

HCS Peer Review Panel Report for PT Tekukur – East Kalimantan, Indonesia 11 January 2017

Background information to be provided by the HCS Secretariat:

- a) Did a Registered Practitioner Organization lead the HCS assessment? If not, has the organization which led the assessment started the process of registration? *Yes, Aksenta*
 - b) Was the HCS Team Leader a Registered Practitioner? *Yes, Bias Berlio Pradyatma from Aksenta*
 - c) Were at least 2 HCS team members Registered Practitioners? *No*
 - d) Was the HCV assessment judged 'satisfactory' by the HCV Resource Network (HCVRN) Assessor Licensing Scheme (ALS)?
(See <https://www.hcvnetwork.org/als/public-summaries>). HCV report was done before the launching of ALS.
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(Peer Reviewers: Tri Agus Sugiyanto (Lead), Kimberly Carlson, Julian Crawshaw)

1. Peer Review Summary

1.1. What are the major findings and recommendations from the peer review?

Please refer to the peer review results in this report.

Social issues:

The HCS area seems to have not been communicated to the community. Community and company must have a common agreement to keep the HCS areas. Public meetings and socialization related to planning of conservation in company areas are still needed. Map of Participatory Mapping must be in each village (in village area) and have the following information: administrative boundary, village spatial structure, land ownership pattern, land use and land cover, including area for development/community settlement in the future, so that they can see the future adequacy of agricultural land for the community. Company should integrate conservation area management into the FPIC process and SIA should be reviewed again more detail.

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Ecological and Conservation Issues:

Mapping of HCV presence needs to be redone with reference to the land cover map provided in the HCS report. Open area on riparian zones can be identified in the HCS land cover and should be restored. Pre-RBA/RBA must still be carried out in the relevant patches unless the HCV assessment had already visited them. Some further points suggested (see below).

Image analysis, forest inventory and HCS Forest Patch Decision Tree

Image analysis should use multiple dates to reduce cloud contamination; Sentinel-2 (free) image resolution of 10 meters can help to get good quality interpretation and delineation. Forest inventory and forest patch HCS Decision Tree process are good enough, but point of location sample distributions not be spread evenly. An accuracy assessment is required to see the truth and trust interpretation. Some further points suggested (see below).

Land use planning

All data and information should be integrated to produce the final map of land use planning and conservation area. This should be subsequently communicated to the community and local government. The participatory conservation plan includes the village administrative boundaries and future farmland inside or outside company area.

1.2. Did the HCS assessment team include or have adequate access to relevant expertise to undertake the HCS assessment?

Yes, for some stages in the HCS inventory, calculation and statistical analysis of GIS data. But the team must deepen analysis for HCV and HCS assessment process, so that the activities carried out strictly in accordance with the toolkit HCVRN and HCSA. Attention should be placed on ensuring the assessors are suitably qualified and experience.

1.3. What elements of the HCS Approach still need to be completed or re-done in order to create a final land use and conservation plan?

HCV assessment, quantity and distribution of HCS forest sample plots, Participatory Mapping inside the village area. Then overlay all the maps to get the land use plan (identify area to develop, conserve, enclave) integrated and continued with participatory conservation plan with company, community and local governance.

1.4. If the recommendations in this peer review report are followed, will the HCS forests in the area of interest be conserved?

HCS conservation areas must be measured, marked and to be socialization by company to community and local governance to make mutual agreement so that the sustainability and monitoring of the conservation area will continue.

2. Social Issues

2.1. Does the summary provided in Section 3.1 adequately represent the community engagement, FPIC, and participatory mapping activities?

The summary in section 3.1 only mentions that these activities took place. There is no mention of the specific activities (e.g. community meetings), outputs or conclusions that were drawn.

Reviewer Recommendation: The summary should include outputs (e.g. participatory maps) and also describe agreements that were made as part of the FPIC process. Based on the current information provided in the summary report the reviewer is not confident that these processes were undertaken satisfactorily. A map of area reserved from development has been provided which is a combination of FPIC and HCS processes. A description of the community engagement that took place has been provided.

2.2. Does the summary provided in Section 3.2 adequately represent the findings of the social impact assessment?

No, the summary in Section 3.2 does not represent the findings of the SIA. The summary has 5 very general statements, whereas the SIA is a very comprehensive study of the area with many findings and recommendations. The SIA would provide a land manager a good understanding of the community and worthwhile recommendations for a CSR programme.

Reviewer Recommendation: the SIA should be reviewed and the summary be rewritten. It should incorporate the main findings and recommendations. Some findings have been added by the company during this peer review process, but these are not sufficient.

2.3. Were affected communities adequately identified?

In the HCV report, there is a reasonably good discussion about HCV 5. (Natural Areas Critical for Meeting the Basic Needs of Local People). It points out the people in the area are transmigrants and Dayak communities (who are actually newcomers to the area also) and their main focus is wet land agriculture and their reliance on natural resources is minimal. The key things that the reviewer considers to be missing from the HCV report are:

- a map of the villages,
- a comprehensive discussion on the use of the use of natural resources for meeting all basic needs – as defined in the toolkit (a. Food b. Water c. Clothing d. Materials for the house and tools e. Firewood f. Medicine g. Livestock)

The HCV toolkit suggests presenting a matrix of resource usage which maps out usage of all natural resources. In this analysis, only a few are mentioned e.g. wood, fishing. But there is no mention of access to fresh water and also NTFPs such as honey are mentioned elsewhere in the report but not covered here. The reviewer believes that fishing would likely constitute HCV 5 in this area.

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Regarding HCV 6 there is a discussion of the culture of the local communities; this includes transmigrants and Dayaks. It makes the point that both communities are relative newcomers to the area; whilst they have festivals and traditions these do not take place in natural areas or have special culture relating to the larger landscape. Therefore, HCV 6 is absent.

Reviewer recommendation: In order to identify the affected communities a map of the villages in and around the assessment area and their village boundaries must be provided. Also, a matrix of resource usage by village must be provided. An example of this is presented in the HCV toolkit (Table 8.5.3. Identification of level of dependency on forest by sub-group). Regarding HCV 6 – confirm that there are no cemeteries within the development area. A review of all basic needs is mandatory under the HCV approach. Unfortunately, it is not sufficient to say that they are “exposed to modern world, and they are dependent on well irrigated paddy field.” Just a quick review of the SIA the reviewer finds the following statement “Menangkap ikan di sungai dan rawa merupakan sumber penghasilan penting bagi masyarakat Siduung Muara, biasanya dilakukan oleh anak-anak dan wanita. Tidak ada lagi hasil sumberdaya alam yang mereka jual.” This suggests that there are still segments of the community that are dependent on catching fish for meeting their basic needs. Similarly, the rice farmers have mentioned their concern about changes in the water table – therefore water is important to be mentioned.

2.4. Were affected communities adequately consulted about the proposed development and the HCS Approach?

Section 3.1 of the HCS Summary Report discusses the approach to consulting with the community on the proposed development. The affected communities were given the option of (a) opting out of the scheme and having their land enclaved, (b) land compensation for company’s plantation or (c) land swap for a partnership scheme plantation. The process was based on both the company’s land acquisition Standard Operational Procedures and FPIC Guidance for RSPO Members. It mentions that there were many meetings with the community. There was no mention of socialization of the HCS Approach. The summary report references minutes of the meetings done with the communities, however only one meeting report was provided (SIA Report – Meeting dated 30 Jan 2013); no mention was made of the HCS Approach in these notes. Nevertheless, the summary report should summarise the main messages and feedback from the meetings. Probably anyone reading the summary report will not have access to meeting minutes.

Reviewer Recommendation: There should be mention of socialization of the HCS Approach in the community meetings so that the community understand the conservation areas and the various conservation recommendations that the company will implement should be formulated in conjunction with the community. If socialisations have not taken place, then the reviewer recommends these are done. The main points of the meetings should be summarized in the summary report. The company is taking sole responsibility for management of conservation areas and socialization of the management plan will be done at a later date.

2.5. Were their views incorporated into the findings?

It appears from the report that the main focus of the consultations with the community was in dividing up the area into inti, plasma and enclave areas. Given that it was done based on RSPO FPIC guidance the reviewer can only assume the community was not forced to accept the outcomes. There is no mention of socialisation of the location of conservation areas nor is there any mention of the communities' views regarding management of these areas.

Reviewer Recommendation: Communities' views on management of HCS areas should be summarised in the report, this should be based on the information from minutes of meetings. If the HCS areas and their management has not been done, then community engagement on this issue must be undertaken. All socialization about conservation area management is yet to be done. To date the community doesn't appear to have been consulted about how these areas will be managed.

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2.6. What recommendations do you have for any improvements regarding community consultation and negotiation of Free, Prior and Informed Consent?

No FPIC report was provided, only an FPIC *verification* report. The steps to verify that FPIC had been undertaken were as follows:

Verification Steps	Result
Review the steps in the company SOP regarding socialization with the community about plans to develop an oil palm plantation.	The SOP was followed. This meant that the community was well informed about the company's plans and individuals had the option to opt in or out of the scheme offered.
Key stakeholders were identified and their roles defined	Kepala desa, tokoh masyarakat, etc.... were involved and played roles in informing the community
Provision of information to the community	Based on observations the verifiers were confident that the community was fully informed of options which involved (1) pay GRIT, (2) tukar guling and join plasma or (3) enclave.
Participatory Mapping	This was undertaken with all landowners with boundaries mapped and land use recorded.
Review of documentation	There appeared to be recording of discussions and agreements.
Principles of FPIC followed	The reviewer was satisfied that the principles of FPIC had been followed.

Elements that were missing from the FPIC process that were reported by the verifier:

- Insufficient reporting of the negative impacts of oil palm to the community. Especially how these negative impacts might be prevented or mitigated.
- An independent FPIC facilitator should be involved and the field staff should join so that they are aware of the process. This takes into account that FPIC is not a one-off event but a long term process.
- Better recording of agreements is required by the company – this is required for verification, evaluation and auditing

Reviewer Recommendation – in the FPIC verification review there was no mention of HCS or HCV. In fact, the map provided (Gambar 1) showed the HCV and HCS areas mainly allocated to “Rencana Pembebasan”, there was no mention of conservation enclaves. It appears the HCS Approach has not been taken into account at all in the FPIC process. There appeared to be no mention of conservation set asides that were mapped in conjunction with the community. There were no agreements with the community mentioned regarding management of the set aside areas. The company review the HCS toolkit and undertake a retro-fitting process to integrate conservation area management into the FPIC process.

3. *Ecological and Conservation Values*

3.1. Does the summary provided in Section 4.1 of the Summary Report adequately represent the findings of the HCV study?

The findings are presented in a table where 9 HCV areas are listed along with the HCVs that are present within the HCV areas. All of which are river buffer areas. The total area is 129.7 ha. Additionally, a map is provided which shows the location of these HCV areas.

However, HCV Management Area is also mapped, however there are no details provided about the HCVMA in the summary report (other than mapping them). This leaves the reader quite confused. Furthermore, no definition of what is considered to be HCVA and what is considered HCVMA is required.

3.2. If the HCV assessment was not judged satisfactory by the ALS scheme of the HCVRN, please do a cursory review of the HCV report as it relates to HCVs 1-4. Do you have any general comments on the quality of the site description, the analysis of the landscape and national or regional context, or the methods used to undertake the HCS study? Were the determinations of the absence/presence and extent of HCVs 1-4 well-justified? Are the HCV management and monitoring maps accurate?

The reviewer searched for the report on the HCVRN website and it was not present. Therefore, it is assumed that it had not been reviewed by the ALS. Furthermore, the HCV report is not written in the ALS format – however it is dated 2013, which predates the ALS format.

The Site Description is divided into the following sections:

4.1. Landscape biodiversity values	There are general references about the rich biodiversity of Kalimantan, this information is based on a literature review. The text then refers to the particular study area, there is threatened flora which is protected by Gol (Govt of Indonesia). Many of these trees have a high commercial value also. Also, there are many animals that are on the IUCN Red List in the area. There are many threats to their survival mentioned. It goes on to mention that in the study area these animals are mainly threatened by land clearing for agricultural development.
4.1.1. Forest areas and land cover	Based on the spatial plan this area has a status of being ear-marked for agricultural development (APL). There are no conservation areas nearby. A satellite image is provided (Landsat 7 2012). Landcover is divided into 3 groups from the image, open land, scrub (belukar) and secondary vegetation. No landcover mapping has been provided. This is a major shortcoming in the report because the reviewer cannot make a link between the landcovers and the HCV areas that are mapped. The report mentions that the secondary vegetation is only present on the borders of 4 rivers. Based on the resolution of the image provided all of the northern area appears to be secondary vegetation.

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	Furthermore, the report mentions these rivers a located in the “south” of the concession, whereas the rivers are in fact in the north.
4.1.2. Vegetation	<p>Description of the vegetation:</p> <ul style="list-style-type: none"> - Belukar – pioneer species such as acacia, macaranga and piper - Open areas- imperata grass - Secondary vegetation <p>The report refers to swamp areas where such species as <i>Eusideroxylon zwageri</i> were growing. However, these areas were not mapped.</p>
4.1.3. Fauna	The report mentions 25 species of mammals, 82 bird species and 15 reptile species that were detected during field work. This appears a very comprehensive list.
a. Mammals	5 Endangered mammals and 7 vulnerable species are listed. It goes on to mention that some of these are wide ranging species and land cover change has not left sufficient area for many of these mammals to live. Orangutans can no longer be found in the area.
b. Birds	9 species that were IUCN Near Threatened and 12 species CITES App II
c. Reptiles	2 species that were IUCN Vulnerable and 5 species CITES App II. The main habitats for these reptiles were the swamps and rivers
4.2. Physical Landscape	
4.2.1. Climate	Rainfall data is provided and mention of the communities’ efforts to control streamflow through dams was mentioned
4.2.2. Topography	A map of the elevation is provided and mention that the areas adjacent to Sungai Segah are affected by tides because they are very low-lying. A map of slopes is also provided; this shows that the concession is predominantly flat. With few areas above 15% slope.

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4.2.3. Physiographic Conditions	A map of physiographic data is provided with mention of sedimentary nature of soil. The data appears to come from RePPPProT – but no source is cited.
4.2.4. Soil	Discussion of soil types and a soil map is provided.
4.2.5. Hydrology	The concession is in 2 watersheds, Segah and Kelai. It is located in the lower reaches of these rivers and where the river meanders. It is located in the inner band of a meander on the Segah River.
4.2.6. Benefits and management of water resources	Mention of how dams are used to store water for wet land agriculture (sawah).
4.3. Social Landscape	
4.3.1. History of the land and natural resource	Mention of the kingdoms that used to rule the area. History of the area when the Dutch based coal mining companies in this area. As well as that logging companies were established to support the coal mining. In the times of the New Order the following logging companies operated in the area - Inhutani I, PT Swaran Jaya, dan PT GP. Only PT Inhutani I still operate. In 1983 it was used as a transmigration area. It was then that the land status was changed from Forest area to agricultural area.
4.3.2. Village history	All the villages located around the concession are transmigration villages – there are no traditional villages in the area. Information about the population is provided. Also, there is a village where Dayaks have moved to the area.
4.3.3. Social economy of the local community	Mention of access via road is good so are telecommunications. There is water supply from PAM and electricity from PLN. There are health and education facilities present (e.g. high school). Information about source of wealth in the village is provided.

Reviewer recommendation:

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The reviewer considers the site description to be very good, except for the absence of a land cover map. This is a crucial oversight and should be included. It gives the reader a comprehensive background to the area. The biodiversity and social field survey appear to be quite comprehensive and information is reasonably well presented in the Site Description section.

Were the determinations of the absence/presence and extent of HCVs 1-4 well-justified? Are the HCV management and monitoring maps accurate?

The HCV assessment uses the Indonesia HCV toolkit, not the Common Guidance. This splits HCV 1 up into HCV1.1 – 1.4, HCV 2 into 2.1 – 2.3 and HCV4 into HCV 4.1 – 4.3. The Common Guidance should be used now, but at the time of the survey the National Interpretation was the correct toolkit.

HCV 1.1 – the assessment overlooks that river buffers and man-made canals are legally protected by a Presidential Decree – therefore all buffers are legally protected and considered HCV1.1. There are many rivers and canals that are not included in HCV1.1¹. Also, there is mention of swamps, but there are no maps provided.

HCV 1.2 and 1.3 - the assessment mentions the existence of many HCV1.2 and 1.3 species. However, it states that the only areas with forest remaining are the river buffers (which contrasts with the HCS findings). The site description mentioned swamps also, but these are not mapped. Note that HCV 1.2 requires the conservation of every individual. The reviewer is left without sufficient land cover information and species location information to make an informed judgment. Definitely a land cover map is required and this should show the location of swamps.

HCV1.4 - refers to “Areas that Contain Habitat of Temporary Use by Species or Congregations of Species.” The report mentions that a number of species live on the banks of the river and use this as a justification for the presence of HCV 1.4. However, it does not mention that this is a

¹ Indonesian law (Keputusan Presiden No 32/1990). This law requires the maintenance of buffer zones of at least 100m on both sides of ‘large’ rivers, and 50m on ‘small’ rivers, as well as a buffer of 200m radius around surface springs. No minimum size of a river or spring requiring a buffer is stipulated in the law.

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place of temporary use e.g. for a migration corridor or used during a phase of its lifecycle. Based on the information provided the reviewer does not believe HCV 1.4 is present.

HCV2 – the report points out that the forest in this area is very fragmented and generally in a degraded condition and therefore HCV 2 is absent. The reviewer agrees with this conclusion; however, it would be worthwhile presenting some general forest cover mapping over the whole landscape. This sort of data is freely available (e.g. Miettinen J, Shi C, Tan WJ, Chinliew S (2012) 2010 land cover map of insular Southeast Asia in 250-m spatial resolution. Remote Sensing Letters 3: 11–20)

HCV 3 – refers to rare and endangered ecosystems. However, the HCV report assumes the degraded nature of the forest in the area precluding the presence of HCV 3. If the ecosystems are rare or endangered in the area this will strengthen the case for conserving even degraded forest areas. The reviewer believes that an analysis of the ecosystems in the area must be undertaken before assuming HCV 3 is not present.

HCV4 – The discussion in the HCV report mentions the activities for identifying HCV 4 however it does not mention outcomes. At a minimum, the reviewer was expecting to see:

- A map of the rivers and any man-made canals with buffers around them that were consistent with Keputusan Presiden No 32/1990.
- A map of areas with slopes greater than 22 degrees that are prohibited from clearing for agriculture.
- All wetland areas e.g swamps that function as a retarding basin are considered HCVA 4.1.

There was no discussion at all around HCV 4.3 “Areas that Function as Natural Barriers to the Spread of Forest or Ground Fire” which is especially significant because of the incidence of fire mentioned in the area.

Regarding the accuracy of the HCV management and monitoring maps; it appears significant areas of HCVs have been omitted (as mentioned above).

Reviewer Recommendation: The mapping of all HCVs should be repeated with careful reference to the toolkit. It is the reviewer’s belief that many areas that should be HCV have been omitted. Mapping of HCV presence needs to be done with reference to the land cover map provided in the HCS report.

3.3. Please review Section 5 of the Summary Report. Does the summary provided in Section 5.1 adequately represent the findings of the Environmental Impact Assessment? Was the Environmental Impact Assessment of adequate quality?

The summary report regarding the EIA states 3 points

“4.3 Summary of SEIA (UKL-UPL) Findings

- 1. Local communities are generally positive towards the development of their land by PT TI.*
- 2. There is an expectation of job opportunity for local communities around the area to be developed by PT TI.*
- 3. There is a concern of negative environmental impacts as a result of development like air quality, safety and health, noise, soil erosion, sedimentation and quality of surface water.”*

Only the third point is the only point that relates to the environment. However, this statement provides no quantification of these impacts and no recommendations regarding mitigation and monitoring.

Reviewing the EIA chapter 4A tabulates impacts and management and monitoring activities associated with these impacts. It is quite a thorough list but it is very general and could be used for almost any EIA. The reviewer believes this needs to refer to actual areas and present specific maps that point out areas where problems will occur. Note all the maps were missing from the report that was provided; therefore, the reviewer was not able to check the roads did not cross drainage lines and planting was not planned in the HCV / HCS areas.

The reviewer noted there was no reference to the results of the HCV or HCS studies in the EIA.

Reviewer Recommendation: The EIA is reviewed again and a summary of the impacts of the development is provided in the summary report as well as recommendations regarding mitigation and monitoring activities. Maps must be provided in the EIA. The EIA should integrate the results of the HCV / HCS assessments.

3.4. Was the methodology used for the Rapid Biodiversity Assessments (if any) satisfactory? Did the RBA(s) reveal any HCVs that should have been captured in the HCV assessment but were not?

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The reviewer expected to see a series of maps that stepped through the patch analysis process. Such a series was not included in the report. Based on the information provided the reviewer could not see where RBAs had taken place. It was mentioned that “PreRBA and RBA check was approached with the result of HCV Assessment due to identical issues of study” from this the reviewer assumes that is a RBA area overlapped with a HCV 1 area it was assumed to be significant. The reviewer only believes this is an acceptable approach “if” the HCV team visited the patch in question, and as such has knowledge of that particular area. If the patch was not visited it should be resurveyed otherwise there will be no feedback loop to the HCV assessment.

In this survey, it was not mentioned that any additional HCV area was found based on the RBA. This is something of a pity given the vast discrepancy between HCV and the HCS area. The reviewer’s experience is that the areas of HCV and HCS tend to be closely aligned. Where there is a significant discrepancy the results need to be revisited.

Reviewer Recommendation: The results of the HCV should only be used if the HCV team surveyed the area in question. Otherwise a follow-up survey should be undertaken. RBAs are required of low priority patches unless it is in a high forest landscape, but the forest cover in the landscape is not mentioned in the report.

3.5. Are the forest conservation management and monitoring activities outlined in Section 10.3 adequate? Do they take into account forests and protected areas outside the concession?

Section 10.3 states the following: *“Land acquisition by the company have includes the potential for development area and also the conservation area according to the FPIC process. Company have full authority of managing the area. Conservation area management and security are the further action need to be taken to assure that the ecological function and environmental services goes well.”* The reviewer considers the management and monitoring recommendations here to be inadequate.

The report only suggests that the Company take full responsibility for conservation area management. In the opinion of the reviewer management should be based on shared responsibilities with the community. The community should see mutual benefits in healthy and intact

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conservation areas. Furthermore, recommendations should be much more specific and relate to threats that were noted during the field survey e.g. fire, illegal logging or agricultural clearing.

No monitoring recommendations are made. This is a major oversight. How will the company show its success in managing the HCS area? This might show prevention of fire or encroachment compared with previous years; alternatively, they might establish permanent carbon stock plots and show accumulation of C stock through growth of the area.

Reviewer Recommendation: the HCS team should go through threats (envisaged or actual) that they perceived in the concession during their survey. They should also read HCV and SIA reports to pick up additional background. From there list management and monitoring activities. They should try to include forests external to the concession if appropriate.

4. *Image Analysis*

4.1. Was the Area of Interest correctly identified?

The AOI considered in the analysis is the Izin Lokasi boundary. This AOI does not include any buffer, which may affect mapping outcomes because it potentially excludes adjacent forested areas. The summary report clearly states this limitation.

Reviewer Recommendation: Following guidance from the HCS Toolkit, the analysis should include at minimum a 1 km buffer around the Izin Lokasi as the area of interest (AOI).

4.2. Please review Section 6.2 of the Summary Report. Were the images used of adequate quality, including resolution and date?

The classification used a Landsat image (30 m) collected on May 10 2016. Therefore, the time limit (<12 months) and resolution (30 m or less) is satisfactory. General data quality is not provided. The image is haze-free, but has ~30% cloud cover, more than the maximum cover of 5%. The

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Summary Report clearly states this limitation and justifies use of the image based on the recent date. There seems to be no attempt to use imagery from multiple dates, as suggested in the Toolkit, to reduce noise/clouds etc.

Reviewer Recommendation: Use imagery from multiple dates to reduce cloud contamination. Consider using higher resolution imagery with <30 m spatial resolution.

4.3. Was the initial land cover classification done properly? Do the land cover areas in the tables in Section 6 look reasonable? Are there any obvious errors in classification?

Note: this section is labelled 6.4 in the Summary Report.

The classification used three bands – 6, 5, 4 (SWIR 1, NIR, Red). It did not take advantage of other potentially useful information including the Green band, nor relationships between bands (e.g., EVI). No pre-processing was performed prior to classification. Classification used ArcGIS 10.1 and visual interpretation. There is no description of use of training data or post-classification modifications/quality control such as removal of small polygons. Critically, the report does not provide an accuracy assessment of the classification.

Based on visual analysis, the initial classification appears to be accurate, including the values in the land cover table (Section 6.6). The map generally reflects the Landsat image. The analysis successfully identified clouds, but not cloud shadows, for which there are clear polygons delineated. It seems that the authors corrected these areas manually, and the manual correction seems sufficient. However, without an accuracy assessment, the quality of the classification is unknowable.

Reviewer Recommendation: An accuracy assessment should always be performed to ensure that classification meets minimum quality benchmarks. In addition, pre-processing of satellite data to remove noise, haze, clouds, and cloud shadows should be undertaken prior to classification. Use of the full suite of bands, or relationships between bands, may improve results. Finally, the summary report should describe any post-classification modifications such as removal of small polygons.

5. Forest Inventory

5.1. Were the sample plots selected, set up, and measured properly? Please check the inventory plot layout for adequacy.

Based on figure the sample plots appear to be on the edges/boundaries of various land covers. No navigation plan is specified, although “stratified random sampling” is mentioned as the approach. In many cases, multiple plots are very close to one another. The likely result of this biased sampling strategy, due to edge effects, is that the amount of carbon will be underestimated for forested land covers. In addition, since the plots are on land cover edges, re-classification of the imagery after field sampling would be challenging because these are more likely to be “mixed” pixels containing two land covers. This is not the sampling strategy recommended in the Toolkit.

Sample plots were not distributed based on the land cover extent, as evidenced by comparing Table 6.6 and 7.8.

Reviewer Recommendation: Short of re-surveying to measure vegetation not heavily affected by edge effects, the authors should acknowledge the shortcomings of this sampling strategy and how they likely bias forest inventory results.

5.2. Was the forest inventory team qualified?

Five individuals made up the forest inventory team, including the team leader who has a MSc in Natural Resource Management Technology from Bogor University and substantial experience doing field work, and assistants all with bachelor’s degrees in science. The team was slightly smaller than recommend by the Toolkit (6-8 people). Also, the descriptions are not focused on HCS (e.g., they include soils and necromass, which is not part of the HCS forest inventory). Nevertheless, the team seems well-qualified to carry out this work.

5.3. Was the allometric chosen adequate?

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The allometric equation (reported in section 7.7) was developed by Brown (1997), and is adequate to convert DBH to biomass for these forest types.

5.4. Are there any obvious errors in the raw forestry data? Are there any flags where a result does not seem consistent with your rough interpretation of the land cover image? Do the final carbon classes seem accurate given what is known about other forests in the region?

The plot sampling method is not clearly described. The team used a nested sampling technique, with 1x1, 5x5, 10x10, 20x20 and 40x40 m plots. According to the diagram, three of these nested plots were laid out along a transect. However, this is not clear from the text. The sampling design was not designed for HCS, since it considers 2-5 cm DBH vegetation. Surveys were done in 2014, and therefore may not coincide perfectly with the satellite imagery. While these plots are not ideal according to the HCS methodology, each plot does cover a larger area than suggested by the HCS Toolkit and therefore is more likely to capture large trees with high carbon stocks.

The photos are sufficient to describe the land use, although there were not canopy-facing photos provided to demonstrate canopy density.

For Section 7.7 (Statistical Analysis), the only information provided is the allometric equation. Based on review of spreadsheets, calculation of biomass and carbon seem robust at the plot level, and the carbon stocks reported in Table 7.8 seem correct. However, the confidence limits and the SE in this table seem incorrect. There are no statistical tests on the separability of classes, nor a justification for why each plot was included in each class.

Section 7.9 (Forestry Inventory Results) states: *“Carbon stock estimation within the concession boundary was undertaken with field plot data extrapolation based on the spectral radiance value contained in the satellite imagery. A model represents the correlation between the biomass value of the sample plots and the spectral radiance was developed. The model then was used to estimate the biomass and the carbon stock within the concession based on the spectral radiance value within the concession.”* There is no need to develop a regression since the average biomass derived from plot based samples should represent the whole land cover class. The carbon stocks reported in Table 7.9 conflict with those in Table 7.8.

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Reviewer Recommendation: The authors should include a clear description of the plot sampling scheme (transect length, direction, number of samples per transect, etc.), provide geo-located canopy-looking photos and all photos from the survey for reviewers, re-analyze the data to ensure that accurate carbon stocks are reported and sufficient sampling was completed, and justify why each plot is in each land cover class. The authors should abandon the satellite-field data regression approach in favor a simpler and more accurate method of simply using the field plots to assess carbon stocks in the plantation.

6. *Land use planning*

6.1. Was the initial land cover map adequately adjusted to take into account forest inventory results?

The original map was refined based on ground check data. However, and the “initial” shapefile was not provided so the comparison was not able to be done in ArcGIS. HCS lands (YRF and LDF) are indicated on the map in figure 8.1.

Reviewer Recommendation: Provide more detail on adjustments made to the initial land cover map based on forest inventory results.

6.2. Were patches merged correctly? Was the core area correctly identified?

Since no out-of-concession land use was mapped, core areas may be underestimated. While no text illustrated, patch merging and core area identification, the shapefiles suggest that this step was done correctly, including the 100 m negative buffer.

Reviewer Recommendation: To rectify these issues, land cover should be mapped in the 1 km buffer surrounding the concession boundary, and taken into consideration when doing this analysis.

6.3. Were the patches correctly identified as High, Medium, or Low Priority? Was the Patch Analysis done according to the HCS Approach Decision Tree?

High Carbon Stock Approach

The process of moving through the decision tree is barely described in the summary report, but is adequately described in the full report. Visual inspection suggests that outside of the issue of mapping “buffer” lands around the concession mentioned by me above, as well as the RBA issue of needing to visit patches under question for an HCV assessment raised by the other reviewer, classification is sound.

Reviewer Recommendation: Summarize steps of patch analysis using an image of the concession for each step, that depicts the decision being made at that node in the decision tree.

6.4. Were the results of the final ground verification (if any) adequately incorporated into the land use plan and final HCS map?

No ground verification has been completed.

Reviewer Recommendation: Please complete ground verification and incorporation into the land use plan and final HCS Map.