 44.
3 Planning Act, s. 45. Impact assessment is assessed against benchmarks in relevant codes, as well as other criteria. See Planning act s.45(5); Planning Regulation, Part 4, Division 4, Subdivision 2.
4 Planning Regulation, Schedule 10.
5 See for example Mackay Region Planning Scheme, Table 5.5.17. Specifically, the following are impact assessable in the rural zone: 'Any other use not listed in this table. Any use listed in this table and not meeting the criteria in the "Categories of development and assessment" Any other undefined use.'

The codes themselves include benchmarks against which eligible development is assessed. At a state level, the codes that could apply to a blue carbon restoration project are known as State Development Assessment Provisions (SDAPs). Relevant SDAPs are set out in Table 6.1. There may be other codes that apply, including code-based overlays in a local planning scheme.

It is worth noting that during an initial meeting with the State Assessment and Referral Agency (SARA), there was some discussion as to whether the site and project could be subject to a Ministerial Infrastructure Designation (MID) under the Planning Act [6] (as water cycle management infrastructure).[7] However, it was subsequently communicated that the MID process would not be applicable as the project could not be classified as water cycle management infrastructure.

6.2.4 OVERVIEW OF LEGAL FRAMEWORK

Lessons Learned: *There are a number of ADRs, SDAPs and planning scheme codes that are potentially relevant to blue carbon projects in QLD. However, the precise mix of applicable laws depends on the location of the site, its tenure and the nature of proposed works. Some projects will be relatively straightforward, whilst others will be more complex.*

6 Planning Act, Chapter 2, Part 5.
7 Planning Regulation, Schedule 5.

TABLE 6.1: QLD LEGAL FRAMEWORK APPLICABLE TO BLUE CARBON RESTORATION PROJECTS

LEGISLATION	ASSOCIATED DELEGATED LEGISLATION & PLANNING INSTRUMENTS	PURPOSE (RELEVANT TO BLUE CARBON PROJECTS)
Planning Act 2016	Planning Regulation 2017 State Planning Policy Regional Plans Local Planning Schemes and associated local accepted development requirements (ADRs) [8] and code-based overlays [9] State-based ADRs State Development Assessment Provisions (SDAPs) [10]	Regulation of planning and development. This includes environmental assessment, development applications and development approvals. Note: The Planning Regulation sets out the circumstances in which ADRs or SDAPs apply, and the assessment manager. It interacts with the legislation set out below.
Local planning scheme	Planning overlays and associated codes. Relevant overlays include acid sulfate soil, biodiversity and agriculture. Also sets out the level of assessment that applies to different forms of development in different zones. Note: Blue carbon restoration projects will often be undertaken in the rural zone. Permanent plantations (which are defined to cover blue carbon restoration work) are generally classified as 'accepted development' in this zone.	Zoning, planning controls.
Fisheries Act 1994	Fisheries (General) Regulation 2019 **ADRs:** ADR for operational work that is constructing or raising waterway barrier works.[11] ADR for operational work that is the removal, destruction or damage of marine plants.[12] ADR for operational work that is completely or partly within a declared Fish Habitat Area.[13] **SDAPs:** State code 18: Constructing or raising waterway barrier works in fish habitat.[14]	Regulating impacts on fish, fish habitat and marine plants.
Water Act 2000	Water Regulation 2016 **ADRs:** ADR for the construction of new levees or the modification of existing levees.[15] **SDAPs:** State code 19: Category 3 levees.[16]	Development of levee banks.

8 Concerning, for example, permanent plantations (which would include blue carbon restoration projects). This is discussed in more detail, below.
9 Concerning, for example, acid sulfate soils and certain types of development. This is discussed in more detail, below.
10 A list of all SDAPs can be found here. Accessed 1 December 2023.
11 Queensland Government, (2024). Waterway barrier works accepted development requirements. Accessed 1 December 2023.
12 Queensland Government, (2024). Marine plant disturbance accepted development requirements. Accessed 1 December 2023.
13 Queensland Government, (2020). Accepted development requirements for operational work that is completely or partly within a declared Fish Habitat Area. Accessed 1 December 2023.
14 State code 18: Constructing or raising waterway barrier works in fish habitats. Accessed 1 December 2023.
15 Queensland Government, (2022). Accepted development requirements for the construction of new levees or the modification of existing levees. Accessed 1 December 2023. Note: This ADR is unlikely to apply to blue carbon projects due to the definition of 'levee', which is provided for in the Water Act.
16 State code 19: Category 3 levees. Accessed 1 December 2023. Note: This code is unlikely to apply to blue carbon projects due to the definition of 'levee', which is provided for in the Water Act.

Nature Conservation Act 1992	Nature Conservation (Animals) Regulation 2020 Nature Conservation (Plants) Regulation 2020 **ADRs:** Nil **SDAPs:** State code 9: Wetland Great Barrier Reef [17]	Impacts on listed species, communities, populations and critical habitat.
Aboriginal Cultural Heritage Act 2003 Torres Strait Islander Cultural Heritage Act 2003.		Regulating impacts on Aboriginal and Torres Strait Islander cultural heritage.
Vegetation Management Act 1999	Vegetation Management Regulation 2023 **ADRs:** Various codes.[18] Exempt clearing code.[19] **SDAPs:** State code 16: native vegetation clearing.[20]	Clearing of native vegetation. Defining 'essential habitat'.[21]
Coastal Protection and Management Act 1995	Coastal Protection and Management Regulation 2017 **ADRs:** ADR for tidal works, or works completely or partly in a tidal management district.[22] **SDAPs:** State code 8: Coastal development and tidal works.[23] Code for prescribed tidal works.[24]	Defines the coastal zone, coastal management districts and erosion prone areas.
Environmental Offsets Act 2014	Environmental Offsets Regulation 2014. Significant Residual Impact Guideline.[25]	Requires environmental offsets to be required for 'prescribed activities' (set out in Schedule 1 of the Regulation) or 'prescribed environmental matters' (set out in Schedule 2 of the Regulation).
Land Act 1994	Land Regulation 2020.	Regulation of State (Crown) land. Registration of carbon abatement interest.
Land Title Act 1994	Land Title Regulation 2022.	Regulation of freehold land. Registration of carbon abatement interest.

17 State code 9: Great Barrier Reef wetland protection areas. Accessed 1 December 2023.
18 Queensland Government, (2023). Clearing codes. Accessed 1 December 2023.
19 Queensland Government, (2019). List of exempt clearing work. Accessed 1 December 2023.
20 State code 16: Native vegetation clearing. Accessed 1 December 2023.
21 VM Act, s.20AC.
22 Queensland Government, (2017). Code for accepted development. Accessed 1 December 2023.
23 State code 8: Coastal development and tidal works. Accessed 1 December 2023.
24 Coastal Protection and Management Regulation, s.15 and Schedule 3.
25 Queensland Government, (2014). Significant Residual Impact Guideline. Accessed 1 December 2023.
26 Cl. 19(d) of the Blue Carbon Method requires tidal structures to have been lawfully constructed.

6.3 LEGALITY OF TIDAL BARRIER

Lesson Learned: *Ascertaining the legal status of a tidal barrier built decades in the past can be a complex and time consuming exercise. However, a number of pathways do exist and should be properly explored. Our experience further demonstrates that it is vital to seek expert advice from the correct experts within government.*

The relevant tidal structure is located entirely on the subject property. Satellite imagery indicated that it was constructed somewhere between the mid 1970s and mid 1980s. However, a precise date could not be established due to the limited nature of available imagery. Further, a first pass assessment could not immediately clarify the legal status of the structure.[26]

Advice was subsequently sought from the appropriate team within the Department of Environment and Science (DES). Based on their analysis, the structure would not have been located within the tidal zone at the time of construction. Nor would it have been located within ‘navigable waters’. As such, it was their view that an approval was not required under the Harbours Act 1955. Based on this analysis, it is arguable that the structure is lawful.

It is important to note that undertaking this analysis requires specific coastal mapping layers that are not generally available. As such, it is important to seek advice from the relevant team within DES.

More generally, ascertaining the legal status of a barrier installed decades ago (which is often the case) can be a complex and time-consuming exercise. This is because record keeping for historic structures and any relevant approvals is often poor; land may have changed hands since the structure was installed; the law can and does change, and as such it may be difficult to determine which specific law was applicable at the time of installation; there may be no way of knowing when it was constructed due to the paucity of relevant satellite imagery; and some structures that are today located in the tidal zone may not have been decades ago.

As a side note, rectification pathways are generally available for structures of uncertain legal status. Where this is the case, legal advice should be sought and the relevant assessment manager (often the local council) contacted to discuss the applicable process.

26 Cl. 19(d) of the Blue Carbon Method requires tidal structures to have been lawfully constructed.

7. Financial

Numerous individual financial parameters can affect the financial viability of a project. While some of these parameters are likely to be consistent across all projects, others will vary in response to the particular characteristics of a particular project. Key learnings to date on project financials are presented below.

7.1 INCOME EXPECTATIONS

Lesson Learned: *The future earning potential from a blue carbon project needs to be greater than the projected business-as-usual scenario on the project site. It also has to have a suitable risk profile to make it commercially attractive for the landholder.*

To be competitive with typical, existing farming returns, a blue carbon project would need to provide returns in the following ranges:

- The average annual rate of return for all farms in QLD from 2000 to 2023 was 1.24% with a range of -1.5% to 3.7%.
- Annual returns (ex-capital appreciation) for cattle producers in QLD, NT and WA between 2011 and 2021 have ranged from -2.2% to 5.4%.
- Recent annual returns for the sugar industry have ranged from -2.5% to 2.5%.

While it is challenging for a blue carbon project to meet the landholders' income expectations for the assessed site (as set out in Section 4.5), it is our view that blue carbon projects are most financially compelling when coastal farming properties have a land value per hectare below the area median and have a low agricultural yield. Based on the information from the landholder, the assessed property is neither, but it is likely to still outperform the listed business-as-usual returns.

Based on this, a critical first-pass selection criteria for future projects would be a review of the recent returns for the site and benchmarking of these against these against broader industry returns.

Lesson Learned: *The bank is an interest holder if the landholder has a mortgage over the property.*

A bank with a mortgage over the property will also want to know whether the future earning potential of a blue carbon project will be equal to or greater than business-as-usual on the project site. Like landholders, banks with a mortgage[27] interest must also understand the project risks. Different banks have varying and evolving policies on carbon projects, and the banking industry needs to be upskilled about the risks and benefits of blue carbon projects.

27 Unesco (2022), 'Urchinomics secures world first kelp restoration blue carbon credits'. See for example.

7.2 CARBON PRICE

Lesson Learned: *The achievable blue carbon ACCU price is a key consideration when determining the financial viability of a blue carbon project.*

Blue Carbon projects are in their infancy in Australia, and while registration of the first projects that will generate blue carbon ACCUs is imminent, there are no Blue Carbon ACCU sale transactions to use as a pricing benchmark. There are market precedents for ACCUs with verified co-benefits selling at a premium. Likewise, there are international examples of certain types of carbon credits trading for far above average (including certain blue carbon sales). While these are a useful reference, until a Blue Carbon ACCU is sold, the revenue-generating potential of a Blue Carbon project remains unverified.

The carbon price required to meet the landholder income expectations for the assessed blue carbon project is significantly higher than other ACCUs with verifiable co-benefits sold on the market, such as savannah burning+ and environmental planting ACCUs. Restore Blue is currently in discussions with potential customers to ascertain the market appetite for securing blue carbon ACCUs at a price that will support the project.

Restore Blue's base case blue carbon ACCU price curve aligns with sales precedents for ACCUs with verified co-benefits.

7.3 PROJECT PERMANENCE PERIOD

Lesson Learned: *There are implications for the landholder to consider when choosing the project permanence period.*

The Blue Carbon Method provides a 25-year crediting period for the project. This means that the revenue generated through the production and sale of ACCUs is more or less limited to 25 years. The permanence period options for the Blue Carbon Method are 25-years or 100-years. If a 100-year permanence period is adopted, a 5% discount is applied to the entire volume of carbon sequestered and stored by the project over the 25-year crediting period (and associated ACCUs). If a 25-year permanence period is adopted, a 20% discount is applied to the sequestered carbon component.

As such, and based on ACCU volume, the revenue-generating potential of the project through ACCU sales is maximised by adopting a 100-year permanence period. The adoption of a 100-year permanence period might also make the ACCUs more appealing to potential customers and as such, could potentially attract a higher price premium. For the proposed project, the discount for a 25-year permanence period results in an estimated -7.5% reduction in the volume of ACCUs compared to adopting a 100-year permanence period.

Since the assessed blue carbon project is wholly contained on the consolidated landholding and will not impact neighbouring land, expenses for the additional 75 years are likely limited to costs associated with maintaining the fire management plan, the mosquito management plan and feral animal management. Nevertheless, these costs would continue after the project ceases to produce revenue from ACCUs, which may affect the re-sale value of the land. These assumptions should be included in financial modelling.

While adopting a 25-year permanence period limits the exposure of the landholder to ongoing management costs and land valuation impacts as described for the 100-year permanence period, the reality is that re-establishing a blue carbon wetland over a 25-year period would not be easily reversible. Further, State and potentially Commonwealth environmental laws will likely make it difficult to legally reverse an intact tidal wetland. In practical terms, a commitment to a blue carbon project of either permanence duration is more or less permanently committing the area to a coastal wetland.

Ultimately, it is for the landholder to determine which permanence period to select for the purposes of a project. Any associated project partner should provide clear information to the landholder regarding the implications of each option. In the case of the assessed property, a 100-year permanence period has been used in the analysis to derive the IRR.

7.4 LAND VALUE

Lesson Learned: *Policy settings need to evolve to capture the value of a blue carbon wetland – both on and off-farm.*

Recent discussions with landholders and potential funding partners have raised the issue of the terminal value (TV) of the land at the end of the 25-year crediting period. All parties have acknowledged that the habitat created by a blue carbon project is important and generates quantifiable off-farm benefits (including benefits that can, in certain instances, be valued in dollar terms). However, in the absence of a nature or ecosystem services market that would allow for the site to generate revenue beyond 25 years, or policy settings that clearly recognise and quantify the overall value of a restored wetland, the commonly held view is that the land would have no book value at the end of the project. This is a concern for existing landholders who might see the capital value of their property erode, as well as for potential land asset managers whose base assumption that the capital value of land will increase.

To meaningfully compare the TV of a site with a blue carbon project and its TV under the business-as-usual scenario, it is necessary to consider the impact of climate change (including sea level rise). Generally speaking, a blue carbon wetland is relatively resilient to the impacts of climate change, while certain forms of agriculture may be less so. In either case, this issue needs to be assessed on a site-by-site basis, ensuring that the TV of a property is appropriately discounted over the life of the project.

In the case of the assessed property, the financial modelling completed for the project assessment has assumed zero value for the land's TV, which is the most conservative case.

A successfully restored wetland site will provide ongoing co-benefits beyond the 25-year crediting period of a Blue Carbon project, including significant ecosystem services both on and off site. It's possible that the value of these services may at some point in the future be recognised by (for example) other nature crediting schemes and methods, which could potentially allow the landholders to tap into additional revenue streams. However, this potential opportunity has not been assessed as part of the study.

Lesson Learned: *The implications of the blue carbon project for the value of the project area and the overall property will be an important consideration for the landholders*

Historically, Australian rural land values have increased consistently and remain an important component of the value proposition of owning and farming land, beyond annual return on investment. Whilst there are a range factors that will influence future land value, it is clear that material implications of the blue carbon project for the value of the land will be strongly considered by the landholders against the return on investment and risk profile for the project. The possibility that the terminal land value of the land at the end of the 25 year crediting period could effectively be zero with no clear revenue pathways thereafter is not an attractive concept for the landholders to consider given the high current value of the land.

7.5 AREA VS RETURNS

Lesson Learned: *Project profitability improves with increasing project area.*

Blue carbon projects have both fixed and variable costs (with the latter depending on individual project characteristics). As some costs are fixed, cost-to-income ratios will improve with as project area increases in size (assuming carbon sequestration rates are relatively constant by area).

As individual project characteristics can vary quite significantly, it is difficult to offer guidance on a minimum viable project area. The current project is not a particularly good prototype as the assessed project has carbon sequestration yield rates at the lower end of the potential scale, and the landholders' income expectations are relatively high.

7.6 GRANTS

Lesson Learned: *Government and philanthropic grants can support the financial viability of, and de-risk, a project. They can play a crucial role as they offset upfront costs associated with project feasibility assessments, project design, project approvals, project registration and infrastructure costs.*

Blue Carbon projects require an upfront investment to deliver a 'shovel ready' project that can be activated by the reintroduction of tidal flows. Grant funding removes the requirement to source funding from other parties seeking a return. This in turn means that a greater quantum of the profits associated with the project stay with the landholder.

The financial modelling for the assessed project accounted for GBRF funding of the project feasibility assessment (completed). It also took into account the possibility of obtaining a grant under the current DCCEEW funding round or via some other means.

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