INTERNATIONAL CLIMATE INITIATIVE

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Climate Protection through Forest Conservation in Pacific Island Countries

On behalf of

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

REDD Feasibility Study for East Rennell World Heritage Site, Solomon Islands

SPC Secretariat of the Pacific Community

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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ACRONYMS AND ABREVIATIONS

AFOLU	Agriculture, forestry, and other land uses
AGLB	Aboveground live biomass
CAR	Climate Action Reserve
CCB	Carbon Community Biodiversity Standard
CER	Certified Emission Reductions
GHG	Greenhouse Gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IFM	Improved Forest Management
LtPF	Logged to Protected Forest
NGO	Non-Governmental Organization
NPA	National Protected Area
PD	Project Document
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forest Authority
REDD	Reduced Emissions from Deforestation and Degradation
SIG	Solomon Islands Government
SPC	Secretariat of the Pacific Community
tCO_2e	Metric tons of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
VCS	Verified Carbon Standard
VCU	Verified Carbon Units = 1 ton CO_2e

EXECUTIVE SUMMARY

The REDD feasibility study for the East Rennell World Heritage Site (WHS), Solomon Islands, assessed eligibility, potential revenues, benefits, costs, and constraints to implementing a forest carbon project that reduces emissions caused by deforestation and forest degradation.

This report concludes that the East Rennell WHS could generate at least three times higher revenue from selling carbon emission reduction units than from logging operations, not yet considering the value of conserving the goods and services provided by the forest ecosystem.

Rennell Island is unique from geographical, ecological, and cultural perspectives. The Island is the world's second largest raised coral atoll with Lake Tegano recognized as the largest lake in the insular Pacific. Each of the island's unique habitats are found within the East Rennell WHS along with 43 bird species, four species and nine subspecies of which are endemic to Rennell and Bellona Islands. Additionally, Lake Tegano is the only known location for the endemic sea krait (*Laticauda crockery*).

While East Rennell has been a UNESCO World Heritage Site for the last 14 years, it does not have national protected area status; and thus, the decision to continue conserving the island or to log it, is mostly in the hands of the customary landowners. There have been at least two formal proposals to log East Rennell, with the latest presented in 2011/12 when a timber rights hearing was held in two villages. This report contends that without a forest carbon project, and facing declines in agricultural production and fish catches, the customary landowners will most likely be forced to allow logging of East Rennell to gain revenue for food and other staples.

The feasibility study assessed the likelihood that emissions would occur in the near future (additionality), legal aspects, potential carbon credits that would be accrued under a REDD project, and a cost/benefit analysis that compares revenue from REDD versus that from logging.

This report assumes that emission reduction credits (carbon credits) could be generated from the voluntary carbon market that in 2011 transacted more than US$ 500 million. To participate on the voluntary carbon market, a project must comply with the principles and criteria of a carbon standard. The Verified Carbon Standard (VCS) is the most widely applied standard for REDD projects and was chosen for the East Rennell WHS.

A land cover analysis was conducted for East Rennell WHS using LANDSAT 7 imagery and validated using Google Earth and a rapid field assessment. Almost 19,000 ha of forest were identified; of which 2,557 ha were degraded forest situated around the four villages and on the karst ridges, while the remaining area was identified as primary lowland forest. The actual forest area that could be allocated for a REDD project came to 12,000 ha, and was estimated by deducting secondary forest used for shifting cultivation in addition to steep slopes and karst ridges.

Applying a VCS approved methodology in East Rennell WHS a forest carbon project could conservatively *generate a total of 1.03 million tons CO2e of avoided emissions over 10 years, which could generate total revenues* from US$ 3.1million to US$ 9.3 million from carbon credit sales depending on low, medium, or high price scenarios for the credits. The mean annual revenue from REDD for the lowest priced scenario was estimated to be US$ 308,600. Logging revenue allocated over the same ten years to the customary landowners came to US$ 1.34 million or an annual mean of US$ 134,400. It should be noted that REDD revenue is a gross estimate and does not include taxes or transaction costs. Even so, REDD revenue applying the lowest priced scenario for carbon credits exceeds logging revenues.

1 INTRODUCTION

The German Agency for International Cooperation (GIZ) and the Secretariat of the Pacific Community (SPC) are supporting the Solomon Islands' national REDD program through its regional project "Climate Protection through Forest Conservation in Pacific Island Countries". The regional SPC/GIZ REDD+ project is funded by the International Climate Initiative of the German Federal Environment Ministry. As part of this support, GIZ commissioned a forest carbon feasibility study on Rennell Island. The Eastern portion of Rennell Island was selected since it has UNESCO World Heritage Status and has suffered from a lack of government funding, which could possibly be addressed through the sale of carbon credits from a reduced emissions from deforestation and degradation (REDD) project. Typically, the first step in developing a REDD project is to conduct a feasibility study to assess whether there are technical, social, and/or legal constraints that could significantly impede the implementation of the project.

Rennell Island is unique from geographical, ecological, cultural, and historical perspectives. The Island is the world's second largest raised coral atoll with Lake Tegano recognized as the largest lake in the insular Pacific (Thosal and Molloy 1998, UNEP-WCMC 2008). With the exception of Papua New Guinea, the Solomon Islands have a greater diversity of animal species and higher level of endemism than any other Pacific island nation (Munch-Petersen 1988, Filardi et al. 1999). All habitats represented on the island are found in East Rennell along with 43 bird species, of which four species and nine subspecies are endemic to the Rennell and Bellona Islands, and ten endemic plants that have been identified and recorded on Rennell. Additionally, Lake Tegano is the only known location of the endemic sea krait (*Laticauda crockery*).

Culturally, Rennell and Bellona Islanders are of Polynesian decent, not Melanesian like the main population of the Solomon Islands, and the islanders maintain an oral history tracing the migration to Rennell back 26 generations from the Wallis and Futuna island group.

Lake Tegano played an important role during World War II as a Catalina Flying Boat base. At the end of the war nine Catalina planes were scuttled in the lake, where they remain today. Furthermore, the last naval battle for the Solomon Islands was fought offshore of Rennell Island, where the USS Chicago was sunk (Hadden 2007).

From April 16 to May 5 a field visit to the Solomon Islands was conducted to assess the feasibility for a REDD project, starting first in Honiara, followed with fieldwork on Rennell Island. The main tasks of the author are outlined below.

1. Provide recommendations on whether an existing GHG methodology approved by the VCS is compatible for the project site.
2. Assess aspects related to whether the project would be eligible under VCS criteria with a focus on additionality, leakage, and permanence in the project.
3. Determine the most likely land use scenario and provide a rough estimate of GHG emissions from those baseline activities.
4. Provide a first iteration rough estimate of the 'with project' GHG emissions and assess the financial feasibility of the potential revenue that could be generated through carbon credit sales on the voluntary market.
5. Even in the event that the project would not be feasible under the stringent criteria of the VCS, it may still have significant merit for climate change mitigation and conservation reasons and the consultant should consider suitable certifications and broader implications of whether bilateral support is warranted.
6. Using freely available satellite imagery and imagery that the project partners have on hand, provide a first iteration of the forest stratification that would correspond to statistically significant differences in biomass between strata. Conduct rapid ground truthing of the stratification.
7. Previous biomass surveys done in similar forest, provide a rough estimate of the number of sample plots needed to comply with VCS's criterion of a +/-10% sample error with a 90% level of confidence.

8. A final report for East Rennell should be submitted that assesses the technical and financial feasibility of a REDD project applying VCS principles and criteria. In the annexes, it should include a summary socio-economic and biodiversity assessments on the basis of previous work done by third parties.
9. Produce maps (JPEG, Google Earth (.kml) and ARCGIS format) that show the following:
    a. First iteration carbon accounting area of the project; and,
    b. First iteration forest strata based on expanded IPCC categories.

This report is divided into the following sections: Project site description, brief discussion of the current status of the voluntary carbon market, additionality analysis, eligibility analysis under the VCS guidelines and selecting a VCS-approved methodology, legal analysis, potential to generate verified carbon units (VCU), cost/benefit analysis, and recommendations.

Wherever possible, conservative estimates of the potential carbon credits have been applied in accordance with the principles and criteria of the Verified Carbon Standard (VCS). Since a compliance market capable of accepting REDD credits will not come on board until at least 2020, accessing funds on the voluntary carbon markets is the emphasis of this feasibility study; and VCS is the world's most accepted standard. While no decision has been made to apply the standard, it is much easier to adapt a rigorous standard such as VCS as opposed to one less stringent, versus the other way around.

2 PROJECT SITE DESCRIPTION

2.1 Land Cover Types

In the Solomon Islands five forest types can be found, which are mangrove, freshwater swamp, lowland, hill, and montane forests. Of these five, lowland forest is the dominant type, followed by hill forest with 400m altitude generally recognized as the elevational boundary between these two types. To a much lesser extent, freshwater swamp forest and beach forest are also found in the Solomon Islands, along with montane forest on two islands with elevations that exceed 1700m (Whitmore 1969). On East Rennell, there are only three major vegetation types: the tall lowland forest of the interior island (shown in yellow color in Fig.1), the karst forest found on ridgelines (brown colour), and the mangrove and beach flora found on the more than 300 islands of Lake Tegano and the shoreline of Rennell island.

Figure 1: Map of Rennell Island showing the boundaries of the World Heritage Site and the extent of the lowland forest in yellow (source: Wein 2007).

LANDSAT imagery was downloaded and ortho-rectified for the years 1989, 2000, 2006, and 2012. Land cover change analysis was not possible due to high cloud cover nor is it required for the selected VCS methodology. Figure 2 below indicates the current land cover analysis for the 2012 imagery.

Figure 2: Land cover analysis for Rennell using LANDSAT 7 imagery for 2012

No shape files were available for East Rennell, and the UNESCO maps did not have a full set of geographic coordinates; thus, the location of the border between eastern and western sides of the island had to be approximated. UNEP and UNESCO documents have Lake Tegano occupying 15,500 ha while the GIS analysis undertaken during this study indicated it is 1,000 ha larger. This could be due either to a mapping error or the lake may have increased in size since UNESCO listing 14 years ago (that possibility is discussed in a following section). Approximately 2,500 ha of forest were classed as degraded with canopy openness between 30 to 70% and were mostly located either near villages or on karst ridges exposed to frequent cyclones that cause extensive tree falls. In West Rennell, degraded forest closely followed the primary roads, villages and the two active logging concessions (see Figure 4, page 7).

2.2 Land Use History

The current inhabitants of Rennell Island maintain that their ancestors migrated to the island 26 generations ago, about 1400 AD from the Wallis and Futuna island group. Population growth has been limited due to lack of suitable agricultural land and freshwater sources, and currently about 700 inhabitants are living on the island. Since the island's geological origin is from uplifted coral reefs, the soils are shallow except for a narrow belt surrounding Lake Tegano (Figure 1) where taro and other tubers have traditionally been grown. Going away from the lake by several hundred meters, the soils become increasingly karstic with very rapid drainage, with exposed ancient remnant reefs, unsuitable for agricultural production. While taro provides starch, protein sources come from tilapia introduced in Lake Tegano in 1957. Cash income has traditionally been derived from logging concessions on West Rennell and the sale to Honiara of coconut crabs, trochus, crayfish, and earlier from the collection of Bêche de Mer., On West Rennell, coconut crabs were extirpated years ago, and demand is high in West Rennell towns and in Honiara. However, on E. Rennell these cash income sources have all declined in recent years due to overharvesting (Wein 2007), leaving the communities with increasingly few alternatives.

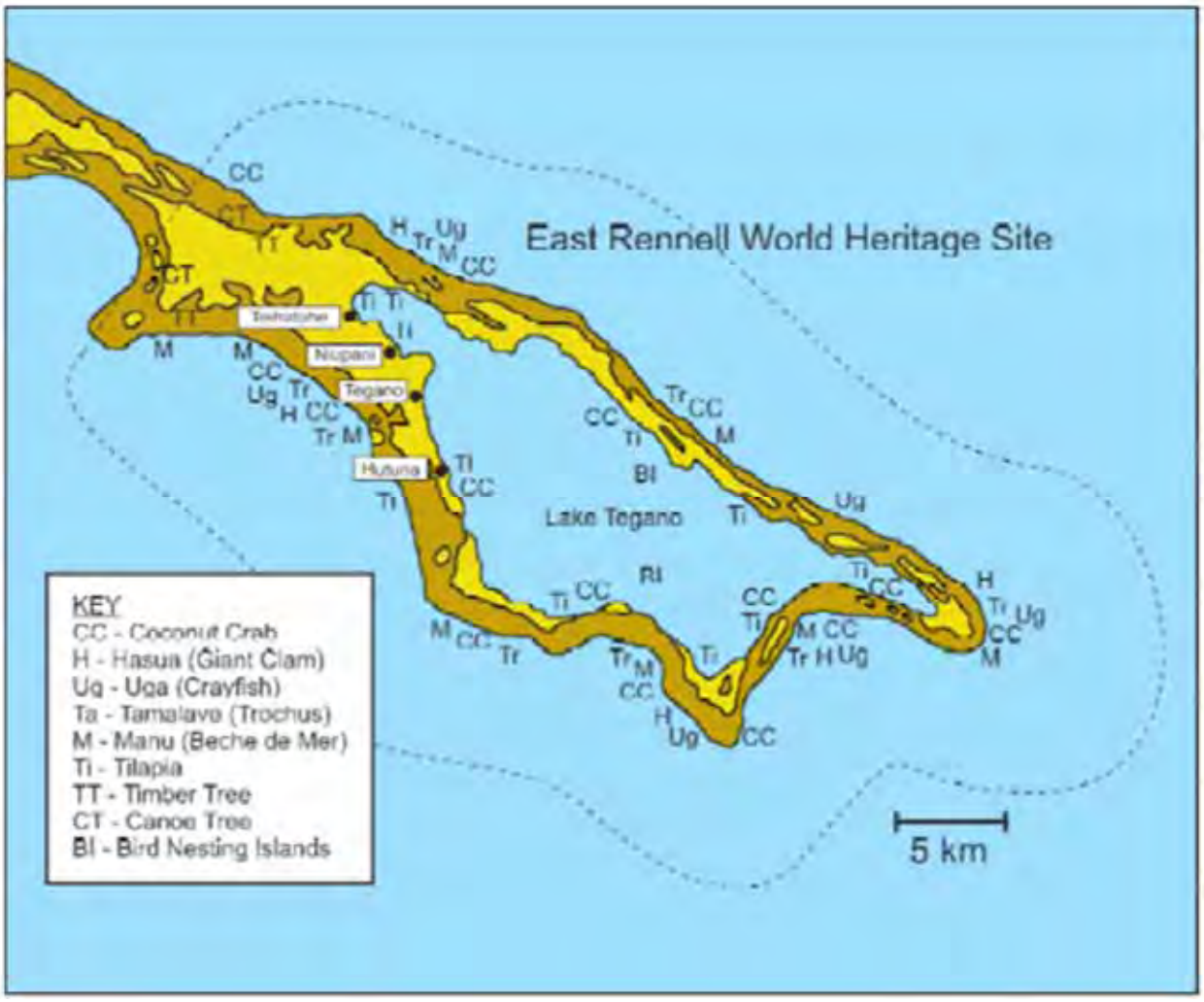

Figure 3: Indicative location of harvesting of natural resources by the E. Rennell villagers (Wein 2007).

Further complicating the welfare of the E. Rennell villagers is that the lake level has been rising over the last ten years and frequent flooding is now common in the low lying agricultural areas used for taro production.

2.3 Current and Planned Land Use Dynamics in Project Area

In 1998, East Rennell received World Heritage status, but the impetus to list the site in the first place came more from outside the country rather than from SIG officials. While the justification for listing East Rennell was for its unique environmental attributes, the Ministry of Tourism and Culture was responsible for managing the site until 2011. Over the past 14 years, the only allocation of SIG funds to support East Rennell conservation activities was in 2012, after management responsibility passed to the Ministry of Environment, Conservation and Meteorology, and an allocation of SBD 500,000 was sent via the provincial government. However, the East Rennell villagers reported that the funds have not reached the communities. In fact, the most frequent comment heard during four community meetings was the discontent in regard to the World Heritage Status, which has not led to any benefits over the last 14 years. Less than 10 tourists visited the site last year. However, there have been bilateral aid projects to assist these communities, which include the construction of three eco-lodges, water projects, a computer lab with satellite internet connection (no longer functional), and the provision of funds for a learning mission to Cairns, Australia.

Logging began on West Rennell in 2008 in two locations and is still operational (Figure 4). A further three concessions were proposed in 2011 including an area that covers most of East Rennell, and in March 2012 timber rights hearings were held in Tabaitahe and Teabamagu villages, but at that time there was not

sufficient community support to continue the process. Additional information on Rennell's logging concessions is provided in the following section.

2.3.1 Existing and Proposed Logging Concessions on Rennell

Concession Area A1 (Tehakamagoku)– A Timber rights hearing was conducted in 2007 and felling was started in 2008. Approximately 6 shipments (around 60,000 cubic metres) have already been made so far, no landowners received money from it. The Samling Sang Logging Company is the Contractor. Amos Teikagei is the Licensee. The customary landowners filed a case with the high court alleging breach of contract due to lack of promised payments, and the case was scheduled to be heard in March 2012, but no additional information was available on the outcome.

Concession Area B1 (Magaone & Aga'eha, white lines) – A Timber rights hearing was conducted in April 2007. Solomon Eco Lumber is the Licensee; but transferred the license to the Samling Sang Logging Company. Extensive road system construction took place, as well as the establishment of a log pond located just 4 kilometres away from the Tehakatu'u Marine Protected Area.

Concession Areas C1, C2 & C3 (Agapogabu, Namalaga & Temagabai) – Joses Saueha is the Licensee and the timber rights hearing was conducted in March 2012, however, insufficient support was gained from customary landowners. Joses Saueha proposed to cover three locations shown in Figure 4 (C1, C2 & C3).

Figure 4: Rennell Island showing active logging concessions (A1 and B1) and proposed concessions in 2012 (C1, C2, and C3, with C1 covering most of East Rennell)

3 CURRENT STATUS OF THE VOLUNTARY CARBON MARKET

3.1 Trends In Demand And Price

The conceptual framework for how carbon credits are accrued, monitored, and eventually retired under many national REDD schemes is still evolving, and a compliance market for carbon credits will not come into existence before 2020. However, a voluntary carbon market (VCM) currently exists and could both provide financial benefit to impoverished rural communities and act as an incubator of ideas and a testing ground for monitoring and revenue distribution methods. Development of various national REDD components could be accelerated by applying the lessons learned from VCM projects, along with helping to inform policy enactment and reform.

In 2011 the voluntary carbon markets recorded the second highest number of carbon credit transactions, totalling US$ 576 million (Peters-Stanley and Hamilton 2012). It should be remembered that the world's worst recession since the Great Depression has occurred over the last five years, and has had an effect on carbon markets, most notably the existing compliance markets, especially under the CDM that allows developed countries to offset their emissions by financing carbon projects in developing countries and by purchasing Certified Emission Reduction (CER) credits. Currently, CERs are trading at US$ 0.50 down from US$ 20 in 2008. However, REDD-derived credits continue to be in demand with a mean price at credit issuance of US$ 9/ton CO_2 (VCU), which is higher than energy-derived credits due mainly to the generation of social and ecological co-benefits and the charismatic nature of some projects (Figure 5). Future demand for REDD credits, while showing some effect from stalled UNFCCC negotiations and the economic crisis are still predicted to nearly double by 2020 (Figure 6).

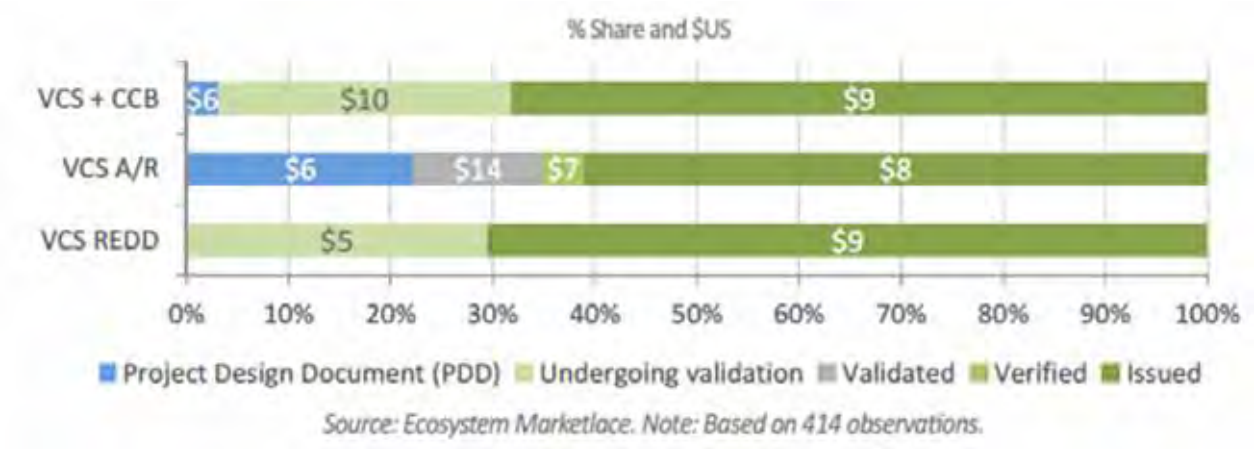

Figure 5: Mean prices received for REDD-related Verified Carbon Units (VCU) according to project development stage (Peters-Stanley et al. 2012).

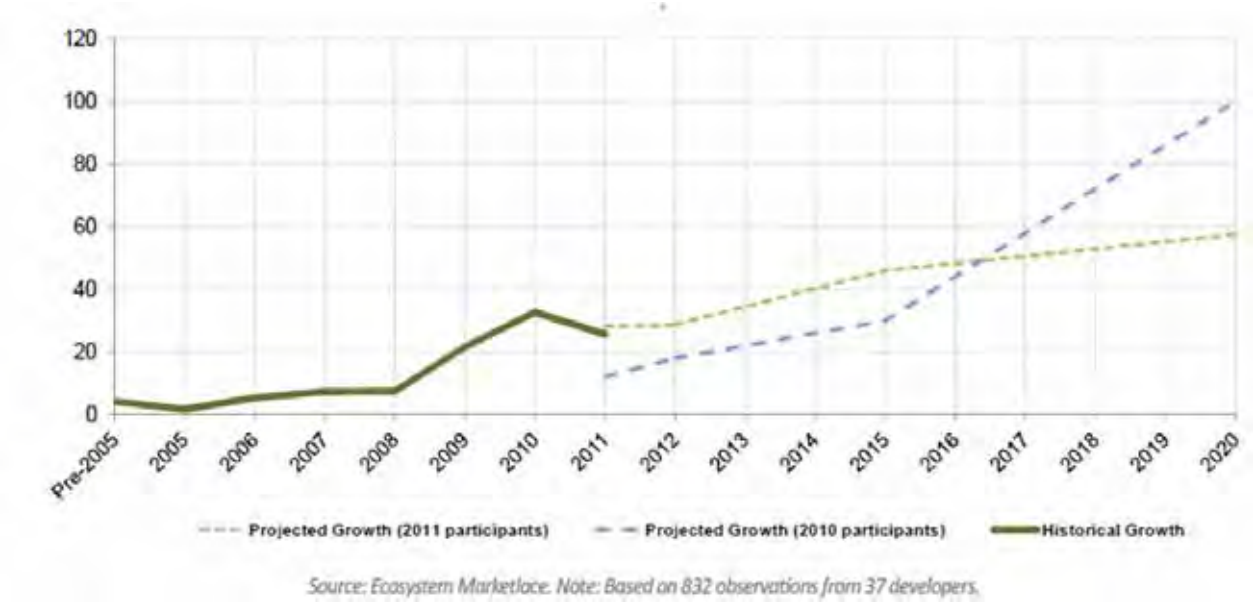

Figure 6: Future demand for forest carbon related VCU through 2020 (Stanley-Peters et al. 2012).

3.2 Selection Of A Third Party Standard

Of all issued carbon credits on the voluntary market, 28% applied the Verified Carbon Standard (VCS), which has become the world's most commonly applied standard over the last three years (Figure 7).

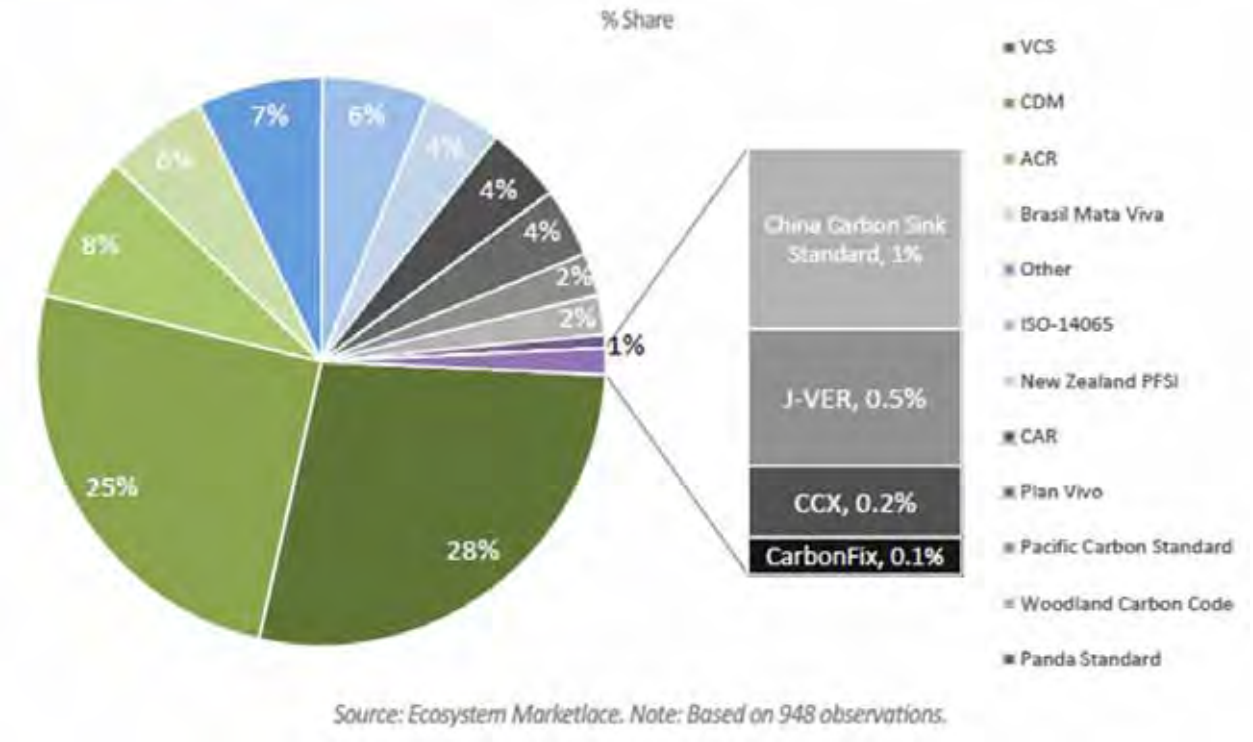

Figure 7: Market share for independent and US domestic standards.

While various other standards exist besides VCS, most of them are designed to meet the needs of specific domestic markets, with Plan Vivo as one exception. Plan Vivo was designed as a low-cost alternative for community-based initiatives, and the NGO Live and Learn has elected to apply this standard to two REDD community projects they are establishing on Choiseul Island. Its advantages are simplicity and relatively low costs; however, as shown in Figure 7, Plan Vivo projects represented only 2% of the market share in 2011, and for many institutional REDD credit buyers, this standard is not well known and would lack credibility.

An additional standard is the Climate Action Reserve (CAR), which, while created for the US market, is now being applied in at least two projects outside of the US. However, there is a strong likelihood the two CAR projects (both in Latin America) would like to participate in offsets generated through California's cap and trade initiative, which could partially explain why the CAR standard was chosen.

The majority of institutional investors and bilateral development agencies view a project's commitment to obtain VCS verification as a prerequisite for their involvement, because the standard ensures that rigorous scientific principles and methods are applied to quantify carbon pools and estimate future emissions. An additional point is that the Solomon Islands follow a Melanesian traditional land tenure system whereby 88% of the forestland is owned by tribes or clans. Given the preceding and recognizing that logging has generated substantial social issues, going beyond VCS will most likely be necessary. The Climate, Community, and Biodiversity (CCB) Standard provides safeguards for social and ecological aspects of REDD projects. A REDD project would not necessarily need to undertake VCS and CCB activities simultaneously, but would rather need to ensure that the commitment is there and that plans are made so that the project eventually complies with both standards. To facilitate joint implementation of VCS and CCB, both standards recently collaborated to create a Project Design (PD) template that accommodates the criteria of both standards; and thus would help to lower the project development costs[1].

The Solomon Islands Government (SIG) could ensure that social and biodiversity safeguards are embedded into REDD by requiring that projects are validated and verified under CCB or an equivalent standard. Nevertheless, since this feasibility study focuses primarily on the technical aspects and secondarily on identifying potential social and/or ecological constraints, VCS guidelines and VCS approved methodologies have been used in the analysis.

[1] http://v-c-s.org/sites/v-c-s.org/files/VCS%20CCB%20Guidance%20Project%20Development%20Process.pdf

4 ADDITIONALITY ANALYSIS

An analysis of additionality tests to see whether emissions would occur beyond a reasonable doubt in the absence of carbon financing. In essence, would this particular project generate emissions reductions that wouldn't have happened otherwise? For projects in the logged-to-protected category, additionality must be shown using the "Tool for the Demonstration and Assessment of Additionality in IFM Project Activities". A three-step process is carried out to satisfy the above test, which are listed below:

Step 1: Identification of the alternative land use scenario to the IFM project activity

Step 2: Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios

Step 3: Barrier analysis

4.1 Step 1: Identification Of Alternative Land Use Scenarios

Demonstrating that a REDD project in East Rennell will create additional emission reductions is more challenging given its World Heritage status. However, East Rennell has no national protected area status, and therefore, legally nothing could stand in the way of logging it if the proposal had support from customary landowners and government leaders. From discussions held in the four E. Rennell villages, the community members are clearly aware of the World Heritage status, but repeatedly expressed dissatisfaction with not receiving any benefits from this special status over the last 14 years. Nevertheless, village leaders recognize the negative environmental consequences caused from traditional logging practices, and it's hard to see without the situation changing significantly that a logging proposal would gain sufficient support.

Examining topographic and edaphic characteristics of Rennell Island indicates whether there are natural constraints that rule out certain land use options. The geological origin of the island is a raised coral atoll, and as such it possesses shallow rocky soils in the flat lands with exposed craggy limestone outcrops going up into the hills. Those steep areas are unsuitable for either small-scale or agro-industrial scale farming. However, the areas that exceed 30° slope making logging unfeasible occur only near the ridgelines and are limited to 426 ha. Even in the flat areas agro-industrial estates for oil palm would be entirely unfeasible since there is not enough suitable land, no CPO processing facilities exist on the island, and the distance to ship fresh palm kernels is too far to process them in Honiara.

If agro-industrial estates are not financially feasible, could the status quo with small-scale agriculture and fishing continue on indefinitely? There's a paucity of published studies on surveys of the fish stocks and other marine resources in East Rennell. The limited information that could be found suggests that overharvesting is occurring in regard to most natural resources, including coconut crabs, trochus, and crayfish (Wien 2007). Even for the introduced tilapia in the lake, the villagers mentioned that abundance and size have declined in recent years.

An issue that may cause further complications in the future is that the lake is rising and is inundating the alluvial agricultural areas used for cultivating taro and other tube crops. Only one published study on climate change was found for the Solomon Islands, which indicates an increase in surface temperatures of 0.15° to 0.25° C per decade since 1979, and that annual mean precipitation has decreased by 20 to 40% since 1901 (Trenberth et al., 2007). With increasing time, the effects of climate change will most likely worsen, and it is predicted to decrease the frequency but increase the strength of cyclones, worsen droughts, and most likely lead toward wide-scale reef die offs that will further reduce fish populations.

Overharvesting of marine and freshwater natural resources exacerbated by climate change will financially stress the East Rennell villagers, and cause them to seek out alternative income sources. Unfortunately, tourism doesn't appear to be a feasible alternative that would benefit a substantial number of community members. Annually, less than a dozen tourists tend to visit East Rennell, which is most likely due to its remote location and lack of access. The dirt road from the airport in West Rennell to East Rennell takes about six to eight hours driving time and is a major constraint to boosting tourism. Even if tourism were to

grow 100% annually over the next few years, the benefits would be confined to the few families that run the eco-lodges.

Even if the communities do agree to logging, central or provincial government could stop the process. National government officials would meet with substantial criticism from UNESCO along with bilateral aid agencies with the consequences potentially meaning reduced funding for environmental initiatives. However, the Solomon Islands government has not shown any resolve to actively manage this site, ignoring requests by the UNESCO World Heritage Committee for annual status reports. Additionally, up until 2012, no government funding of any kind was allocated to manage this area. The World Heritage Committee repeatedly indicated that the government could apply for funding to assist in the management of East Rennell, but this was not followed up. In the most recent annual meeting of the World Heritage Committee in 2012, East Rennell was declared a *World Heritage Site in Danger*, which helps to substantiate the threat to this site.

4.2 Step 2: Investment Analysis

Carbon credits generated from REDD projects range in price depending on the stage of project development. The highest prices are generated after the carbon credits have been issued and in 2011 the mean price reported was US$ 9.00 per carbon credit (VCU). For carbon credits to financially compete with revenues generated from industrial logging, the carbon credit price would need to be at least US$ 25 – US$ 30 per VCU. The baseline scenario assumes that logging will happen, and an initial proposal to log East Rennell was submitted in 2012 (see annex 2). Almost no island in the Solomon Islands has been left untouched by loggers, and as log supply decreases, the demand will grow substantially.

Profitability in logging operations is determined by two main factors – commercial timber volumes that can be extracted and log haul distances. Table 1 summarizes the results of the rapid forest survey conducted on East Rennell, which indicate that the sampled forest possesses basal area values commonly associated with primary forest and that roughly 95% of the trees falling inside the sample points were of commercially acceptable species. The sampling was undertaken at least 3 to 4km from the villages where small logging for house construction was limited. Commercial-sized pencil cedar (*Palaquim* spp.) trees, a species highly sought after by logging companies for its timber qualities, were commonly found inside the sample points.

Table 1: Results of 3P point sampling conducted during the rapid forest survey on East Rennell

Site Name	Total Sample Points		Basal Area (m^2/ha)	Total Trees Sampled	Total Commercial Trees In Plot	Percent Commercial Species
E. Rennell	30		29.7	446	427	95.7

4.3 Step 3: Barrier Analysis

Barriers could be technological, cultural or legal, while financial barriers are dealt with in Step (2). In East Rennell's case, while there are no cultural barriers that would limit a REDD project, there are legal barriers that discourage investment in REDD projects, especially regarding lack of legal clarity on carbon rights and taxation of carbon credits. In regards to a logging scenario as the most likely land use option, there are no barriers of any type that would preclude this option.

5 ELIGIBILITY ANALYSIS

5.1 Eligibility Criteria Under VCS Project Type

REDD projects are categorized by VCS according to their 'business-as-usual' scenario, or often termed the baseline case. In essence, determining the baseline case requires answering the question – what is the most likely land use activity that will happen in the project site? Given the decline in resource availability that will

financially stress the East Rennell villagers, the most likely business as usual scenario would be commercial logging of the site. Applying VCS guidelines, this type of scenario fits into the Improved Forest Management (IFM) category. Improved forest management projects are somewhat unique in that there is no change in land use classes driven by deforestation, but rather the baseline and project scenarios assume that forest will stay as forest; thus the focus is on reducing forest degradation commonly caused by logging. Besides degradation and its associated emissions, eligible activities are those that increase sequestration and both activities must be on forestlands managed for wood products under a license granted by government.

To be eligible for an IFM project the following VCS criteria need to be met:

- Forest management in the baseline scenario must be planned timber harvest;
- Planned timber harvest must be estimated using forest inventory methods that determine allowable harvesting intensities (m3 ha-1);
- The boundaries of the forest land must be clearly defined and documented;
- The baseline condition cannot include conversion to managed plantations.

The latest version of VCS's Forestry guidelines lists four major activities that can qualify under the IFM category, which are:

1. **Reduced Impact Logging (RIL):** Encompasses a comprehensive suite of activities that range from improved planning of roads and skid trails, accurately mapping the location of trees to be felled, improved techniques in directional tree felling, and reducing the size of roads, skid trails, and log decks.
2. **Logged to protected Forest (LtPF):** Applies to either logged over or virgin forests and could be partially implemented in a concession in conjunction with FSC certification or the entire forest area HPH could be taken out of production. An example of the latter option is the Noel Kempff project in Bolivia.
3. **Extended rotation or cutting cycle (ERA):** Originally designed for even-age plantations this objective is also applicable to natural forest concessions under a selective harvesting regime. The two most common examples applicable to Indonesia are:
    a. Increasing the minimum cut diameter of harvestable trees,
    b. Extending the re-entry period for selective harvesting.
4. **Low productive to high productive (LtHP):** Applies to highly degraded forest where there is a paucity of commercial species or where the normal successional forest cycles have been arrested. The aim is to increase stocking of commercial species that leads to enhanced carbon sequestration and typically has been done through enrichment planting. Additionally, this objective could be employed where the normal successional stages have been arrested, examples being where intense wildfires devastate extensive forest stands and subsequently bamboo and/or vines dominate, thereby suppressing natural regeneration. Even though this objective is primarily for rehabilitating degraded forest, VCS does require that the area is characteristic for the country's definition of forest.

5.2 Relevant IFM Activities

Of the four major activities under the IFM category, only the Logged to Protected Forest (LtPF) option fits with the circumstances of Rennell Island since the forests of Rennell are pristine, have never been logged on a commercial scale and are thought to harbour high biodiversity.

There are two applicable VCS-approved methodologies under the Logged to Protected (LtPF) option, listed below:

a. VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest

b. VM0011 Methodology for Calculating GHG Benefits from Preventing Planned Degradation

Of the two above methodologies, VM0011 allows for emissions from logging damage and road and skid trail construction to be included in the baseline. The baseline scenario for forest management includes selected

timber harvest practices. The quantification of avoided GHG emissions is determined based on a change in land use practice and an increase in carbon sequestration.

Key criteria of the VM0011 methodology are:

- The IFM project activity may contain more than one discrete area of land.
- The minimum duration of a monitoring period is one year and the maximum duration is 10 years.
- Project proponents are free to decide on the periodicity of verifications, however, under the VCS AFOLU Guidance Document, if verification does not occur within 5 years, 50% of the buffer account credits are cancelled.
- Carbon pools included: aboveground trees, dead wood, harvested wood products.
- Project emission source included: burning of biomass.
- A Historical Baseline Scenario derived from the historical practices of timber harvest must be used where data is available, otherwise a Common Practice Baseline Scenario determined from timber harvest plans shall be used.
- A planned timber-harvesting schedule has to be submitted by project proponents as part of the VCS PD.
- Project proponents have to submit a detailed description of the vegetation stratification adopted for the project area ex-ante.
- Baseline projections are calculated ex-ante and are not adjusted throughout the project lifetime.
- In all cases, where wood is harvested for conversion to wood products, carbon stock in the long-lived wood products pool must be included in the baseline case.
- The potential for illegal extraction of trees from the project area shall be assessed ex-ante and ex-post through a participatory rural appraisal (PRA) of the communities in and surrounding the project area.

The eligibility criteria above can all be met in the East Rennell World Heritage site.

6 LEGAL ANALYSIS

6.1 Applicable Laws

It's not yet clear who would be the REDD project proponent in East Rennell's case, whether it would be managed as a community-based effort or a combination of government agencies and community enterprise, or what role the NGO Live and Learn would play. Therefore, if a REDD initiative were to receive funding, one of the first steps would be to determine the project proponent – who is the legal entity that would enter into a buy/sale contract for the credits.

While almost 90% of the forest land is owned by clans, as is typical in a Melanesian land tenure system, laws that deal with customary rights over land and the associated bundle of rights with owning land (e.g. timber, carbon, water, etc.) aren't clearly defined in the Solomon Islands. Since the business-as-usual scenario is that logging will occur in the future, the most relevant law is the Forest Resources and Timber Utilization Act, last amended in 2000. This Act was designed to regulate forest management including logging and has been amended repeatedly, starting with the original act known as the Forests Act of 1960, and amended in 1969, 1977, 1982, 1984, 1990, 1991, and 2000. None of the amendments clearly differentiate landowner rights versus timber rights, and customary ownership is not defined clearly, even though 88% of the land is under that form of ownership. The Revised Solomon Islands Code of Logging Practice (2002) is an additional regulation that specifies particular practices that a timber concessionaire must follow to reduce environmental impacts. However, there appears to be limited ability by the State to monitor compliance with the Code of Logging Practice. A new Forest Bill was drafted in 2004 that policy experts believe may offer better guidance in relation to timber rights on customary lands, but has yet to be voted on by the parliament. Figure 5 illustrates the major steps involved in the issuance of a logging concession on customary land.

Figure 8: Legal steps needed to acquire a timber concession (Public Solicitor's Office 2011)

While Figure 8 does suggest that customary landowners do have some say in the granting of timber rights, in practice the voices of dissenting groups are seldom heeded. Another issue is that often there are overlapping claims on customary lands from different clans and no formal mediation process exists to help solve the problem, nor is there a functioning Lands Registration Office that can grant recognition and title to customary lands (Corrin 2012). Potentially problematic for REDD projects is that there may be a statutory restriction that prevents customary landowners from entering into a contract to sell emission reduction credits. This would need to be further clarified and may require an amendment to the Land and Titles Act that would exempt REDD contracts (Corrin 2012).

6.2 Governance in Relation to REDD

During the last two decades, log sales have been the primary driver of export earnings (URS 2006). The high importance that log sales have had on export earnings combined with weak governance in regulating and monitoring compliance has resulted in the logging companies for all practical purposes enjoying '*carte blanche*' in the Solomon Islands. This status has manifested itself in several ways that would directly and indirectly affect REDD projects:

- By 2008, the total amount of log exports exceeded by six times the sustainable production of timber, and has meant that undisturbed lowland forest appropriate for REDD is practically non-existent on a national level.
- If a logged-to-protected REDD project were initiated, its risk rating would be high given the weak governance and lack of compliance by logging companies. High-risk ratings lower financial feasibility since a larger percentage of carbon credits would need to be set-aside in a non-permanence buffer. Of note is that among developing countries, the Solomon Islands rank high for income potential from REDD, but low for governance (Figure 9).
- Underpayment of timber royalties and duties totalling hundreds of millions of dollars has resulted in even weaker state regulatory agencies without the resources to effectively carry out their duties. Furthermore, this foregone tax revenue could have funded development and infrastructure projects that would have benefitted a significant percentage of the population.

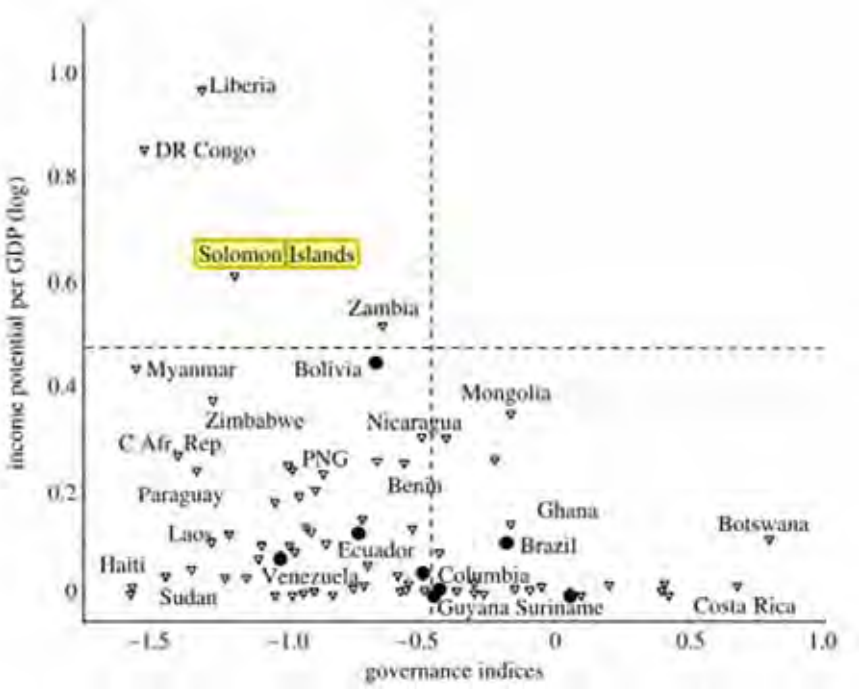

Figure 9: Relationship between income potential (expressed as percentage of GDP, log transformed) and governance.

The Governance index used is the mean of two variables measuring law enforcement and corruption perception. Lower values indicate more severe governance problems (Kaufmann et al. 2005). Filled circle – Amazon countries; triangle – non-Amazon countries with past net deforestation. None of the countries are located in the top right quadrant of the figure where high income potential would coincide with governance levels potentially needed to implement REDD schemes effectively (source: Ebeling and Yasue 2008)

7 POTENTIAL TO GENERATE CARBON CREDITS

7.1 Project Boundaries And Scope

7.1.1 Spatial Boundaries

The spatial boundaries of this potential REDD site should include the forest types on East Rennell that would be logged under the baseline scenario, which encompasses the entire island except a narrow belt of mangrove forest on the lakeshore and the short stature forest found on the very steep karst ridgelines near the coast. The revised Solomon Islands Code of Logging Practice (2002) mandates a maximum allowable slope that can be logged of less than 30°. Figure 6 indicates slope classes on Rennell with dark red representing slopes that exceed 30°.

Figure 10: Rennell Island with slope classes in degrees calculated from 90m SRTM data.
Dark red colour indicates very steep slopes (>= 30 degrees slope) to be excluded from logging.

From a total area of 18,476 ha, only 26 ha was identified with slopes exceeding 30° (Figure 10). An additional 430 ha on karst ridges have also been excluded since tree sizes are limited along with commercial species. A socio-economic assessment of the four East Rennell villages estimated that the total area under cultivation or in fallow was approximately 6,000 ha and this area would be excluded from logging (UNEP 2008). After deducting the abovementioned exclusions, the total effective logging area equals 12,000 ha.

7.1.2 Temporal Boundaries

Logged-to-protected REDD projects are typically for 30 years, and two logging cycles are foreseen during the project life cycle, with the second cycle starting in year 11, and follows common practice in the Solomon Islands. While two cycles are contemplated, it should be noted that the emission estimates have only been examined for the first ten years in the project cycle since VCS requires that a new baseline be developed after the project's first decade.

7.1.3 Carbon Pools

For logged to protected project types, the carbon pools to be measured are typically restricted to biomass in the aboveground tree component and do not include non-woody above ground vegetation since its total contribution is normally insignificant. The selected methodology, VM0011, lists the following carbon pools shown in Table 2. Harvested wood products under a baseline scenario are included and the percentage that goes to long-lived wood products needs to be estimated.

Table 2: List of carbon pools and which ones are to be included in the GHG methodology according to VM0011

Carbon pools	Included/Optional/Excluded	Justification / Explanation of choice
ABG trees	Included	The stock change in the ABG tree biomass shall be estimated
ABG non-trees	Excluded	Exclusion is always conservative when forests remain as forests
Belowground	Excluded	Unlikely to change significantly in forests remaining as forests and is difficult to measure – omission is conservative
Dead wood	Included	Required under VCS Tool for AFOLU Methodological issues
Harvested wood products	Included	Will be greater in baseline than project scenario and significant
Litter	Excluded	Insignificant and exclusion is conservative
Soil organic carbon	Excluded	Exclusion is always conservative when forests remains as forests

7.2 Modelling The Baseline And With-Project Scenarios

In order to model the business as usual or baseline scenario, reliable estimates of the following parameters are needed:

a. Total biomass in unlogged forest,
b. Biomass that would be extracted during logging and the percentage that would go toward long-lived wood products,
c. Biomass that would be killed due to road, skid trail construction, and felling damage, and
d. Regrowth rates post logging.

7.2.1 Total Biomass In Unlogged Forest

There is a total absence of published biomass studies for the Solomon Islands. Whitmore (1966, 1969, 1989a, 1989b) was one of the few authors that installed a systematic array of plots in the Solomon Islands, but his work focused on forest ecology and the silvics of various commercial species and did not measure biomass. While the Solomon Islands will have fewer tree species compared to PNG, biomass within the same forest types should be similar, and a decision was made to use published studies from PNG. However, since average tree height on East Rennell is roughly 20m, considerably shorter than most PNG lowland forest, biomass on this island is expected to be substantially less. Table 3 lists the studies that measured biomass throughout PNG.

Table 3: Summaries of aboveground live biomass plots across PNG (Bryan et al. 2010)

Name	Biomass (t/ha)	Annual mean temperature (°C)	Reference
Mt Hagen mixed 1	375	8.3	Powell, 1970
Mt Hagen mixed 2	411	10.2	Powell, 1970
Mt Hagen mixed 4	493	12	Powell, 1970
Mt Hagen *Nothofagus* 5	458	12	Powell, 1970
Chimbu mixed	350	13	Edwards and Grubb, 1977
Finschaffen	597	26.3	Abe et al., 2000
Madang Ramu	320	27.5	G. Weiblen (unpublished data)
Mt Bosavi	311	23.8	Shearman (unpublished data)
Mt Missim	428	19.1	Pratt, 1983
Nothofagus pullei	333	12.2	Ash, 1988
Nothofagus grandis	296	14	Ash, 1988
Mixed forest	180	13.4	Ash, 1988
Montane conifer	118	10.4	Ash, 1988
Mixed (*Nothofagus*) Kutubu limestone	270	21.9	Ash, 1988
Mixed (*Nothofagus*) Kutubu volcanics	378	23.1	Ash, 1988
Vanimo 1	414	28.4	Cameron and Vigus, 1993
Vanimo 2	441	28.4	Cameron and Vigus, 1993
Kapiura 1	328	28.3	Cameron and Vigus, 1993
Kapiura 2	361	28.3	Cameron and Vigus, 1993
Kumusi 1	479	28.1	Cameron and Vigus, 1993
Makapa 1	305	25.5	Bryan et al. (submitted)
Makapa 2	230	25.5	Bryan et al. (submitted)

To adjust for the shorter stature of trees on Rennell, while still utilizing published PNG biomass estimates, a decision was made to utilize the 25th quartile (300 t/ha) rather than the mean biomass from the range of estimates presented in Table 3. Therefore, from Table 3, of the listed biomass estimates, 75% are greater than 300 t/ha, which should represent a conservative estimate for Rennell until actual biomass sampling has been done. While tree stature is less comparable to PNG forest, many large diameter trees exceeding 100cm were counted in the sample points during the rapid forest survey. Results from the point sampling corroborate this fact; a mean basal area of 30 m^2/ha was measured from 30 sample points and is indicative of primary undisturbed forest (Table 1).

7.2.2 Biomass Extracted During Logging And Percentage Toward Long-Lived Wood Products

The principal data source for this section are the National Forest Resource Assessment reports (URS 2003 and 2006) that examine log export volumes over 10 years (Table 4). Following the same logic from Table 3 of utilizing the 25th quartile value, and using the 2006 URS assessment for merchantable volumes from seven islands provides an estimate of 21m^3/ha.

Table 4: Summary of merchantable volumes for unlogged natural forests with export potential.

Province	2003 assessment[1]		2006 assessment[2]	
	(m^3/ha)	(m^3)	(m^3/ha)	(m^3)
Guadalcanal	14	623,000	12	481,200
Western	41	2,632,200	42	2,079,000
Isabel	23	1,796,300	21	1,190,700
Choiseul	41	3,653,100	31	2,573,000
Makira	35	735,000	28	487,200
Malaita	22	655,600	26	751,400
Central	43	288,100	49	279,300
National		10,383,300		*7,841,800*

Source: 1 URS (2003), note that Malaita and Central have been included to allow for a direct comparison with 2006 data
2 URS

The annual logging plans for the two active timber concessions on West Rennell were obtained from the Ministry of Forestry,. In addition to the planned harvest volumes in 2012, extracted volumes were reported for 2011 and were 10m^3/ha and 21m^3/ha (Fig. 4, B1 and A1 concessions, respectively) with the mean of these two values being 20.5m^3/ha. Therefore, while being a limited sample, the timber volumes extracted on West Rennell from similar forest types to those on East Rennell suggest that 21m^3/ha is a valid and conservative estimate.

Timber volumes shown in Table 4 can be easily converted to biomass by multiplying the mean species-wide wood density for Southeast Asia, 0.57 t/m^3 (Reyes et al. 1992). A second step is to approximate the logs and branches left in the forest as waste. A Winrock study estimated that 48% of the total biomass is extracted with the remaining 52% left as waste, which equals 25.32 t/ha of biomass (Casarim et al. 2010).

For the biomass that is extracted as logs and eventually processed, VM0011 provides an equation to calculate the amount of carbon stock sequestered in long-lived wood products, and is shown in Equation 1 below.

Eq. 1:
$$C_{WP,i|BSL} = \sum_k \left(C_{EX,i,k|BSL} * (1 - WW_k) * (1 - SLF_k) * (1 - OF_k) \right)$$

Where:

$C_{WP,i\|BSL}$	carbon stock sequestered in wood products in stratum i as a result of planned timber harvest in the baseline scenario, in tC·ha^{-1};
$C_{EX,i\|BSL}$	mean carbon stock of extracted timber per unit area in stratum i, tC·ha^{-1};
WW_k	fraction of biomass carbon from wood waste immediately emitted as a by product of milling operations for wood product k, dimensionless; [17]
SLF_k	fraction of biomass carbon for wood product k that will be emitted to the atmosphere within 5 years of timber harvest, dimensionless; [18]
OF_k	fraction of biomass carbon for wood product type k that will be emitted to the atmosphere between 5 and 100 years of timber harvest, dimensionless; [19]
i	1, 2, 3 ...M strata; and
k	wood product classes (1. sawnwood, 2. wood-based panels, 3. other industrial roundwood, 4. paper and paper board, and 5. other).

The logs are exported mostly to Malaysia, China, and South Korea and the end products are assumed to be either boards or plywood. Given the preceding assumptions, Equation 1 indicates that about 16% of the

carbon goes toward long-lived wood products, which are considered an emission sink in the carbon accounting.

7.2.3 Biomass Lost Due To Mortality, Road/Skid Trail, And Log Deck Construction

Data on mortality of residual trees was assessed from various studies in Malaysia and Indonesia and was conservatively set at 5% in the first year, declining to 2% by the second year, and then by year 5, the last year that includes logging-inducted mortality, being set to 1%[2] (Sist et al. 2002, Cassarim et al. 2010). The percentage area cleared for road/skid trails and log decks was set at 5 and 6% respectively (Cassarim 2010). One of the most comprehensive studies addressing biomass lost from selective logging in PNG is Bryan's PhD dissertation (2012) that indicated on average logging reduced the total biomass by 33%, including the extracted timber, mortality, and road and skid trails. Applying the abovementioned percentages for mortality, road, and log deck percentages combined with the 50 t/ha of biomass from logs that would be extracted, indicates that 30% of the total biomass would be eliminated; very similar to Bryan's estimate. That percentage is considered conservative since other studies calculated that 50% of the biomass was lost from logging (Fox et al. 2011) (Tangki and Chappell 2008).

7.2.4 Biomass Regrowth Post-logging

Regrowth post-logging is one of the most variable parameters with some studies showing a 2.5 tC/ha/yr rate (Brown and Lugo 1990), while others indicate sequestration as high as 7.5 tC/ha/yr to 10 tC/ha/yr. (Scatena et al. 1993, Hughes et al. 1999). Fox et al (2011) analysed a series of PNG forest plots and measured a sequestration rate of 1.12 ± 3.41 tC/ha/yr, which was chosen for the baseline sequestration rate for this study. The same study in unlogged primary forest indicated a rate of 0.23 ± 1.57 tC/ha/yr.

Based on the biomass parameters discussed in the above subsections, a spreadsheet model was constructed to estimate the potential emission reductions with the results shown on the following page.

7.2.5 Annual Area Logged

In Table 5, the annual logging area was assumed to start small at 500 ha and then expand as the company gains more equipment and personnel and eventually reaches a maximum of 2,000 ha/yr by year 8. From discussions with a former logging surveyor the extent of the annual logging coupe is conservative[3]. An additional note is that the Samling Company, one of Malaysia's largest wood products companies with concessions around the world, operates two timber concessions on West Rennell and would have the resources and personnel to quickly log East Rennell. Given the controversial nature of this scenario, if it did move forward, it would be in the logger's best interest to accelerate the logging as soon as possible and thus the logging area schedule and number of years used in this baseline are viewed as conservative.

[2] The percentages are in addition to the natural (background) mortality found in unlogged forest.

[3] Personal communication – Kennedy – former logging surveyor.

Table 7: Baseline emission sources and sinks per hectare for the first ten years under an industrial logging scenario

Baseline Activity	Project Yr.	Annual vol. Cut	Annual Coupe Size	Baseline biomass accounting (tons dry matter)										Yearly baseline CO_2 emissions (t/ha)								BASELINE
				AG Biomass (tons dry matter)			Post-logging Biomass Components under Baseline					Sinks		Emissions Sources						Emissions Sinks		
		m3/ha	Area Logged (ha)	Total	Commercial	Non-Commercial	Removed as Timber	Dead logging debris	Accum. Mortality post-logging	Roads and skid trail	Landings	LLWP Deduction	Accumulated Regrowth	Removed as Timber	Dead logging debris	Mortality to residual stand	Roads and skid trail	Landings	Total Sources	LLWP Deduction	Sequestration	Total Emissions w/out sequest.
	0			300.0	210.0	90.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0
Logging	1	21	500	228.5	160.0	68.6	12.0	13.0	13.53	18.0	15	1.9	0.0	18.4	23.8	24.8	33.0	27.5	127.5	-3.51	0.00	124.0
Logging	2	21	700	275.5	192.9	82.7	12.0	13.0	18.84	18.0	15	1.9	1.12	18.4	23.8	34.5	33.0	27.5	137.2	-3.51	-2.05	131.7
Logging	3	21	1000	275.5	192.9	82.7	12.0	13.0	23.78	18.0	15	1.9	2.24	18.4	23.8	43.6	33.0	27.5	146.3	-3.51	-4.11	138.7
Logging	4	21	1000	275.5	192.9	82.7	12.0	13.0	26.38	18.0	15	1.9	3.25	18.4	23.8	48.4	33.0	27.5	151.1	-3.51	-5.95	141.6
Logging	5	21	1200	275.5	192.9	82.7	12.0	13.0	28.98	18.0	15	1.9	4.17	18.4	23.8	53.1	33.0	27.5	155.8	-3.51	-7.64	144.7
Logging	6	21	1800	275.5	192.9	82.7	12.0	13.0	28.98	18.0	15	1.9	5.10	18.4	23.8	53.1	33.0	27.5	155.8	-3.51	-9.35	143.0
Logging	7	21	1800	275.5	192.9	82.7	12.0	13.0	28.98	18.0	15	1.9	5.99	18.4	23.8	53.1	33.0	27.5	155.8	-3.51	-10.98	141.4
Logging	8	21	2000	275.5	192.9	82.7	12.0	13.0	28.98	18.0	15	1.9	6.84	18.4	23.8	53.1	33.0	27.5	155.8	-3.51	-12.55	139.8
No logging	9	21	2000	275.5	192.9	82.7	12.0	13.0	28.98	18.0	15	1.9	7.71	18.4	23.8	53.1	33.0	27.5	155.8	-3.51	-14.13	138.2
No logging	10		0	275.5	192.9	82.7	0.0	0.0	0.00	0.0	0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0	0.00	0.0
			12,000																			

Table 6: With-project emission sources and sinks per hectare for first ten years under a logged-to-protected scenario

	With project biomass accounting (tdm)				With project CO_2e Emissions			
	AG Biomass (tons dry matter)				Total Biomass Growth			Sink
	Total	Commercial	Non-Commercial	Annual increment (tdm)	Total	Commercial	Non-Commercial	w_Project Sequestration
No activity	300.0	210.0	90.0		550.0	385.0	165.0	0.0
Monitoring	300.6	210.4	90.6	0.6	551.0	385.7	165.3	0.0
Monitoring	301.1	210.8	91.1	0.6	552.1	386.4	165.6	1.9
Monitoring	301.7	211.2	91.7	0.6	553.1	387.2	165.9	1.9
Monitoring	302.2	211.6	92.2	0.6	554.1	387.9	166.2	2.5
Monitoring	302.8	212.0	92.8	0.6	555.1	388.6	166.5	3.4
Monitoring	303.4	212.4	93.4	0.6	556.2	389.3	166.8	4.3
Monitoring	303.9	212.7	93.9	0.6	557.2	390.0	167.2	5.1
Monitoring	304.5	213.1	94.5	0.6	558.2	390.7	167.5	5.9
Monitoring	305.0	213.5	95.0	0.6	559.2	391.5	167.8	6.8
Monitoring	305.6	213.9	95.6	0.6	560.3	392.2	168.1	7.5

Table 5: Estimate of potential credits (VCU) per hectare that would be generated from emission reductions

VCS Credit Generation					
From logging	From sequestration	Subtotal Credits	Non-permanence Risk Withholdings	Leakage Deduction	Total Credits (VCU/ha)
0.00	0.0	0.00	0.00	0.00	0.00
124.00	0.0	124.00	(37.20)	(12.40)	74.40
131.68	1.9	133.58	(40.07)	(13.36)	80.15
138.68	1.9	140.58	(42.18)	(14.06)	84.35
141.61	2.5	144.11	(43.23)	(14.41)	86.46
144.69	3.4	148.09	(44.43)	(14.81)	88.86
142.98	4.3	147.28	(44.18)	(14.73)	88.37
141.35	5.1	146.45	(43.94)	(14.65)	87.87
139.79	5.9	145.69	(43.71)	(14.57)	87.41
138.20	0.0	138.20	(41.46)	(13.82)	82.92
0.00	0.0	0.00	0.00	0.00	0.00

7.3 Potential Carbon Credit Generation

Tables 5 – 7 provide estimates of emission sources and sinks for the first ten years of a VCS project and the total credits that could be generated. While VCS projects typically span 30 years, only the first ten years are used in this feasibility study since the standard requires a new baseline to be developed and validated after year 10. National policies can change over time that could strongly influence the additionality and baseline, and predicting further into the future than a decade, given the changes that can rapidly occur, is not practical.

Table 8 provides detail on how cumulative biomass losses from mortality shown in Table 5 were estimated. The percentage of mortality due to logging declines over a five-year period (Sist et al. 2002). The initial pre-logging biomass of 300 t/ha is multiplied by the percentage of mortality for each year shown in Table 9.

Table 8: Estimated biomass lost due to mortality post-logging for the baseline scenario.

Yr. of Project	Mortality (t/ha) by Logging Coupe								TOTAL Accumulative Mortality (t/ha)
	1	2	3	4	5	6	7	8	
1									
2	0								0
3	13.5								13.53
4	5.3	13.5							18.84
5	4.9	5.3	13.5						23.78
6	2.6	4.9	5.3	13.5					26.38
7	2.6	2.6	4.9	5.3	13.5				28.98
8	0.0	2.6	2.6	4.9	5.3	13.5			28.98
9	0.0		2.6	2.6	4.9	5.3	13.5		28.98
10	0.0			2.6	2.6	4.9	5.3	13.5	28.98

Table 9: Percentage mortality post-logging (Sist et al. 2002)

Mortality (Yrs. after logging)				
1	2	3	4	5
5%	2%	1.3%	1%	1%

Biomass growth on a cumulative basis was estimated the same way as in Table 6 for both the baseline and with-project scenarios and shown in Table 10. Additionally, as with mortality, biomass growth accumulation is assumed to decline over time (Sist et al. 2002).

Table 10: Biomass accumulation from growth under the baseline (logging) scenario.

Yr. of Project	Biomass Accumulation by Logging Coupe										
	1	2	3	4	5	6	7	8	9	t/ha	Growth rate
1											
2	1.12									1.12	
3	1.12	1.12								2.24	0%
4	1.01	1.12	1.12							3.25	10%
5	0.92	1.01	1.12	1.12						4.17	20%
6	0.94	0.92	1.01	1.12	1.12					5.10	20%
7	0.89	0.94	0.92	1.01	1.12	1.12				5.99	25%
8	0.85	0.89	0.94	0.92	1.01	1.12	1.12			6.84	30%
9	0.86	0.85	0.89	0.94	0.92	1.01	1.12	1.12		7.71	30%
10	0.77	0.86	0.85	0.89	0.94	0.92	1.01	1.12	1.12	8.48	40%

7.3.1 Non-Permanence Withholding For Risks

Under VCS rules, REDD projects are required to evaluate the risks that affect the permanence of the carbon stocks and include natural, political, social, and management related risks. A percentage withholding of credits is estimated based on the identification of the assessment of the most serious identified risk, and range from 10% to 30%, or at times higher for particularly risky projects. Table 7 applies a 30% risk withholding, which is due to low capacity to monitor and regulate the logging industry and low overall governance. The VCS tool is normally applied with the project proponents to accurately weigh the risks and at this stage is somewhat premature to use; it also provides only an indicative idea. After five years of project implementation without major incident, a release of these withheld credits can be requested.

7.3.2 Leakage

Leakage is the displacement of emissions from the project site to another site. Experience has shown that once increased funds are allocated, it leads to improved management, some of the activities that produced deforestation and degradation simply move to an area that doesn't have the same level of scrutiny. For IFM projects, there are two components to leakage – market-based leakage and project leakage. Market-based leakage addresses the demand at a provincial or national level for wood and what effect stopping logging will have on that demand. Since East Rennell hasn't yet become an active logging concession, market-based demand and associated leakage should not be a factor. However, in order to ensure that the final emission reduction estimates are conservative, a 10% leakage deduction has been included.

The last column in Table 7 shows the verified carbon units (VCUJ) after the risk withholding and leakage deductions have been included. First year emission reductions are predicted to be 74 VCU/ha and over ten years range from 74 to 89 VCU per ha with a mean of 76 VCU/ha.

8 COSTS/BENEFITS ANALYSIS

8.1 Potential Revenue from VCU Sales

The financial viability analysis factored in three price scenarios for the sale of VCU, ranging from US$ 3, US$ 6, and US$ 9 per VCU (tCO_2e). The price scenarios are pegged to what projects are currently receiving based on their stage of development. Projects that have completed a PDD but have not yet been validated are receiving on average US$ 3 per ton CO_2e for emission reductions. REDD projects that have been both validated and verified, with the credits ready to be issued received a mean price of US$ 9 per VCU in 2011 (Peters-Stanley and Hamilton 2012). Under the lowest price scenario, gross revenue ranges from US$ 110,000 to US$ 524,000, while the medium price scenario ranges from US$ 220,000 to US$ 1.05 million (Table 11).

Table 11: Potential gross revenue for the first ten years applying three price scenarios for carbon credits (VCU).

Baseline Activity	Project Yr.	VCS Credit Generation	Price Scenario VCU/ha			Gross Revenue/yr. (VCU/ha x No. ha logged)		
			Low	Med	High	Low	Med	High
		Total Credits (VCU/ha)	$3	$6	$9	$3	$6	$9
	0	0.00	$ -	$ -	$ -	$ -	$ -	$ -
Logging	1	74.40	$ 223	$ 446	$ 670	$ 111,596	$ 223,192	$ 334,788
Logging	2	80.15	$ 240	$ 481	$ 721	$ 168,312	$ 336,624	$ 504,936
Logging	3	84.35	$ 253	$ 506	$ 759	$ 253,052	$ 506,104	$ 759,156
Logging	4	86.46	$ 259	$ 519	$ 778	$ 259,392	$ 518,784	$ 778,176
Logging	5	88.86	$ 267	$ 533	$ 800	$ 319,881	$ 639,762	$ 959,644
Logging	6	88.37	$ 265	$ 530	$ 795	$ 477,176	$ 954,352	$ 1,431,528
Logging	7	87.87	$ 264	$ 527	$ 791	$ 474,506	$ 949,011	$ 1,423,517
Logging	8	87.41	$ 262	$ 524	$ 787	$ 524,471	$ 1,048,941	$ 1,573,412
No logging	9	82.92	$ 249	$ 498	$ 746	$ 497,530	$ 995,060	$ 1,492,590
No logging	10	0.00	$ -	$ -	$ -	$ -	0.00	0.00

If the project proponent could wait until validation and verification have taken place and the credits are ready to be issued, then there is a likely chance that gross revenue could range from US$ 334,000 to US$ 1.57 million. The last year of the ten-year cycle in Table 11 does not generate income from credit sales; and thus, it is best to calculate an average over ten years. Additionally, based on common practice in the Solomon Islands that loggers re-enter a logged over area after ten years, by year 11 in the project cycle, the baseline scenario assumes that logging would begin again. However, the baseline would need to be validated again in year ten to reflect current site conditions and national policies. It needs to be emphasized that the preceding revenue projections while conservative in nature are gross estimates and have not factored in the transaction or operational costs, which is discussed in the following section.

8.2 Estimated Transaction and Operational Costs

The costs of an IFM project can be broken down into two basic components, which are the origination and marketing of the carbon credits – often referred to as transaction costs, and annual operating costs that would initially include any infrastructure costs, such as the construction of guard posts, access roads or trails, etc.

Table 12: Approximate transaction costs to be able to sell carbon credits compliant with the Verified Carbon Standard (VCS).

Activity Description	Costs Estimate (USD)
VCS compliant biomass survey (sample error +/-10%) [a]	50,000 – 55,000
Writing of full VCS PDD using new VCS/CCBA template	30,000
VCS validation	15,000
Annual monitoring using LANDSAT & Rapid Eye imagery (incl. only GIS/RS analysis) [a.]	25,000
Reporting	10,000
VCS verification	25,000
Registry and credit issuance fees	2,500
Technical support services/interaction with VCS audit body before/during validation & verification	25,000
TOTAL (range)	**$182,500 – 187,500**

[a.] Assumes in-kind labour costs
[b.] Patrolling and field-based monitoring assumed to be part of annual operating costs
[c.] Assumes over-the-counter transaction of credits and no additional costs included to list project on a carbon exchange

Table 12 provides an approximate estimate of the transaction costs through the verification phase and issuance of the carbon credits. A typical timeframe for the completion of this process would be from three to five years. During this time, the carbon credits could either be sold under a 'futures' or 'forward sale' contract that could take place directly after VCS validation or could be held with the credits pooled together from multiple years. In any event, the accounting would take into account the number of years needed to obtain fungible credits subtracted by the transaction costs plus operational costs.

Given that there is only one road into East Rennell and sea access is practically non-existent, the necessity for regular monitoring of the forest is not as high compared to many other REDD sites. The annual operating costs would mostly be comprised of community monitoring and inter-village meetings for coordination and communication, and should not exceed US$ 20,000 – US$ 30,000/year.

One cost not yet included would be to broker the credits. The majority of carbon credits generated by VCS projects are marketed through over-the-counter transactions, which essentially involves a buyer and seller of credits, and typically a broker. A broker's fees can vary depending on how the contract is structured and whether the broker contributes financing to develop the project. In this case, the funds to develop a REDD project would be through donors; thus, the brokerage fees should be approximately 5% of the total contract amount.

Even under the assumption that short-term prices would be low at US$ 3 per VCU, the gross revenues would considerably exceed the transaction and operational costs.

8.3 Costs/Benefits From A Community Standpoint

8.3.1 Benefits

This section does not provide information on a comprehensive financial analysis typically done for corporate clients, but rather discusses what the particpating community members stand to gain or potenitally lose by choosing a REDD option versus logging the site. Additioinally, there are various unknowns in the Solomon Islands that factor into a discussion of potential benefits and costs; first of which is that it's still very unclear whether the State will tax REDD credits or how the revenue should be distributed in an equitable and transparent manner.

The Gross National Income (GNI) in the Solomon Islands is US$ 1,110 [4] and is used to measure the financial effect that REDD revenue could have on an average household. Given that there are so many unknowns about REDD revenue distribution, this analysis uses gross revenue divided by the total households and gross revenue divided by total villages as two ways to assess benefits from the communities' perspective (Table 13). These figures may not represent actual amounts that the customary landowners would receive since it is likely that some revenue would go toward the State and/or a broker.

Table 13: Gross annual revenue projections per East Rennell household and per village.

Project Year	Gross Revenue/Household/Yr. 200 households			Gross Revenue/Village/Yr. 4 Villages		
	Low	Med	High	Low	Med	High
	$3	$6	$9	$3	$6	$9
2	$558	$1,116	$1,674	$27,899	$55,798	$83,697
3	$842	$1,683	$2,525	$42,078	$84,156	$126,234
4	$1,265	$2,531	$3,796	$63,263	$126,526	$189,789
5	$1,297	$2,594	$3,891	$64,848	$129,696	$194,544
6	$1,599	$3,199	$4,798	$79,970	$15,941	$239,911
7	$2,386	$4,772	$7,158	$119,294	$238,588	$357,882
8	$2,373	$4,745	$7,118	$118,626	$237,253	$355,879
9	$2,622	$5,245	$7,867	$131,118	$262,235	$393,353
10	$2,488	$4,975	$7,463	$124,382	$248,765	373,147
Median	$1,448	$2,896	$4,345	$72,409	$144,818	$217,227
Median/GNI	130%	261%	391%			

Published estimates of the total population in the four villages range from 500 to 800 people (Thorsell and Molloy 1998), and using the higher estimate equates to 160 households (assuming 5 people/household). Because some families have moved to Honiara or other islands in search of employment, if a REDD project did generate significant community benefits it is likely that many of those migrants would claim customary rights; and as such Table 13 adds an additional 40 households, with the table showing gross revenue divided by 200 households. On a household basis, the revenue distribution among the three VCU price scenarios is quite attractive and is due to East Rennell's low population. Potential revenue from REDD greatly exceeds Gross National Income from 1.3 to 4 times the GNI (Table 13).

However, of note, is that REDD projects rarely distribute directly to households and most frequently community members as a majority decide on the most pressing needs which can be funded by REDD credit sales. The added advantage in funding village level development projects is that this could help diminish feelings of envy from community members that aren't customary landowners.

Typically, communities reap a variety of non-tangible benefits from REDD logged-to-protected projects such as flood and erosion control, the provision of clean drinking water, maintenance of forest, freshwater, and near-shore marine habitats that provides protein sources from fish and game animals, etc.

[4] http://devdata.worldbank.org/AAG/slb_aag.pdf

8.3.2 Costs

It is assumed that donor funds would cover the costs of preparing the REDD project for market, along with an initial period of annual monitoring. After credit sales have been generated, the annual monitoring expenses and administrative expenses should be borne by the project proponents. However, there are foregone opportunity costs, mostly arising from the decision to not allow logging of the island, which are covered in the following section.

8.4 Potential Benefits Or Costs From Logging

8.4.1 Benefits

Round log exports remain the largest source of export earnings and have been increasing over the last ten years despite the warnings that demand far outstrips sustainable supply (Development 2003) (URS 2006). In 2011, exports surged 37% over the previous year and reached a total of SBD 1.5 billion or US$ 221million[5] (Table 14). Assuming that the government collects 25% of the preceding in royalties this would equate to US$ 55.25 million flowing into government coffers in 2011.

Table 14: National export statistics for timber by quarter for 2010 and 2011 in Solomon Island Dollars

Value of Export of selected commodities by quarter							
HS Code	Commodity	Qtr ended on same period ago % change	2011 Dec	Sep	Jun	Mar	Dec
	Total Timber	**37%**	**439,586**	**388,878**	**403,895**	**320,261**	**321,716**
4403	Timber Logs	33%	415,822	376,137	387,344	301,782	313,890
4407	Timber Sawn	192%	23,764	12,741	16,551	18,480	8,126

Logging concessions have generated considerable employment in rural areas. However, timber concessions are given out on a five-year basis and this timeframe does not encourage the logging companies to take a long-term view with one effect being employment with concessions generally is short term before the concessionaire moves on to another site[6].

The distribution of logging royalties on customary land is shown in Table 15 and indicates that the landowners receive 5% of total royalties, while the licensee receives 10%. The value for each commercial species is determined by the Ministry of Finance and set each quarter (see Annex 3). The table in Annex 3 shows 23 commercial species with a mean FOB price of US$ 112/m^3.

Table 15: Distribution of royalties from export timber and per hectare USD royalty allocation by stakeholder, assuming 41 m3/ha as mean commercial volume and $112/m3 as mean FOB timber price.

Stakeholder Description	Percent Allocation	Royalty allocation/ha (USD)
Logging contractor	60	1,411.20
Government	25	588.00
Licensee	10	235.20
Customary landowner	5	117.60
TOTAL	100	2,352.00

In an earlier section, the average exportable timber volume was determined to be 21m^3/ha and multiplying that times the mean FOB price of US$ 112/m3 equals roughly US$ 2,352/ha for royalties with US$ 117.60/ha allocated for the customary landowners. The licensee in many cases is also a landowner in the area being logged and is responsible for distributing the royalties to the landowners, along with paying all the costs required to obtain the permits.

[5] Statistical Bulletin: 6/2012, http://www.spc.int/prism/solomons/index.php/economic/trade-statistics

[6] Personal communication 2013, Kennedy on Rennell Island, former logging surveyor

Table 16: Comparison between mean REDD gross revenue per hectare using three VCU price scenarios and the royalty allocation to customary landowners from logging.

Gross Revenue/ha averaged over 9 yrs. from REDD			Logging
Low	Med	High	Scenario
$US3	$US6	$US9	(USD/ha)
$228.24	$456.47	$684.71	$117.60

Table 16 suggests that revenues expressed on a per hectare basis from the REDD credit price scenarios substantially exceed logging revenues allocated to landowners. However, it should be noted that REDD revenues are gross estimates and taxes, if any will be charged by the government, haven't been factored in. Nevertheless, even if the government decides to tax carbon credits at the same price as export timber (25%), both the medium and high price REDD scenarios still substantially exceed the revenue generated from logging. It is also assumed that transaction costs to bring this REDD project to market would be covered through grants.

The preceding comparison between timber and REDD revenues assumes that the customary landowners actually receive the stipulated percentages. Frequently, the clans are made many promises that are not fully delivered on, with the licensee using the excuse that costs were higher than anticipated. There is no government oversight of this allocation process and taking the case to the courts is financially prohibitive for most villagers.

9 RECOMMENDATIONS

1. REDD projects that participate on the voluntary carbon markets must be seen as an important hands-on learning experience that can provide much needed income to rural villagers in lieu of selling their logging rights and suffering the environmental consequences.

2. Clarification and legal recognition of carbon rights should be sought. VCS guidelines for verification require that the project proponent demonstrate legal tenure over the area; however, demonstrating clear legal tenure on customary lands is problematic in the Solomon Islands since the process is ambiguous, at best. There appears to be some effort at land reform and registering customary lands through a special office of the PM[7], reinforcement through donor funds could support the REDD case.

3. There is no national legislation that supports this conservation effort, and the island is certainly worthwhile of NPA status. However, it is important that in the formal justification for establishing Rennell as a NPA, there should be language that states that the conservation of Rennell will partially contribute to the Solomon Islands commitment to reduce GHG emissions. Including the preceding language in the justification for NPA status will help to meet the additionality criteria for the project site.

4. The feasibility of inserting language into the draft Forestry Bill that would clarify carbon rights should be explored. Further support would be needed to ensure that adequate consultation at the province level has taken place. The current Forest Utilization Act is widely unpopular, does not promote sustainable forest management, and does not take into account customary landowners.

[7] Personal communication with Stephanie Price

10 CONCLUSION

The cost/benefit analysis in this report suggests that REDD revenue for the four East Rennell communities could become a significant source of funds. However, there are various challenges to REDD implementation, including low capacity by State agencies and communities to effectively implement projects, widespread corruption, and comparatively weak governance. There are various policies that could be enacted that would improve the situation, such as the passage of the pending Forestry Act. The adoption of the Forestry Act with increased funding allocations toward monitoring and oversight of logging concessions would be a significant advance toward improved governance. Of paramount importance is that timber demand needs to be brought more in sync with supply, not only to ensure that there will be remaining forest for REDD, but more importantly to prevent the severe degradation of the nation's natural heritage with subsequent losses of environmental services that benefit a large percentage of the population, and will be increasingly needed to buffer the effects of climate change. The Solomon Islands are one of the few countries without a network of national protected areas, and may lose the chance to create one unless the rate of logging can be brought more under control. REDD could provide vital long-term funding to support a network of protected areas, starting first with East Rennell.

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ANNEX 1: Natural Values Of East Rennell WHS

(Excerpt from: East Rennell World Heritage Site Management Plan, January 2007, East Rennell World Heritage Trust Board, Solomon Islands)

A detailed overview of the natural values of East Rennell is available in the UNESCO World Heritage nomination file for East Rennell (see References). There has also been a substantial amount of information on the natural history of Rennell, although much of this is now quite old. Only a very brief summary of some aspects is given here.

Flora

The flora of East Rennell is markedly different from other parts of the Solomon Islands and diversity is lower than in the more westerly parts of the Solomon Islands.

There are 3 major vegetation types within Rennell and all are represented inside the World Heritage site. These are:

i) low mature forest of the karst ridge on the island perimeter
ii) tall forest of the island interior
iii) beach flora of the Lake Tegano margins

Some patches of mangroves are located on the edges of Lake Tegano.

Ten endemic plants have been identified and recorded. These include the endemic orchid ***ghasighui*** *(Dendrobium rennellii)*, which occurs on the small islands of Lake Tegano, as well as two endemic species of *Pandanus* sharing the local name ***haga***, (*P. lacustris* and *P. rennellensis*).

Fauna

Eleven species of bats occur in the area, including ***langa***, the Rennell flying-fox (*Pteropus rennelli)*, which is endemic to the island. Other species present are ***puli***, the bare-backed fruit-bat (*Dobsonia inermis)*, ***peka***, the Pacific flying-fox (*Pteropus tonganus)*. These 3 bats are believed to play key roles in the dispersal of the canoe tree. Canoes fashioned from this species provide the traditional means of transport around the lake. The spurred horseshoe-bat (*Hipposideros calcaratus*) and large Melanesian bent-wing bat (*Miniopterus propitristis*) are also present.

Some 43 species of breeding land and water birds occur in Rennell. Four species and 9 subspecies are endemic to Rennell itself, while 7 are subspecies endemic to Rennell and Bellona. ***Manusigi***, Australian dab-chick (*Tachybaptushas novaehollandiae)* and ***manukitai***, little pied cormorant (*Phalacrocorax melanoleucus)* are common at Lake Tegano. ***Higi,*** pink-spotted fruit dove (*Ptilinopus richardsii cyanopterus)* is endemic to Rennell and Bellona and is found mainly in the canopy but also uses the lower secondary vegetation. Endemic species include ***magighape,*** Rennell fantail (*Rhipidura rennelliana)* and ***ghoghobiu,*** Rennell shrike-bill (*Clytorynchus hamlinii).*

The ***tugihono*** or endemic sea krait (*Laticauda crockery*) is known only in Lake Tegano. The other species of sea snake in the lake is *Laticauda colubrina,* which is also found elsewhere in Solomon Islands.

There are 5 species of geckos, 4 skinks, 1 monitor lizard (*Varanus sp.*) and 3 snakes, all of which are species with widespread distributions and are typical of the region.

No amphibians have been recorded for Rennell Island so far. This is unusual, as the rest of the Solomon Islands has a rich and peculiar frog and toad fauna. This absence is probably explained by the topography and the lack of surface water (except for Lake Tegano). Rennell has 27 species of land snails, seven of which are endemic to the island. Coconut crab (*Birgus latro)* and two other species of land hermit crabs (*Coenobita sp.*) occur on the island. A total of 731 insects has been identified from collections made at Rennell and Bellona. Moths (Lepidoptera) have the greatest number of species (246, in total) with 35 species and 25 subspecies exclusive to Rennell and Bellona (Wingham, 1997).

ANNEX 2: Methods

The purpose of the forest survey is to systematically ground truth the land cover analysis conducted by my GIS/RS staff. Since basal area and various remote sensing variables are highly correlated such as canopy openness, colour, and texture and Forest Carbon Consultants applies eCognition, recognized as the most advanced remote sensing software to distinguish these variable, basal area measurements at various sample points can provide a robust ground-truthing method. Basal area is also strongly correlated with biomass and thus, a secondary benefit is that basal area sampling can rapidly indicate biomass present. Biomass was measured according to 3P sampling technique using a cruising prism available from Forestry Suppliers with a BAF[8] of 2. Cruising prisms were preferred over angle gauges such as the early Bitterlich sticks since the distance between the observer's eye and hand holding the device doesn't have to remain fixed.

Figure 11: Digital form created in DoForms Android app

The ground truthing process was to be exceptionally rapid without requiring further data entry then what is done in the field using tablet computers and freely available applications. This method was applied in Milne Bay, PNG but used a different application. The current digital form is shown in Figure 11, with the advantage that the app is available for Android and Apple tablets and phones; thus allowing me to bring two tablets (iPad and Samsung) and two Android phones that all run the same app containing the digital form, which provided two weeks of continuous field use without charging.

After the form is completed for each sample point it is stored in the Samsung tablet and once a 3G signal is available, the data can be sent to the server and is available for analysis as an Excel file that can subsequently be imported into ARCGIS software.

[8] BAF – basal area factor. The tree count is multiplied by the BAF to derive basal area per hectare

Figure 12: Map of Rennell with sample point locations conducted over three days of forest surveys.

In East Rennell, Bill Apusae with the NGO Live and Learn accompanied the author along with Felix Tahua, as the tree identifier and within less than 5 minutes fully understood how to enter the data, including capturing the GPS data automatically in the form. Sample points were systematically laid down every 200 to 500 meter along the trail according to the length of the trail visited during that day and in accordance with the overall target of gaining 30 to 40 sample points. Besides a count of trees inside the sample point, the number that were commercially acceptable by loggers was recorded along with the forest type and degradation level.

Figure 13: Entering data into tablet using Doforms app and GPS mapping software.

ANNEX 3: Value Schedule to Determine Royalty Payment by Timber Species

Table 17: Value Schedule (Jan – March 2013) to Determine Royalty Payment by Timber Species (source: Min. of Finance)

Timber Grade	Species Name	Regular Grade USD/m^3	Small Grade USD/m^3	Supper Small Grade USD/m^3	Low Grade USD/m^3
Grade 1	Insia bijuga (Kwila)				
	Vitex spp. (Vasa)				
	Palaquim (Pencil Cedar)	137	123	120	100
	Calophyllum	140	127	123	100
	Pometia spp. (Tuan, Akwa)	140	127	123	100
	Planchonella spp.	137	123	120	100
Grade 2	Schizomeria (Beabea)	123	113	109	96
	Dillenia spp.	113	104	100	93
	Gonostylus (Ramin)	120	113	104	93
	Terminalia brassii	117	109	100	88
	Terminalia (except T. brassii)	104	96	93	84
	Terminalia calamansanai	104	96	93	84
Grade 3	Canarium (Gnali)	109	100	96	93
	Burkella spp.	109	100	93	93
	Celtis spp.	104	96	93	84
	Astonia (Milky pine)	104	96	93	84
	Dysoxyllum spp.	104	96	93	84
	Eugenia (Water gum)	109	100	93	93
	Endosperma spp.	104	96	93	84
	Amoora spp.	104	96	93	84
	Campnosperma spp.	109	100	96	93
Grade 4	Maranthes spp.	96	93	84	73
	Parinari spp.	96	93	84	73
	Others	140	127	123	100