



Risk Assessment for Wet Tropics Biocarbon Sequestration Project

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1 Risk Assessment

Assessment of the risks associated with the project is a critical part of understanding the inherent weaknesses and potential for the project to fail or not perform in accordance with expectations. Accordingly, we have undertaken a risk assessment in accordance with international standard *Risk Management* AS/NZS 4360:2004 guidelines, and subsequently according to the Voluntary Carbon Standard (2008) *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination*. We have chosen to undertake both risk assessments because the AS 4360 approach provides a robust means to assess risks of projects. It is complementary to the VCS Tool, and allows the buffer of the carbon pool to be determined.

2 AS 4360 Risk Assessment

Under the AS/NZS 4360 Standard, the main elements of risk assessment are:

(a) Communicate and consult

Communicate and consult with internal and external stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.

(b) Establish the context

Establish the external, internal and risk management context in which the rest of the process will take place. Criteria against which risk will be evaluated should be established and the structure of the analysis defined.

(c) Identify risks

Identify where, when, why and how events could prevent, degrade, delay or enhance the achievement of the objectives.

(d) Analyse risks

Identify and evaluate existing controls. Determine consequences and likelihood and hence the level of risk. This analysis should consider the range of potential consequences and how these could occur.

(e) Evaluate risks

Compare estimated levels of risk against the pre-established criteria and consider the balance between potential benefits and adverse outcomes. This enables decisions to be made about the extent and nature of treatments required and about priorities.

(f) Treat risks

Develop and implement specific cost-effective strategies and action plans for increasing potential benefits and reducing potential costs.

(g) Monitor and review

It is necessary to monitor the effectiveness of all steps of the risk management process. This is important for continuous improvement. Risks and the effectiveness of treatment measures need to be monitored to ensure changing circumstances do not alter priorities.

2.1 Project Context & Risk approach

Consultation and communication with stakeholders have been an integral part of the process of developing the Project. During this process, a number of risks have been identified by both the providers and by the Project team. A workshop was held to document and assess the risks, and the results are tabulated in Table 4. Before moving to the assessment, however, the context of the project needs to be established.

The Project is a multi-dimensional one which incorporates a wide range of land management practices and activities across a large region incorporating many small to medium landholders and their

activities which have resulted in carbon sequestration and emissions mitigation. While this presents some management difficulties for the Project, the risks to the Project as a whole are reduced by the nature of the many small non-critical components and the geographic spread of the activities which make up the Project. In other words, if one or two, or even a percentage, of the component parts of the inventory fail or are less efficient than expected, it is *highly unlikely* that the whole Project will fail. By having a diversity of small holdings spread over a large region, there is inbuilt stability.

The Project is dependent on sound financial backing to establish it. The Project has been supported by Terrain and BIOCARBON Pty Ltd with investment from other regional groups within the Regional Groups Collective, who have a vested interest in trialling this Project as a pilot, initially for those regions comprising the catchment of the Great Barrier Reef, and for the State as a whole. Included in the risk assessment is the potential revenue from the sale of the inventory in the carbon trading markets.

The Project is also dependent to some degree on the Australian National Greenhouse Gas Inventory (NGGI) and the proposed Carbon Pollution Reduction Scheme (CPRS), which is still at the consultation stage. The CPRS has potential to change the outcome of the Project in terms of which carbon markets would potentially be available. The Project design and methodologies would remain the same, however, since markets rely on IPCC or equivalent approaches.

The risk consequences and likelihoods are given a qualitative ranking accordance to experience, observation and expert knowledge. These are summarised in Tables 1 and 2, and the ranking process summarised in Table 3.

Table 1 Threat criteria and consequence (adapted from AS4360)

Level	Descriptor	Project operation	Environment & stakeholders	Financial
5	Catastrophic	Project fails	Providers and clients lose inventory; massive loss of inventory	Huge financial loss to project
4	Major	Project operation may be suspended for 3 months or more; loss of provision capability	Significant detrimental impacts on stakeholder; significant loss of sinks	Major financial loss to remedy
3	Moderate	Project jeopardised; recovery procedures implemented	Detrimental impacts on stakeholders; reduction of sinks	High financial loss to remedy
2	Minor	Project continues; operational procedures reviewed	Minor impacts on stakeholders and inventory	Medium financial loss to remedy
1	Insignificant	Project continues as normal; diligence maintained	Negligible impacts on stakeholders & inventory	Low financial loss to remedy

Table 2 Qualitative measures of likelihood

Rating	Likelihood	
5	Almost certain	Is expected to occur at least several times per year
4	Likely	High, may arise about once per year
3	Possible	May arise at least once in a one to ten year period
2	Unlikely	Likely to occur at some time during next ten to twenty-five years
1	Rare	Very low, may occur in exceptional circumstances, very unlikely in life of project

From the measures of consequence and likelihood, risk levels for each identified risk can be rated by multiplying the consequence ranking by the likelihood ranking.

Table 3 Risk levels and management action

Risk Level	Descriptor	Indicative management action
16-25	Extreme	Top priority action, contingency plans implemented, buffer utilized
9-16	High	Urgent planning & action, specific management actions required, external advice may be sought, part buffer used to recover inventory
4-8	Moderate	Review planning & management, assess revised practices or monitoring, minor use of inventory
1-3	Low	Good planning & management, accepted standards

2.2 Assessed Risks and Ranking

Risk assessment is an iterative process, and as the project develops into the future, adjustments to the risk assessment are likely to be required. Risks are often considered in terms of ‘events’ which can be managed or planned for. Most events and risks do not remain static over time. A risk register is usually established which documents the risks. Table 4 forms the first stage of the risk register. Additional risks which become recognised over the life of the Project will be added, and assessments made of the risks.

Residual Risk is the risk remaining after risk treatment. This is calculated in the same way as primary risks.

Table 4 – Ranked risk register for the Wet Tropics Biocarbon Sequestration Project

Risk	Description of likelihood	Description of Consequence on Project	Primary Likelihood Rating	Primary Consequence Rating	Primary Risk ranking	Treatment, Mitigation, Management	Residual Risk Level
HIGH							MODERATE
Cyclone damage	At least 1 cyclone expected per year in Wet Tropics (BoM data 2009), ranging from Cat 1 to Cat 5; Cat 1 is unlikely to cause much damage, except flooding in some areas; Cat 3 cyclone could cause moderate to severe damage, return interval for Cat 3 is 15 years ¹ . Cats 4-5 could severely damage whole forests and a number of plantings and aggregated pools, taking years to recover, but from recent experience and data, over less than 10% of the area, and only once in 50 years. Primary likelihood rating is therefore 4.	Damage can range from minor to severe, depending on strength of cyclone, stage of growth, landscape position, vulnerability of site; could remove part of inventory for years. Primary consequence rating is therefore between 2 & 3, with moderate damage and jeopardy to the project, but with only moderate financial cost to remedy.	4	3	12	Risk is spread over the whole region of small aggregated holdings. Buffering of the aggregated pool is required to provide insurance against partial loss of inventory. Buffering would need to be 10% at most, as only part of the potential damage at the extreme end of the cyclonic damage spectrum would be severely damaged.	Residual Likelihood: 4 Residual Consequence: 2 RESIDUAL RISK = 8
Flooding	Heavy rain which causes flooding common in region; plantings usually take flooding into account so that appropriate species are chosen; older forests are not likely to be damaged by flooding	Can affect large areas of region, resulting in proportion of pool being damaged or destroyed; for some areas, consequences could be moderate	4	3	12	Planning of plantings, management plans, monitoring to assess effects of flooding; buffer to allow for proportion of pool lost	Residual Likelihood: 4 Residual Consequence: 2 RESIDUAL RISK = 8
Low Project revenue from sales of units	Moderate likelihood of low price being paid for units, negatively affecting landholders from taking up contracts.	Inadequate revenue to be able to operate Project and undertake activities; inadequate return on investment for landholders resulting in lower than expected inventory	3	3	9	Degree Celsius will expand and contract according to revenue obtained. With the large pool, a substantial proportion of potential providers is likely to 'opt in' to the Project, which should be adequate for success. Proportion of total revenue (60% to landholders, 30% to Degree Celsius, 10% for Insurance) will enable Project to succeed.	Residual Likelihood: 3 Residual Consequence: 2 RESIDUAL RISK = 6
MODERATE							
System failure	Unlikely that the whole system would be destroyed due to redundancy and backups in place	Would be serious but not catastrophic = moderate	2	3	6	System backups and fail-safes, redundancies, duplication, off-site backup; Security system; QC/QA plan and measures; monitoring and maintenance; periodic checks; knowledge & data dissemination	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4
Legislative policy and legislation changes	Likely that the policy and legislation relating to many aspects of project will change as carbon trading is an evolving field	Minor consequence to Project as Degree Celsius Project complies as much as possible with existing policy and legislation and will lock in Project and associated contracts under approved regimes	3	2	6	Contracts and agreements will be established progressively and ensure retrospectivity; Lobbying and education to ensure changes are not detrimental; Corporate support in terms of sales of credits will stabilise project	Residual Likelihood: 3 Residual Consequence: 2 RESIDUAL RISK = 6
Contractual breach	Low likelihood due to penalties and loss of income from sales of credits	Could damage a small proportion of aggregated total	2	2	4	Contracts will include penalty for breach; monitoring & consultation	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4
Inadequate maintenance and management of inventory	Some inattention is assumed, depending on the landholder	Poorly maintained or managed plantations, soils, regrowth etc resulting in lower than expected performance; limited to a proportion of aggregated pool; Consequence is considered minor, as result would be lower increment rather than loss of inventory; complete failure of some plantings or other sequestration a small possibility	3	2	6	Monitoring, contract conditions, management planning and extension service will reduce likelihood and consequence	Residual Likelihood: 3 Residual Consequence: 2 RESIDUAL RISK = 6
Poor monitoring	Unlikely as Degree Celsius has interest in monitoring to maintain inventory quality for revenue	Moderate consequence if monitoring poor, as it would affect the inventory only marginally, by not contributing to best outcomes	2	3	6	Degree Celsius Project Development Plan and QA/QC plan in place; regular audits and due diligence checks, including by external clients	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4
External developments	Low likelihood of developments affecting individual project pools	Potential to damage plantings and other carbon pools; but only small proportion would be affected	2	2	4	Buffer of percentage to account for loss; contractual requirement	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4
Fire	Unlikely in rainforest plantings, but may increase in frequency in forestry plantings and sclerophyll plantings.	Could damage plantings, reducing the inventory by a small proportion; Consequence varies according to age and species – young plantings could be killed, whereas older ones damaged and set back in growth	2	2	4	Risk is spread over region amongst many small holdings; management plans for maintenance to reduce risk of fire where considered a threat; monitoring will reduce risks	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4

Risk	Description of likelihood	Description of Consequence on Project	Primary Likelihood Rating	Primary Consequence Rating	Primary Risk ranking	Treatment, Mitigation, Management	Residual Risk Level
Clearing	Low likelihood of unintentional or illegal clearing as all holdings are on freehold or leasehold land which is protected by law and owners wish to maintain the forests	Could affect individuals plantings or forest patches, reducing the inventory; consequence would be only minor as only a small proportion, if any, would be cleared	2	2	4	Monitoring, pool buffer, contractual requirement to retain; risk spread.	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4
Detrimental research findings	Unlikely as the Project has relied on peer-reviewed literature and international standards and guidelines and has estimated conservatively; chances of significant negative changes are low	Minor consequence which would affect the aggregate only marginally	2	2	4	Project relies on state of science data & literature; project is also contributing to research	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4
Pathogens & disease, including insects	Moderate likelihood of pathogens and disease affecting more than small proportion of plantings	Could damage plantings, reducing the inventory by a small proportion; consequence likely to be minor	3	2	6	Monitoring, pool buffer, risk spread	Residual Likelihood: 2 Residual Consequence: 2 RESIDUAL RISK = 4

Note 1: S Turton (2008) Impacts of Cyclone Larry on Rainforests. *Austral Ecology* 33, 409-416

The results of the risk assessment, shown in Table 4, demonstrate that there are no extreme risk categories for the project. Four risks may present a high level of risk: cyclones, flooding, contractual breach and potential revenue from sales of carbon units; the other risks present a moderate to low risk of detrimentally affecting the project.

Many of the risks can be managed in the planning, implementation and monitoring stages of the Project. These are summarised in Table 4, and each will be implemented at the appropriate stages of the Project's development. Many have already been implemented. Those risks which cannot be managed, such as the likelihood of cyclones or flooding, have been mitigated by providing buffers in the total aggregated pool of the Project, which is detailed below.

3 VCS Risk Analysis and Buffer Determination

In accordance with VCS (2008) *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination*, risks to the Project need to be determined from analysis of the risks of the Project failing or partially failing. The process is a step-wise one, which contains the following steps and processes. The Wet Tropics Project aggregated pools include three of the four types of project: Afforestation, Reforestation and Revegetation (ARR), Improved Forest Management (IFM) and Reduced Emissions from Avoided Deforestation and land Degradation (REDD). Agricultural Land Management (ALM) (grazing and cropping) has not yet been modelled sufficiently for the region for them to be incorporated at this stage, and are not analysed below.

3.1.1 Methods

Generic risk factors must be assessed for all project types. The generic risk factors are tabulated in Table 5. Tables 5 to 9 are taken from VCS (2008).

Table 5 - Risk factors applicable to all project types

Project risk
Risk of unclear land tenure and potential for disputes
Risk of financial failure
Risk of technical failure
Risk of management failure
Economic risk
Risk of rising land opportunity costs that cause reversal of sequestration and/or protection
Regulatory and social risk
Risk of political instability
Risk of social instability
Natural disturbance risk
Risk of devastating fire
Risk of pest and disease attacks
Risk of extreme weather events (e.g. floods, drought, winds)
Geological risk (e.g. volcanoes, earthquakes, landslides)

The next steps in the process of risk analysis for project types are as follows. For each type, a set of risk factors has been determined. Risk factors applicable to ARR projects are shown in Table 6. These risk factors are then analysed to determine the buffer required for the Project, as shown in Table 7.

Table 6 - Risk factors applicable to ARR projects

Risk factor	Risk Rating
Project longevity/ Commitment period	
Long-term commitment (i.e., many decades or unlimited) with no harvesting	Low
Long-term commitment with no harvesting in politically unstable countries	Medium
Long-term commitment with harvesting	Medium
Medium-term commitment with harvesting	High
Medium-term commitment (i.e., a few decades) with no harvesting	High
Short-term commitment with or without harvesting	Fail
Ownership type and user rights	
Established NGO or conservation agency owner; or owner-operated private land	Low
Rented or tenant-operated land	Medium
Clear land tenure but disputed land use rights	High
Uncertain tenure but with established user rights	High
Uncertain land tenure and no established user rights	Fail
Technical capability	
Proven technologies and ready access to relevant expertise	Low
Technologies proven to be effective in other regions under similar soil and climate conditions, but lacking local experimental results and having limited access to relevant expertise	Medium
Financial capacity	
Financial backing from established financial institutions, NGOs and/or governments	Low
Long-term project funding not secured	Medium
Management capacity of project developer	
Substantial previous project experience (. 5 projects) with on-site management team	Low
Limited project experience (<5 projects) with on-site management team	Medium
Limited project experience (<5 projects) without on-site management team	High
Future income	
Appropriate management plan, and financial analysis demonstrates that likely income stream(s) will finance future management activities (e.g., carbon finance to be used for project management, tending operations, etc.)	Low
Future costs and revenue stream(s) not documented	High
Future/current opportunity costs	
Alternative land uses are unlikely to become attractive in the future	Low
Project is competing with other land uses likely to become more attractive in the future	High
Endorsement of project or land-use activity by local population and local/ national political establishment	
Endorsement given and not likely to change in the future	Low
Endorsement given but may be subject to change in the future	Medium
No endorsement given	High

Table 7 - Default buffer withholding percentages for ARR projects

ARR Risk Class	Buffer Range
High	40-60%
Medium	20-40%
Low	10-20%

Improved Forest Management (IFM) forms a substantial part of the Project. These forests are remnant forests for which a Notice of Forest Practice has been given to the Queensland Government, and which is allowable under the legislation. It is permitted to log these forests in accordance with a Code of Forest Practice which allows logs to be removed. We have used a conservative value of 25% of the standing biomass (which was used in the Ulu Masen PDD, under CCBA), but this could be higher at around 40%, according to the Garnaut report (2008).

Table 8 – Risk factors applicable to IFM projects

Risk factors	Conventional to Reduced Impact Logging (RIL)	Convert logged to protected forest (LtPF)	Extend rotation age (ERA)	Conversion of low-productive forests to high-productive forests (LtHP)
Devastating fire potential				
Low to medium fire return interval (> 50 years)	Very low	Low to Medium	Very low to Low	Low
High fire return interval (< 50 years)				
with fire prevention measures such as fuel removal, fire breaks, fire towers, fire fighting equipment	Low	Low to Medium	Low to Medium	Low to Medium
with NO significant fire prevention measures in place	High	High	High	High
High timber value				
Highly valuable species on site, with strong likelihood that the timber value increases over time and there is no forest certification	Low	Medium	Very low to Low (if extend rotation ≤5 yrs)	Medium
the project is certified by a recognized forest certification company	Very low	N/A	Very low for any extension period	Low
Illegal logging potential				
Presence of illegal logging in area (location and intensity in relation to the project area affects actual risk value with forest guards	Zero	Low	Very low	Low
without forest guards	Low with no change in harvest intensity* and medium with change in harvest intensity (as potentially more timber to harvest illegally)	High	Low	Medium

Risk factors	Conventional to Reduced Impact Logging (RIL)	Convert logged to protected forest (LtPF)	Extend rotation age (ERA)	Conversion of low-productive forests to high-productive forests (LtHP)
Unemployment potential				
Alternative livelihood opportunities for local workforce to mitigate risk of unemployment: Few	Very low to Low -because expect no change in labor needs	Medium to High	Low (extend rotation .5 yr or >5 yr), because expect no change in labor needs	Very low to Low - because expect no change in labor needs
Many	Very low	Low	Very low	Very low

As the Project's inventory does not include Extended Rotation Age (ERA) and Conversion of Low to High Productive (LtHP) Forests they are not dealt with again here.

Table 9 - Default buffer withholding percentages for IFM projects

IFM Risk Class	Conventional to RIL	Convert logged to protected forest
High	40-60%	40-60%
Medium	15-40%	15-40%
Low	10-15%	10-15%

In the case of IFM projects, the factor with the highest rank determines the project's overall risk rating and must be used to determine the required buffer.

REDD projects, which form a significant proportion of the Degree Celsius Wet tropics Project inventory, require risk assessment in accordance with the following ratings shown in Table 10.

Table 10- Risk factors and risk ratings applicable to REDD project

Risk factor	Risk rating for APD*	Risk rating for AFUDD and AUMDD*
Land ownership/land management type		
Land owned by private or public forest conservation organization with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land	Very low	Very low
Privately owned land	Low-medium	Low-medium
Uncertain land tenure	Not applicable	Medium-high
Land legally protected	Not applicable	Low-medium
Land not protected by laws or protected with weak enforcement	Medium	Medium-high
Technical capability of project developer/implementer		
Proven capacity to design and successfully implement activities that are likely to ensure the longevity of carbon benefits (e.g., creating sustainable livelihood alternatives and/or effectively managing protected areas)	Very low	Very low
No previous experience in the design and implementation of activities that may ensure the longevity of carbon benefits	Medium	Medium-high
Net revenues/financial returns from the project to ALL relevant stakeholders (e.g., project developer, deforestation agents, national to local governments)		
Lower than pre-project or lower than alternative land-uses	<ul style="list-style-type: none"> • Low if project developer a conservation group • Medium to high 	<ul style="list-style-type: none"> • Low if project developer a conservation group • Medium to high for other developer

Risk factor	Risk rating for APD*	Risk rating for AFUDD and AUMDD*
	for other developer types	types
Similar to pre-project or similar to alternative land-uses	<ul style="list-style-type: none"> Low if project developer a conservation group Medium to high for other developer types 	<ul style="list-style-type: none"> Low if project developer a conservation group Medium to high for other developer types
Higher than pre-project or higher than alternative land-uses	Very low	Very low
Infrastructure and natural resources		
High likelihood of new road(s)/rails being built near the REDD project boundary	Low-medium	Medium-high
Low likelihood of new road(s)/rails being built near the REDD project boundary	Very low	Low
High-value non-forest related natural resources (oil, minerals, etc.) known to exist within REDD project area	Low to High depending on who owns the project lands and their mission (private company or conservation organization) and who owns (or is likely to own in the future) the mining right if separate from land ownership	Low to High depending on who owns the project lands and their mission (private company or conservation organization) and who owns (or is likely to own in the future) the mining rights
High hydroelectric potential within REDD project area?	Same as above	Same as above
Population surrounding the project area		
Decreasing or increasing, but with low population density (e.g., <50 people/km ²)	Very low	Very low
Stable and medium-high population density (e.g., 50-150 people/km ²)	Very low	Low
Increasing and high population density (e.g., >150 people/km ²)	Low to medium	Medium to high
Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases		
Infrequent (<1 in 10 years)	Very low	Low
Frequent (>1 in 10 years)	Low	Medium-high
Project financial plan		
Credible long-term financial strategy in place (e.g., endowment, annuity-paying investments, and the like)	Low	Low
Credible long-term financial strategy absent	Medium	High
Legal easement for ongoing protection tied to land title in place	Very low	Very low

* APD: Avoided Planned Deforestation; AUFDD: Avoided Unplanned Frontier Deforestation & Degradation; AUMDD Avoided Unplanned Mosaic Deforestation & Degradation

Calculations of the percentage of carbon credits to be withheld as a buffer reserve are then determined from Table 11.

Table 11: Default buffer withholding percentages for REDD projects

Risk Class	Avoided Planned Deforestation (APD)	Avoided Unplanned Frontier Deforestation & Degradation (AUFDD)	Avoided Unplanned Mosaic Deforestation & Degradation (AUMDD)
High	20-30%	25-35%	30-40%
Medium	10-20%	10-25%	10-30%
Low	10%	10%	10%

The risk levels resulting from the AS/NZS 4360 Risk Assessment approach are calculated on a multiplied scale of probabilities of likelihood and consequence, which means that they are intended to exaggerate the spectrum of categories so that the risk areas in most need of attention are highlighted and addressed adequately. The lowest likelihood and consequence risk levels are therefore *rare* (1) (i.e. exceptional circumstances) and *insignificant* (1), which, in the assessment of real-world risks which have been identified as relevant to a project such as this, are extremely difficult to attain. Accordingly, they are not directly equal to the VCS risk classes, as the latter are not scaled, but fall along a scale of risks. In order to resolve this, the following table aligns the AS/NZS 4360 risk levels with the VCS risk classes as follows:

Table 12 – Aligned risk levels and risk classes

AS/NZS Risk level	VCS Risk Class
Extreme	High
High	High
Moderate	Medium
Low	Low to Very low

3.2 Determination for Degree Celsius Wet Tropics Project

Using the tabulation of risk factors to be used for all project types, the Wet Tropics Project has the following characteristics and risk ratings, as shown in Table 13.

Table 13 – Risk determination for all projects applied to Wet Tropics Project

Generic risk category	Wet Tropics Project Characteristics	Risk Rating
Project Risk		
Risk of unclear land tenure and potential for disputes	All land in the Project area is secure freehold or leasehold under Australian law. There is negligible potential for disputes, other than minor boundary location disputes.	Very low
Risk of financial failure	The Project a joint venture between Terrain NRM Ltd, which is a corporation limited by Government Guarantee and worth AU\$20M and, and Biocarbon Pty Ltd., a private company. Neither company has any significant liabilities.	Very low
Risk of technical failure	The science and technology behind the Project are based on state-of-the-science peer-reviewed scientific literature and IPCC and UNFCCC research and guidelines. Technical failure is not likely to occur under any scenario.	Very low
Risk of management failure	Both Terrain NRM Ltd and Biocarbon Pty Ltd have strong management systems in place, and operate under quality management systems. The Project is not dependent on any one individual, but on the joint venture’s collective management input and dedicated support.	Low
Economic risk		
Risk of rising land opportunity costs that cause reversal of sequestration and/or protection	Current pools include Reforestation and Avoided Deforestation. In both types, landholders have undertaken plantings voluntarily, foregoing opportunity costs to date. Sales of the carbon sequestered in the Reforestation and AD standing forests will be bound by Contracts. Opportunities that could reverse sequestration and protection include grazing, cropping and timber-getting. In most cases, the value of the carbon in the standing forests is greater than potential returns from alternatives. Beef cattle, for instance, return between \$200 and \$300 /ha/a on good agricultural land, whereas carbon sales (at a conservative \$20/t) return an average \$300/ha/a (average annual increment of CO ₂ /ha from inventory is above 15t). Most of the plantings have been undertaken on lower-value agricultural land, which returns much less per hectare for cattle, and are on land of low value for cropping, being steep, of poorer soils, small life-style blocks, or otherwise lower value. Australian legislation in the current climate is leaning towards better protection of lands, and incentives for planting for sequestration of carbon and reduction of pollution from runoff, all of which fit the types of activities in the Project. For instance, the Australian Taxation Office in 2007, and re-asserted in October 2008, allowed claims for expenditure on plantings of forests for carbon sequestration up to the costs of planting.	Low
Regulatory and social risk		
Risk of political instability	Australia has had a stable political system for over a century, and this is not likely to change.	Very Low
Risk of social instability	Australia has had no serious social unrest for over a century, and this is not likely to	Very low

Generic risk category	Wet Tropics Project Characteristics	Risk Rating
	change.	
Natural disturbance risk		
Risk of devastating fire	The Project is located in the Wet Tropics region, with some parts bordering on the wet-dry (monsoonal) tropics. Most of the plots include rainforest, while some include Eucalyptus wet sclerophyll forests. Due to the high rainfall in the region, averaging 1580 mm, and mostly spread throughout the year, the likelihood of devastating fire is very low. Some of the planted forests and regenerating forests may be vulnerable to fires from time to time, but they are unlikely to be devastating, more escaped grass fires which might damage the individual plantings. Because the Project is aggregating many disaggregated plantings, the overall risk of devastating fire significantly affecting the Project inventory is considered to be low.	Low
Risk of pest and disease attacks	For forest plantations in the Project region, main risks from pest and disease are insect attack on sensitive species such as Leaf-tip Moth on Red Cedar <i>Toona ciliata</i> , and a few others which are not so sensitive, and fungal attack by species such as <i>Phytophthora cinnamomi</i> . Red Cedar is not common in plantations, and rare in monocultures where it is most vulnerable. Vulnerable rainforest species are vulnerable in only the first few years, after which they become much more resistant, suffering only minor effects, rather than complete devastation. <i>Phytophthora</i> infestations are restricted in the region to limited areas with relatively poor soils. None of the plantings in the inventory show signs of either <i>Phytophthora</i> damage, nor of major insect attack.	Low
Risk of extreme weather events (e.g. floods, drought, winds)	Analysis of the risk of extreme weather events is detailed in Table 4 above. In the AS/NZS 4360 context, the risk of cyclones and floods is considered to be high, in the context of likelihood and consequence. The residual risk, however, is considered to be low because only a small proportion of the inventory is likely to be damaged, and with a recurrence interval of decades	Low
Geological risk (e.g. volcanoes, earthquakes, landslides)	The region is in a tectonically stable geologic province. Landslides, however, are known to occur in steeper parts of the region, and could potentially damage or destroy small patches. The likelihood is considered to be low, and the consequences in the context of the aggregated project also low (we did not identify this as a risk in the AS/NZS 4360 risk assessment).	Low

The overall risk rating in the generic risk categories is therefore considered to be *low to very low*.

A proportion of the Degree Celsius Wet Tropics Carbon Sequestration Project includes Reforestation activities which have been conducted for the past few decades by landholders on their properties. Accordingly, the risks to the Reforestation component have been assessed to comply with VCS requirements for ARR. The results of the risk analysis are included in Table 14.

Table 14 – ARR Risk Analysis for Wet Tropics Project

Risk factor	VCS Risk Rating	Wet Tropics Project Risk Analysis	Resultant Project Risk Rating
Project longevity/ Commitment period			
Long-term commitment (i.e., many decades or unlimited) with no harvesting	Low	Almost all aggregated components of the Project have made a long-term commitment and will be bound by contract for at least 30 years, and only a very small proportion have indicated that they may harvest any timber in the plantings. In the latter cases, the timber intended for logging has been deducted from the total of the assessed carbon stocks.	Low
Long-term commitment with no harvesting in politically unstable countries	Medium	Not applicable	
Long-term commitment with harvesting	Medium	A small proportion only of the Project's aggregated properties have indicated that they may wish to harvest some timber in the future. The harvestable proportion has not been included in the inventory, so this risk factor does not apply	
Medium-term commitment with harvesting	High	Not applicable	
Medium-term commitment (i.e., a few decades) with no harvesting	High	Not applicable	
Short-term commitment with or without harvesting	Fail	Not applicable	
Ownership type and user rights			
Established NGO or conservation agency owner; or owner-operated private land	Low	All the properties in the Wet Tropics Project inventory at this stage are private freehold.	Low
Rented or tenant-operated land	Medium	Not applicable	
Clear land tenure but disputed land use rights	High	Not applicable	
Uncertain tenure but with established user rights	High	Not applicable	
Uncertain land tenure and no established user rights	Fail	Not applicable	
Technical capability			
Proven technologies and ready access to relevant expertise	Low	Biocarbon Pty Ltd directors are qualified ecologists with either MSc,	Low

Risk factor	VCS Risk Rating	Wet Tropics Project Risk Analysis	Resultant Project Risk Rating
		MEnvSt or PhD's, and are leading the project. Terrain NRM Ltd is headed by a PhD in Science, and many of the staff are BSc or higher qualified in the sciences (including agriculture, forestry, biology, etc). The GIS which provides the main inventory for the Project is operated by GIS specialists from Terrain NRM. The key players are highly skilled in the field of NRM and in ecological science, which forms the basis for the inventory. The science behind the project, and the technology are all state-of-science.	
Technologies proven to be effective in other regions under similar soil and climate conditions, but lacking local experimental results and having limited access to relevant expertise	Medium	Not applicable	
Financial capacity			
Financial backing from established financial institutions, NGOs and/or governments	Low	Terrain NRM Ltd is a government-guaranteed private company, with assets in the region of \$20M. Terrain fully supports the Project. Biocarbon Pty Ltd is a private enterprise company which is providing a significant part of the expertise and capability for the Project. The Project's financial capacity is sound.	Low
Long-term project funding not secured	Medium	Not applicable	
Management capacity of project developer			
Substantial previous project experience (. 5 projects) with on-site management team	Low	The Directors of Biocarbon Pty Ltd have each over 20 years of successful track record in running private enterprise businesses, and have accrued over 200 professional projects in the environmental fields. Terrain operates many projects across the region, and has done so for many years.	Low
Limited project experience (<5 projects) with on-site management team	Medium	Not applicable	
Limited project experience (<5 projects) without on-site management team	High	Not applicable	
Future income			
Appropriate management plan, and financial analysis demonstrates that likely income stream(s) will finance	Low	The PDD is supported by a management plan and the analysis of the income stream shows that the finances will support management	Low

Risk factor	VCS Risk Rating	Wet Tropics Project Risk Analysis	Resultant Project Risk Rating
future management activities (e.g., carbon finance to be used for project management, tending operations, etc.)		and monitoring activities for the foreseeable future.	
Future costs and revenue stream(s) not documented	High	Not applicable	
Future/current opportunity costs			
Alternative land uses are unlikely to become attractive in the future	Low	The planting projects and established forests in the inventory have all been undertaken voluntarily, with the purpose of protecting the environment, including sequestering carbon through Afforestation and Reforestation. It is unlikely, given the incentives from trading the carbon rights, that alternative uses would become attractive. Where projects have been undertaken on operating agricultural properties, the owners have sacrificed the potential grazing and cropping value for the value to be obtained from trading the carbon.	Low
Project is competing with other land uses likely to become more attractive in the future	High	Not applicable	
Endorsement of project or land-use activity by local population and local/ national political establishment			
Endorsement given and not likely to change in the future	Low	Land use activity is an approved activity under Australian and Queensland law, and is therefore endorsed. The individual plantings and activities are undertaken by the local population, and as such, on the freehold properties which form the basis of the Project, there is negligible likelihood of this changing in the future. The Project will comply with the Australian Emissions Trading Scheme or Carbon Pollution Reduction Scheme (CPRS) when it is established, and therefore endorsement will be either obtained or assumed.	Low
Endorsement given but may be subject to change in the future	Medium	Not applicable	
No endorsement given	High	Not applicable	

The overall rating for the ARR Risk factors is therefore considered to be *low*.

A significant proportion of the Wet Tropics Project includes IFM projects. Analysis of the associated risks is documented in Table 15.

Table 15 – Risk Analysis for Wet Tropics Project IFM projects

Risk factors	Conventional to Reduced Impact Logging (RIL)	Convert logged to protected forest (LtPF)	Wet Tropics IFM Projects	Resultant risk
Devastating fire potential				
Low to medium fire return interval (> 50 years)	Very low	Low to Medium	The forests subject to IFM all exhibit low to medium fire return intervals	Low to Medium
High fire return interval (< 50 years)			Not applicable	
with fire prevention measures such as fuel removal, fire breaks, fire towers, fire fighting equipment	Low	Low to Medium		
with NO significant fire prevention measures in place	High	High		
High timber value				
Highly valuable species on site, with strong likelihood that the timber value increases over time and there is no forest certification	Low	Medium	The IFM projects included in the Project may contain some high value species; none are certified under any forest certification scheme	Medium
the project is certified by a recognized forest certification company	Very low	N/A	Not applicable	
Illegal logging potential				
Presence of illegal logging in area (location and intensity in relation to the project area affects actual risk value) with forest guards	Zero	Low	Illegal logging in the region is very rare, and Police would enforce the law. Illegal logging where it has occurred in the past has been reported and successful prosecution action taken.	Low
without forest guards	Low with no change in harvest intensity and medium with change in harvest intensity (as potentially more timber to harvest illegally)	High	Low	Medium

Risk factors	Conventional to Reduced Impact Logging (RIL)	Convert logged to protected forest (LtPF)	Wet Tropics IFM Projects	Resultant risk
Unemployment potential				
Alternative livelihood opportunities for local workforce to mitigate risk of unemployment: Few	Very low to Low - because expect no change in labor needs	Medium to High		
Many	Very low	Low	Many alternative employment opportunities exist in the region, other than logging	Low

The resultant risk is therefore *medium*, in compliance with VCS requirements shown in Table 9.

A proportion of the inventory of the Wet Tropics Carbon Sequestration Project is Avoided Deforestation which forms part of the REDD category. As such, it must be analysed for risks in accordance with the VCS REDD Risk Analysis procedures. The results of this analysis are provided below in Table 16.

Table 16 - Risk factors and risk ratings applicable to Wet Tropics Project Avoided Deforestation Component

Risk factor	Risk rating for APD*	Risk rating for AFUDD and AUMDD*	Wet Tropics Project Risk Analysis	Resultant Risk rating
Land ownership/land management type				
Land owned by private or public forest conservation organization with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land	Very low	Very low	Not applicable	
Privately owned land	Low-medium	Low-medium	All the land is privately owned, or owned by local government, which are statutory bodies.	Low-medium
Uncertain land tenure	Not applicable	Medium-high	Not applicable	
Land legally protected	Not applicable	Low-medium	Not applicable	
Land not protected by laws or protected with weak enforcement	Medium	Medium-high	Not applicable	
Technical capability of project developer/implementer				
Proven capacity to design and successfully implement activities that are likely to ensure the	Very low	Very low	Terrain NRM has proven capacity across the region in designing and implementing activities which are equivalent	Very low

Risk factor	Risk rating for APD*	Risk rating for AFUDD and AUMDD*	Wet Tropics Project Risk Analysis	Resultant Risk rating
longevity of carbon benefits (e.g., creating sustainable livelihood alternatives and/or effectively managing protected areas)			to carbon sequestration and mitigation of emissions. The activities have assisted in maintaining livelihoods while achieving effective carbon sequestration and biodiversity conservation and enhancement outcomes. Terrain has been instrumental in many of the planting projects.	
No previous experience in the design and implementation of activities that may ensure the longevity of carbon benefits	Medium	Medium-high	Not applicable	
Net revenues/financial returns from the project to ALL relevant stakeholders (e.g., project developer, deforestation agents, national to local governments)				
Lower than pre-project or lower than alternative land-uses	<ul style="list-style-type: none"> • Low if project developer a conservation group • Medium to high for other developer types 	<ul style="list-style-type: none"> • Low if project developer a conservation group • Medium to high for other developer types 		
Similar to pre-project or similar to alternative land-uses	<ul style="list-style-type: none"> • Low if project developer a conservation group • Medium to high for other developer types 	<ul style="list-style-type: none"> • Low if project developer a conservation group • Medium to high for other developer types 	Some of the Avoided Deforestation components will return revenues which are similar to pre-project or alternative land-uses, such as grazing or cropping, or intensive logging.	Low
Higher than pre-project or higher than alternative land-uses	Very low	Very low	The majority of Avoided Deforestation components of the inventory will return higher than pre-project and higher than alternative land uses net revenues	Very Low

Risk factor	Risk rating for APD*	Risk rating for AFUDD and AUMDD*	Wet Tropics Project Risk Analysis	Resultant Risk rating
Infrastructure and natural resources				
High likelihood of new road(s)/rails being built near the REDD project boundary	Low-medium	Medium-high		
Low likelihood of new road(s)/rails being built near the REDD project boundary	Very low	Low	No roads nor rails are likely to be built on the properties included in the inventory.	Low
High-value non-forest related natural resources (oil, minerals, etc.) known to exist within REDD project area	Low to High depending on who owns the project lands and their mission (private company or conservation organization) and who owns (or is likely to own in the future) the mining right if separate from land ownership	Low to High depending on who owns the project lands and their mission (private company or conservation organization) and who owns (or is likely to own in the future) the mining rights	Very unlikely that non-forest resources in the REDD project components have not already been identified and utilised.	Low
High hydroelectric potential within REDD project area?	Same as above	Same as above	No potential for hydro-electric projects in the region	
Population surrounding the project area				
Decreasing or increasing, but with low population density (e.g., <50 people/km ²)	Very low	Very low	Population is slowly increasing, but density is very low at <9 people/km ²	Very low
Stable and medium-high population density (e.g., 50-150 people/km ²)	Very low	Low		
Increasing and high population density (e.g., >150 people/km ²)	Low to medium	Medium to high		
Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases				
Infrequent (<1 in 10 years)	Very low	Low	Infrequent loss of crops, usually associated with cyclones and tropical depressions. Most crops planted are resilient under flooding and pests are managed. Drought is a rare event in the wet tropics region.	Low
Frequent (>1 in 10 years)	Low	Medium-high		
Project financial plan				
Credible long-term financial strategy in place (e.g.,	Low	Low	The Project is imbedded in the Terrain NRM Regional	Low

Risk factor	Risk rating for APD*	Risk rating for AFUDD and AUMDD*	Wet Tropics Project Risk Analysis	Resultant Risk rating
endowment, annuity-paying investments, and the like)			Plan, which has a comprehensive long-term financial strategy in place.	
Credible long-term financial strategy absent	Medium	High	Not Applicable	
Legal easement for ongoing protection tied to land title in place	Very low	Very low	Not applicable	

* APD: Avoided Planned Deforestation; AUFDD: Avoided Unplanned Frontier Deforestation & Degradation; AUMDD Avoided Unplanned Mosaic Deforestation & Degradation

The overall risk for the Avoided Deforestation components of the Project ranges from *Very low* to *Low*.

4 Summary

Across all categories and for all factors, the Wet Tropics Project presents a low to medium risk rating, according to both the AS/NZS 4360 Standard and the VCS (2008) Tool, as summarised in Table 17.

Table 17 – Summarised resultant risk ratings from Analyses

Category	Resultant risk	Withholding percentage
Generic	Low to very low	Not stated
ARR	Low	10-20%
IFM	Medium	15-40%
REDD	Low	10%

The withholding buffer should therefore be in the order of 15-20% of the inventory, in accordance with the ratings in tables 7, 9 and 11.