New Planting Procedure - Summary of Assessments

NPP Reference Number:	GGC-ECO-NPP-2025
Country of the NPP submission:	Papua New Guinea
RSPO Membership Number:	1-0493-24-000-00

Section 1: General Information

Guidance Note: In this section, the growers need to provide all the necessary information in relation to the new development projects. This includes the type of assessment conducted, location of the project, the type of permit currently obtained, the rights to use the land information, and all relevant information. The land clearing plans will be included in this section as well.

In this report it is intended that Ecocycle will carry out New Planting Procedure (NPP) activities with the purpose of NPP areas is ± 10,361.01 Ha where It is part of ecocycle areas and not covering land has planted oil palm plantation by cpmpany on the company areas before NPP process has finished. Ecocycle Limited is RSPO membership since 20 September 2024 with category is ordinary and sector of oil palm grower & country/teritory is Papua New Guinea.

Ecocycle Ltd have certificate of incorporation (No.1-123480236) dated on 25 July 2023 from Registrat of companies – Papua New Guinea. The company's land has planted and will be planting is totally on customary land which is mobilised through lease-lease back arrangements with the customary land owners, using Incorporated Land Groups (ILG).

The company have joint venture agreement between Ecocycle Limited and Pacific Agro Capital Limited (PACL) & Pacific Elite Investment Limited (PEIL) date on 5 August 2024 but the company has taken over management control against two estates in East Sepik and has taken over the management of the assets of three companies i.e Pacific Elite Investment Ltd (oil palm plantation company), Pacific Agriculture Company Ltd (oil palm plantation company) and Sepik Palm Oil Holdings Ltd (palm oil mill). Refer to JV agreement that PACL and PEIL are authorised and entitled to use and develop the oil palm land pursuant to the principal land use and development agreement and they are existing oil palm operators and has been acquiring land and clearing land for plantation and harvesting of FFB through leases obtained. Whereas, Ecocycle shall undertake the full development of the oil palm land and manage fully and solely the existing operations of PACL and PEIL in accordance to the terms herein created refer to the JV obligations.

Location

The assessment areas are located primarily in Angoram District, East Sepik Province, Papua New Guinea (PNG). The assessment area spans 38 km from east to west and 20 km from north to south. The landscape is generally

flat, with a gentle slope down towards the Sepik River in the south (14 masl). The northern region has the highest elevation of approximately 65 masl.

The entire area is managed as one contiguous management unit. The central point of the assessment area is the mill site, located at 143° 43.69' E, 4° 7.50' S. The total assessment area covers 46,568.33 hectares.
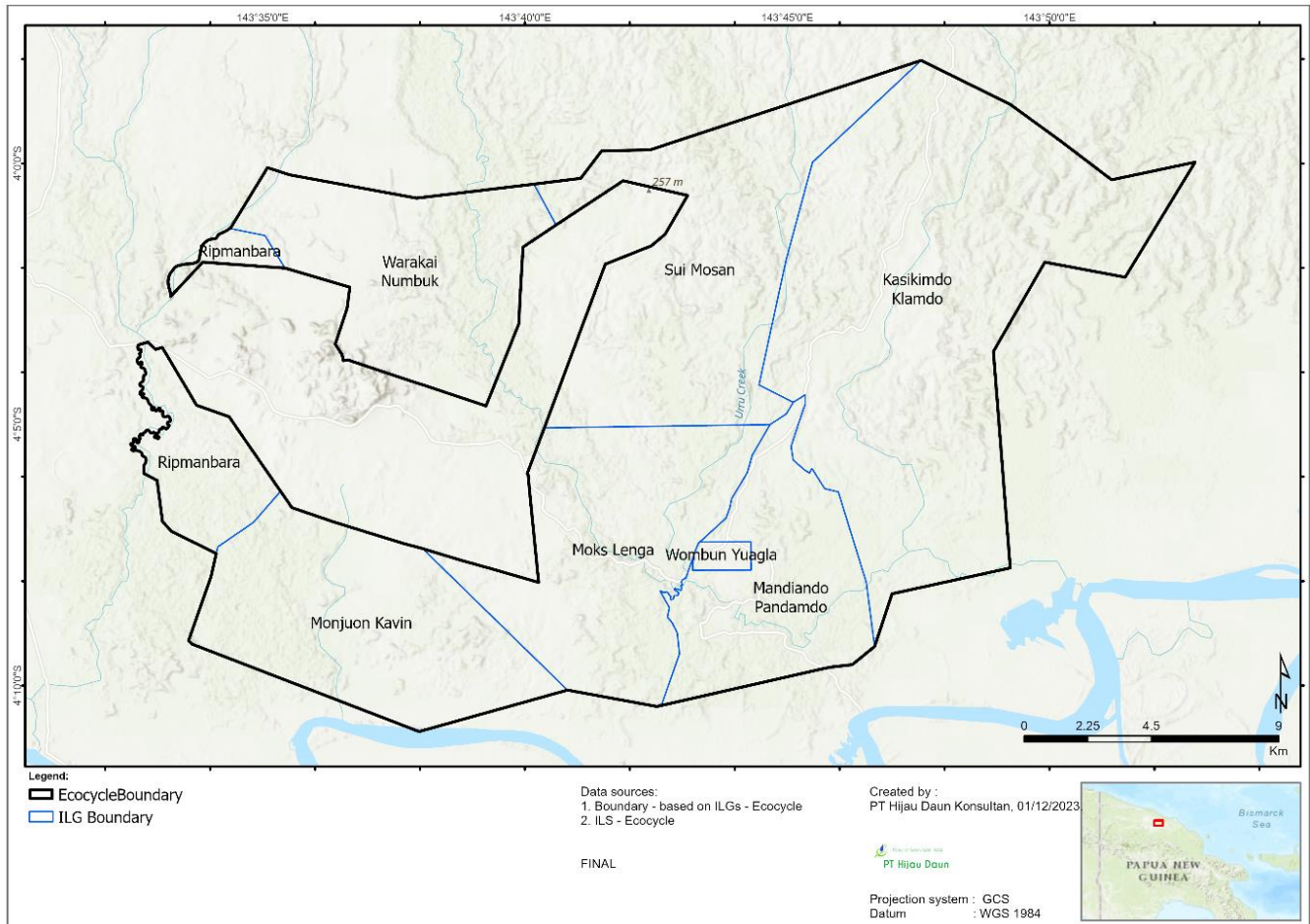

Figure 1.The ILGs within the assessment area.

The PACL & PEIL has secured a Lease-Leaseback Agreement with eight (8) Incorporated Land Groups (ILGs), granting the legal right to develop and manage the land for oil palm plantation and processing activities. These ILGs are represented in Figure 1, which outlines their respective boundaries. The ILGs involved in this agreement include:

- Mandiando Pandamdo Investment Ltd (ILG Mandiando Pandamdo) – Sagadik Land
- Kasikimdo Klamdo Investment Ltd (ILG Kasikimdo Klamdo) – Kionung Kalkap Land
- Sui Mosan Agro Ltd (ILG Sui Mosan) – Kaurinwia Land
- Moks Lenga Agro Ltd (ILG Moks Lenga) – Sagim Land
- Warakai Numbuk Investment Ltd (ILG Warakai Numbuk) – Yamban Land
- Ripmanbara Holdings Ltd (ILG Ripmanbara)
- Anglando Makar Holdings Ltd (ILG Monjuon Kavin) – Singambe Land

Types of Assessments Conducted

The company has conducted various assessments in compliance with RSPO New Planting Procedures (NPP), environmental laws, and local land governance requirements. These include:

- Integrated High Conservation Value (HCV) - High Carbon Stock Approach (HCSA) Assessment – Identifies areas that should be conserved and areas suitable for development. The HCV-HCS report includes annexes detailing FPIC processes conducted before assessments, along with records of community engagement and participatory mapping exercises.
- Social and Environmental Impact Assessment (SEIA) – Evaluates the potential impacts of the project on local communities and the environment. It includes stakeholder consultations, impact mitigation plans, and FPIC documentation.
- Soil and Topographic Assessment – Determines soil suitability, drainage capacity, and potential risks related to erosion or waterlogging.
- Land Use Change Analysis (LUCA)
- Carbon stock and Greenhouse Gas Assessment (GHG) for new plantings
- Land Tenure and Legal Compliance Assessment – Ensures that land acquisition adheres to PNG land tenure laws and RSPO requirements.
- Free, Prior, and Informed Consent (FPIC) Documentation – Confirms that communities and landowners were properly informed and agreed to development plans before land lease agreements were signed.
- Hydrological and Riparian Buffer Assessment – Identifies watercourse locations, riparian buffer zones, and necessary measures to protect water quality.

Type of Permit

The company holds the following permits, which grant legal authorization for land use, environmental management, and mill operations:

- Lease-Lease Back Agreement – Signed between the company and eight Incorporated Land Groups (ILGs), legally granting the company the right to develop and manage the land. The ILG boundaries are mapped in Figure 1.
- Environmental Permit for Oil Palm Plantation and CPO Mill – Issued under Papua New Guinea's Environmental Act 2000, allowing land clearing and mill operations within the designated area.
- Forest Clearance Authority (FCA) Permit – Authorizes the clearing of forest areas in compliance with national forestry and land-use laws.
- Water Use Permit – Grants permission for water extraction and management related to irrigation and mill processing activities.
- Pollution Control Permit – Ensures compliance with PNG environmental regulations on waste management, emissions, and effluent discharge.
- Business and Operational License – Required for conducting agriculture and palm oil processing activities within the designated project area.

These permits ensure that land development, environmental protection, and industrial activities are conducted in full compliance with national laws and RSPO standards.

Land clearing plans

Location	Proposed Time Plan for Development	Approx. size of clearing

	Month	Year	
Kasikimdo-klamdo/Mandiando-pandamdo/Sui-mosan	June to May	2025/2026	± 3,253.35 Ha
Moks-lenga/Warakai-Numbuk	June to May	2026/2027	± 3,777.53 Ha
Ripmanbara/Monjuon-kavin	June to May	2027/2028	± 3,330.13 Ha

Section 2: Maps

Guidance Note: Please include the following maps here with minimum 300 dpi resolution

- *Boundary Maps owned by the company*
- *Proposed NPP area Maps*
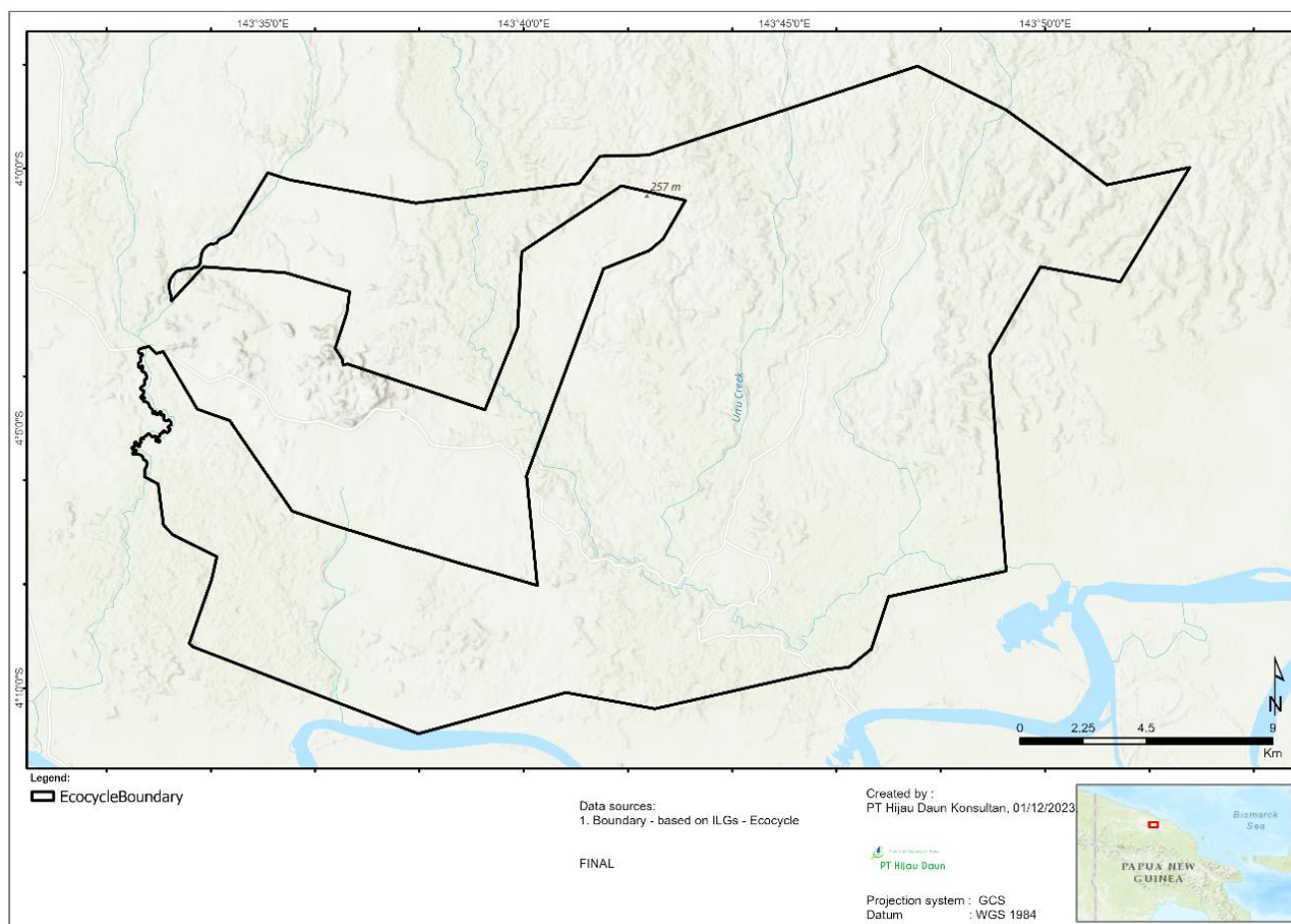- *Proposed NPP area Maps overlay with HCV and HCS areas*

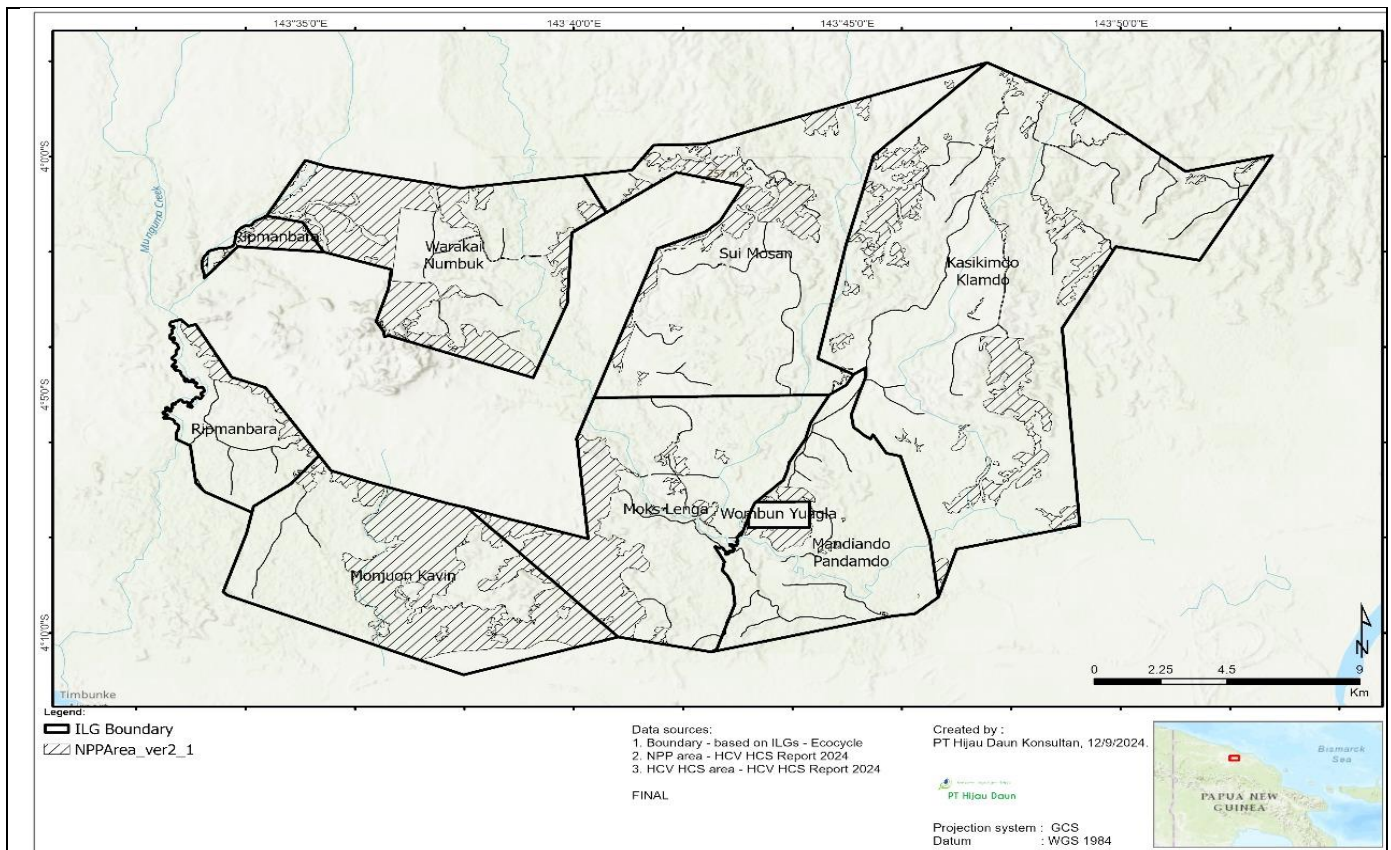Figure 2. Boundary Map of the company's lease area.

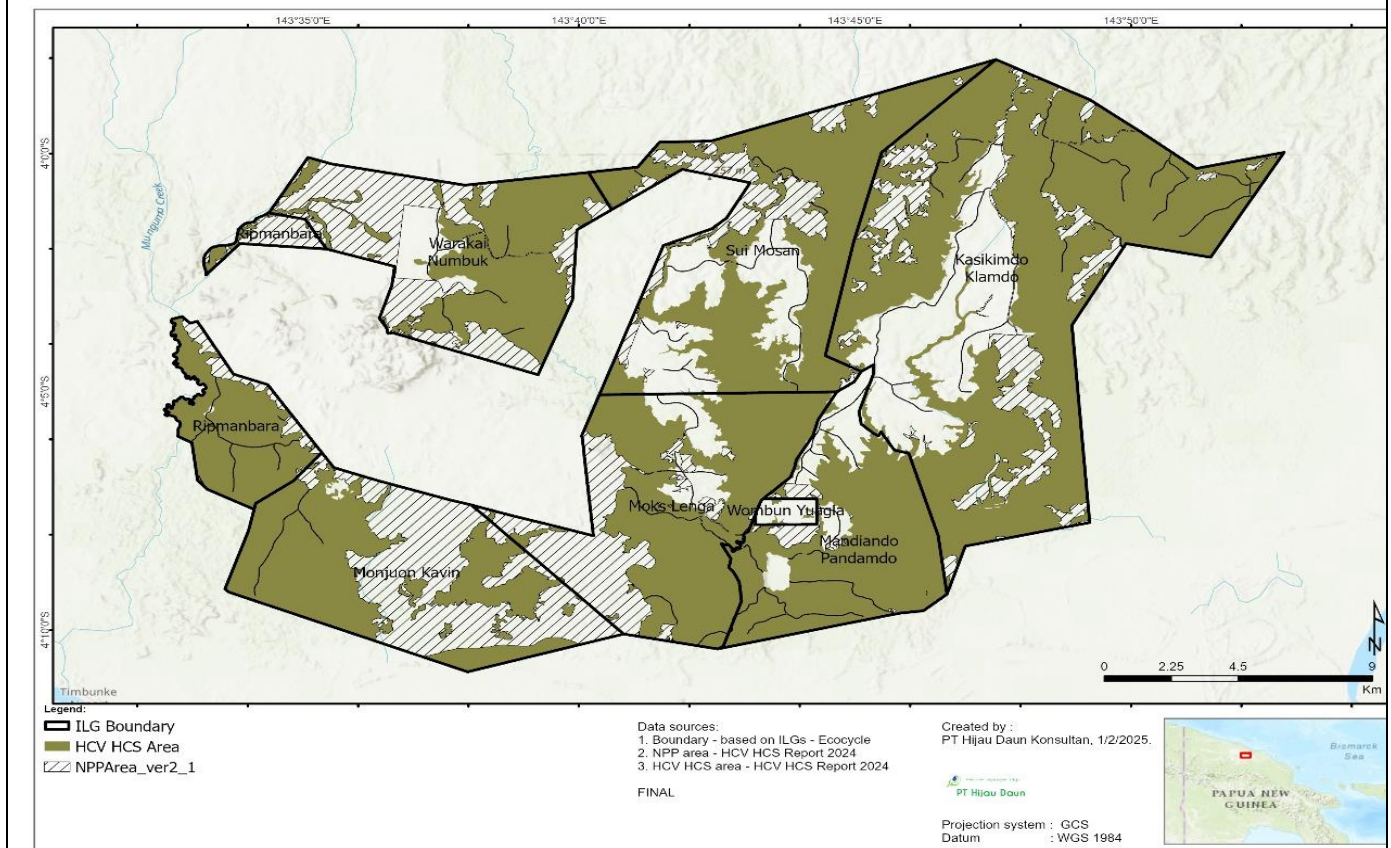Figure 3. Proposed NPP Areas

Figure 4 NPP Area and HCV / HCS Area

The total area of the concession (development area) is 46,568.33 hectares. The total High Conservation Value (HCV) areas is 26,554.48 Ha and High Carbon Stock (HCS) area is 22,938.50 Ha, including conservation and community use areas is 29,748.51 hectares.

Section 3: SEIA

Guidance Note: This section is where the summary findings of SEIA is captured. References and pictorial evidence are recommended. What are the methodology(ies), people involved in the process, date of assessment and findings? Note: Should an assessment carried out by internal staff, just fill the name of the staff and his/her designation.

Date of assessment:

- Scoping Meetings: 26 March 2022 - 6 April 2022
- Full Assessment Field Work: 25 October - 14 November 2023
- Final Consultation: 21 January - 30 January 2024

Name of Assessor:

- Jules Crawshaw: Lead Assessor and Social Team Leader, ALS Fully Licensed Assessor (ALS14006JC), HCS Register Practitioner
- Eluida Pilake: Vegetation Expert
- Bulisa Iova: Birds and Mammals Expert
- Noreiga Igara: Birds and Mammals Expert
- Diane Mirio: Social Expert

Assessor Designation and Company:

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Summary

The Social and Environmental Impact Assessment (SEIA) for Ecocycle Limited, East Sepik, Papua New Guinea, was meticulously conducted in compliance with Papua New Guinea's national regulations, particularly the Environment Act (2000), and the Principles and Criteria established by the Roundtable on Sustainable Palm Oil (RSPO).

The assessment methodology involved a structured approach, including initial scoping meetings (March-April 2022), detailed field assessments conducted from 25 October to 14 November 2023, and final community and stakeholder consultations held from 21 to 30 January 2024.

An independent and multidisciplinary assessment team led by Jules Crawshaw (Lead Assessor and Social Team Leader) included Eluida Pilake (Vegetation Expert), Bulisa Iova and Noreiga Igara (Birds and Mammals Experts), and Diane Mirio (Social Expert). The team ensured objectivity, as they had no vested interests in Ecocycle Limited, while Ecocycle staff provided logistical assistance during field activities.

Key findings from the assessment are summarized below:

Social Findings:

- Positive impacts were prominently related to economic and employment benefits, enhanced local infrastructure, increased household income, and overall economic stability for communities in the surrounding areas.
- Negative impacts identified included ongoing land boundary disputes among clans, potential disruptions to traditional subsistence practices, risk of increased pressure on local resources (particularly water sources), and potential social tensions related to land use changes and influx of external workers.

The assessment underscored that land ownership disputes were significant, with ongoing mediations having limited enforceable outcomes. It was recommended that no development should occur within 200 meters of disputed boundaries to mitigate conflict risks.

Environmental assessments revealed a high dependency of local communities on natural ecosystems for basic needs, such as water, food, timber, and cultural activities. Biodiversity surveys identified several species of conservation importance, including endemic and nationally protected bird species, as well as mammals classified as vulnerable or above on the IUCN Red List. Consequently, the SEIA emphasized the necessity of stringent environmental management practices to safeguard biodiversity, maintain ecosystem functions, and preserve cultural heritage sites.

Following the identification of management strategies the impact significance is reassessed to indicate the residual impact significance. This allows an assessment of the effectiveness of the proposed management strategies. The residual impact significance is also assessed on the likelihood and consequence of impacts occurring. Whereas, summary of positive and negative impacts of development as belows :

Positive impacts of development
- Increased community income levels
- Improved access to health service for landowners and their families
- Improved access to schools
- Improved housing for employees and their families
- Increased skill levels among landowners
- Reduction in subsistence resources
- Increase in tax revenue which could enable social services to be provided

Negative impacts of development
- Roading in sensitive areas
- Concerns regarding the quality of drinking water
- Concerns regarding air quality
- An increase in injuries caused as a result of increased vehicular traffic

- Social problems as a result of increased employment – increased opportunities could attract even more people to the areas
- Social problems resulting from alcohol and drug abuse, as a result or higher income levels
- Reduction in subsistence resources

Ecocycle has committed to stringent sustainability practices, including protecting identified High Conservation Value (HCV) and High Carbon Stock (HCS) areas, prohibiting development on peat soils, implementing zero-burning practices during land clearing and replanting, and executing measures aimed at greenhouse gas emissions reduction.

Recommendations from the SEIA include:

- Implementing clear dispute resolution mechanisms to address boundary conflicts effectively.
- Enhancing stakeholder engagement through regular communication and transparent dialogue.
- Strengthening environmental protection measures, particularly around river buffer zones and conservation areas.
- Establishing comprehensive monitoring plans for social impacts and biodiversity conservation effectiveness.
- Developing community support programs and grievance mechanisms that ensure active and inclusive participation.

This detailed assessment will support Ecocycle's adherence to the Roundtable on Sustainable Palm Oil (RSPO) New Planting Procedure (NPP), underpinning responsible management decisions to balance development objectives with social and environmental sustainability. This SEIA will also guide Ecocycle's operational practices to promote long-term community well-being and ecological integrity.

Section 4: HCV-HCSA Assessment; OR
ALS HCV and Standalone HCSA assessment

RSPO Note: A reference should be made to the full report. All the related maps should be included here. What are the methodology(ies), people involved in the process, date of assessment and findings? Note: Should an assessment carried out by internal staff, just fill the name of the staff and his/her designation.

ALS Satisfactory Date Obtained (ALS HCV & HCV-HCSA assessment) : 5 August 2024

HCSA peer review completion date and link to HCSA summary report (HCSA website): 5 August 2024

Integrated High Conservation Value / High Carbon Stock Approach Assessment Report. Ecocycle Ltd. East Sepik Province. Papua New Guinea | HCV Network

Name of Assessor: J Crawshaw

ALS Number: ALS14006JC

Methodology - Social

The main method for desk-based information gathering was a systematic literature review. There was a lot of secondary data available. However, there was almost nothing available from East Sepik Province. Most of the work generated by government departments was very general in nature. The sources included :

- Satellite images (ranging in dates from 2005 in to 2023)

- Academic papers (e.g. research from Curtin University, Australian National University) – these ranged in dates from 2002 – 2017. The individual references are included in the reference section.
- Census (Papua New Guinea National Statistical Office, 2011) – this is the latest census
- Data from government departments (e.g. Education, Health, Police) – these were ad hoc data sets that they kept and were ongoing data from the last couple of years (e.g. no. of schools).
- East Sepik Provincial Development Plan (Government, 2018)
- Social and Environmental Impact Assessment (Daun, 2023)
- Land Tenure and Land Use Study (Daun, 2023)

One limitation of this study is that some datasets, particularly census data, are outdated. This may affect the accuracy of demographic and socio-economic analyses. Additionally, Ecocycle is a newly established company and lacks a historical record of previous studies conducted in the area, unlike more established companies that may have access to long-term datasets and prior assessments. However, prior to the HCV/HCS assessment, baseline data was collected as part of the Social and Environmental Impact Assessment (SEIA). This included a land tenure and social baseline study, which provided foundational insights into local land use and socio-economic conditions.

The first page of this SEIA document is available in Appendix 14.20.

Table 1. The sites and villages where interviews were conducted during the full assessment are listed in Table 33. The attendance lists for these interviews are available in Appendix 14.21.. A map of the interview locations is in Figure 15.

Date	Venue	ILG Name	Type
07.11.23	Mundomundo Village	Kasikimdo Klamdo	Village / Community
07.11.23	Maringinpaliki Village	Mandiando Pandamdo	Village / Community
08.11.23	Sarapa Village	Warakai Numbuk	Village / Community
08.11.23	Poimbit Village	Moks Lenga	Village / Community
08.11.23	Poimbit Village	Sui Mosan	Village / Community
08.11.23	Poimbit Village	Monjuon Kavin	Village / Community
08.11.23	Poimbit Village	Ripmanbara	Village / Community
09.11.23	Mill	Wombun Yuagla	Village / Community

FPIC

Most of the FPIC that has been done to date has been embodied in the ILG registration process. The company initially approached the landowners and asked them if they were interested in agricultural development. This process was formalised with Benefit Sharing Agreements and then leases on the lands. Associated with this also was getting the exact boundaries of the land surveyed which can be seen as a highly accurate participatory mapping process. This involved formalising boundaries with the neighbouring landowners (the difficulties of doing this in PNG should not be underestimated). Additionally genealogy studies had to be done to formalise exactly who were the landowners.

Within the overall ILG area there were areas of forest and grassland. In the initial agreements that were signed prior to consideration of this study, the company undertook to only develop the grassland areas since the forest areas were of obvious importance to the local communities as this was where all the natural resources are.

Social Fieldwork

The social fieldwork methodology was primarily based on the HCV Resource Network's (HCVRN) Common Guidance (CG). However, the assessor also incorporated elements from the Papua New Guinea (PNG) HCV Toolkit to enhance the assessment of resource usage. Specifically, a Level of Dependency Table was utilized to provide additional insights into how communities rely on natural resources to fulfill their basic needs (HCV 5) and to identify culturally significant sites (HCV 6) (see Table 46 for details).

To evaluate these dependencies, structured village-level meetings were conducted, where a set of targeted questions was used to assess reliance on natural ecosystems. These questions were designed in reference to CG guidelines and are provided in Appendix 14.3.

In addition to interviewing customary landowners, workers living in plantation compounds were also engaged to determine whether they depended on natural resources for their daily needs. They were specifically asked about which natural resources they used and where they obtained them.

The data collection approach was consistent across the Area of Interest (AOI) and involved a combination of participatory mapping and Focus Group Discussions (FGD) with all affected communities. Village interviews were conducted in directly impacted villages, with attendance lists available in Appendix 14.21. Maps of both the development area and the wider landscape were used as references for participatory mapping exercises.

During every village-level interview, the assessor explicitly asked if there were any objections to the assessment taking place. No objections were raised by any community members, and this was documented in the assessor's notebook. Although formal consent is not explicitly defined in HCVRN documentation, the assessor considered the absence of objections as an implicit form of consent. Furthermore, prior to the assessment, formal community-wide meetings were conducted by Ecocycle, during which all communities granted permission for the survey.

To ensure inclusivity, letters of invitation were sent to each community group, and the assessment team emphasized the importance of broad community representation, including women and other social groups. This was further reinforced by an Ecocycle staff member, who coordinated with village leaders to organize a daily schedule for the assessment. While community participation was encouraged, attendance was voluntary, and no fixed percentage of attendance was required. Instead, the objective was to gather input from as many people as possible.

Meetings were attended by Incorporated Land Group (ILG) and clan leaders, along with other stakeholders, including women, youth, and farmers. Each interview session began with a general introduction to HCV concepts, explaining the company's "No Deforestation Commitment" and ensuring that community reliance on natural resources would not be negatively impacted by the proposed development.

To improve community understanding and engagement, the social and biodiversity teams worked concurrently in the assessment area. The biodiversity team's activities were explained to community members, and several locals volunteered as guides to assist with the biodiversity survey.

Following these introductions, Focus Group Discussions (FGD) were conducted to gather detailed social and cultural data. The FGD approach facilitated open discussions, allowing community members to exchange ideas in an informal setting. Community group dynamics were also assessed, although income disparity and religious differences were found to be minimal. However, age-related power structures were evident, as elders typically held decision-making authority. Additionally, the patrilineal tribal structure meant that men primarily made decisions regarding land use. Despite this, efforts were made to ensure all community groups were represented.

During clan-level meetings, it was common for leaders to dominate discussions. To counteract this, the social assessment team actively engaged women and youth, encouraging them to participate in discussions. In some cases, assessors conducted informal interviews during field visits by walking with women to their gardens or water sources, where they gathered additional insights into resource use and household needs.

Figure 5. Focus Group Discussion taking place with the people from Maringpalike.

All interviews were conducted in Tok Pisin, the lingua franca of Papua New Guinea (PNG), which is widely spoken in the assessment area. This ensured effective communication and allowed all community members to actively participate in discussions.

In addition to formal interviews and Focus Group Discussions (FGDs), clan members actively participated in the HCV/HCS survey team's fieldwork while the team conducted assessments on the estates. During these field visits, informal discussions provided valuable insights on various topics, including land ownership, resource use, population expansion, disputes, and cultural ties to natural areas.

For example, during fieldwork, local people requested that the team avoid certain areas because they were considered sacred sites. This was critical supporting information for the assessment. Additionally, as part of the cultural site identification process, clan members guided the survey team to locations of cultural and community significance. GPS coordinates were recorded where appropriate, such as locations where creeks were used as water sources, which were then marked on the survey maps.

Furthermore, clan leaders were asked to delineate the full extent of their lands using participatory mapping. This step was essential to ensure that sufficient land would remain available for community gardens and other resource use after oil palm development. Areas containing important community resources were also mapped.

Next Steps and Community Consultation

At the end of each meeting, the next steps in the assessment process were clearly communicated to the community:

- Drafting a report to map out the GO / NO GO areas for development.
- Returning to the villages for final consultations, where the mapped areas would be socialized with the community, allowing them to provide feedback and approve or suggest modifications.

Limitations of the Social Assessment

Potential limitations of the social assessment include:

- Some key information may have been missed if a community member chose not to speak up during the meetings.
- Certain individuals may have missed the interviews because they were away (e.g., in town during the assessment).

However, each village was visited at least twice, and in most cases, three times, providing multiple opportunities for community members to raise concerns or contribute insights. The assessor considered this a "best endeavors" approach, ensuring that the data collected was comprehensive and representative of the community's views.

Data Processing and Final Consultation

After the full assessment, all participatory maps were collected, scanned, and digitized for further analysis. Likewise, all social data was entered into spreadsheets for systematic review. This process helped to identify issues requiring further clarification, such as:

- Overlaps in clan boundaries
- State land mistakenly considered as customary land

These issues were revisited with the communities during the final consultation to ensure accuracy and consensus.

The initial participatory maps, as marked during the Full Assessment, are available in Appendix 14.35. The revised maps, incorporating community feedback from the Final Consultation, are available in Appendix 14.29

Figure 6. Marking up the extent of the clan's lands with the Mundomundo people. The community were asked to mark up the complete extent of their clan's land on maps.

Participatory Mapping

At each village interview the communities were asked to mark up the complete area of their land to (1) understand the area over which the community had jurisdiction, (2) test, based on HCSA metrics, whether the current oil palm area (and any subsequent development) would impact on their gardening area and (3) understand the areas where there were disputes with neighbouring landowners. The communities were then asked to mark out areas where they obtained key natural resources; e.g. fish, housing materials, water, hunted meat, gardening areas, medicinal plants etc. Additionally, any areas of community set asides, within the assessment area, were asked to be mapped out.

The final maps, documenting community land use and conservation areas, are available in Appendix 14.35.

The assessor also asked about any sacred areas and set asides. Following this the assessors went to have a look at the areas of interest within the area. Examples of areas of interest would be :

- Spirit Areas
- Sago areas
- Cultural sites

Having studied these maps, the assessor found some inconsistencies and some of the data was incomplete. During the final consultation the assessor asked the communities more questions and asked further clarifications.

Figure 7. Reconfirming some of the results of the Participatory Mapping (Poimbit).

Methods - Environmental

Literature review and use of secondary data

The main method for desk-based information-gathering activities and literature review was a systematic literature review – the main data sources for the vegetation assessment are listed in Table 2. This method was chosen as there is a wealth of data available on biodiversity and eco-systems in this area.

Soil Survey

There have not been specific soil surveys done over this area by Ecocycle. However, there has been soil mapping done and this is mapped in the PNGRIS data (PNGRIS, 2008). This data was used to support the study. The vegetation team was informed about the importance of peat data. During the traverses between plots and at the HCS plots themselves the vegetation team looked for peat soil. No peat soil was reported (although there is peat mapped in the area near the Sepik River).

Vegetation survey

Much of this phase of the assessment sought to understand if any species likely to be found within the study areas are listed under various international agreements or are protected under any national legislation. Any potential species found during this phase of the assessment were cross referenced against the digital herbarium records at the Forest Research Institute (FRI) at Lae (Papua New Guinea) for records of listed species occurring in East Sepik. From this search, a potential candidate species list was formed, which was further refined by general habitat and elevation (where possible). Resources utilised during the desktop review are listed in Table 2. The results of the IUCN Red List search are provided in Appendix 14.22.

Table 2. Major information sources used to perform desktop review.

Resource	Comment
National herbarium – Lae (digital)	This resource was used to understand the potential presence or absence of RTEs identified by the PNG HCV National Interpretation, or individuals found from the area-based search of the CITES (*CITES PLants PNG*, no date) or IUCN databases(*IUCN Red List of Threatened Species*, no date). Record data (if present) was interrogated to understand potential location, habitat and growth form of the species. The online herbarium is not complete, but provides an excellent starting point for understanding the potential distribution and ecology of RTE's.
Relevant field guides	Once the indicative list was compiled, the following references were interrogated to understand any information about the identified species (full bibliographic entry in the reference list); • Peekel, P. G (1984). *Flora of the Bismarck Archipelago*[1] • Verdcourt, B. (1979). *A manual of New Guinea legumes* • Baker, W. J and Dransfield, J. (2006). *A field guide to the palms of New Guinea*. • Lewis, B. A and Cribb, P. J.(1991). *Orchids of the Solomon Islands and Bougainville*.[2] • Handbooks of the flora of Papua New Guinea Vols 1, 2 and 3
IUCN Red list	An area-based search using the IUCN online database was performed before the commencement of field work in October, 2023. A list of all flora species with an IUCN rating of vulnerable or greater (i.e. inclusive of endangered or critically endangered), was collated. The area of focus was the Papua New Guinea in general, with further investigation determining the relevance of each listed species to the Northern PNG context
CITES prohibited	An area-based search using the CITES online database was performed before the commencement of field work October, 2023. The area of focus was the Papua New Guinea in general, with further investigation determining the relevance of each listed species in PNG.
Nationally protected species	Little guidance is provided by the Papua New Guinea government as to the formal protection of particular plant species, but the HCV toolkit for Papua New Guinea (PNG FSC, 2005) provides a range of species that a considered rare, threatened or endangered by IUCN or prohibited for trade under the CITES convention.

The understanding of Papua New Guinea's (PNG) rainforest flora remains incomplete, with significant gaps in ecological and distributional knowledge. Many plant species recorded in the region are only known from their original type specimens, which are housed in herbaria in Australia and Papua New Guinea. This lack of comprehensive data presents a challenge in assessing the true diversity and conservation status of plant species in the country.

As part of the vegetation assessment, efforts were made to integrate this component with the requirements of the High Carbon Stock (HCS) approach. Each field team was equipped with a list of target species, and systematic searches were conducted in the vicinity of each HCS plot as well as along survey traverses. This approach ensured that conservation considerations were included within the broader landscape assessment.

The target species list was compiled by conducting a search of the IUCN Red List online database, specifically filtering for vascular plant species recorded in mainland PNG that are classified as Vulnerable (VU) or above. This database search resulted in a list of 192 species, which were then used as a reference during the field assessment. The full list of these species is provided in Appendix 14.22.

A significant proportion of the CITES-listed plant species in PNG belong to the categories of cycads, orchids, and ferns, which are predominantly found in rocky or montane environments. However, such habitats are not present within the current assessment area, thereby reducing the likelihood of encountering these species. Notably, many

of the protected species identified in the literature belong to climax communities, meaning they are primarily found in large expanses of undisturbed forests rather than fragmented landscapes.

Among the 192 species identified through the IUCN search, only 15 species did not belong to the cycads, orchids, or ferns groups. However, none of these species were found within the assessment area during the field survey. While individual species were absent, certain genera were recorded—for instance, *Aquilaria filaria* was not present, yet other species within the Aquilaria genus were observed.

The findings highlight the importance of continuous field assessments in PNG, as existing data sources alone cannot fully capture the diversity of species present in the landscape. The complete list of CITES-listed plant species for PNG is available in Appendix 14.25. The integration of biodiversity assessments within HCS field surveys allows for a more holistic approach to sustainable land-use planning, ensuring that conservation priorities are adequately addressed in future developments.

Bird Survey

The bird expert has considerable experience with bird surveys through PNG. He developed an informal species checklist for this survey. This was augmented from information collated from field guides ((Coates and Peckover, 2001) and (Beehler, Pratt and Zimmerman, 1986)). This resulted in a list of potentially present bird species.

Mammal Survey

The bird expert has considerable experience with mammal surveys through PNG. Most of the mammals present were likely to be bats. To develop an informal species checklist for this survey he was able to use a checklist that was developed from other surveys in the area. This was augmented with information from "The Mammals of New Guinea" (Flannery *et al.*, 1995).

Slope Analysis

Excessive slope (i.e. that greater than 25°) is an operational constraint (prescribed by RSPO) needing to be factored into decision making, although the paucity of topographic data available for this study made this process difficult within the GIS environment. Slope analysis was performed using the Synthetic Aperture Radar (SAR) derived ALOS PALSAR ('Dataset: ©JAXA/METI ALOS PALSAR Accessed through ASF DAAC, 25/4/2021', 2021) as an input, then using the 'slope' (spatial analyst) tool within ArcGIS to convert elevation values to slope values. The data is "Radiometric Terrain Corrected" and uses 12.5 m pixels.

River Courses

There was secondary river course data available from Ecocycle. Although this was taken from a generic rivers dataset and needed to be reprojected as it appeared to be about 200 m from the true river locations. There were some inaccuracies in this data which were corrected. Another issue is that in some areas the rivers spread out into swamps before emerging again as rivers later on in the course.

Field Methods

Birds

In surveying birds, the point count method was employed where the observer walks along a designated path and pauses for fifteen (15) minutes at three intervals. Each interval is 300m apart. At each interval, bird species are either recognised by their calls or if they are sighted. Bird species were identified by either their unique

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[1] There are many common species between mainland PNG and the Bimarcks

[2] Note that the Orchids of the Solomon Islands and Bougainville is of a separate area to Northern PNG. The flora of Northern PNG was considered is sufficiently similar to have value in this study and there were no specific orchid references to Northern PNG.

vocalizations or visually sighting individuals of the species, using techniques described by Bibby at al, (1998) and Imanuddin *et al.*, (2013).

Observations commenced between 6:00 AM and ended at 7:00 AM, although times differed depending on logistical arrangements as well as changes in weather. During the day, opportunistic sightings and other interesting observations made of birds were also recorded.

A binocular (Bushnell, 8 x 42 magnification) was used to visually identify birds at a distance while a camera (Nikon) and a (mobile phone) was used to take photographs of the habitats where surveys were conducted and also take photographs of birds and mammals. While conducting birds survey, a conscious attempt was made to look out for Papua New Guinea's protected species and also IUCN and CITES protected species that were likely to be found in the area.

A total of seven sites were visited within the project development area to conduct bird surveys. The project development area consisted of the following habitat types; sago swamps, primary forest, secondary disturbed forest, riverine forest. Also included were interviews conducted in three villages within Eco Cycle Ltd.

The key references used in identifying birds included:
- BEEHLER, B. M., PRATT, T. K. & ZIMMERMAN, D. A. 1986. Birds of New Guinea, Princeton University Press.
- COATES, B. J. & PECKOVER, W. S. 2001. Birds of New Guinea and the Bismarck Archipelago, A Photographic Guide.
- PRATT, T. K., BEEHLER, B. M., ANDERTON, J. C. & KOKAY, S. 2015. Birds of New Guinea, Second Edition, Princeton University Press.
- Anthony, N., Byrnes, DG., Foufopoulos, J., Putnam, M. 1999. New Britain Biological Survey.

Mammals

Mammals were surveyed from 29th October - 10th November, 2023, at selected sites within the Eco Cycle Limited area (Figure 10). Survey locations were chosen based on the availability of existing tracks through the areas for ease of accessibility but more so to use the tracks. In addition, to set up mist nets to capture bats along those existing tracks.

The mist nets were set in sites where there would be a high chance of capturing bats. Such areas included forest understory, potential flyways within the forest, along bush tracks or in open areas. It was important to setup the mist nets to capture and identify various species of bats that fly within the forest as well as those that venture into open areas. We set and run mist nets at night time at two sites - Pandamdo and Kasikimdo (2x 18m, 2x 12m and 1x 9m long mist nets). Trapped individual bats were identified to species level using (Bonaccorso, 1998). All live bats were released immediately.

For ground dwelling mammals (Rats and Bandicoots), Elliot traps were used to trap them. Elliot traps were set at three different sites within the Ecocycle Ltd area (Sarapa, Pandamdo and Kasikimdo). We used peanut butter and oil palm loose fruits as baits for the Elliot traps.

Figure 8.Left: Baiting Elliot traps with peanut butter. Right : Elliot trap set in order to catch rats or bandicoots.

Figure 9 Left : Dobsonia's Tube-nosed bat captured in the mist Right : Taking out a micro bat from the mist net during night netting at the Pandamdo site.

Environmental field work

Based on the information gleaned from the secondary data as well as the assessment team's experience with similar surveys in other parts of PNG it was decided that the focus of the environmental survey should be on forest areas. The environmental survey therefore focussed on forest areas, however the assessment team still passed through areas of cultivation, grassland, bareland and village areas in the process of accessing the forest and was constantly vigilant regarding sighting of species of interest in these land cover types. The birds and mammals surveyor frequently walked along forest edges where birds were more easily able to be seen. Similarly the vegetation team walked through all landcover types and was vigilant for any species of interest in all landcovers. Though, as predicted, the vegetation of interest for HCV was located in the forest areas.

Peat

PNGRIS has mapped an area of peat. It was acknowledged that the soil mapping for PNGRIS was highly generalised and done many years ago. For this reason, the putative peat area was visited to determine whether there was peat at this site.
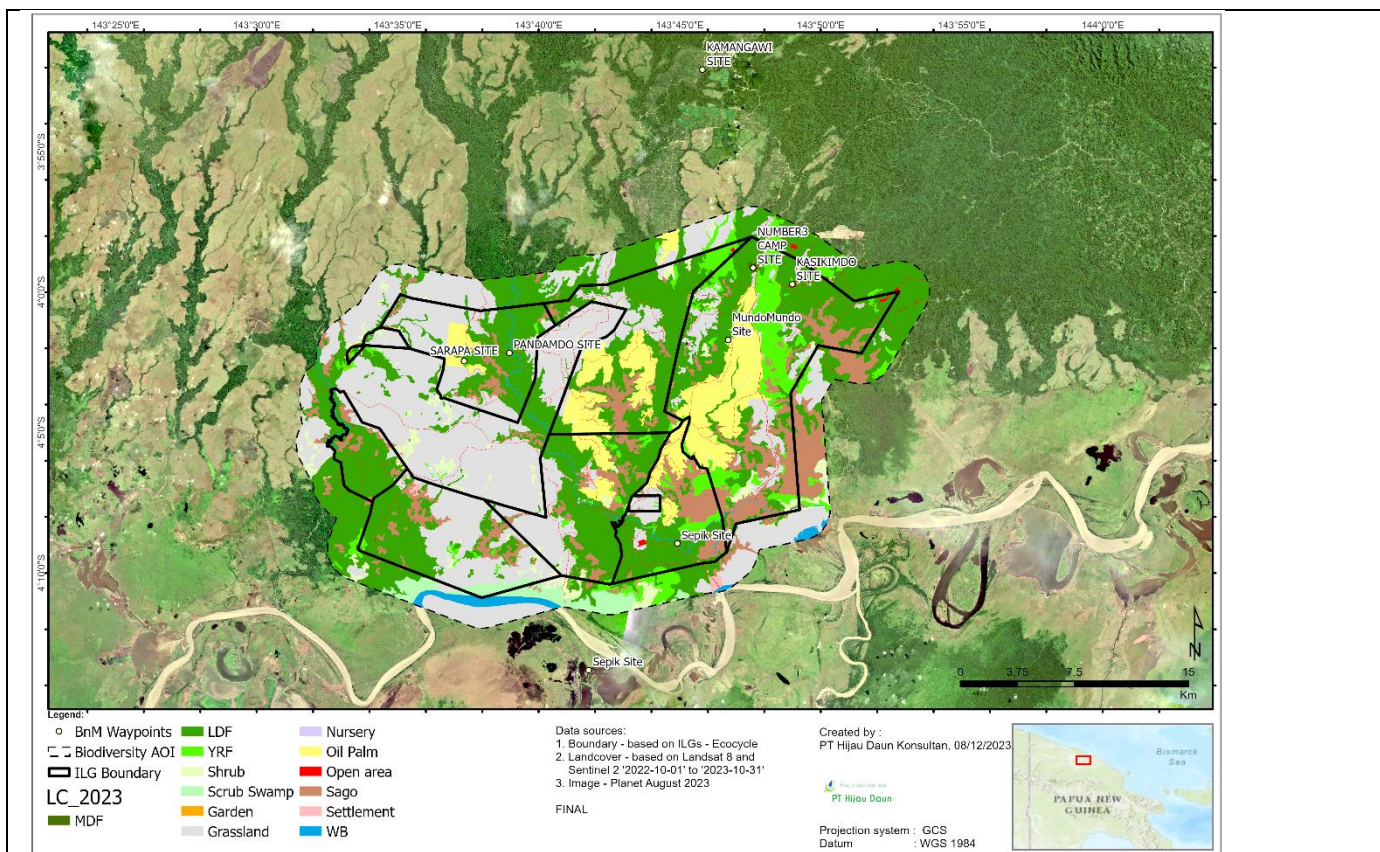
Figure 10. Locations where mammal surveys were undertaken. The Kamangawi and the Sepik Site[3] were outside the AOI but points were still taken there – in the case of Kamangawi (logistical reasons) and in the Sepik because the boat started at Mundomundo waterfront and drove down the Sepik River, stopping at a location where the team could get off the boat.
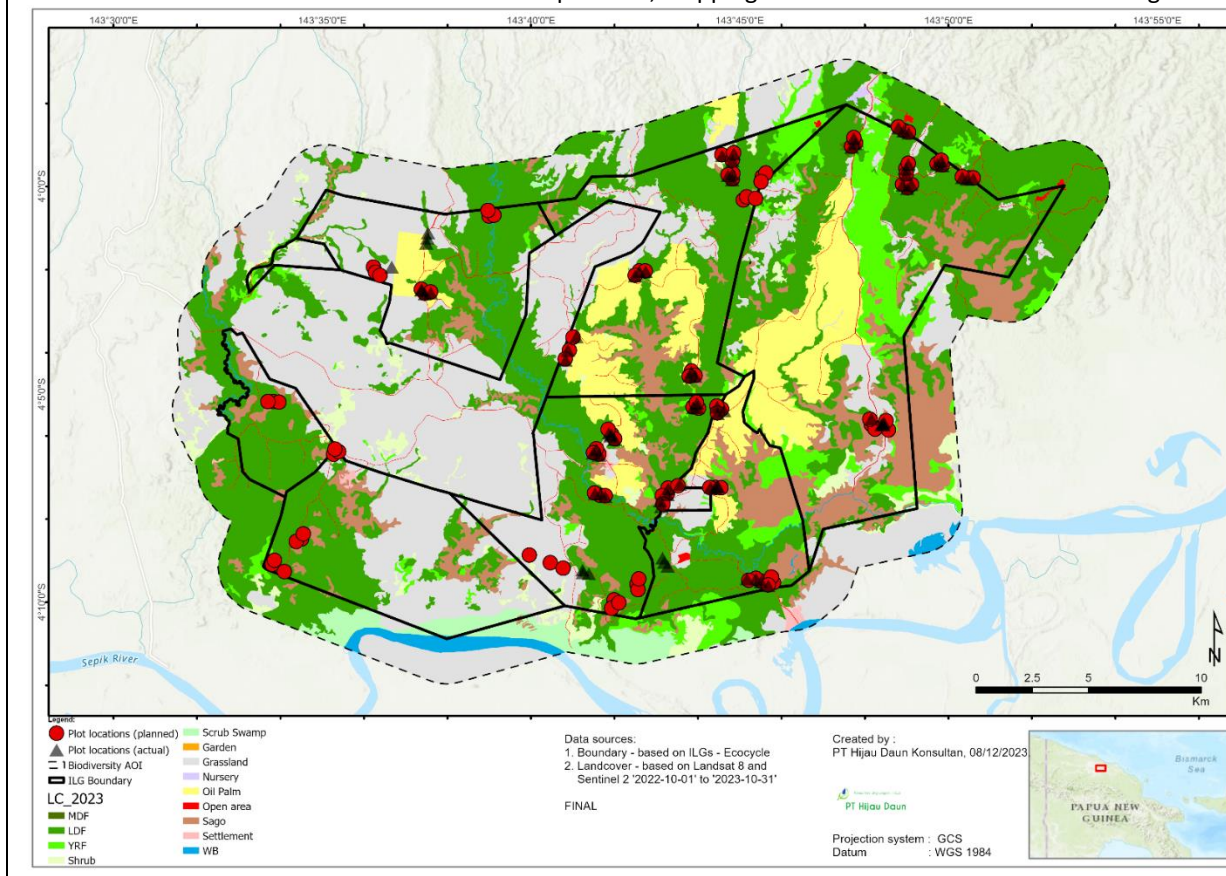
Figure 11 Final HCS class and planned plot locations. There were 104 plots planned and 81 plots were measured. The main reason for not measuring plots was access (i.e. broken bridges).

Assessment Dates

Table 3. Timelines associated with this integrated assessment

Step	Step description	Dates undertaken/scheduled	Location
1	Scoping Contracting	August 2021	Indonesia
2	Scoping Preparation	April 2019	Indonesia
3	Scoping Study fieldwork	26th March 2022 - 6th April 2022	PNG
4	Developing a proposal and contracting for continuation of the assessment	June - August 2023	Indonesia
5	Compilation of secondary and available primary data, including preliminary stakeholder consultation during a short, initial visit to the license areas (Scoping Study)	August -October 2023	Indonesia
6	Planning for fieldwork and agreement on field methods for primary data collection	August -October 2023	Indonesia
7	Fieldwork and primary data collection, including direct stakeholder consultation	25th October − 14th November 2023	PNG
8	Data analysis and interpretation	November 2023 - December 2023	Indonesia
9	Writing a Social and Environmental Impact Assessment, - which included a land tenure and social baseline study. (Appendix **Error! Reference source not found.**)[4]	November 2023 - December 2023	Indonesia
10	Final consultation to report interim HCV findings and refine threat assessment\n\nConsultation with NGOs	21st January 2024 - 27th January 2024	PNG
11	Preparation of a Draft Report, including HCVA maps and management and monitoring recommendations (phase 1)	January – February 2024	Indonesia

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[3] Note there are 2 "Sepik Sites" on the map. These represent a boat trip along the Sepik River.
[4] Completed by a third party

| 12	Amend the draft report based on the feedback from Ecocycle	January – February 2024	PNG
13	Submission of the HCV/S Report to HCVRN	February 2024	Indonesia

Assessment Findings

Table 4. Summary of environmental and social values (in hectares) identified during this assessment

Environmental and social values to be conserved	Area (ha) where the value is found(inside MU only	Management areas (ha)(inside MU only))[5]
HCS forest areas (Value includes forests YRF or better)	22,938.50	
HCV 1 Value includes : *Endospermum medullosum* *Anisoptera thurifera* *Aquilaria malaccensis* *Diospyros insularis* *Casuarius unappendiculatus* *Haliastur indus* *Milvus migrans* *Haliaeetus leucogaster* *Accipiter cirrocephalus* *Goura victoria* *Eclectus roratus* *Probosciger aterrimus* *Cacatua galerita* *Charmosyna placentis* *Lorius lory* *Pseudeos fuscata* *Geoffroyus geoffroyi* *Rhyticeros plicatus* *Paradisaea minor* *Spilocuscus maculatus* *Phalanger intercastellanus* *Pteropus conspicillatus*	25,735.69	25,735.69
HCV 2 Large forested landscapes.	25,735.69	25,735.69

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[5] HCV Management Areas are areas in a site, MU or landscape for which appropriate management decisions must be taken and implemented in order to maintain or enhance an HCV. Note that the HCV Area and the HCV Management area overlap in this assessment because PT Hijau Daun considers that if an HCV is found, the area that is mapped out as NO GO is the area that is required to maintain that HCV.

|		
HCV 3 **Overlaps with swamp forest**	25,735.69	25,735.69
HCV 4 **Overlaps with Forest in LDF condition or better .** **Overlaps with riparian / swamp areas** **Forests for protecting from catastrophic fires.**	26,508.95	26,508.95
HCV 5 **Overlaps with rivers and buffers.** **Overlaps with forests in condition of LDF or better.**	26,204.20	26,204.20
HCV 6 **Sacred areas** **Old Villages**	816.73	816.73
Total HCV area (all overlaps removed)	26,554.48	26,554.48
Peat	16.29	16.29
Area enclaved for community usage	77.57	
Totals (ha). Conservation + enclave areas with all overlaps removed.	29670.94+77.57 = 29,748.51	
Total Assessment Area	46568.33	
Total Developed / Developable Area	16,819.82	
Potentially Developable non-oil palm areas (this is a sub-set of the number above)	10,623.71 (6196.11 ha already oil palm)	

Figure 12. All the HCVs AOI.
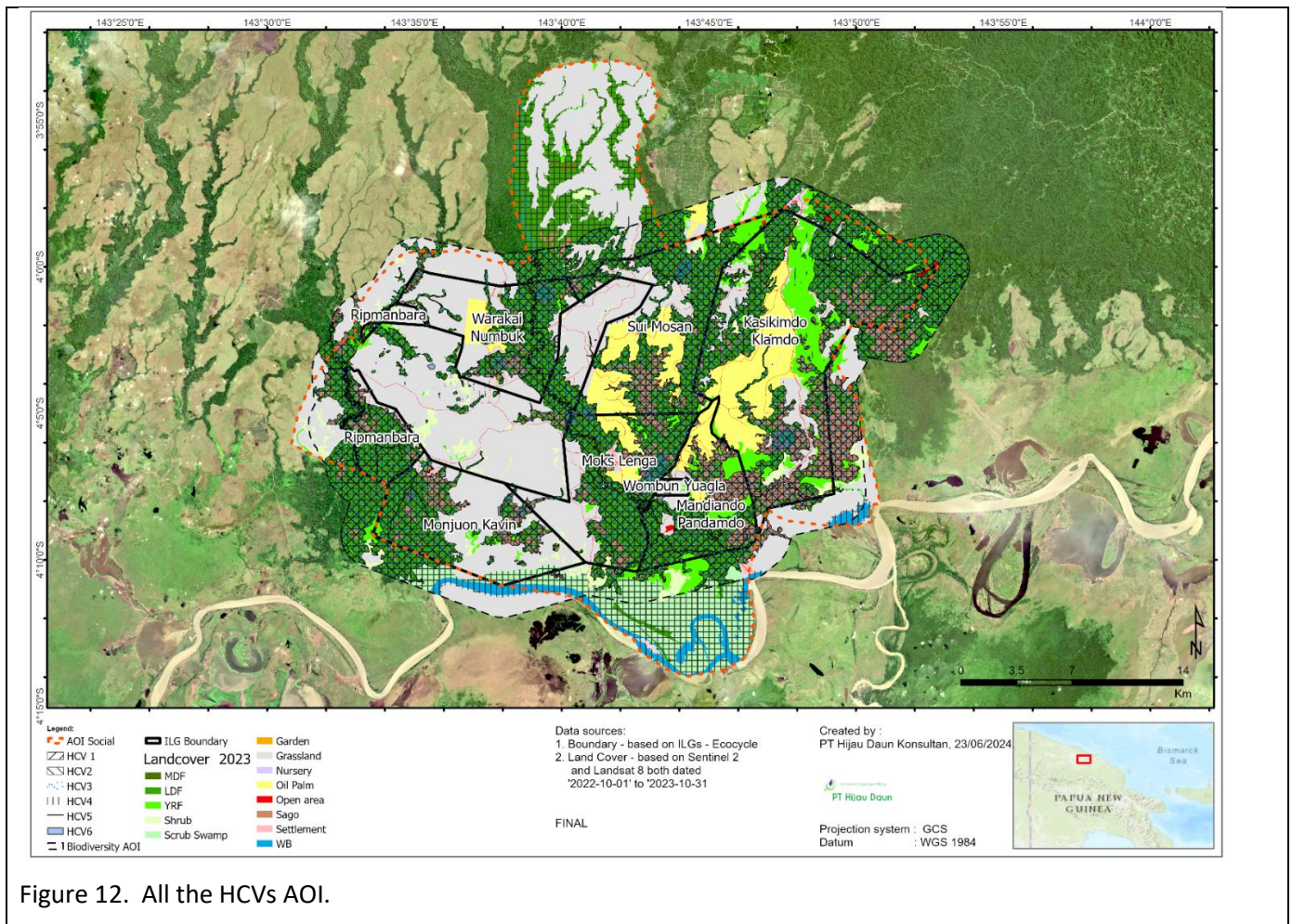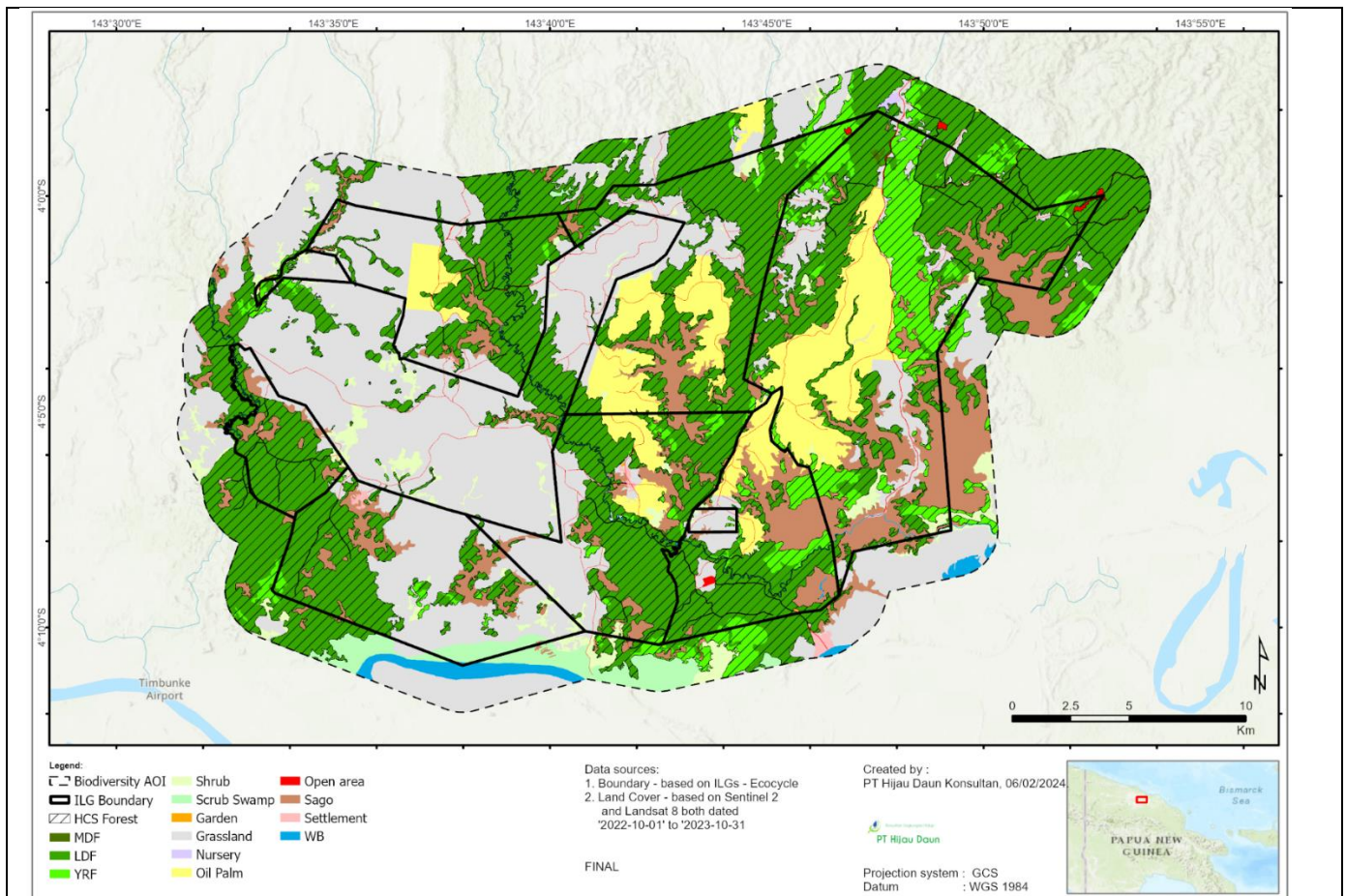
Figure 13. HCS in the AOI

Section 5: FPIC

Guidance Note: This section is where the information on stakeholder mapping is put and all required information that the building blocks for FPIC have been conducted. References and pictorial evidence are recommended. What are the methodology(ies), people involved in the process, date of assessment and findings?

Timelines

Table 5. Timeline of activities to capture data and subsequently write this report.

Activity	Timing
Scoping Meetings	26th March 2022 - 6th April 2022
Full Assessment field work	25th October – 14th November 2023
Writing up	November 2022 – February 2023
Final Consultation	21st January 2024 -27th January 2024
Writing up and subsequent research	February 2024

Table 6. Full Assessment Interviews with villagers.

Date	Venue	Village where community lives	ILG Name
07.11.23	Mundomundo	Mundomundo	Kasikimdo Klamdo
07.11.23	Maringinpaliki	Maringinpaliki	Mandiando Pandamdo
08.11.23	Sarapa	Sarapa	Warakai Numbuk
08.11.23	Poimbit	Poimbit	Moks Lenga
08.11.23	Poimbit	Poimbit	Sui Mosan
08.11.23	Poimbit	Kamangawai	Monjuon Kavin
08.11.23	Poimbit	Koiwut	Ripmanbara
09.11.23	Mill	Maringinpaliki	Wombun Yuagla

Table 7. Final Consultation meetings

Date	Village where meeting took place (ILG / Villages participating)
22.1.2024	Kasikimdo Klamdo / Mundomundo
22.1.2024	Mandiando Pandamdo / Maringa Palike
23.1.2024	Warakai Numbuk / Sarapa

Stakeholders

Table 8. Stakeholder Interviews

Date	Stakeholder
3.11.23	Labour Department
10.11.23	East Sepik Provincial Administration
10.11.23	Angoram LLG
10.11.23	East Sepik Health Authority
10.11.23	East Sepik Health Department
13.11.23	Police

FPIC Methods

The primary technique for collecting social data was through face to face interviews. During the study interviews were undertaken with the following key stakeholders:

- Village leaders and ordinary villagers

- Workers

- Government Departments

- Company staff both from plantation and mill

There were no NGOs that were known to be active in this area.

Combined with this, the assessors walked through the assessment areas and the surrounding areas to gain an understanding of the terrain and the natural landscape. Observations were made about the villages, rivers (both large rivers and smaller rivers), sago swamps and other natural habitats. This was focused on areas where natural resources were being used (e.g. using river water, fishing or cutting timber).

This was done in two phases; (1) an initial consultation and (2) final consultation. The initial consultations used interviews and participatory mapping. The assessor then took the results of all the interviews and put all the information together; e.g. digitised all the participatory mapping. Sometimes this raised issues with overlapping boundaries which were followed up with the communities during the final consultation. Additionally, the participatory mapping data was checked with the communities to ensure it was correct and complete.

Village Level

For the full SEIA; questions were prepared for meetings at the village level to understand :

- The current situation in the village. Particularly with reference to :
  a. the village and families structure
  b. the social, economic and environmental conditions at both village and family level.
  c. The rules relating to land use.
  d. Disputes within the village or between villages / clans.
- The dependency of community members on natural ecosystems to fulfil basic needs as well as mapping the areas where these resources are obtained.
- The condition of natural resources around the village and the pressure on these resources.
- the location of important cultural sites
- the locations of potential oil palm expansion areas.
- the full extent of the customary land.
- How customary land would be managed after it had been converted.

In all cases, community meetings were attended by clan leaders as well as rank-and-file community members, ensuring broad representation. To facilitate participation, a company representative contacted each village in advance and organized the community meeting schedule. While Ecocycle actively encouraged as many people as possible to attend, participation was ultimately voluntary, and attendance was not measured against a specific percentage target.

Each interview session began with a general introduction to the purpose and context of the Social and Environmental Impact Assessment (SEIA). This introduction was followed by a Focus Group Discussion (FGD), which provided a platform for community members to share insights on social and cultural aspects of their lives. The discussion also covered key natural resources in the area and how their availability had changed over the past twenty years. To facilitate this dialogue, participatory mapping was used, allowing community members to visually represent their resource use and land tenure patterns (see section below). The questionnaires used during these sessions are available in Appendix 14.3.

All interviews were conducted in Tok Pisin, the lingua franca of Papua New Guinea, ensuring clear communication. The assessments were led by native speakers, which helped to foster trust and encourage open discussion.

Beyond structured interviews, the assessors conducted field observations by walking around the village, spiritual sites, and community gardens. This allowed them to directly observe and document:

- The quality and type of construction of houses, providing insight into livelihoods and material access.
- Water sources, assessing their accessibility and cleanliness.
- Community gardens, noting the types of crops grown, their level of maintenance, and overall food security.

These observations complemented the interview data, helping to validate community responses and provide a comprehensive understanding of local socio-economic and environmental conditions.

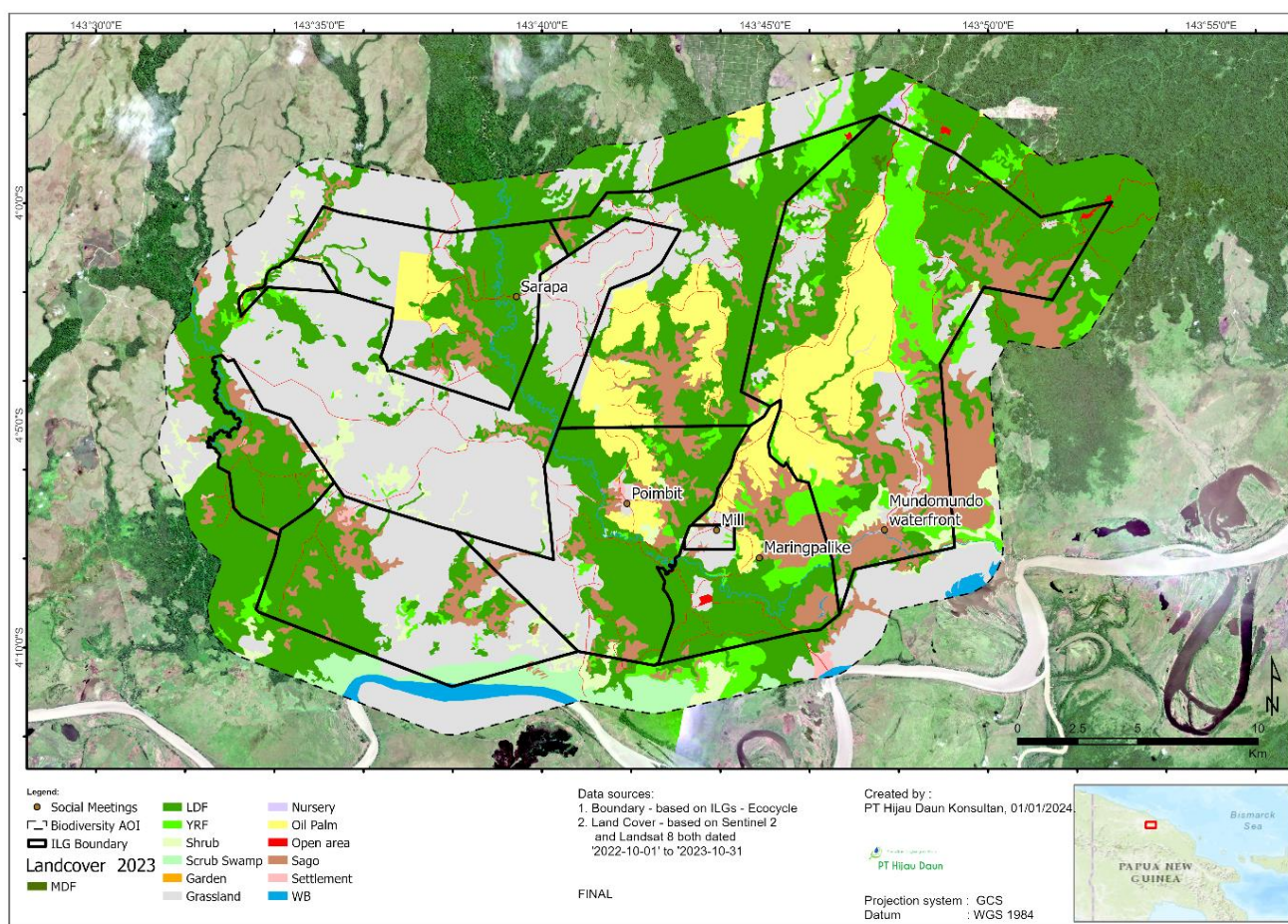Figure 14. Interview underway at the Mundomundo Village

Figure 15.Villages where full assessment meetings took place. People from a number of the inaccessible villages (Kamangawi and Koiwut) walked to Poimbit for the meeting there, similarly the Mundox people came to Mundomundo because they were part of the same ILG. There are 2 ILGs in Maringpalike – 1 meeting was held in the village itself and the other at the mill. Additionally there were some stakeholder meetings in Wewak (Government officials, Police).

Table 9. Number of people engaged per village.

Village	Scoping	Full Assessment	Final Consultation	Total
Kamangawi	0	17	13	**30**
Koiwut	0	23	2	**25**
Maringi Palike	0	32	40	**72**
Mundo 2 waterfront	15	54	26	**95**
Mundox	0	73	0	**73**
Poimbit	15	95	15	**125**
Sarapa Village	0	65	24	**89**
Grand Total	**30**	**359**	**120**	**509**

Compound Workers

There are 2 workers compounds (Table 10). It was decided to undertake interviews in the field as well as in the compounds.

Table 10. Interviews with workers from the field and the compounds.

Task	Female	Male	Grand Total
Boiler attendant		3	3
Catering	1		1
Clerk	1		1
Cook	1		1
Harvesters		16	16
Kernel		2	2
Loader		2	2
Manuring (Fertilizer applicator)	11		11
Process Attendant		3	3
Security		1	1
Sprayer		16	16
Sterilizer		1	1
Supervisor		1	1
Not stated		12	12
Grand Total	**14**	**57**	**71**

For the Workers questions were prepared for meetings at individual level to understand :

- The household conditions and living conditions of the workers (e.g crowding
- The amenities available (e.g. water, electricity, rubbish collection, toilets)
- The services available (e.g. medical care, education, garden areas)
- The social conditions (e.g. security, issues with domestic violence, drunkenness)
- The company policies and how they are implemented (e.g. passengers, leave, sick days, PPE, medical check-ups).
- Pay (paid award rates, overtime)

The questionnaires used for these interviews are available in Appendix 14.3.

A total of 71 workers participated in the interviews (Table 10), with efforts made to include a diverse range of job roles within the workforce. Among them, 50 were full-time employees, while 21 were part-time workers. The interviews were conducted both in worker compounds and in the field, allowing interviewers to:

- Randomly select workers for interviews, ensuring a broad representation of perspectives.
- Observe real-life conditions, including the state of worker housing, the presence of worker gardens, compliance with PPE requirements, and the presence of children assisting in work activities.

This field-based and site-specific approach ensured that the data collected provided valuable insights into workers' welfare, company policy enforcement, and overall working conditions.

Figure 16. Interviews with workers and housewives at Mundomundo compound.

Stakeholders

A wide variety of stakeholders were interviewed. Questions were asked relating to their :

- Activities (e.g. what was the purpose of their organisation).
- Relationship with Ecocycle and how did Ecocycle's operations affect their activities.

Table 11. Stakeholders who were interviewed

No	Stakeholder
1	**Labour Department**
2	**East Sepik Provincial Administrator**
3	**East Sepik Provincial Health**
4	**LLG President**
5	**East Sepik Health Authority**
6	**Education Department**
7	**Provincial Police Commander**

There were no NGOs that were known to be active in the area.

Participatory Mapping

At each village interview the communities were asked to mark up the complete area of their land to ensure (1) the full extent of the clans' or communities' land was mapped / also disputed areas were

mapped, (2) the locations where resources are extracted such as water, timber or fish (3) gardening area, (4) cultural or sacred sites and (5) locations where additional oil palm development could take place. Additionally, any areas of community set asides, within the assessment area, were asked to be mapped out. The concept of this was to develop (1) a land use map and (2) a land ownership map.

Following this the assessors went to have a look at the areas of interest within the area. Examples of areas of interest would be :

- Rivers
- Gardens
- Sago areas
- Cultural sites

Having studied these maps and digitised all the data on marked up maps into the GIS, the assessor found some inconsistencies and some of the data was incomplete. During the final consultation the assessor asked the communities more questions and asked further clarifications in order to resolve the inconsistencies. The maps were subsequently revisited to get further information.

Figure 17. Marking boundaries and locations (Maringipalike Village) where resources are used on prepared maps / satellite images. Ecocycle staff assisted the residents by pointing out landmarks and various boundaries.

People Involved in the Process

Table 12. Assessment team

Name	Assessment role	Qualifications
Jules Crawshaw	Lead Assessor and Social Team Leader	• B.For.Sc., M.Bus.Sys • ALS Fully Licensed Assessor (ALS14006JC) • HCS Register Practitioner.
Diane Mirio	Social Expert	• Masters in Management Studies– University of Natural Resources & Environment VUDAL PNG (Ongoing) • Course work, Elements of Public Administration, UPNG • 7.5 years Community Engagement Officer, NBPOL

		• 11 years Alumni Member - Leadership PNG & 4 years Alumni Member Emerging Pacific Leaders Dialogue • 6.5 years FSC Certification Support, FORCERT

Findings

Compounds

The compounds are not up to the standard required by the RSPO. The maintenance is not good, there is poor ventilation, the people live with rats and bed-bugs. The list goes on. The assessor recommends there is an analysis against the ILO Guidance on Workers Housing.

Suitability for Planting

There have been approximately 10,000+ ha identified as being suitable for additional planting with oil palm by Ecocycle. This is based on an integrated HCV and HCS assessment and does not take into account a suite of other factors that may affect whether the areas can be planted.

Lawlessness

The area is in a very bad state with social problems with frequent incidents of lawlessness (e.g. drunkards bothering people, wire catapult injuries) and people in the villages stating that they don't feel safe. Additional development and more income in the community will help assist with this problem.

Recommendation : Ecocycle should pursue the NPP to develop extra land and assist local communities with getting additional public services. Extra policing appears to be the most pressing issue.

Conservation Principles

In all the communities, when the team made presentations about conservation principles (such things as the importance of buffers, importance of maintaining forest areas). The team pointed out how the loss of the environmental services would impact the communities.

The recommendation is that there is more awareness done of the conservation principles done with these communities. The communities all were very interested in the satellite images which were used to assist with the participatory mapping. It is recommended that the communities are provided with images and maps to assist with planning of their own areas. Delineating at the clan / village level areas for oil palm development, gardening and conservation would be worthwhile.

Land Issues – there are many land issues particularly with customary landowners in neighbouring areas encroaching on land owned by clans with ILGs. With the potential of development suddenly the value of land has increased markedly.

There is the issue of the state land (Portions 22 – 50). With new people coming into the area, this land may be seen as a place to encroach by settlers.

Repatriation of ex-employees : Other more established oil palm areas have a lot of ex-employees loitering around. They have nowhere to live so usually encroach on buffer zones or customary land. When people leave they should be repatriated to their original area.

Water : Many communities expressed concerns about their access to water. The company had installed water tanks but these were not functional. Usually they were damaged by the locals and the company was disinclined to fix the tanks as the problem would probably just recur.

Decent Living Wage : Currently Ecocycle pays people based on the minimum wage but there is no analysis done on areas where the cost of living is higher due to the remote location. Furthermore in order to comply with PnC 6.2.6 analysis must be done to ensure DLW is being paid. The national minimum wage may be sufficient but there is no data or analysis being undertaken. The methodology is described in RSPO, (2019).

The general conclusions from the SEIA assessor are that :

- Ecocycle has undergone a very thorough FPIC process. The landowners have a good understanding of the requirements and benefits of development. Furthermore, the local landowners in conjunction with the company have established ILGs.
- An HCV and HCS assessment has been completed that sets aside any areas of high biodiversity value.
- Ecocycle has had considerable experience dealing with social and environmental issues. The company has a suite of SOPs which need to be operationalised.

In the context of this, the assessor considers this a LOW RISK project form both a social and environmental perspective.

The key question that the SEIA is designed to answer is: what differences will there be in the quality of life of the communities as a result of the proposed development. It is the assessor's opinion that provided the existing environmental and social safeguards are applied the community will benefit from this project.

Social Management/ Improvement Plan It is recommended that Ecocycle develop a Social Management Improvement Plan. The management framework that most companies use to address impacts is a "Social Management Plan" and an associated "Social Impacts Register."   In accordance with the RSPO requirements, these are documents which include:

- A list of current, priority social issues for employees and their dependents, local communities and other local stakeholders;
- Management strategies to avoid or mitigate potential negative impacts and promote potential positive impacts;
- A monitoring framework; and
- Timeframes and responsibilities for required actions.

Acceptance of affected right holders

The affected right holders have formally accepted the proposed development and conservation plan. This was confirmed during the final consultation meetings with all communities in the Area of Interest (AOI). The agreement was documented by directly asking community members if they agreed to the proposed development/conservation plan, to which they responded "Yes". This confirmation was recorded as part of the FPIC process .

Additionally, during the community consultation on January 22-23, 2024, multiple village representatives, including Mandiando Pandamdo, Maringa Palike, Warakai Numbuk, and Poimbit,

explicitly stated that they agree with the plan for development of the kunai grasslands and conservation of swamps and forests .

The FPIC process was well-advanced, with communities participating in land-use planning and receiving full disclosure of the project. Supporting documents, including letters of consent, were verified by the assessor to ensure authenticity .

Section 6: Soil and topography

RSPO Note: This section should indicate the type of soil identified and the area of it. Sampling points should be indicated. Topographic maps will be included here as well. Any potential areas identified as steep terrain according to the P&C 2018 definition should be mentioned accordingly. What are the methodology(ies), people involved in the process, date of assessment and findings? Note: Should an assessment carried out by internal staff, just fill the name of the staff and his/her designation.

Date of Assessment: August 2023 – September 2024

Name of Assessor: J Crawshaw

Assessor Designation and Company: J Crawshaw / PT Hijau Daun

Methods

Secondary Data

Secondary data was either downloaded from the internet or sourced from PT Hijau Daun's library of spatial data.

Data Type	Source
Digital Elevation Model (which was used to derive slope)	ALOS PALSAR (30 m pixels)
Soil Type	PNGRIS
Landforms and general soil information	PNGRIS

Primary Data

The secondary data was verified by travelling around the study area to certain points and observing the situation in that area. For example, verifying, at that point, if the area was mapped as being less than 10 degrees slope, was this in fact correct. Similarly looking at the soil and the landforms in the area to determine whether it matched the description.

Additionally, village level interviews were undertaken within and around the assessment area. One of the questions was relating to the soils in the area. In every interview the community was asked about soil fertility and whether there were any soils in the area that were avoided as a result of low yields.

The assessment took place in 25th October – 14th November 2023 over a period of 3 weeks.

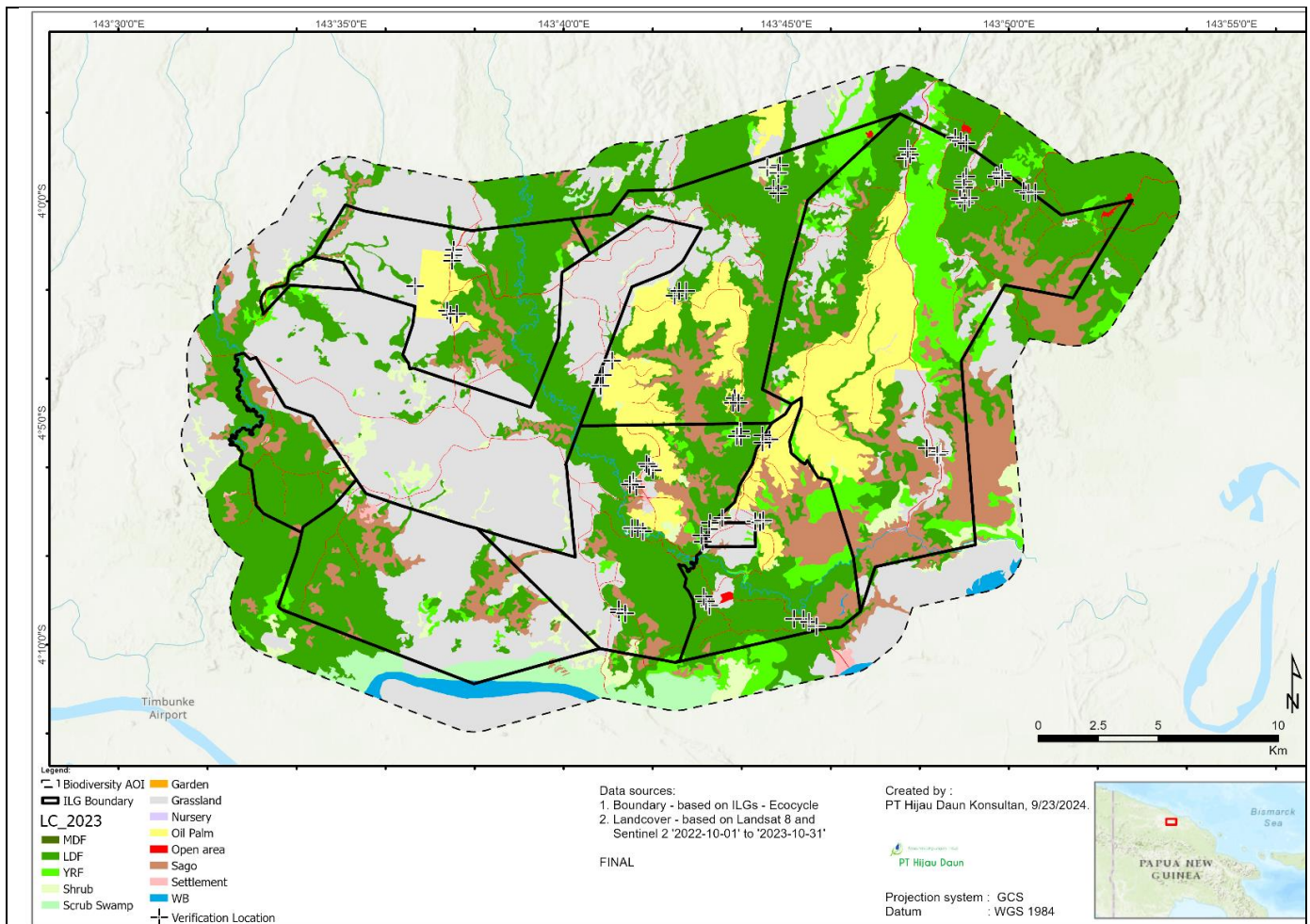*People Involved : J Crawshaw – HCV / HCS Assessor*

Figure 18 Locations of soil and topography observation points.

Findings

Peat

The PNGRIS data maps histosols within the AOI. The areas that are mapped as peat are reserved from development – these are quite inaccessible areas (e.g. riverine swamp areas).
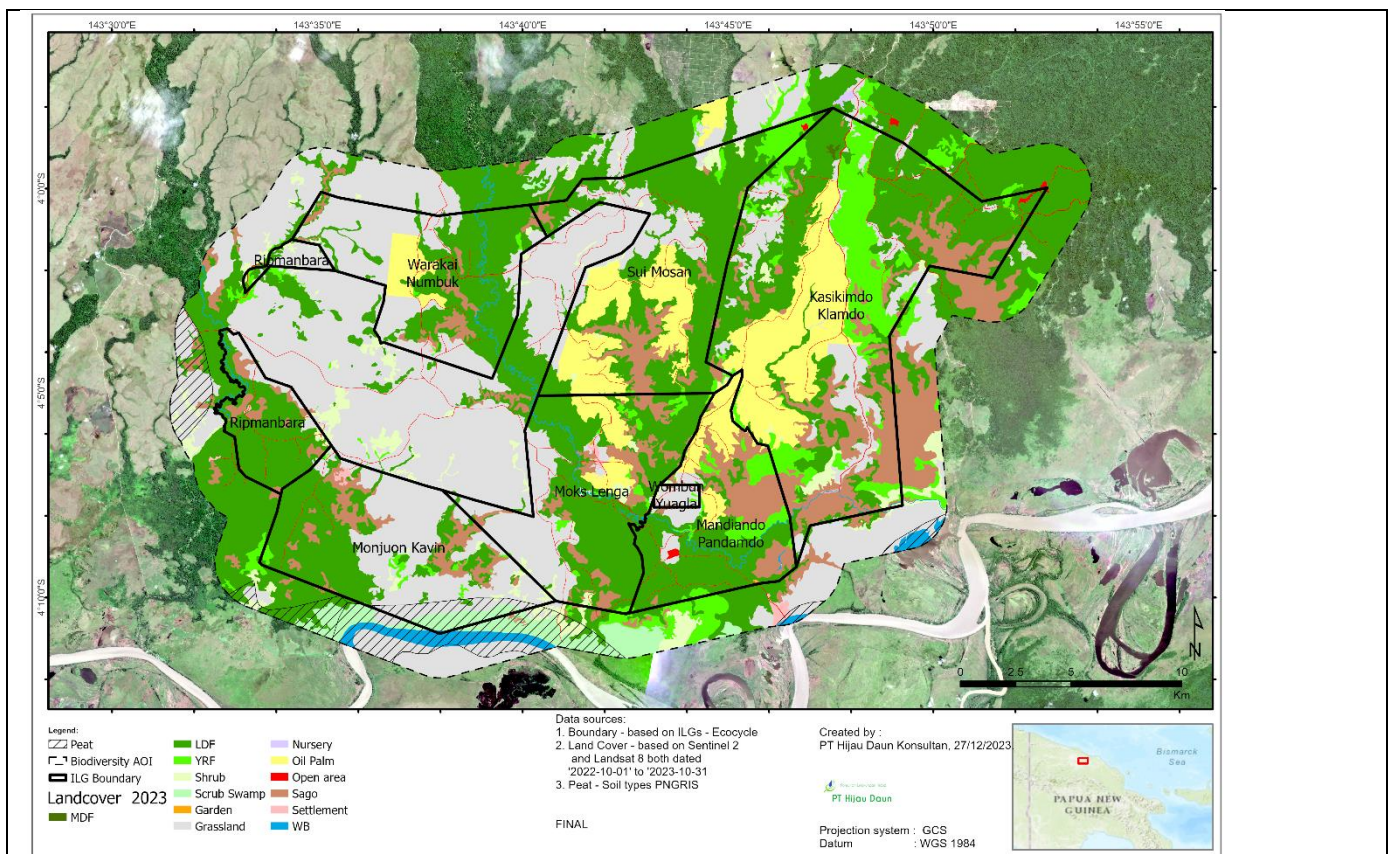
Figure 19. There are small areas of peat soils (histosols) identified by PNGRIS. These are associated with the swamp areas near the Sepik River.

Steep slopes

Justification (steep slopes)

Two main datasets used to determine the presence or absence of vulnerable soils or steep slopes. were; 1) ALOS PALSAR 12.5 m Digital Elevation Model 2) Papua New Guinea Resource Information System (PNGRIS) – Soil data (Bryan and Shearman, 2008)

Justification (vulnerable soils)

The spatial dataset associated with Bryan and Shearman, (2008) provides detailed information regarding various soil chemical and physical properties across the land systems of Papua New Guinea. These are provided as a 30m raster dataset, and thus should be treated as indicative. Nevertheless, this dataset is informative and provides initial guidance to aid in determining the spatial location of potentially erodible soil types. The soil types and the PNGRIS 'erosion risk' present across the study areas are provided above (**Error! Reference source not found.**) and will not be repeated again. Further information about the erosion risk categories is provided below in Table 13.

Table 13. Soil erodibility risk categories (Bryan and Shearman, 2008).

PNGRIS Code	Risk Class	Description (Bryan and Shearman, 2008)

1	Very low	Soils with a high to very high organic matter content and moderate to rapid permeabilities. Granular to fine crumby surface horizons. Some lowland Andepts may have moderate very fine sand and silt contents
2	Low	Except for sandy Entisols, these soils have moderate organic matter content and moderate permeabilities. The sandy Entisols have generally low organic matter content and are rapidly permeable and structureless.
3	Moderate	Generally, slowly permeable soils with moderate organic matter content; alluvial Entisols have low to moderate organic matter content, are massive and may have moderate very fine sand and silt content.
4	High	*Vertisols*: very slowly permeable, often subject to surface scaling and have prismatic or coarse estatey structures, but moderate organic matter content. *Ultisols* and *Alfisols*: generally relatively low organic matter content and relatively high very fine sand and silt content. Poorly structured topsoils.

Based on RSPO P&C (PNG NI), 2017 the assessors consider all areas >30° to be HCV and these have been mapped.

Slope classes 15° – 30° which are on soils classified as Highly erodible (Table 13) would also be considered HCV. PNGRIS maps the areas

However, **there are no soils present in the assessment area that are on highly erodible soils AND slope classes 15° – 25°. This information is only presented to complete the discussion.**
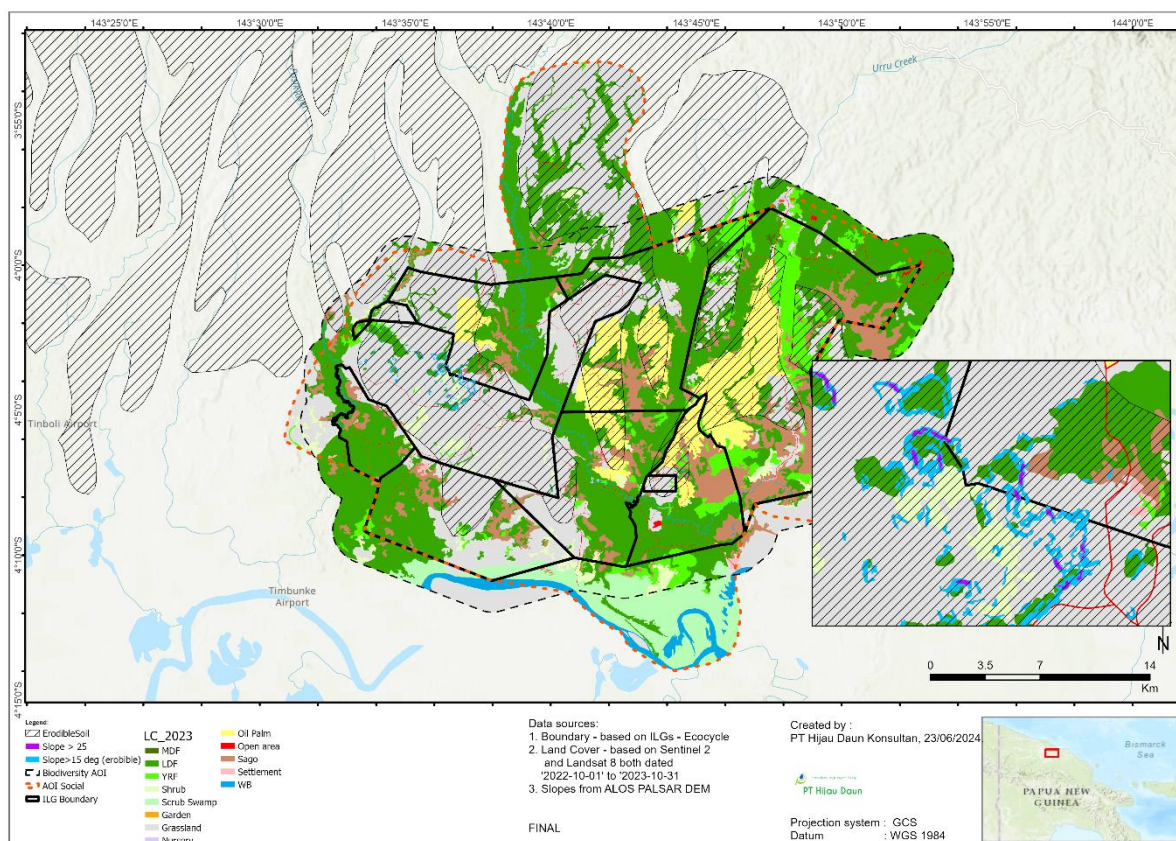

Figure 20. Slopes greater than 25 degrees derived from a DEM with 12.5 m pixels. There is only one area within the AOI that has steep slopes and this is the area of Noahs Ark Hill. The Plinthaqult soils (hatched) are considered highly erodible, any soils greater than 15 degrees on this soil type are mapped.

Results

Table 14. Criteria and Observations

Criteria	Description	Observation
Fragile Soils	A soil that is susceptible to degradation (reduction in fertility) when disturbed. A soil is particularly fragile if the degradation rapidly leads to an unacceptably low level of fertility or if it is irreversible using economically feasible management inputs.	Based on interviews with the community, there was no mention of soils that met these criteria. Indeed agricultural studies have labelled these soils as some of the best in PNG.
Marginal Soils	A soil that is unlikely to produce acceptable economic returns for the proposed crop at reasonable projections of crop value and costs of amelioration. Degraded soils are not marginal soils if their amelioration and resulting productivity is cost effective.	In all the community interviews, it was mentioned that the area could be comprehensively cropped and there was no mention of areas or soil types that were routinely avoided because of low yields **for Oil Palm**. Note that the grassland areas have been routinely burnt which has led to very low levels of soil carbon. This means that large amounts of particularly nitrogen fertiliser will be needed. These can be seen as degraded soils not marginal soils.
Peat	A soil with cumulative organic layer(s) comprising more than half of the upper 80 cm or 100 cm of the soil surface containing 35% or more of organic matter (35% or more Loss on Ignition) or 18% or more organic carbon.	There are peat soils mapped in this area. According to the local community the peat soils are only present in forest areas. These peat areas used to be more extensive but in the grassland areas the peat dried out and was burnt off by fires. Only a thin lens of basinal peat was present. There was never any deep peat present.
Steep soils	Soils over 25 degrees	No areas over 25 degrees were noted.

Section 7: Greenhouse Gas (GHG)

RSPO Note: this section should be used to explain the findings that come out from the usage of the New Development GHG calculator. Please include what are the significant sources and type of emissions expected from this area. What are the methodology(ies), people involved in the process, date of assessment and findings? Note: Should an assessment carried out by internal staff, just fill the name of the staff and his/her designation.

Date of Assessment:29/9/2024

Name of Assessor: J Crawshaw

Assessor Designation and Company: Consultant

Methodology

The following section has been taken from the HCSA assessment that was conducted in February – June 2024 as part of Ecocycle's commitment to 'No Deforestation'[6].

Image Analysis to create a landcover map

The study area for this assessment was a of polygon boundary supplied to the assessment team by Ecocycle.

Recent Landsat 8 was used to gain an understanding of the vegetation present across the broader landscape, and a recent "Planet" image was another dataset used for land cover classification during the project (i.e. preparing for the scoping study and fieldwork).

Field GPS measurement was crucial for defining the sample based on field observation and the current condition of the site shown in the images. These high-resolution images were also key tools in deriving test points for the final accuracy assessment.

Imagery and GPS derived datasets used for this project are shown Table below.

Table 15. Satellite dataset utilised during this integrated assessment

Data source	Capture date	Resolution (m)	Cloud cover (%)
Sentinel 2	'2022-10-01' to '2023-10-31'	10	<5
Landsat 8	'2022-10-01' to '2023-10-31'	30	< 5
Planet	August 2023	5	<5

Figure 21. Landsat 8 image mosaic for the assessment AOI (dated '2022-10-01' - '2023-10-31'). This used bands 5-4-3 which assisted differentiate between sago and natural forest.
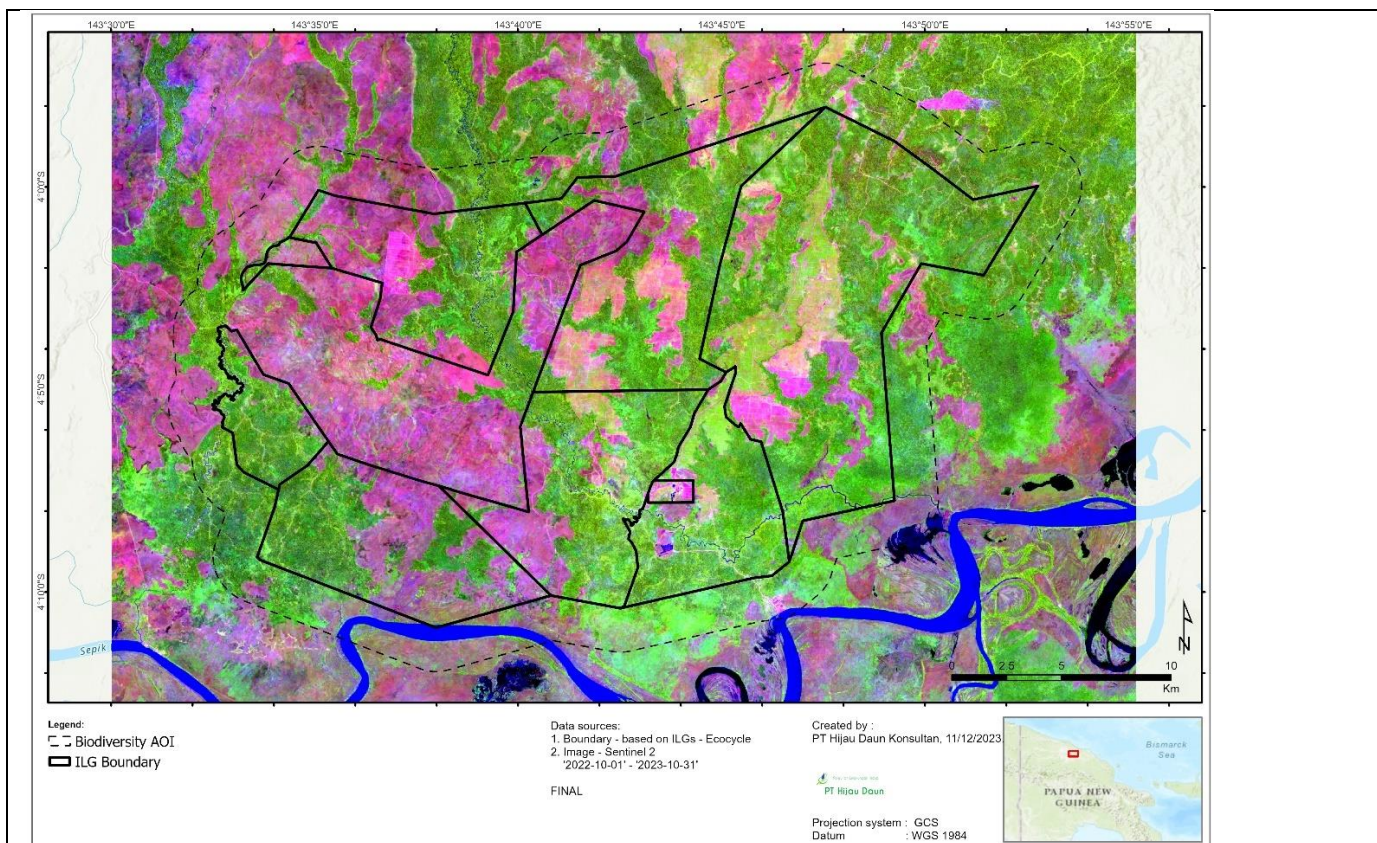
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[6] http://ecocyclelimited.com/

Figure 22. Sentinel 2 imagery. This was the primary imagery used for classification.
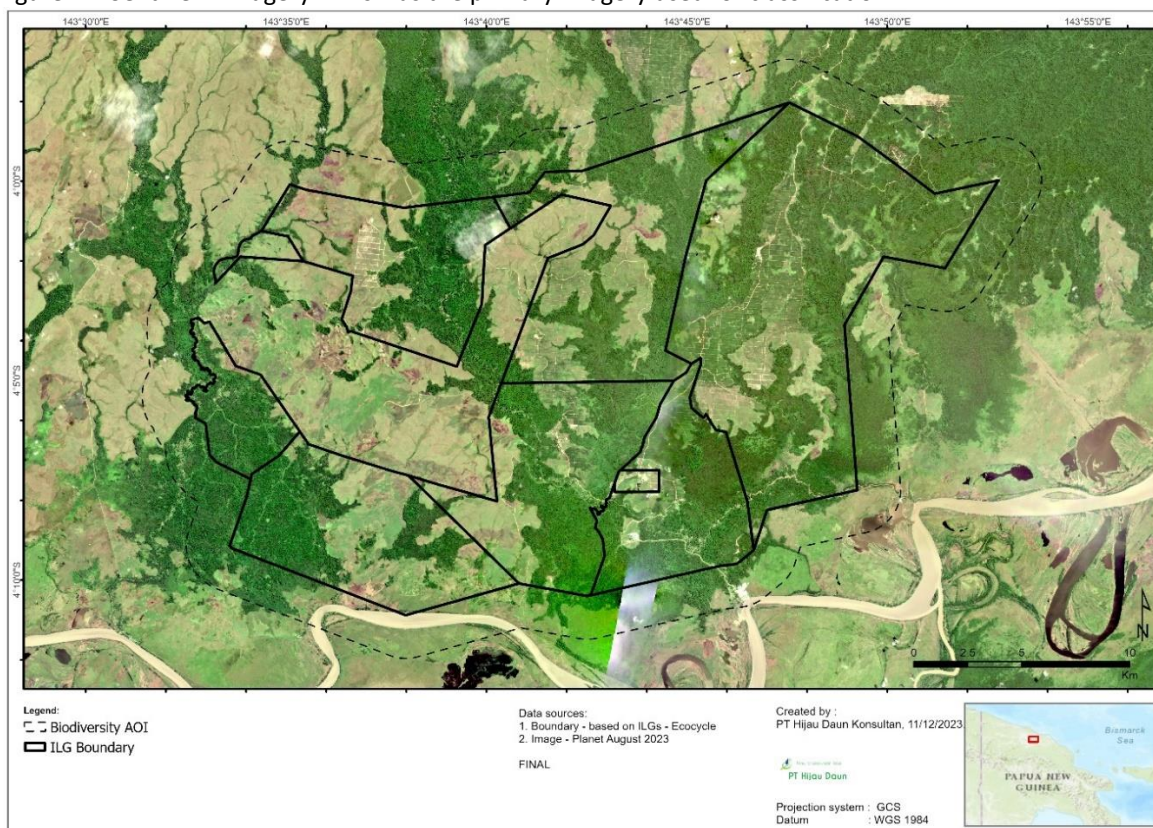

Figure 23. Planet imagery - dated August 2023. This was used for the accuracy assessment and the participatory mapping. It does not have a short-wave infra-red band and as such cannot be used for classification.

Results

The land cover classes that are used for the landcover, are fully described below in both Table 16 and section 8.2.

Table 16. Translation table between assessment land cover classes and RSPO Classes

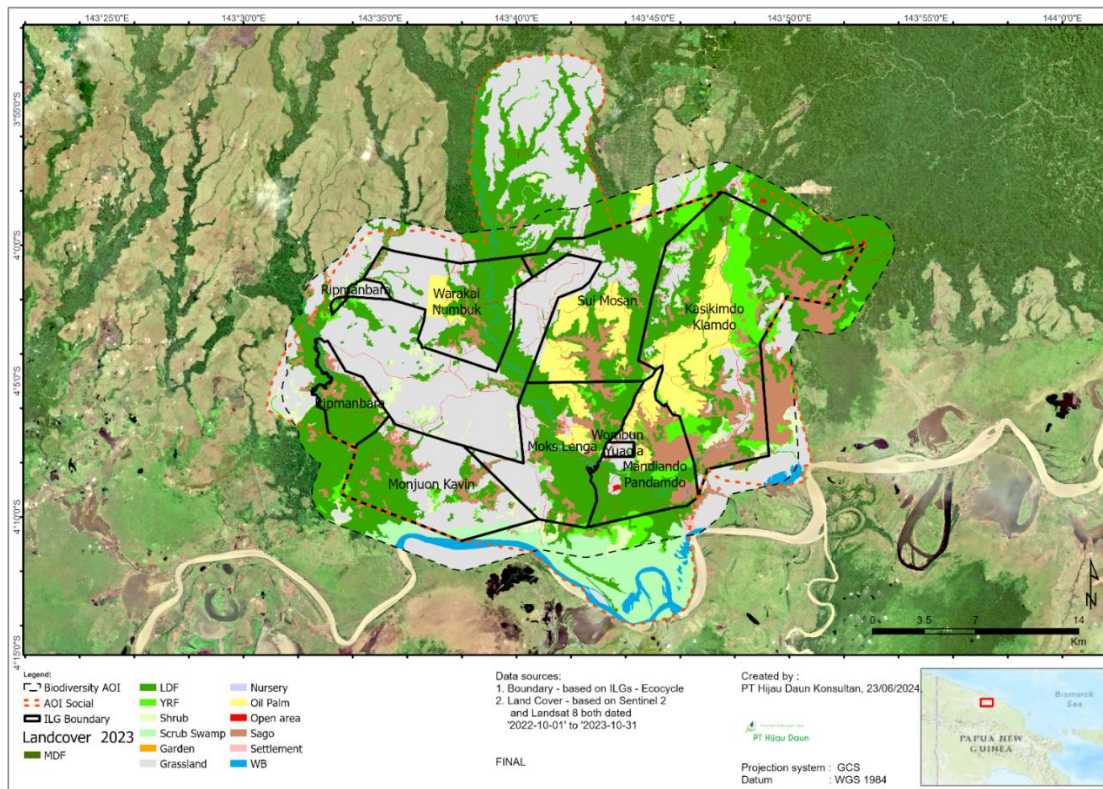| Landcover	RSPO Land cover	Analysis Area (ha)
Garden	Grassland	4.95
Grassland	Grassland	9,493.32
LDF	Disturbed forest	19,609.30
MDF	Undisturbed forest	18.00
Oil Palm	Grassland	6,196.12
Open area	Grassland	526.29
Sago	Not to be developed	6,108.40
Scrub Swamp	Shrub land	279.14
Settlement	Not to be developed	78.48
Shrub	Shrub land	753.76
WB	Other	189.37
YRF	Disturbed forest	3,311.21
Grand Total		46,568.33

Figure 24. Landcover in the east of the assessment area. Areas by landcover (Table 16).

Table 17. Translation table between assessment land cover classes and RSPO Classes

Landcover	RSPO Land cover	Analysis Area (ha)
Garden	Grassland	4.95
Grassland	Grassland	9,493.32
LDF	Disturbed forest	19,609.30
MDF	Undisturbed forest	18.00
Oil Palm	Grassland	6,196.12
Open area	Grassland	526.29
Sago	Not to be developed	6,108.40
Scrub Swamp	Shrub land	279.14
Settlement	Not to be developed	78.48
Shrub	Shrub land	753.76
WB	Other	189.37
YRF	Disturbed forest	3,311.21
Grand Total		46,568.33

Table 18. Carbon stock for the study area.

Land cover class	Area (ha)	Mean Carbon stock (tC/ha)	Total Carbon stocks (tCO$_2$)
Undisturbed forest	18	268	4,824.00
Disturbed forest	22,920.51	128	2,933,825.28
Grassland	16220.68	5	81,103.40
Not to be developed	6,186.88	0	-
Other	189.37	0	-
Shrub land	1032.9	46	47,513.40
	46,568.34		3,067,266.08

Table 19. Summary of preferred conversion scenario (ha).

Classification	Scenario 1		
	Current LC	Conserve	Develop
Undisturbed Forest	18.00	18.00	-
Disturbed Forest	22,920.51	22,920.51	-
Grassland	16,220.68	6,571.94	9,648.74
Shrub land	1,032.90	319.87	713.03
Other	189.37	189.37	-
Not to be developed	6,186.88	6,186.88	-
Grand Total	46,568.34	36,206.57	10,361.77

Table 20. Conversion scenario 1 (*preferred development scenario*)

Classification	Conserve		Develop		Total Area (ha)
	Area (ha)	Carbon stock (tCO2)	Area (ha)	Carbon emission (tC tCO2	
Undisturbed Forest	18.00	4,824.00	-	-	18.00
Disturbed Forest	22,920.51	2,933,825.28	-	-	22,920.51
Grassland	6,571.94	32,859.70	9,648.74	48,243.70	16,220.68
Shrub land	319.87	14,714.10	713.03	32,799.30	1,032.90
Other	189.37	-	-	-	189.37
Not to be developed	6,186.88	-	-	-	6,186.88
Grand Total	36,206.57	2,986,223.08	10,361.77	81,043.00	46,568.34

Table 21. Results of the greenhouse gas emissions scenario modelling, orange box indicating preferred Development Scenario. Field emissions and sinks assume average growth for oil palm, used by large scale operations. Data derived from RSPO GHG Calculator (RSPO-PRO-T04-003 V2.0 ENG).

	Scenario 1		
Field emissions & sinks	tCO2e	t CO2e/ha	tCO2e/tFFB
Land clearing	3,241.72	0.33	0.03
Crop sequestration	-91,668.90	-9.36	-0.78
Fertilisers	4,204.35	0.43	0.04
N2O	12,399.61	1.27	0.11
Field fuel	3,172.72	0.32	0.03
Peat	0.00	0.00	0.00
Conservation credit	-22,938.51	-2.34	-0.20
Total	-91,589.00	-9.35	-0.78
Mill emissions & credit	tCO2e	tCO2e/ha	tCO2e/tFFB
POME	23,032.47	2.35	0.20
Mill fuel	1,085.16	0.11	0.01
Purchased electricity	0.00	0.00	0.00
Credit (excess electricity exported)	0.00	0.00	0.00
Credit (sale of biomass for power)	0.00	0.00	0.00
Total	24,117.63	2.46	0.21
Total emissions, tCO2e (field and mill)	-67,471		
t CO2e/t CPO	-2.18		
t CO2e/t PK	-2.18		

Section 8: Land Use Change Analysis (LUCA)

RSPO Note: This section will be used to analyse that there has been no land clearing in the area before the NPP is submitted. Arrangement should be following the proxy dates indicated in section 2.2.7 of the current NPP Document. Please ensure that the minimum resolution is 300 dpi. What are the methodology(ies), people involved in the process, date of assessment and findings? Note: Should an assessment carried out by internal staff, just fill the name of the staff and his/her designation.

Date of RSPO approval as satisfactory: 29/7/2024

Name of Assessor: J Crawshaw

Assessor Designation and Company: Consultant – PT Hijau Daun

The Land Use Change (LUC) Analysis conducted for ECOCYCLE LTD was performed in accordance with the RSPO standards and guidelines. The methodology applied in this analysis included a combination of spatial data verification, supervised classification techniques, and visual interpretation.

The LUC analysis process involved the following key steps:

1. **Data Verification and Comparison**

   • The completeness of spatial data was checked against the LUC Reporting Checklist and AGP's LUCA Service System.
   • The submitted satellite imagery was overlaid with georeferenced boundaries of the management unit to detect inconsistencies.

2. **Image Processing and Classification**

   • The primary method used for land cover classification was Supervised Classification.
   • Satellite imagery from Landsat and Sentinel-2 was utilized, with necessary corrections applied to address Scan Line Corrector (SLC) failures in Landsat ETM+ 7 images.
   • Vegetation coefficients were assigned based on RSPO classification standards.

3. **Spatial and Geometric Analysis**

   • The management unit and land cover classifications were verified using visual inspection.
   • Geometric calculations were conducted on boundary shapefiles and land cover classes to ensure consistency with the reporting template.
   • Land use changes over different time periods were analyzed, with specific emphasis on vegetation coefficient classification.

4. **Final Liability Calculation**

   • The land cover map was cross-checked to ensure accurate compensation liability calculations.
   • The results of the LUC analysis were reviewed and compared against the RSPO's compensation scheme guidelines to assess compliance.

Results

Table 22. Land Use Change Matrix

Land cover	Early Nov 05	End Nov 07/Early Dec 08	End Dec 09/Early Jan 10	2014	2023
Garden	-	-	-	-	4.95
Grassland	15,562.11	15,154.23	14,613.22	15,147.02	9,493.32
Low Density Forest	18,951.23	18,942.03	18,928.87	19,013.98	19,613.84
Medium Density Forest	-	-	-	-	18
Oil Palm	-	-	-	-	6,192.13
Open Area	11.13	412.46	700.4	506.41	526.29
Sago	6,104.67	6,115.60	6,115.04	6,114.96	6,114.96
Settlement	33.7	33.7	49.31	54.57	70.47
Shrub	3,789.25	3,793.61	2,235.53	2,038.71	754.66
Shrub swamp	279.14	279.14	279.14	279.14	279.14
Water Body	189.37	189.37	189.37	189.37	189.37
Young Regenerating Forest	1,647.74	1,648.19	3,457.46	3,224.17	3,311.21
Total	46,568.33	46,568.33	46,568.33	46,568.33	46,568.33

Table 23. 2005 - 2007 Land Use Change Matrix

	Land cover class	Nov-07									
		Grassland	LDF	Open area	Sago	Settlement	Shrub	Shrub swamp	WB	YRF	Grand Total
Nov-05	Grassland	15,145.76		409.79			6.56				15,562.11
	LDF		18,942.03		9.19						18,951.23
	Open Area	8.46		2.67							11.13
	Sago				6,104.67						6,104.67
	Settlement					33.7					33.7
	Shrub				1.74		3,787.06			0.45	3,789.25

	Grassland	LDF	Open area	Sago	Settlement	Shrub	Shrub swamp	WB	YRF	Total
Shrub swamp							279.14			279.14
WB								189.37		189.37
YRF									1,647.74	1,647.74
Total Nov 07 (sum of rows)	15,154.23	18,942.03	412.46	6,115.60	33.7	3,793.61	279.14	189.37	1,648.19	46,568.33

Table 24. 2007 - 2009 Land Use Change Matrix

		Nov-09									
	Land cover class	Grassland	LDF	Open area	Sago	Settlement	Shrub	Shrub swamp	WB	YRF	Total Nov 07 (sum of columns)
Nov-07	Grassland	14,210.46		697.73		15.05	230.98				15,154.23
	LDF		18,885.94							56.1	18,942.03
	Open area	402.76		2.67			7.03				412.46
	Sago				6,115.04	0.56					6,115.60
	Settlement					33.7					33.7
	Shrub						1,997.51			1,796.10	3,793.61
	Shrub swamp							279.14			279.14
	WB								189.37		189.37
	YRF		42.93							1,605.26	1,648.19
	Total Nov 09 (sum of rows)	14,613.22	18,928.87	700.4	6,115.04	49.31	2,235.53	279.14	189.37	3,457.46	46,568.33

Table 25. 2010 - 2014 Land Use Change Matrix

		May-14									
	Land cover class	Grassland	LDF	Open area	Sago	Settlement	Shrub	Shrub swamp	WB	YRF	Total Jan 10 (sum of columns)
Jan-10	Grassland	14,452.96		156.32			3.94				14,613.22
	LDF		18,692.31	189.83	1	0.49				45.24	18,928.87
	Open area	687.85		12.55							700.4
	Sago			1.09	6,113.95						6,115.04
	Settlement					49.31					49.31
	Shrub	6.21		142.68		4.77	2,033.67			48.2	2,235.53

	Grassl and	LDF	Open area	Sago	Settle ment	Shrub	Shrub swamp	WB	YRF	Total May 14
Shrub swamp							279.14			279.14
WB								189.37		189.37
YRF	321.68	3.95				1.1			3,130.73	3,457.46
Total May 2014 (sum of rows)	15,147.02	19,013.98	506.41	6,114.96	54.57	2,038.71	279.14	189.37	3,224.17	46,568.33

Table 26. Land Use Change Matrix 2014 - 2024

		Date of HCV assessment											
	Land cover class	Garden	Grassl and	LDF	MDF	Oil Palm	Open area	Sago	Settle ment	Shrub	Shrub Swamp	WB	YRF	Total May 14 (sum of columns)
May-14	Grassland	2.24	9,073.60	5.09		5,987.23				66.1			12.76	15,147.02
	LDF	2.41	25.18	18,860.36	18	3.99	0.66			7.74			95.65	19,013.98
	Open area		1.32				505.09							506.41
	Sago							6,114.96						6,114.96
	Settlement								54.57					54.57
	Shrub	0.3	390.71	48.24		204.25	20.55		11.91	679.05			683.7	2,038.71
	Shrub swamp										279.14			279.14
	WB											189.37		189.37
	YRF		2.5	700.16		0.65				1.77			2,519.09	3,224.17
	Total Ha up to date of HCV assessment (sum of rows)	4.95	9,493.32	19,613.84	18	6,196.12	526.29	6,114.96	66.48	754.66	279.14	189.37	3,311.21	46,568.33

Table 27. Raw Liability

Land cover class	Vegetation Coefficient	Nov 1, 2005 to Nov 30, 2007	Dec 1, 2007 to Dec 31, 2009	Jan 1, 2010 to May 9, 2014	After May 9, 2014
One or more land cover classes which fulfill the criterion of vegetation coefficient 1.0	1	0	0	0	-
One or more land cover classes which fulfill the criterion of vegetation coefficient 0.7	0.7	0	0	0	0.65
One or more land cover classes which fulfill the criterion of vegetation coefficient 0.4	0.4	0	0	0	

One or more land cover classes which fulfill the criterion of vegetation coefficient 0.0	0	0	0	0	6,191.48
Total (sum of rows)		**0**	**0**	**0**	6,192.13

Table 28. Final Compensation Liability

Period of land clearance	Land controlled by a non-member at time of clearance	Land controlled by an RSPO member at the time of clearance. This includes land acquired from other RSPO members
After May 9, 2014	0.91	[hectares]
January 1, 2010 to May 9, 2014	0	[hectares]
December 1, 2007 to December 31, 2009	0	[hectares]
November 1, 2005 to November 30, 2007	N.A.	N.A.
Total (sum of rows and columns)	**0.91**	
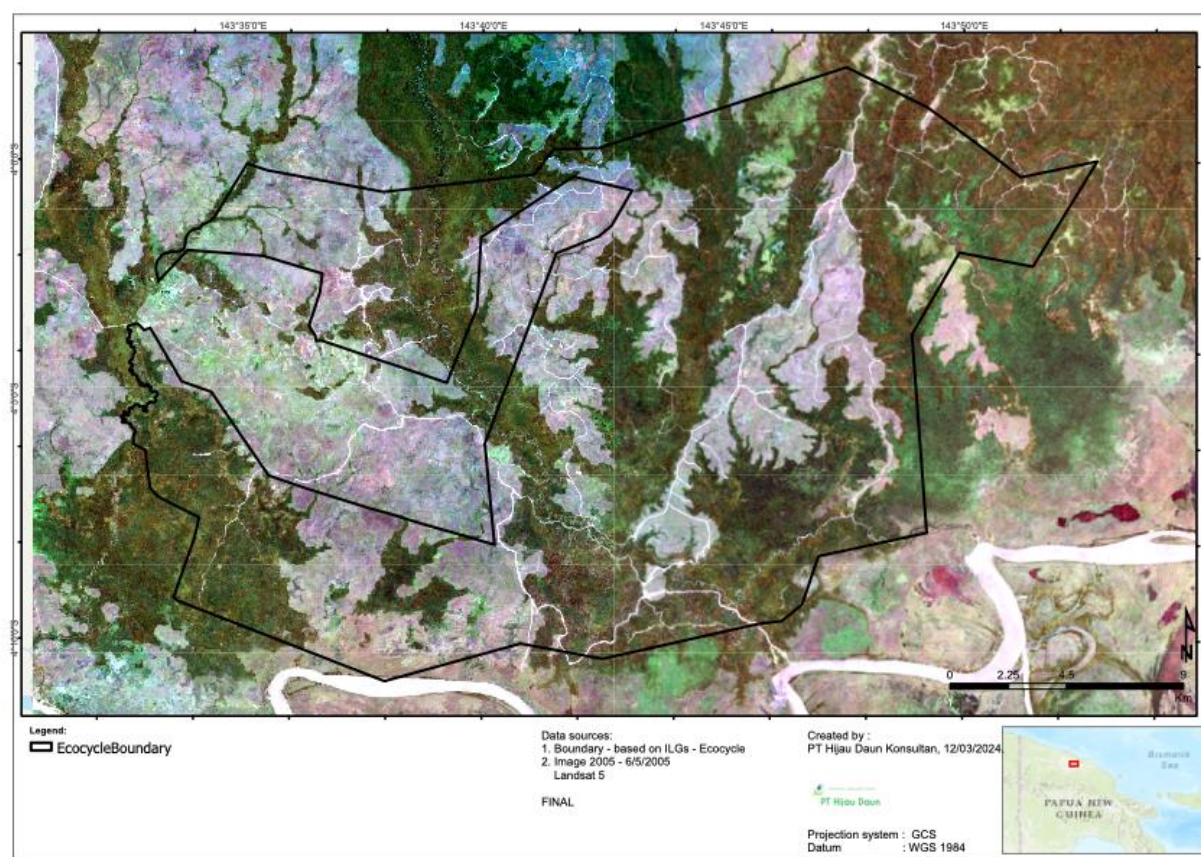
Figure 25. LUCA Image 2005

Figure 26. LUCA Image 2007
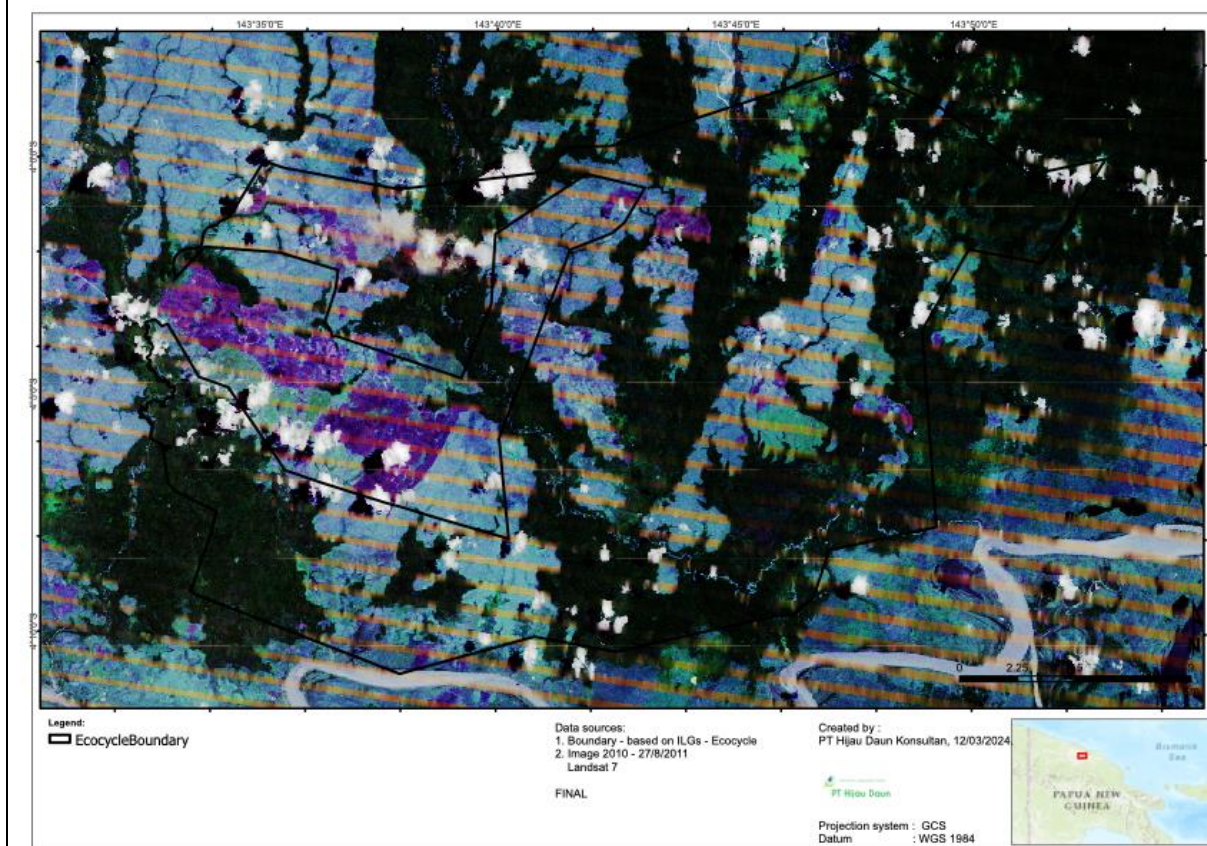
Figure 27. LUCA Image 2010
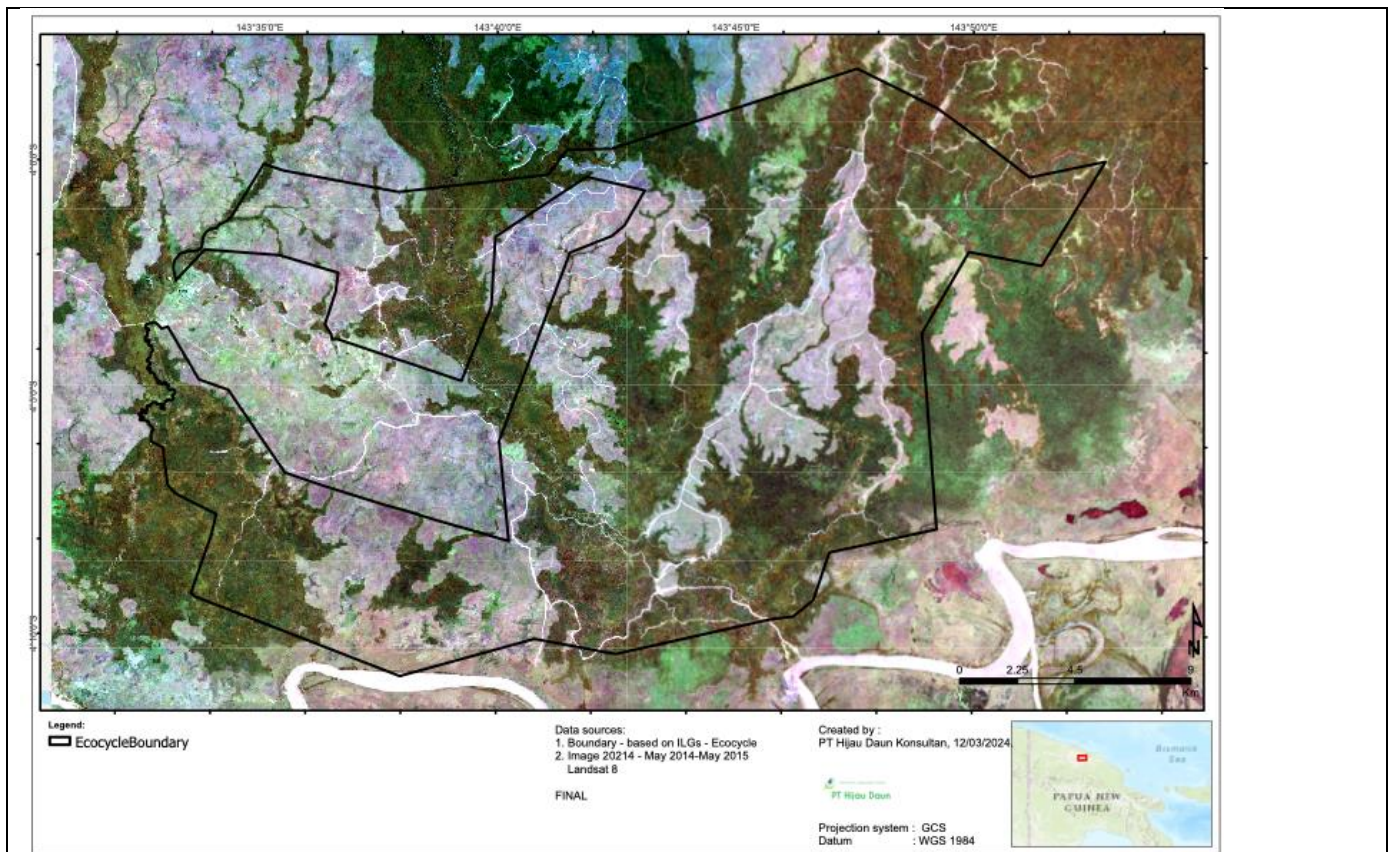
Figure 28. LUCA Image 2014
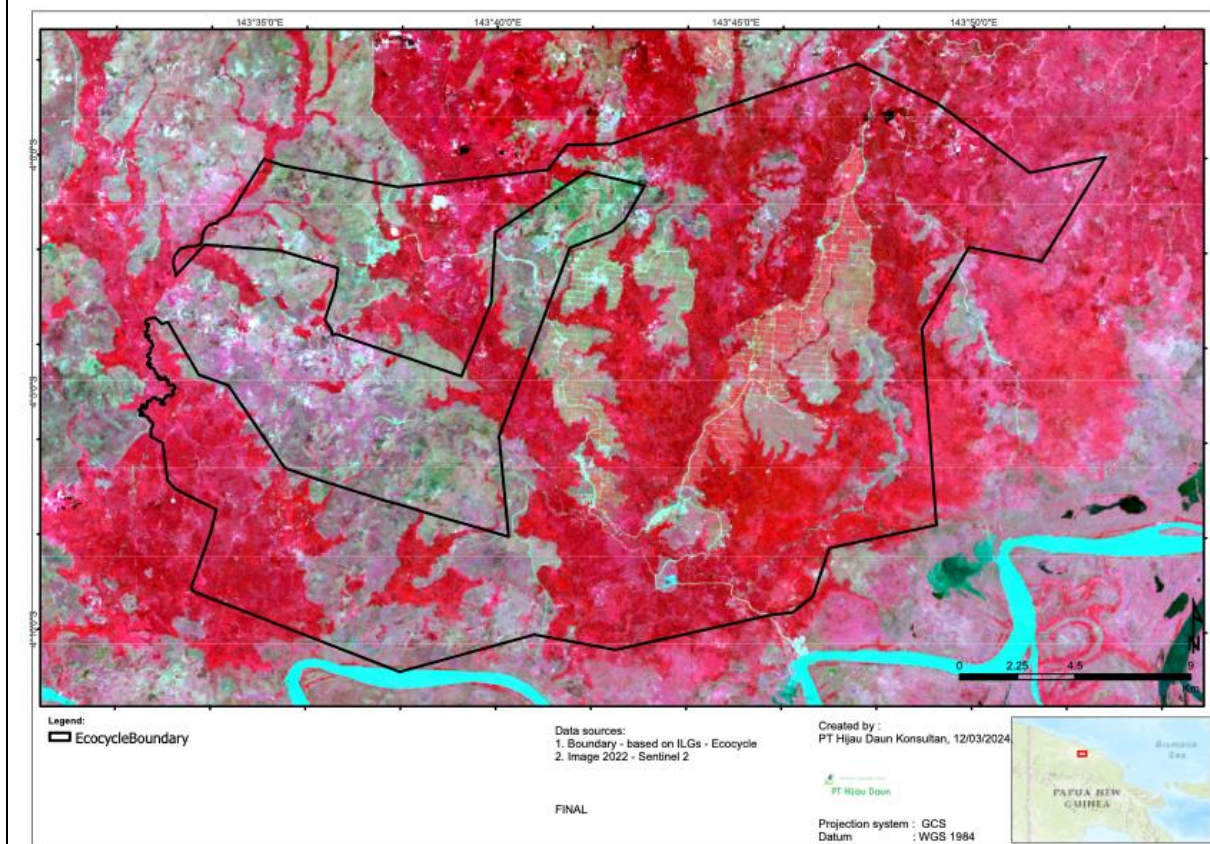
Figure 29. LUCA Image 2022
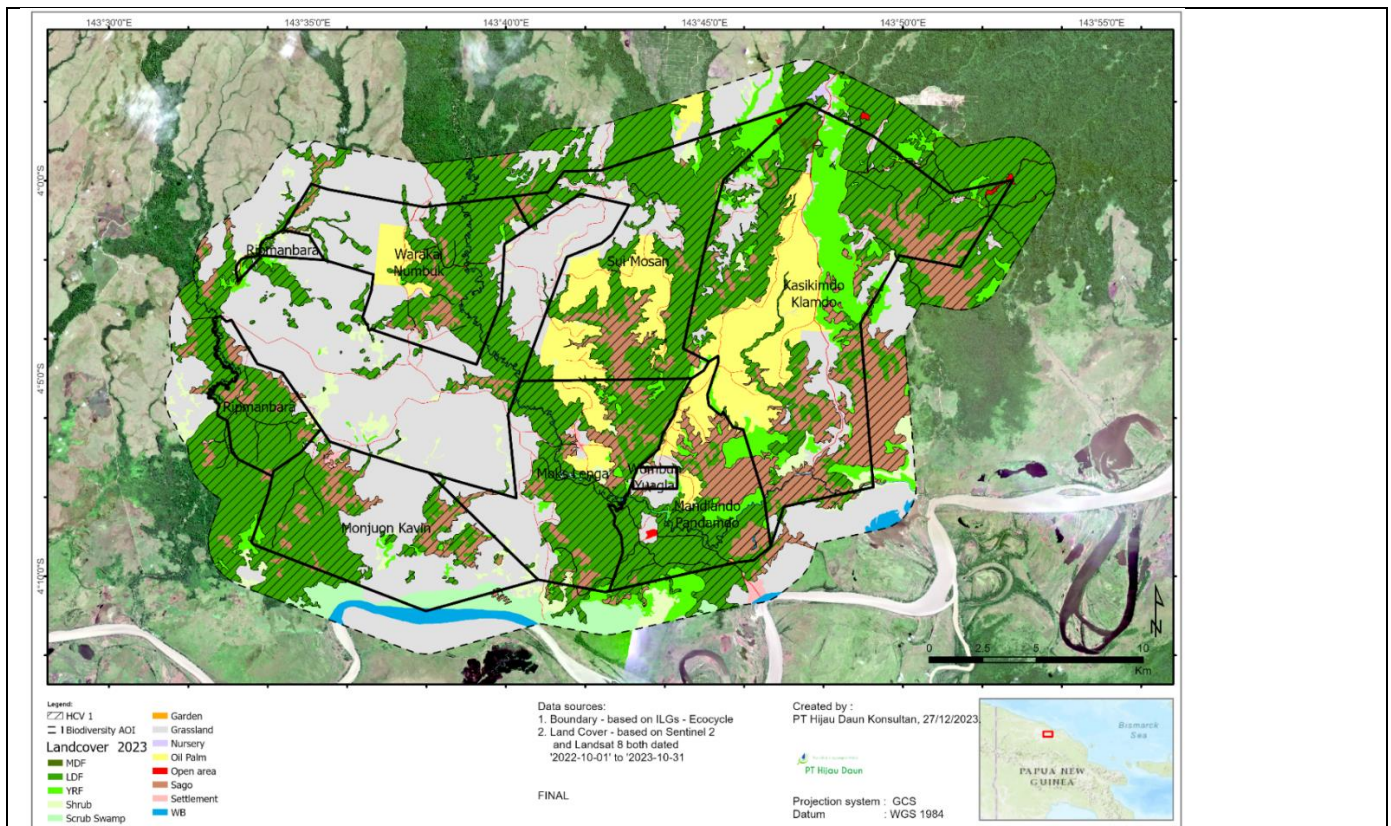
Figure 30. HCV 1 locations in the east of the assessment area. As a proxy for HCV1, forest which is LDF or better is used as well as the sago swamp – which is closely associated with the forest areas.
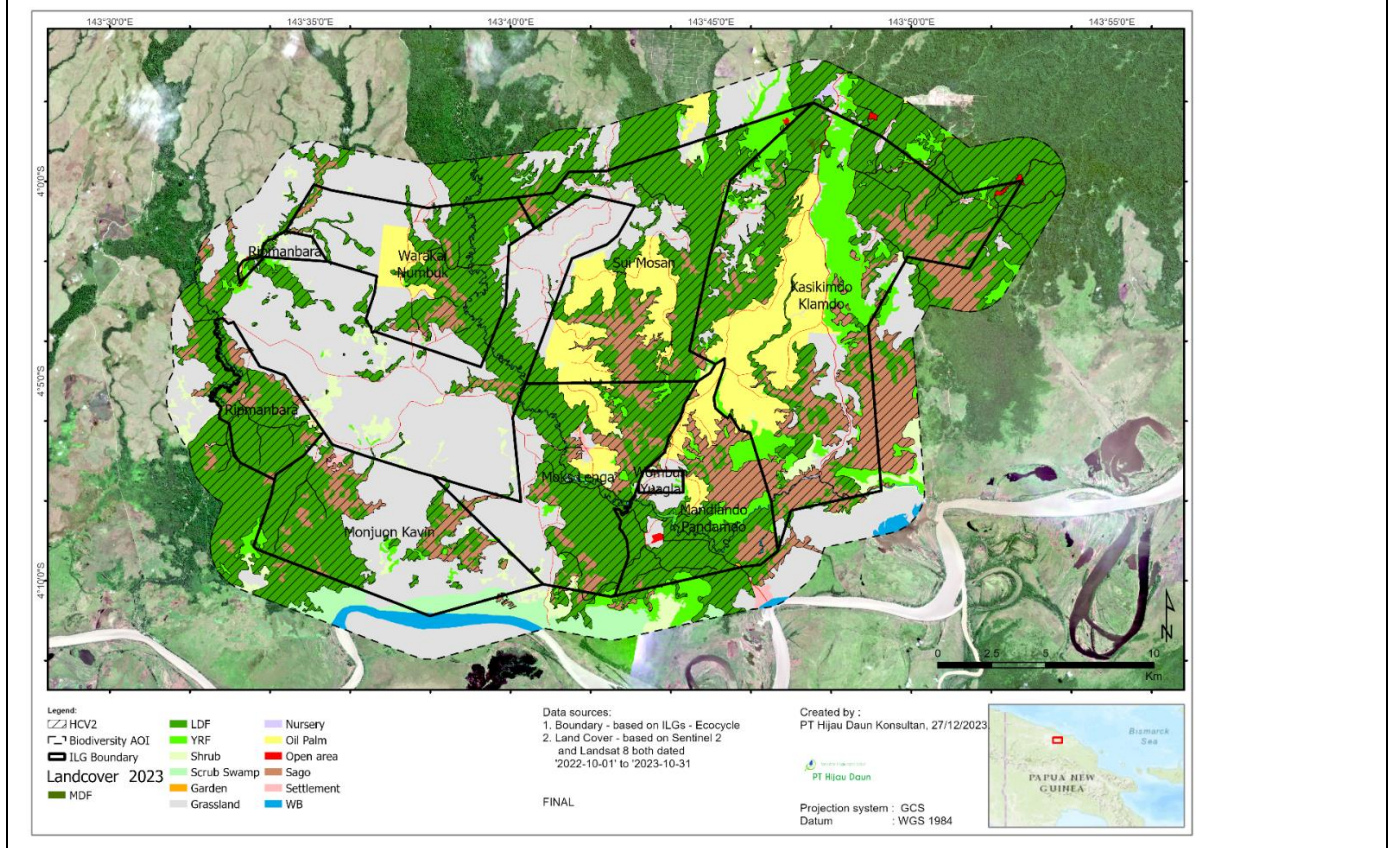
Figure 31 There is no overlap between IFL and the assessment areas. Additionally the large forested areas are considered HCV 2 because of the presence of Cassowaries and Gouria crowned pigeons (indicator species).
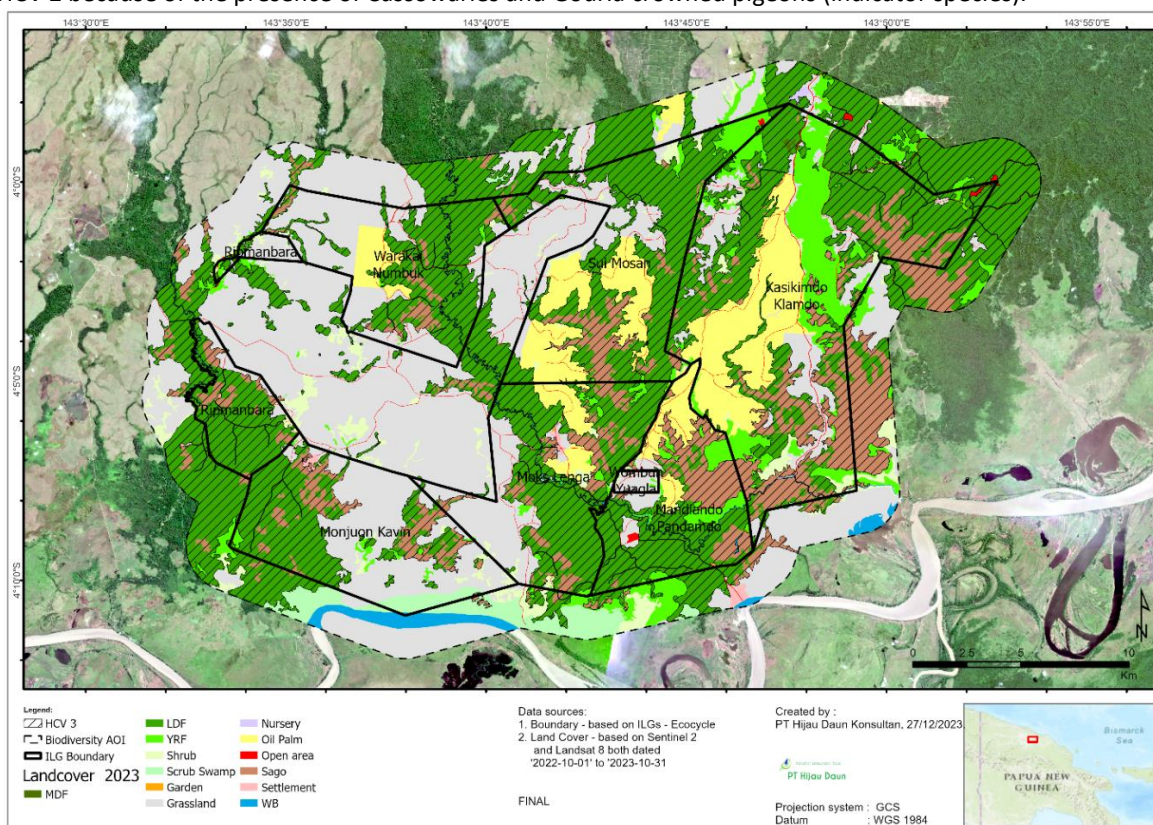
Figure 25. HCV3 is mapped over "Swamp Forests".

Section 9: Conclusions

RSPO Note: Please conclude all the findings of the assessment and how this will be translated into a management plan. If there is any known significant issue, the RSPO member needs to acknowledge its existence and ensure it is a priority for the management to address those issues.

1.1.7 Threats to social values

The population, with a growth rate of around 3 %, throughout PNG, it is assumed in this area also the population has increased rapidly in the last 30 years. The economic opportunities provided by Ecocycle has resulted in the migration of many people from other areas looking for work (e.g. Yanguru, Maprik).

Increased population puts a lot of pressure on the natural resources. The local communities have been looking for opportunities to make money from their natural resources. These communities have had the area logged twice in the last 10 years. The forest will recover but the loggers have taken everything, only species remaining are trees with no timber value at all. By developing oil palm plantations on the grasslands, hopefully the forests will recover. Already the logging roads that would have given access to hunters and people opening gardens are now becoming unpassable. There were no complaints from the communities about poor logging practices.

The environmental pressure in this area is significantly lower compared to other regions in Papua New Guinea (PNG). However, hunting practices, particularly for bandicoots and rats, have led to frequent fires being set on the grasslands. These fires contribute to the gradual retreat of forest edges, and once Imperata cylindrica (sword grass) establishes itself, forest regeneration becomes nearly impossible. This pattern of grassland expansion and forest loss can be observed in the land cover time series analysis (Figure 34 - Figure 38) , which visually demonstrates the progressive shift from forested areas to Imperata-dominated landscapes. Additionally, in many parts of PNG, poor land management practices combined with frequent burning have resulted in large expanses

of Imperata cylindrica growth. According to McKinnon et al. (1996), this grass species represents the final stage of environmental degradation, indicating that once a landscape is overtaken by Imperata, natural ecological recovery becomes extremely difficult without intervention. This highlights the importance of implementing sustainable land-use strategies in the assessment area to prevent further environmental decline and ensure long-term ecosystem health.

People are constantly looking for areas to garden and it is always the areas in the forested river buffers that is the most preferred location. Water is available and the soil in these areas tends to be the most fertile.

Water is a major issue, all the communities drink from the rivers which are very turbid. There are complaints of upset stomachs. Yet none of the communities have the resources to install and maintain a rain-fed water supply.

Resources such as bush meat and sago were heavily relied upon. Unlike other areas in PNG there were no complaints of these resources becoming scarce.

The rivers seem to be invaded by tilapia, which is an introduced species, for many communities this is an important source of protein (albeit introduced).

Current and Future Threats

Note that all the threats identified are current threats. These are all likely to get worse in the future with the rapidly increasing population. The main reasons for this are increasing population – it is anticipated that climate change will also cause the threats to get worse. There are not likely to be any completely "new" threats arrive.

Regarding the HCV 6 areas, although this is a Christian area, there is still a strong belief in spirits. Based on the participatory mapping most of the spirits lived in the forests.

1.1.8 Threats to biodiversity values

Due to the dynamic nature of landuse in developing countries such as Papua New Guinea, a range of threats to the environmental values identified by this integrated assessment exist. These range from minor threats, such as the over-harvesting of non-timber forest products (NTFP) for customary use, to major threats such as the potential contamination of critical water supply by industrial agro-chemicals.

Aside from the rapid expansion of the non-certified oil palm estate, the two main causes of the loss of natural forest habitat in Papua New Guinea is from industrial logging and expansion of subsistence agriculture, driven by an increasing human population especially in rural PNG (Shearman and Bryan, 2011). As a whole, PNG is experiencing a rapid, sustained population growth of about 2.7% per year. This has led to the need for more food to feed a growing population (Bourke and Harwood, 2009). More and more areas are being cleared to plant gardens. Large-scale agricultural projects are also placing a strain on the survival of fauna since natural habitats are cleared and replaced with mono-cropping ventures such as oil palm.

One of the perennial challenges for companies, such as Ecocycle, who operate in an environment dominated by customary land tenure, is the lack control over environmental degradation outside the areas intended for lease. There are many areas in the landscape where logging is taking place with what appears to be no environmental safeguards (e.g. significant mudflows downhill from the logging).

While Ecocycle clearly has corporate obligations and responsibilities to ensure best practice within their lease areas, their good example may only reach so far, and is generally confined to areas under their direct control. They can set an example, and hope to enact positive change within their area of interest, but cannot direct customary land holders how to manage their own land. A wicked problem. Landscape scale HCV's (such as HCV 1 and 2) may be affected by threatening processes that are entirely outside a company like Ecocycle's power to influence.

1.1.8.1 Species related threats – Deforestation

Table 83 and Table 84 discuss the specific threats to HCVs in the assessment areas. However, deforestation throughout the landscape is a major threat to biodiversity. Hijau Daun analysed the area of the Ecocycle's

operational landscape, an area of 176,656 ha. It found that since 1990, the area of this once forested area, has been reduced from 76,239 ha to 59,423 ha (a 31% reduction in extent). The forest cover in the whole landscape has been reduced from 43% to 33% forest cover in this period.

Buchanan & Pilgrim (2008) have observed that the high rate of deforestation, concentrated in the lowlands, is undoubtedly impacting PNG's endemic birds, many of which are forest specialists. Low species diversity, richness, and abundance in oil palm plantations have also been shown elsewhere for birds and other biodiversity.

Species with narrow altitudinal ranges in the lowlands have been most severely impacted. Particular species that will have been affected will be :

1. Dwarf Cassowary

2. Brush Turkey / Megapodes

(Pers comm. B Iova – Curator Port Moresby National Museum)

It is further surmised that even where species are capable of utilising remaining fragments, largely of degraded or secondary forest, their populations are likely to be at greater risk from a range of factors, and such fragmentation may ultimately be a much more serious threat to forest birds than selective logging.

Table 29. Management and Monitoring

Value identified	Threat (current and future)	Management	Monitoring
HCV 1	• Hunting • Fire (made worse by climate change) • Invasive species • Logging • Agricultural clearance • Roading development	• Agreements with the community that there should be no commercial logging within the HCV areas. Subsistence level hunting and cutting trees for community use is allowed. • Awareness raising in villages to discourage random fire lighting (especially in the kunai grasslands). Enforcement of the "No Burn Policy" • Very little can be done about invasive species. • Roading through the HCV areas to access oil palm must be avoided, where unavoidable, damage to vegetation to be minimized.	• Undertake bird / mammals surveys to measure changes in bird mammal abundance / presence. • Map out areas of burns. • Recording the presence of invasive species. • Monitoring using a combination of monitoring from satellite images as well as on the ground patrols and being informed by staff working in the village about encroachment or logging.
HCV 2	• These follow HCV1 and are not repeated.		

HCV 3	• These follow HCV1 and are not repeated.		
HCV 4	• Burning to assist agricultural development within the forested areas / riparian buffer strip. • Lack of awareness by company employees and contractors about HCV 4, particularly small river riparian buffers and mismanagement of high risk activities within buffer areas (e.g building roads through riparian areas). • People constructing huts and living (permanently or temporarily) and making gardens in riparian areas. • River changing course and destroying riparian areas • Fire – this will stop tree lined riparian strips being established.	• Ensure that the communities realise that the riparian buffers within company areas are not empty land available for agriculture. This should be specifically stated in agreements and socialized to the community. • A survey and demarcating areas that are within 50 m of rivers and planting native trees in these areas (where the landcover is grassland). • Where there is already oil palm within the buffer this may be replanted if there is no evidence of environmental damage in the first rotation. No agricultural chemicals should be applied in the buffer zone.[7]	• Monitoring using a combination of monitoring from satellite images as well as on the ground patrols and being informed by staff working in the village about encroachment or logging. • Monitoring of land clearing to ensure buffers are not cleared. • Water quality monitoring. • Monitor the survival of trees on newly planted areas.

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[7] This is consistent with the PnC 2019 "7.8.2 (C) Water courses and wetlands are protected, including maintaining and restoring appropriate riparian and other buffer zones in line with 'RSPO Manual on BMPs for the management and rehabilitation of riparian reserves' (April 2017) or applicable National legislation or specific environmental permit. Smallholders may replant existing planted areas provided there is no evidence of environmental deterioration having occurred during the previous cycle."

5 (internal)	• Agricultural chemicals in the ground water • Claims and disputes on land.	• Manage and maintain buffer zones consisting of natural vegetation. Maintaining SOPs which are that no agricultural chemicals can be used within the buffer zones including where these have not yet been converted to natural vegetation. • Ensuring adequate areas are available for the community to garden and collect natural materials (outside the lease area). • Mapping of clans' lands (not just those areas to be leased) and assisting to have the land included in the ILGs. This is to ensure security of the land and right to use the land in the future. • Ensuring all claims and disputes are registered under the company's grievance process.	• Monitor against HCS metrics of 0.5 ha of garden land per person available. • Monitoring recommendations for HCV 1 & 4 will overlap with HCV 5 and are not repeated. • Keeping abreast of disputes and providing assistance to the communities where possible or necessary.
5 (external)	• Overfishing. • Continued agricultural expansion putting increased pressure on natural areas. Most likely this will be caused by oil palm companies that are not RSPO members nor have a "no deforestation commitment" • Fires in el nino years. • Settlers (or other parties) buying land in undocumented / illegal deals.	• Currently people have stated that the level of fishing is not degrading riverine resources. With the development of OP, hopefully this will reduce the pressure on riverine resources. • Really this is in the hands of the community as it is their land. It is hard to say whether it is inevitable as the community are desperate for development. • Agreements within the community	• Recording problems with settlers or disputes between clans. • Mapping of the number and size of fires.

6[8]	• Accidental clearing of cultural sites by Ecocycle staff. • Fires that may burn these sites. • Communities simply forgetting about their history and / or cultural sites.	• Demarcation in the field prior to land clearing and planting. Including an appropriate buffer to make sure these areas are not disturbed by operations. • Demarcation on operational maps • Documentation of cultural and historical values • Awareness raising with the communities to try to discourage them lighting fires. • On-going fire-fighting to put out fires before they get large and uncontrollable.	• Checks to make sure enclaved areas are still clearly delineated. • Mapping of the number and size of fires.
Local people's lands and future livelihood security	• The LSS have limited gardening area following development (based on the HCSA metric).	• LSS block holders who believe their land may be limited after oil palm expansion should ensure they get user rights for additional gardening areas.	• Surveys of food security – especially during difficult times (e.g. droughts or when FFB prices are low). • Monitor the location where gardening takes place (e.g. are clans being forced to garden in places where gardening would not normally be done.)
Peat	• Clearing and burning of forest areas.	• Procedures in place to ban drainage of swamps and clearing of forest.	• Ensuring the forest and swamp areas remain undisturbed.
HCS forest	• These follow HCV1 and are not repeated here		

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[8] HCV 6 is an unusual situation. The HCV mapped HCV over areas where the communities mentioned the presence of HCV 6, which may be the presence of a spirit. In some cases it was ambiguous whether that spirit still existed or not. The presence of a spirit may not necessarily prevent development (in some cases the area had already been developed). However, any development on these areas should be done with the FPIC of the community.

Section 10: Confirmation of Report	
This document is the summary of assessment result on Enviromental Impact Assessment (EIA), Social Impact Assessment (SIA), Integrated High Conservation Value (HCV) – High Carbon Stock (HCS), FPIC, Fragile/Marginal Soils Survey, GHG assessment and Land Use Change Analysis (LUCA) in Ecocycle areas which done for NPP process. Assessment result / findings above was accepted and will be applied as one of the guidelines in managing oil palm plantation.	
Date of Completion	03 March 2025
Signature	
Name	Leslee Ng
Position	Chief of Operation (COO)