RIAU ECOSYSTEM RESTORATION CARBON PROJECT

Document Prepared by Himpanzee Pte Ltd

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LIST OF ACRONYMS

Acronym	Explanation
A/R	Afforestation/ Reforestation
Af	Köppen's Climate Classification for Tropical Rainforest Climate
AFOLU	Agriculture, Forestry, and Other Land Use
AGB	Above Ground Biomass
ANOVA	Analysis of Variance
APD	Avoiding Planned Deforestation
APL	Areal Penggunaan Lain or Other Land Utilisation
APRIL	Asia Pacific Resources International Limited
APWD	Avoiding Planned Wetlands Degradation
ARR	Afforestation, Reforestation and Revegetation
ASEAN	Association of Southeast Asian Nations
AUDD	Avoiding Unplanned Deforestation and/or Degradation
BAU	Business As Usual
BGB	Below Ground Biomass
BL-ARR	VMD0041 Estimation of baseline carbon stock changes and greenhouse gas emissions in ARR project activities (BL-ARR), v1.1
BL-DFW	VMD0008 Estimation of baseline emissions from forest degradation caused by extraction of wood for fuel (BL-DFW), v1.0
BL-PEAT	VMD0042 Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities (BL-PEAT), v1.1
BL-PL	VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL), v1.3
BL-UP	VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation (BL-UP), v3.3
bopd	Barrels of Oil Per Day
BSL	Baseline
BSP	Bumi Siak Pusako
C	Carbon
CBD	Convention on Biological Diversity
CCB	Climate, Community and Biodiversity Standards
Cd	Carbon Density
CDM	Clean Development Mechanism
cfm	Cubic feet per minute
CH_4	Methane
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CIW	Conservation of Intact Wetlands
CL95	95% Confidence Interval
cm	Centimetre
CO_2	Carbon dioxide
CO_2e or CO_2-e	Carbon dioxide equivalent
COP	Conference of the Parties
COP 13	Conference of the Parties - Bali Action Plan
COP 21	Conference of the Parties - Paris Agreement
COP 3	Conference of the Parties - Kyoto Protocol
CP-AB	VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB), v1.1
CPO	Crude Palm Oil
CPP	Coastal Plains-Pekanbaru or Coastal Plains and Pekanbaru
CP-W	VMD0005 Estimation of carbon stocks in the long-term wood products pool (CP-W), v1.1
CR	IUCN Red List of Threatened Species Status - Critically Endangered

CUPP	Conservation of Undrained and Partially Drained Peatland
dbh	Diameter at Breast Height
DD	IUCN Red List of Threatened Species Status - Data Deficient
DEL	Drainability Elevation Limit
DEM	Digital Elevation Map
df	Degrees of Freedom
dipwells	Peat Water Table Monitoring Points
DJI	Dà-Jiāng Innovations
DOC	Dissolved Organic Carbon
EB	Executive Board of the Clean Development Mechanism (CDM)
E-BPB	VMD0013 Estimation of greenhouse gas emissions from biomass and peat burning (E–BPB), v1.2
E-FFC	VMD0014 Estimation of emissions from fossil fuel combustion (E-FFC), v1.0
EN	IUCN Red List of Threatened Species Status - Endangered
ER	Ecosystem Restoration License
ER	Emission Reductions
ETM+	Landsat 5 Enhanced TM Plus
EUR	Euro
EVI	Enhanced Vegetation Index
F	F Ratio
FGDs	Focus Group Discussions
FPIC	Free, Prior and Informed Consent
FSC	Forest Stewardship Council
GAN	PT. Global Alam Nusantara
GCN	PT. Gemilang Cipta Nusantara
GHG	Greenhouse Gas
GOFC-GOLD	Global Observations of Forest Cover and Land-use Dynamics
H_2O	Water Vapour
ha	Hectares
HCS	High Carbon Stock
HCV	High Conservation Value
HPH	Hak Pengusahaan Hutan or Selective Logging
HPK	Hutan Produksi Konversi or Conversion Production Forests
HR	Human Resource
HTI	Hutan Tanaman Industri or Industrial Plantation Forestry
IFCA	Indonesian Forest Climate Alliance
IFFC	Indonesian Forestry Certification Cooperation
ISO	International Organization for Standardization
IUCN	International Union of Conservation of Nature
IUPHHK-RE	Izin Usaha Pemanfaatan Hasil Hutan Kayu - Restoration Ecosystem
km	Kilometre
km^2	Kilometre Square
KPHP	Local Forest Management Unit
Landsat	Land Remote-Sensing Satellite
LC	IUCN Red List of Threatened Species Status - Least Concern
L-Di	Likelihood of Deforestation
LiDAR	Light Detection and Ranging
LK-ARR	VMD0043 Estimation of emissions from displacement of pre-project agricultural activities (LK-ARR), v1.0
LK-ASP	VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation/forest degradation and avoided planned wetland degradation (LK-ASP), v1.3
LK-DFW	VMD0012 Estimation of emissions from displacement of fuelwood extraction (LK-DFW), v1.0
LK-ECO	VMD0044 Estimation of emissions from ecological leakage (LK-ECO), v1.1
LPF	Low Pole Forest
LPHD	Lembaga Pengelolaan Hutan Desa (LPHD the Village Forest Management Agency)

LUC	Land Use Change
LULUCF	Land Use, Land-Use Change, and Forestry
m	Metre
m^3	Cubic Metre
M-ARR	VMD0045 Methods for monitoring greenhouse gas emissions and removals in ARR project activities (M-ARR), v1.1
mm	Millimetre
M-REDD	VMD0015 Methods for monitoring of greenhouse gas emissions and removals (M-REDD), v2.2
MODIS	Moderate Resolution Imaging Spectroradiometer
MoEF	Ministry of Environment & Forestry
MoF	Ministry of Forestry
MONEV	Laporan Kegiatan Monitoring Dan Evaluasi
M-PEAT	VMD0046 Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities (M-PEAT), v1.1
MPSF	Mixed Peat Swamp Forest
MRV	Monitoring Reporting and Verification
MS	Mean Squares
N_2O	Nitrous Oxide
NDCs	Nationally Determined Contributions
NE	IUCN Red List of Threatened Species Status - Not Evaluated
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
NP	National Park
NT	IUCN Red List of Threatened Species Status - Near Threatened
NTFP	Non-Timber Forest Products
OHSAS	Occupational Health and Safety Management System
OLI	Landsat 8 Operational Land Imager
PA	Project Area
PALSAR	Phased Array Type L-Band Synthetic Aperture Radar
PCC	Precast Cement Concrete
PD	Project Description
PDT	Peat Depletion Timeline
PEFC	Programme for the Endorsement of Forest Certification
PF	Pole Forest
Ph.D.	Doctor of Philosophy
PSP	Permanent Sample Plot
PT	Perseroan Terbatas
P-value	Calculated Probability
Q&A	Questions & Answers
QA	Quality Assurance
QC	Quality Control
R^2	Coefficient of Determination
RAPP	PT. Riau Andalan Pulp & Paper
REDD +MF	VM0007 REDD+ Methodology Framework (REDD+MF), v1.6
RDP	Rewetting Drained Peatland
REDD	Reducing Emissions from Deforestation and Degradation
REDD+	Reducing Emissions from Deforestation and Degradation and Foster Conservation, Sustainable Management of Forests, and Enhancement of Forest Carbon Stocks
REDD-MF	REDD+ Methodology Framework
REKI	Hutan Harapan Initiative
RePPProT	Regional Physical Planning Programme for Transmigration
RER	Riau Ecosystem Restoration
RER-CP	Riau Ecosystem Restoration Carbon Project
RKT	Rencana Kerja Tahunan or Annual Work Permit

RKU	Rencana Kerja Usaha or long-term work plan
RWE	Restoring Wetland Ecosystems
SD	Sekolah Dasar or Elementary School
SDG	Ssutainable Development Goals
SE Asia	Southeast Asia
SFM	Sustainable Forest Management
SINTAS	Save The Indonesian Nature and Threatened Species
SMA	Sekolah Menengah Atas or High School
SMN	PT. Sinar Mutiara Nusantra
SMP	Sekolah Menengah Pertama or Middle School
SNI	Indonesian National Standard
SOP	Standard Operating Procedure
SRTM	Shuttle Radar Topography Mission
SS	Sum of Squares
t	Tonne or Metric Ton
T-ADD	CDM Combined tool to identify the baseline scenario and demonstrate additionality
T-BAR	VCS AFOLU Non-Permanence Risk Tool
TBOT	PT. The Best One Unitimber
tCO_2e	Tonnes of Carbon Dioxide Equivalent
TM	Landsat Thematic Mapper
T-SIG	CDM Tool for testing significance of GHG emissions in A/R CDM project activities
UNCAC	United Nations Convention Against Corruption
UNFCC	United Nations Framework Convention on Climate Change
UN-REDD Readiness	United Nations Reducing Emissions from Deforestation and Degradation Readiness
USD	United States Dollar
USGS	United States Geological Survey
UV	Ultraviolet
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit
VT0001	Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities
VU	IUCN Red List of Threatened Species Status - Vulnerable
WCS	Wildlife Conservation Society
WRC	Wetland Restoration and Conservation
WWF	World Wildlife Foundation
X-STR	VMD0016 Methods for stratification of the project area (X-STR), v1.2
X-UNC	VMD0017 Estimation of uncertainty for REDD project activities (X-UNC), v2.2

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Riau Ecosystem Restoration Carbon Project (the "Project", “RER-Project” or "RER-CP") seeks to protect and restore 130,090 ha of peatland ecosystem located in the Republic of Indonesia while at the same time preserving biodiversity and enhancing local livelihoods. The Project will secure 78,425 ha of forest from risk of conversion to an industrial forestry plantation. The Project is on the island of Sumatra and in the Province of Riau. Specifically, it is located on the Kampar Peninsula, which is a rain-fed domed peatland forest made up of four former logging concessions.



Figure 1- Landscape of project area (Copyright: C. Delacy ©)

The Kampar Peninsula (674,200 ha) was first subjected to commercial timber exploitation in the 1970s through the early 2000s. This phase was followd by a significant part of the peninsula being designated for industrial plantations, primarily *Acacia crassicarpa,* and to a much lesser extent, oil palm plantations. The remaining natural forest block (344,000 ha) on the Kampar Peninsula is the largest peatland forest block in Sumatra with a peat depth that ranges from 3 – 15 meters thick. As of 2014, when the RER area was completing its licensing, 294,227 ha or 43.6% of the peninsula had been converted to *Acacia* forestry plantations. Today, approximately 344,000 ha of natural forest remains on the Kampar Peninsula, and the RER-CP is located at the centre of this.

The Project at its heart is tasked with demonstrating how peat landscapes can be responsibly managed to protect biodiversity and enhance local communities. Forest protection preservation is augmented by the ring of *Acacia* plantations that surrounds the Project and which acts as a natural buffer to the Project Area.

The four original concessions that make up the Project area are PT. Gemilang Cipta Nusantara (20,123 ha), PT. The Best One Unitimber (40,666 ha), PT. Sinar Mutiara Nusantra (32,776 ha) and PT. Global Alam Nusantara (36,525 ha). All have long been gazetted as part of the Forest Production Estate (Hutan Produksi) by the Indonesian Ministry of Environment and Forestry. Through the acquisition of individual Ecosystem Restoration licenses (IUPHHK-RE) for each, they have been saved from the risk of conversion to industrial plantations.

With more than 17,000 people living just outside the RER concession areas, it is essential that the Project provides training and incentivises improved livelihood opportunities. The biodiversity of the Kampar Peninsula has been recognised by Birdlife International, The International Union for Conservation of Nature (IUCN), the Wildlife Conservation Society (WCS) and World Wildlife Fund (WWF) as an “Important Bird Area” (2004), a “Key Biodiversity Area” (2006), and a “Tiger Conservation Area“ (2007). Globally threatened species such as the Sumatran Tiger, Sunda Pangolin, Storm’s Stork, Flat-head Cat, and Malaysian Sun Bear are known to exist in the Project Area.

The carbon financing received from the Project's activities will be reinvested into the landscape and local communities to support environmental restoration, fire monitoring, scientific peatland and wetlands research, and preservation and conservation efforts to maintain and increase the incredible flora and fauna of the Project Area. There are no ongoing incidents of significant deforestation or forest degradation in the project area and unplanned deforestation and unplanned degradation area excluded from both the baseline and the project scenarios.

Under the hypothetical business-as-usual plantation baseline, the landscape would have been converted to *Acacia* plantations.

Through the assistance of carbon financing, the Project, over its initial lifespan of 57 years will avoid 373,116,864 tonnes of CO2e, (i.e. 6,545,910 tonnes of Co_2e per annum) from being emitted. At the same time, the Project will ensure the delicate domed peat landscape remains intact, is not converted to industrial plantations and undergoes rehabilitation (both natural and human-assisted). The landscape will be rehabilitated further by blocking the legacy drainage canals from past commercial selective so that the landscape is rewetted. The Project will ensure carbon remains locked in the environment and that the biodiversity conservation of this unique lowland domed peat swamp forest of Riau can be preserved for generations to come.

1.2 Sectoral Scope and Project Type

Sectoral Scope: Agriculture, Forestry and Other Land Use (AFOLU).

Project Category: Reducing Emissions from Deforestation and Degradation (REDD) and Wetlands Restoration and Conservation (WRC).

Type of Activity: Avoided Planned Deforestation (APD), Restoring Wetland Ecosystems (RWE) and Conservation of Intact Wetlands (CIW) through Avoiding Planned Wetland Degradation (APWD).

The Project is not a grouped project.

1.3 Project Eligibility

The proposed RER-CP is eligible under the scope of the VCS Program due to the following points:

1. The Project conforms to the general and AFOLU specific requirements of § 3.1 and § 3.2 of the VCS Standard v. 4.0.
2. The Project and Project Area is avoiding planned deforestation and planned wetlands degradation. As a result, the Project falls under the Reducing Emissions from Deforestation and Degradation and Wetlands Restoration and Conservation category pursuant to § 3.2.1, § 3.2.8, § 3.5.1, and Appendix A1.8 & A1.15 of the VCS Standard, version 4.0.
3. The baseline of the Project would have seen 78,425 ha of natural forest converted to industrial forestry plantation, which would have seen Acacia harvesting every five (5) years. This baseline conforms to the methodological requirements and § 3.12.1 of the VCS Standard, version 4.0.
4. The lifetime of the Project is 57 years with the option to renew for a further 43 years as allowed by § 3.8.3 of the VCS Standard, version 4.0.
5. The period between the start date of the Project and to the validation of the Project is within the five-year requirement as required in § 3.7.3 VCS Standard, version 4.0.
6. The Project has used a current and valid, approved, and up-to-date methodology to calculate its greenhouse gas emissions (GHG) reductions in a conservative manner as required by § 3.1.1 & 3.1.2 of the VCS Standard, version 4.0.
7. The project has established 300m legally mandated riparian zones adjacent to primary Peat Dome Forest in PT. GAN concession and around rivers, streams, and other significant water bodies within the project area.
8. The Project has demonstrated its additionality requirements as set forth in § 3.13.1(1) of the VCS Standard, version 4.0.

1.4 Project Design

The RER-CP includes the installation of three Project activities on four Production Forest concessions PT. Gemilang Cipta Nusantara (GCN), PT. The Best One Unitimber (TBOT), PT. Sinar Mutiara Nusantra (SMN) and PT. Global Alam Nusantara (GAN). The designed Project activities include:

1. Avoiding the development of 78,425 ha of natural forest into *Acacia crassicarpa* plantations; and,
2. Avoiding the planned draining, degradation and subsidence of 78,425 ha of peat swamp forest through the drainage activity required for a commercial scale *Acacia crassicarpa* plantation.
3. Rewetting 9,106 ha of the landscape through the damming and subsequent blocking of 146 km of legacy canals located in the Project Area.

1.4.1 Eligibility Criteria

The Project is not a grouped Project and therefore provides no additional eligibility criteria.

1.5 Project Proponent

Organisation name	ASIA PACIFIC RESOURCES INTERNATIONAL LTD (APRIL)[1]
Contact person	Lucita Jasmin
Title	Director for Sustainability & External Affairs
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Telephone	+62-21-319-30134
Email	Lucita_Jasmin@aprilasia.com

Table 1- Project proponent information. ASIA PACIFIC RESOURCES INTERNATIONAL LTD (APRIL)

Organisation name	RIAU ECOSYSTEM RESTORATION[2]
Contact person	Bradford M. Sanders
Title	Head of Operations
Address	Jalan Lintas Timur PT. RAPP Townsite Rukan Akasia Blok III No.1 Kota Pangkalan Kerinci, Kec. Pangkalan Kerinci Kapupatan Pelalawan Riau 28300 Indonesia
Telephone	+65 761 95401 ext 4241
Email	Bradford_Sanders@aprilasia.com

Table 2- Project proponent information. APRIL - RIAU ECOSYSTEM RESTORATION

Organisation name	PT. GEMILANG CIPTA NUSANTARA[3]

Contact person	Dian Novarina
Title	Current PT. Director
Address	Jalan Lintas Timur Rukon Akasia, Blok III No. 1 RT 01 / RW 09 Pangkalan Kerinci, Riau 28300 Indonesia
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Email	Dian_Novarina@aprilasia.com

Table 3- Project proponent information. PT. GEMILANG CIPTA NUSANTARA

Organisation name	PT. THE BEST ONE UNITIMBER
Contact person	Bambang Prayitno
Title	Current PT. Director
Address	Jalan Lintas Timur Rukon Akasia, Blok III No. 1 RT 01 / RW 09 Pangkalan Kerinci, Riau 28300 Indonesia
Telephone	+62 8129276006
Email	Bambang_Prayitno@aprilasia.com

Table 4- Project proponent information. PT. THE BEST ONE UNITIMBER

Organisation name	PT. GLOBAL ALAM NUSANTARA
Contact person	Ikhsan
Title	Current PT. Director
Address	Jalan Lintas Timur Rukon Akasia, Blok III No. 1 RT 01 / RW 09 Pangkalan Kerinci, Riau 28300 Indonesia
Telephone	+62 8117524224
Email	Ikhsan@aprilasia.com

Table 5- Project proponent information. PT. GLOBAL ALAM NUSANTARA

Organisation name	PT. SINAR MUTIARA NUSANTARA
Contact person	Rudi Hartono
Title	Current PT. Director
Address	Jalan Lintas Timur Rukon Akasia, Blok III No. 1 RT 01 / RW 09 Pangkalan Kerinci, Riau 28300 Indonesia
Telephone	+62 82388597688
Email	Rudi_Hartono1@aprilasia.com

Table 6- Project proponent information. PT. SINAR MUTIARA NUSANTARA

1.6 Other Entities Involved in the Project

Organisation name	Himpanzee Pte Ltd
Role in the project	Project Developer
Contact person	Ralph J. Strebel
Title	Head of Carbon
Address	International Plaza #27-15 10 Anson Road Singapore 079903
Telephone	+65 9772 6138
Email	ralph@himpanzee.net

Table 7- Entities involved in the Project. - Himpanzee Pte Ltd

Organisation name	Ata Marie Group Ltd.
Role in the project	Assistant Project Developers
Contact person	George Kuru
Title	Director
Address	Ruko Darmawangsa Square No. 5, 4th Floor, Jln Darmawangsa 6, Kebayoran Baru, Jakarta Selatan 12160 Indonesia
Telephone	+62 21 72789411
Email	george.kuru@ata-marie.co.id

Table 8- Entities involved in the Project. - Ata Marie Group Ltd

Table 9- Withdrawn

Organisation name	BIDARA
Role in the project	Community Engagements
Contact person	Ahmad Fachrudin
Title	Executive Director
Address	Jl Pejuangan No 24 Kebun Jeruk Jakarta Barat, 11530 021-535-5995
Telephone	+62 8111630179
Email	Ahmad Fachrudin@gmail.com

Table 10- Entities involved in the Project - BIDARA

1.7 Ownership

1.7.1 Legal & Ownership Requirements

RER-CP is in compliance with the ownership requirements of the VCS Standards (v. 4.0) as fully set forth in § 3.6.1(1) "Project ownership [is] arising or granted under statute, regulation or degree by a competent authority" and § 3.6.1(4) "Project ownership [is] arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions and/or removals".

The Project has acquired the appropriate approvals from the relevant national, provincial and regency authorities to develop and implement the project activities in the four concessions that make up the Project Area.

Government Regulation No. 6/2007 on Forest Arrangement and Formulation of Forest Management Plan as well as Forest Exploitation (and its amendment No. 3/2008).

All four ecosystem restoration licenses are based on Indonesian Government Regulation No. 6/2007 regarding Forest Arrangement and Formulation of Forest Management Plan as well as Forest Exploitation and the amendment of the regulation in the Government Regulation No. 3/2008. For a comprehensive list of the laws and regulations upon which the licenses are based, please see the individual licenses as provided in Appendix 1- Proof of Legal Ownership.

1.7.2 Approval of Ownership Documentation

Tables 11 through 14 below sets forth the list of legal approvals that the Project Owners have obtained for the ongoing implementation of the Project. A copy of each of the below documents is available to the auditors on request and a copy of each of the four concession licenses are provided in the Legal Documents appendix as noted above.

Decree No.	Description	Approval From	Date of Issuance
SK.395/Menhut-II/2012,	Issuance of IUPHHK-RE License to PT.GCN for an area of 20,265 ha	Ministry of Forestry	24 July 2012
SK. 44/VI-BRPUK/2013	Long-Term Management Plan (RKU) approved for PT.GCN IUPHHK-RE	Ministry of Forestry	6 May 2013
Kpts/522.2/Pemhut/3099	Approval of First Annual Work Permit (RKT)	Forestry Office, Riau Province	16 Sept 2013
SK.930/Menlhk/Setjen/PLA.2/10/2019	Approval of the PT. GCN Boundaries for 20,123.33 ha	Ministry of Environment and Forestry	18 Oct 2019

KT.4/JASUNG/PKU/HPL.2/8/ 2019	Issuance of MONEV Certificate	Ministry of Environment and Forestry	28 Aug 2019

Table 11- Proof of Ownership for PT. Gemilang Cipta Nusantara (PT. GCN)

Decree No.	Description	Approval From	Date of Issuance
SK.747/Menhut-II/2014	Issuance of IUPHHK-RE License to PT. TBOT for an area of 39.412ha	Ministry of Forestry	15 Sept 2014
SK.6776/Meat.HK-PHPL/JASLNG/HPL.2/12/2016	Long-Term Management Plan (RKU) approved for PT.GCN IUPHHK-RE	Ministry of Forestry	29 Dec 2016
522.3/PPH/5493	Approval of First Annual Work Permit (RKT)	Forestry Office, Riau Province	29 Dec 2017
SK.515/Menlhk/Setjen/PLA.2/8/ 2019	Approval of the PT. TBOT Boundaries for 40,666 ha	Ministry of Environment and Forestry	08 Feb 2019
KT.5/JASLING/PKU/HPL.2/8/2019	Issuance of MONEV Certificate	Ministry of Environment and Forestry	28 Aug 2019

Table 12- Proof of Ownership for PT. The Best One Unitimber (PT. TBOT)

Decree No.	Description	Approval From	Date of Issuance
SK.162/Menhut-II/2014	Issuance of IUPHHK-RE License to PT.SMN for an area of 32.830ha	Ministry of Forestry	18 Feb 2014
SK.5778/Men LHK-PHPL/JASLING/HPL.2/10/2016	Long-Term Management Plan (RKU) approved for PT.GCN IUPHHK-RE	Ministry of Forestry	27 October 2016
522.2/PPH/5492	Approval of First Annual Work Permit (RKT)	Forestry Office, Riau Province	28 Dec 2017
SK.567/Menlhk/Setjen/PLA.2/8/ 2019	Approval of the PT. SMN Boundaries for 32,776 ha	Ministry of Environment and Forestry	20 Aug 2019
KT.11/JASLING/PKU/HPL.2/8/2019	Issuance of MONEV Certificate	Ministry of Environment and Forestry	28 Aug 2019

Table 13- Proof of Ownership for PT. Sinar Mutiara Nusantara (PT. SMN)

Decree No.	Description	Approval From	Date of Issuance

SK.230/Menhut-II/2014	Issuance of IUPHHK-RE License to PT. GAN for an area of 36,850 ha	Ministry of Forestry	14 Mar 2014
SK.6774/MemLHK-PHPL/JASLING/HPL.2/12/2016	Long-Term Management Plan (RKU) approved for PT.GCN IUPHHK-RE	Ministry of Forestry	29 Dec 2016
522.2/PPH/5494	Approval of First Annual Work Permit (RKT)	Forestry Office, Riau Province	28 Dec 2017
SK.836/MENLHK/SETJEN/PLA.2/10/2019	Approval of the PT. GAN Boundaries for 36,525 ha	Ministry of Environment and Forestry	17 Oct 2019
KT.6/JASLING/PKU/HPL.2/8/2019	Issuance of MONEV Certificate	Ministry of Environment and Forestry	28 Aug 2019

Table 14- Proof of Ownership for PT. Global Alam Nusantara (PT. GAN)

1.8 Project Start Date

The Project start date is defined by **§ 3.7 of VCS Standard v.4.0.: "The project start date of an AFOLU project is the date on which activities that led to the generation of GHG emission reductions or removals are implemented."**

The Project has denoted **17 June 2016** as the Project Start Date. This date corresponds to when actual activities that would lead to emission reduction credits began. The Project has two emission reduction activities, WRC and APD, and the implementation of the WRC activity began first with the activity that led to the construction of canal blocking dams.

1.8.1 WRC Activity

17 Jun 2016 is the date that the Project received its initial shipment of Geo-Reinfox[4] material which was needed to begin constructing sandbags required in the building of dams in the canal blocking programme. The material was delivered to a location just outside of the RER Project Area, along with several loads of aggregate material. The sandbags were filled with sand and aggregate and then shipped by boat to the dam locations that were constructed in July and August of 2016. Before this time, the Project did not implement any on-the-ground activity that would lead to the creation of emission reduction credits. The beginning of the dam construction began at scale with the delivery of the Geo-Reinfox material. There were, however, three dams that were built in 2015 as "proof of concept" activities. Three different types of dams were built on a small 800-meter stretch of one canal: one sandbag dam, one made of the conveyor belt "velt" material, and one made of velt and boards. The successful demonstration of the dams paved the way for approval of the more extensive rewetting program integrated into the WRC component of the Project. The Project has a variety of records to show the purchase and delivery of the sandbag material, and when the work

began to produce the sandbags used for the dams was initiated i.e. purchase order records, delivery records, human resource records and work order records. The first 16 dams were installed in 2016, from 23 July through 10 September.

1.9 Project Crediting Period

The Project Crediting Period will be 57 years. The Project Crediting Period starts on 17 June 2016 and ends on 23 July 2072. The beginning of the Project Crediting Period coincides with the Project Start Date and the delivery of the materials used for the construction of sandbags needed for installing dams in the legacy canals to rewet the landscape. For project reporting purposes, the start and end dates for any specific year is 1 January and 31 December respectively except for project start year (2016) and project end year 2072.

The Project Crediting Period of 57 years coincides with the length of the Ecosystem Restoration License (IUHHPK-RE) held by GCN, which is valid for 60 years from 24 July 2012 and through 23 July 2072. The GCN license was the first of the four licenses acquired by the Project Owner and expires the earliest. Thus, to be conservative, the initial crediting period is linked to the GCN license.

The Project Crediting Period may be renewed for up to 43 years, subject to the renewal of the four concession licenses via the Indonesian Ministry of Environment and Forestry. Any extension would require that the Project continues to have the right to manage the area and originate emission reductions and removals. It is anticipated that the Project would, if feasible, extend for another 44 years so that it may be active for the full 100 years allowed by § 3.8.3 of the VCS Standard, v.4.0.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	X

Table 15- Project Scale

Year	Estimated GHG emission reductions or removals (tCO_2e)
2016	2,304,810
2017	5,155,399
2018	7,014,900
2019	8,718,080
2020	9,626,273
2021	7,029,326
2022	7,159,902
2023	6,938,956
2024	6,976,616
2025	6,976,616
2026	6,891,289
2027	6,814,359
2028	6,725,584
2029	6,631,419
2030	6,547,087
2031	6,541,582
2032	6,535,301
2033	6,535,301
2034	6,535,301
2035	6,535,301
2036	6,535,301
2037	6,535,301
2038	6,535,301
2039	6,535,301
2040	6,535,301
2041	6,535,301
2042	6,535,301
2043	6,535,301
2044	6,535,301
2045	6,535,301
2046	6,535,301
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2061	6,535,301
2062	6,535,301
2063	6,535,301
2064	6,535,301
2065	6,535,301
2066	6,535,301
2067	6,535,301
2068	6,535,301
2069	6,535,301
2070	6,535,301
2071	6,535,301
2072*	3,652,607
Total estimated ERs	**373,116,864**
Total number of crediting years	57*
Average annual ERs	**6,545,910**

Table 16- Estimated annual GHG emission reductions or removals

*Crediting in 2072 is only for 6 months and 23 days, see § 1.9 above for explanation.

1.11 Description of the Project Activity

1.11.1 Summary Description of REDD+ Activity

By applying the VCS REDD+ framework, the Riau Ecosystem Restoration Carbon Project ("RER-CP" or the "Project") will protect and preserve the peat domes of the eastern Kampar Peninsula. Without the Project, this biodiversity hotspot could otherwise have been developed into a commercial-scale Acacia plantation. Prior to the Project, forest degradation mostly occurred from historical unsustainable logging practices. The selective logging that took place in the Project Area and the Kampar Peninsula, primarily in the early and mid- 2000's removed most of the commercially valuable timber in an unsustainable manner. This legacy was exacerbated by the uncontrolled drainage from a large number of opportunistic legacy canals built by the former selective logging concessions and possibly also by illegal loggers. Generally, in the Kampar Peninsula, once the valuable timber had been removed, the selective logging concession became dormant, however as all selective logging concessions are part of the forestry estate known as Production Forest (Hutan Produksi), the license could legally, upon application be changed to allow plantation forestry activity[5]. All of the concession surrounding the Project Area went through this process and are today Acacia plantations. Once an area receives its HTI license and has its forest management plan approved by MoF, the designated production area would be clear felled and planted with Acacia seedlings. Water table management systems (i.e. canals and drains) will be established and maintained, and every 5-7 years, the Acacia would be harvested via clear felling and then replanted. Liberal use of nitrogen fertilizers would be used.

The four ecosystem restoration licenses, now organised into the RER-Carbon Project, will avoid plantation development and undertake a plan of canal blocking and monitoring that will assist in the rewetting of the broader landscape. Although not part of the larger carbon project, RER will be replanting native species in degraded areas of various conditions, as well as undertaking and managing additional natural regeneration and enrichment planting efforts. No GHG emission reductions or removal claims will be made for this activity. However, these efforts will help ensure the long-term environmental sustainability of the Kampar Peninsula. Project Activities will also be integrated with community support efforts that will impact the more than 17,000 local community members that live on and around the Kampar Peninsula.

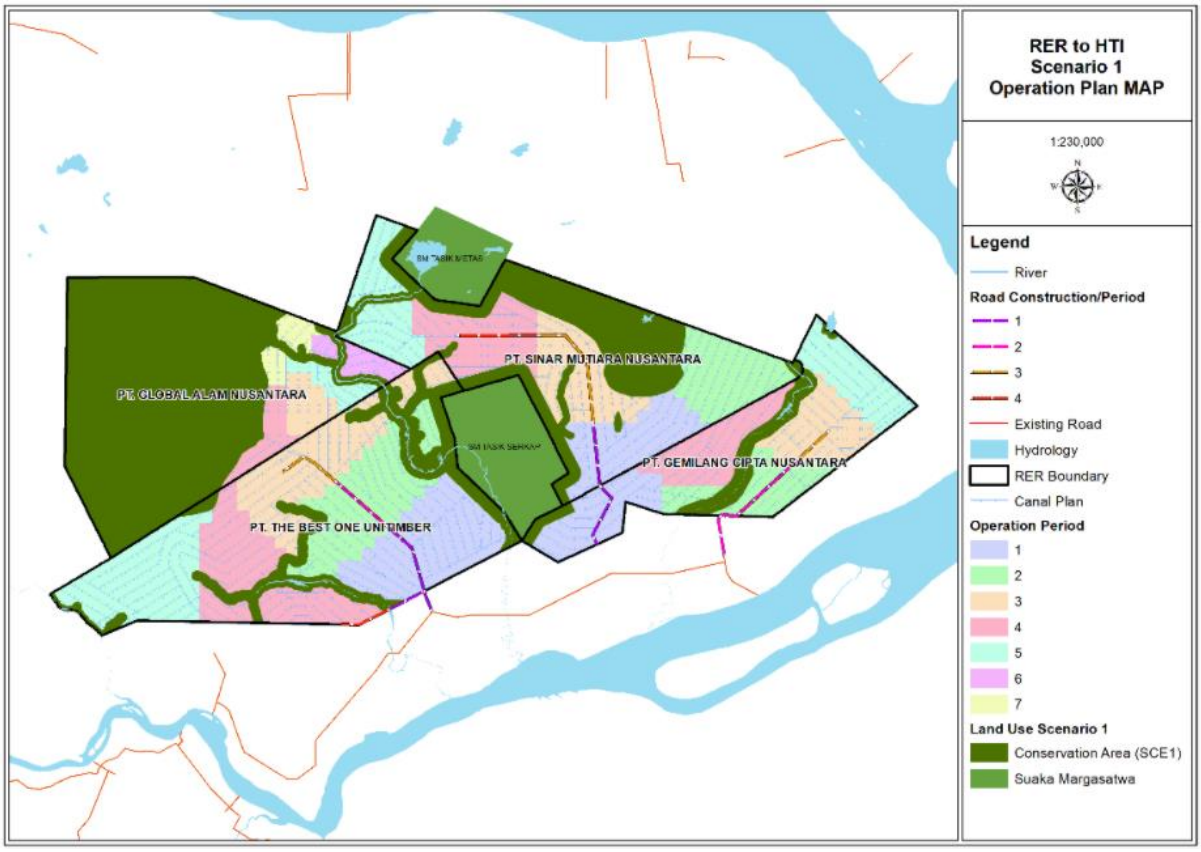
RER-CP is not located within a jurisdiction covered by a Jurisdictional REDD+ Programme or a jurisdictional forestry baseline.

RER-CP will use the following activities to achieve a four-pronged restoration approach: Protect, Assess, Restore, and Manage.

1.11.2 Project Crediting Activity

1.11.2.1 Avoided Planned Deforestation (APD)

The primary VCS activity that the Project will undertake is the avoiding of planned deforestation and conversion of 78,425 ha of the landscape into industrial Acacia fiber plantations. The Project avoids the risk of conversion, which is the baseline scenario. The baseline is associated with large amounts of carbon emissions from the activities required to clear, plant, and manage Acacia. Additional carbon emissions from the application of fertilizers and forest loss from infrastructure development will also be avoided. The baseline scenario is more clearly set forth below in Chapter 3 in § 3.4.



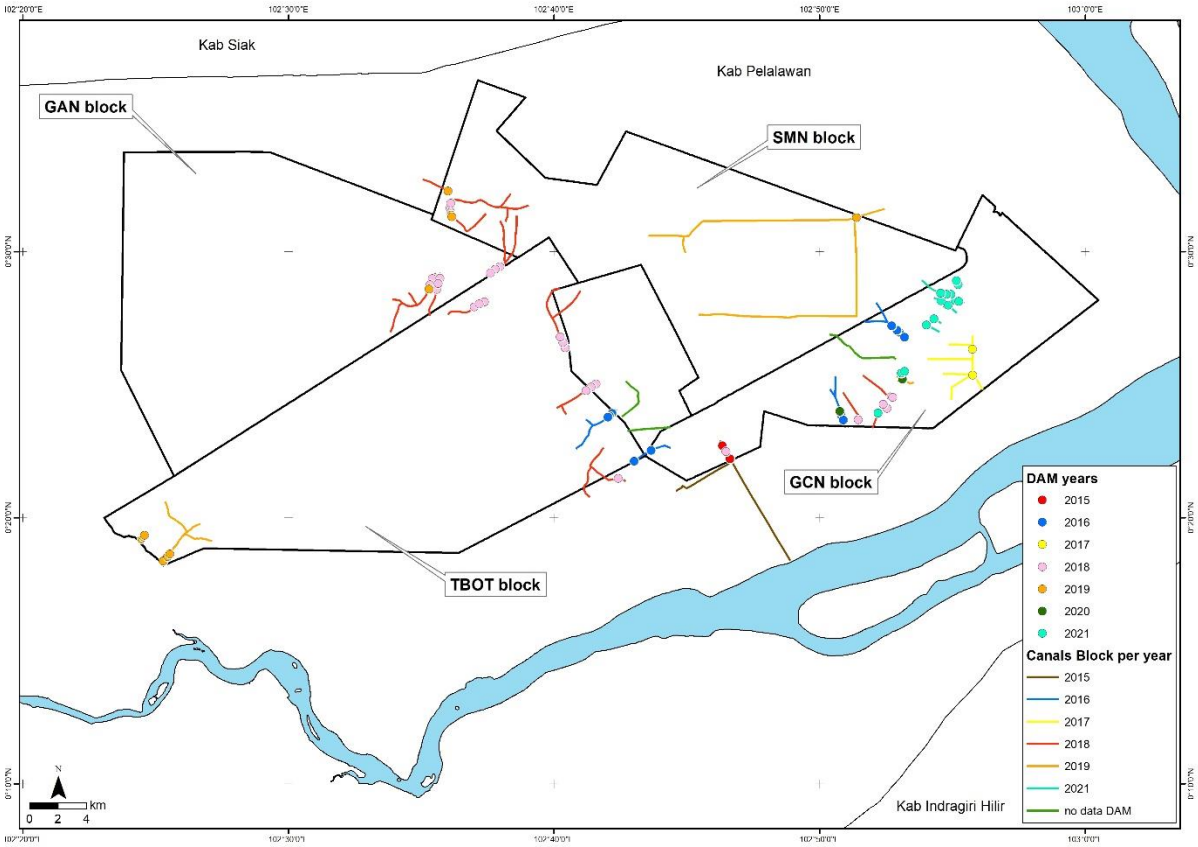
Map 1- Operation Plan of the Project

The REDD+ activities and the associated restoration of wetlands over the lifespan of the Project will allow the biodiversity of the Kampar to remain intact and flourish. This activity will, in turn, ensure the long-term sustainability of the ecosystem services of the Kampar Peninsula benefiting the local communities, the Province of Riau, and indeed all of Indonesia.

1.11.2.2 Peatland Rewetting and Conservation

The Project has identified the location of the 146 km of legacy drainage canals that were constructed legally and illegally for selective logging purposes. The canals were used along with a system of rails for access into the forest and to float logs out of the forest to the nearest river or coastline. Canals are usually about 1-2 meters wide by 1-2 meters deep. The Project prioritizes the

old drainage canals for closure (based on distance from the nearest road access) as mapped from satellite images and conducts field surveys to confirm its status and conduct topographic profile survey (see Map 2). These profile surveys allow RER-CP water management specialists to identify the approximate number and location of dams to be constructed.



Map 2 - Map of the RER legacy canals from former HPH logging activity and current dams

RER aims to raise water levels in 40-cm steps along the length of each canal, essential for establishing a series of terraces that will slow the flow of water and retain peat moisture longer during the dry season. Once the dams are established, the RER Project area will retain water more consistent with the natural seasonal variations of rainfall and the natural characteristics of the former undrained landscape.



Figure 2 - Dam construction in RER

RER plans to close all of the canals during the ten years beginning in 2016. So far, 23 of 36 canals have been closed, totalling 126 km using 63 hand-built dams. The Project's goal is to finish construction of all dams in all the canals by 2025. Inspection of all dams occurs at least annually.

The wetlands restoration and conservation activities are intended to rewet a 300-meter radial distance from each legacy canal and slow the rate at which peat water table declines during the dry

season in order to maintain the hydrological stability of the landscape. The rewetting activity will reduce oxidation of peat that would otherwise occur. It will also ensure that the landscape will be resistant to the damages caused by anthropogenic use of fire.

1.11.2.3 Dam Construction

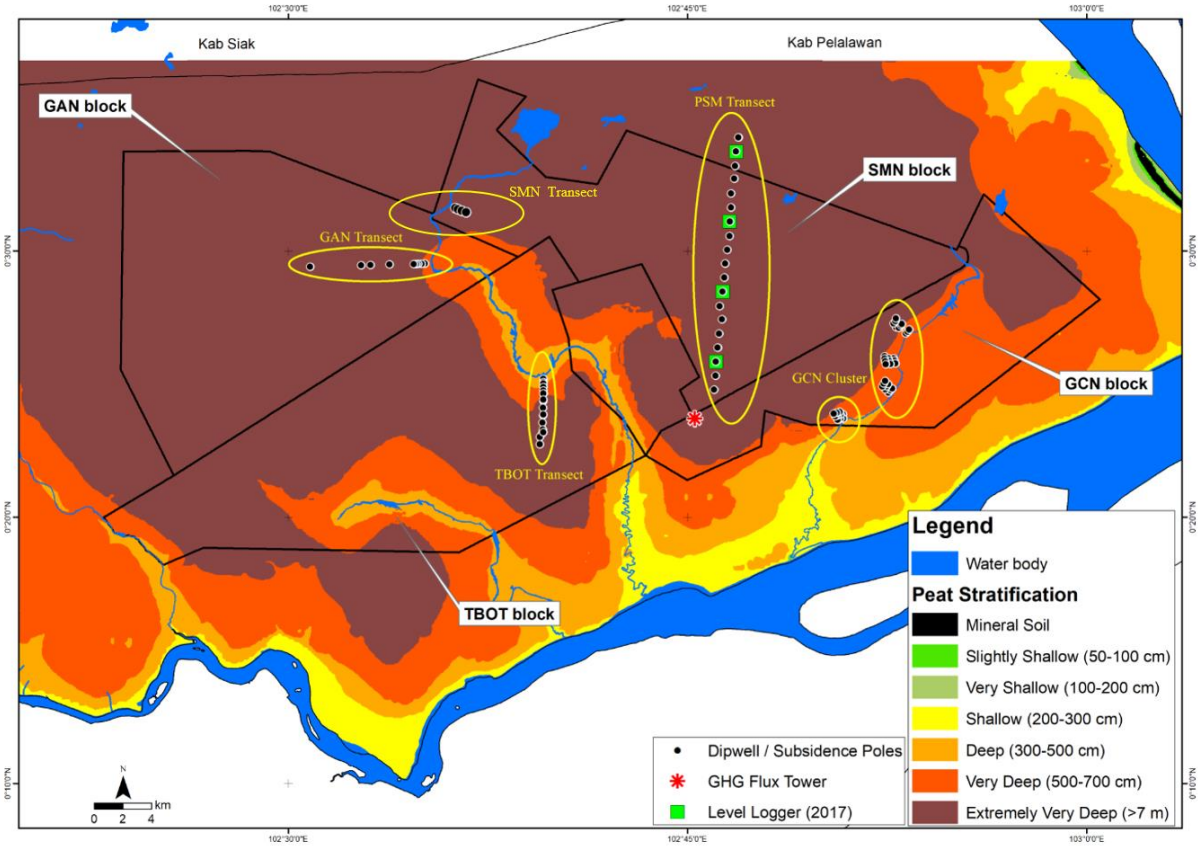
Dams are being constructed from a variety of materials pursuant to a Canal Blocking SOP (see Appendix 23). Sandbag dams are used at the mouth of each canal where it empties into a river. Each 25-30 kg sandbag is constructed from a synthetic polypropylene material known as "Geo-Reinfox" that is resistant to corrosion and UV light. The bags are layered in a stair-step fashion to withstand the weight of the water pushing against the dam.

Additional dams are constructed upstream in canals, in remote locations, and/or on wild canals without heavy equipment access from lighter weight, recycled materials such as aluminium piping and sections of used "press felt" conveyor obtained from APRIL's paper mill manufacturing facility. The felt has low permeability (26-35 cfm), has reached the end of its useful life and is repurposed for the dam building[6]. It is made from a combination of nylon and polyester. Experience has shown that the press felt becomes impregnated with soil particles, moss and lichens and becomes less permeable with time, increasing its ability to retain water behind the aluminium frame.

The dams will ensure that the water flow from the old drainage canals is substantially decreased, so that peat water table variations will follow natural seasonal rainfall fluctuations.

1.11.2.4 Water Level Monitoring

In addition to the canal blocking, the Project monitors the water table in the Project Area to ensure the effectiveness of the canal blocking programme. To date, the Project has *in situ* 75 water table monitoring points (each is a dipwell and subsidence pole) in the RER-Project Area. These are the GAN Transect (9 monitoring points), the TBOT Transect (9 monitoring points), the SMN Transect (4 monitoring points), the 4 GCN clusters (36 monitoring points) and the PSM Transect (17 monitoring points). These have been monitored every 3-months and have been increased now to every two months. A number of the monitoring clusters in GCN are situated around dams. Additionally, there are currently four automated level-loggers along the PSM Transect that automatically measure water table levels multiple times per day, with stored data collected on an ongoing basis. The Project will continue to expand its water table and subsidence monitoring capacity with the inclusion of additional dipwells, subsidence poles and automated level-loggers, as well as increasing automated level-loggers around dams. Further monitoring information is provided in Chapter 5 and Appendix 24.



Map 3: Installation of monitoring equipment: level loggers, dipwells and subsidence poles)

Monitoring of the dams, water tables, and subsidence rates will ensure that the Project is maintaining its activities and that the landscape remains intact.

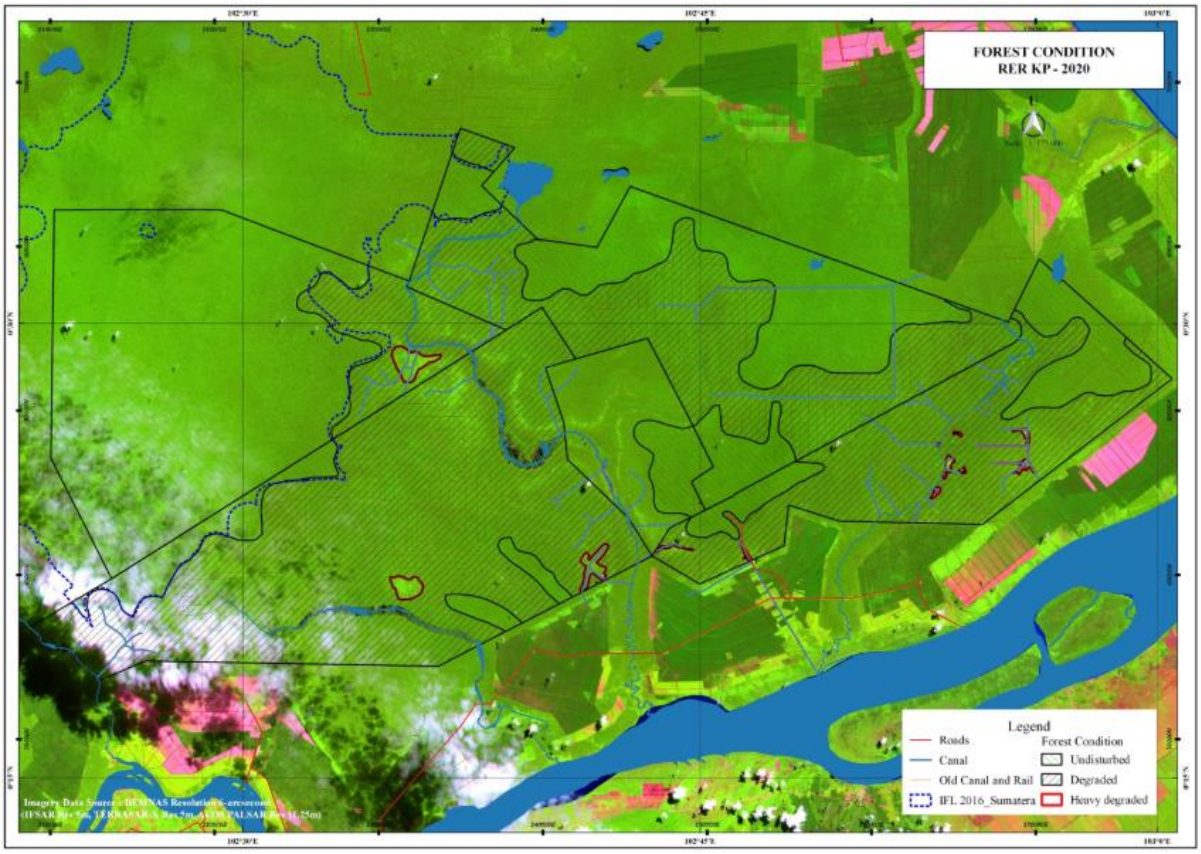
1.11.3 Additional Non-Crediting Activity

1.11.3.1 Planting & Revegetation



Figure 3 - Reforestation Flow

The Project will also, as a non-carbon generating activity, undertake planting and revegetation program. RER-CP intends to revegetate 875 ha of heavily degraded forest lands by planting seedlings of native origin and conducting assisted regeneration in areas that have been identified as degraded from prior logging activities. The project has established 4 native species tree nurseries on the Kampar Peninsula and aims to identify and revegetate highly degraded areas with strip-planting and assisted regeneration. See Map 4 below. The activity is undertaken via a three-step process: assessment, restoring via active and natural efforts and monitoring the results.



Map 4 - 875 ha of Heavily Degraded areas to be reforested and revegetated

1.11.3.2 Native Species & Nurseries

The RER-Carbon Project is committed to replanting native and endangered species only. RER produces seedlings in the nurseries from 70 different native tree species, primarily early successional species. RER has replanted and revegetated 68 ha in the GCN and GAN concession areas.



Figure 4 - Seedling gathering

New seedlings come from three sources: 1) uprooted seedlings; 2) seeds that have fallen from forest trees; or 3) cuttings from mature trees.

RER has primarily focused on the use of uprooted seedlings. It involves carefully removing individual tree seedlings from the forest floor and placing them in planting bags with peat soil. They are then maintained in one of the four nurseries for 12-18 months; until their roots, stem, and leaves are strong and 'ready-to-plant'. These seedlings are taken from locations in the forest where abundant seedlings exist. The intention is to plant in the identified highly degraded locations. See Map 4 – Heavily Degraded Area above.

RER also seeks to follow the flowering (and seed production), of certain dipterocarp tree species, which rarely and unpredictably produce fruit. Known locally as; Meranti Bakau (*Shorea uliginosa*), Meranti Bunga (*Shorea teysmanniana*), and Meranti Paya (*Shorea platycarpa*). The IUCN classifies these species as Vulnerable (VU), Endangered (EN) and Critically Endangered (CR), respectively. When these dipterocarps flower, which happened in 2018 (the first time in the past five years) special efforts were made to acquire such seeds for the nurseries, and over 10,000 seeds were collected from March to May 2018. These endangered species were a favourite of past commercial logging activities. The efforts in 2018 established over 6,000 seedlings of these endangered species, which are now available for planting at different locations.

1.11.3.3 Assessment Prior to Planting



Figure 5 - Phantom 4 Pro Drone

Following the initial identification of highly degraded areas (the combined result of drainage, intensive logging and fire) from satellite imagery, RER-CP uses a DJI Phantom 4 Pro Drone to obtain high-definition photos to stratify the site based on the density of natural tree regeneration. Based on strata, existing vegetation data is collected from 0.04 ha field plots (11.28-metre radius) and used by the Restoration Manager to develop a restoration site prescription which is then implemented by the Estate staff.

Two main types of planting take place:

1. **Active Planting** of the seedlings in thoroughly degraded and open areas in regular strips, currently at 5m x 5m intervals, and
2. **Enrichment Planting** of the seedlings in degraded areas but not so intensely, so that seedlings that are naturally *in situ* remain and are part of the regrowth process.



Figure 6 – High-definition drone photos of highly degraded site.

The project also undertakes a combination of "**Assisted Natural Regeneration**" and "**Enrichment Planting"** in designated areas where the ferns and vines are cut back to allow the growth of *in situ* seedlings and where seedlings "may be" planted where gaps exist.



Figure 7 - Replanting native seedlings in RER

Fertilizers are not used in any of the regeneration techniques described above. As no Afforestation, Reforestation and Revegetation (ARR) crediting is claimed for this activity which acts as a way to increase the conservativeness of the Project's GHG accounting. But it also helps with the non-carbon project's efforts to undertake long term regeneration activity.

1.11.3.4 Monitoring

In both assisted Natural Regeneration and Enrichment Planting, the seedlings and young saplings are periodically monitored. Approximately 1-3 months after seedling establishment, a Restoration Quality Assessment is conducted to identify seedling survival and stocking. At 6 and 12 months after establishment a Restoration Monitoring Assessment is conducted to further assess stocking and determine the need for "blanking" to replace dead seedlings and "weeding" to reduce competition with ferns and vines. No fertilizers are used. Data related to all activity is maintained for each plot. The RER Carbon Project does not anticipate to originate any carbon crediting from any replanting or revegetation activity.

All of the Project's replanting and revegetation activity is managed and overseen by RER and APRIL staff, including a dedicated biology science team led by PhD biologists/conservationists. The field teams that operate the nurseries collect seedlings, undertake the planting, vegetation clearance and maintenance of the replanting areas are, and mostly local community members retained as staff by RER and APRIL.

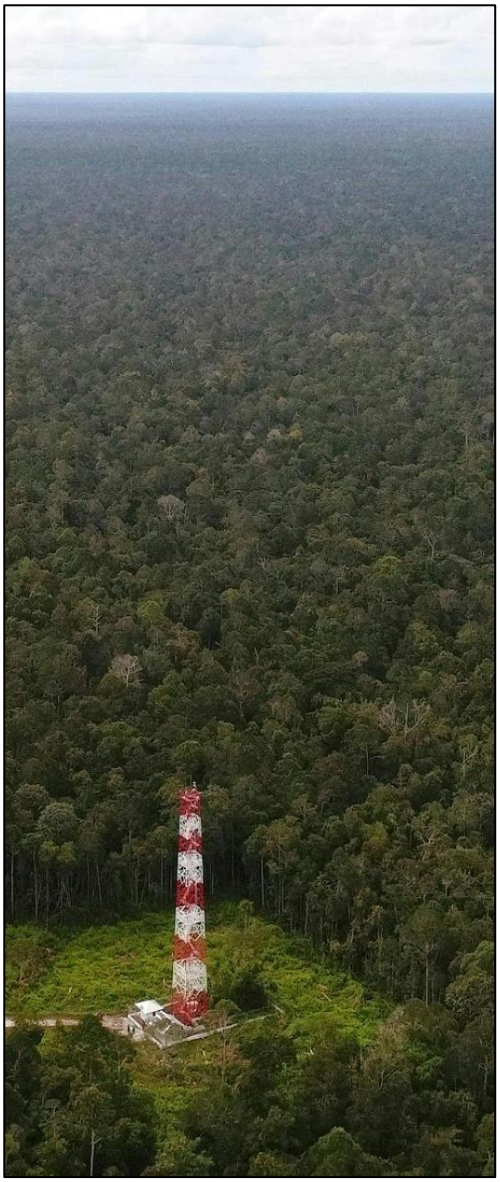


Figure 8 - GHG Flux tower in the Kampar

1.11.3.5 Research: GHG Flux Towers

The APRIL Group has established three GHG Flux Towers on the Kampar Peninsula, one of which (the third and last one built) is located in the RER Project Area and was completed in May of 2017. Since October 2016, when the first tower came online, these towers have begun to collect greenhouse gases (GHG) flux data. Findings from this monitoring activity are not anticipated to be available for the use of the Project until the first baseline re-assessment in 2025. APRIL has a dedicated GHG research team that coordinates with the RER programme and has a highly qualified science team led by PhD researchers.

1.11.3.6 Forest Protection

The RER Carbon Project also maintains active forest protection efforts in the Project Area with its 31 contracted Security staff; 16 of which are focused on forest protection efforts every day. Over 80% of RER's total workforce (including rangers and fire protection services) are drawn from the two regencies in Riau where RER is located, Kabupaten Pelalawan and Kepulauan Meranti. The RER forest protection staff are overseen and managed by the RER programme managers.

The Ranger teams have posts located at the primary access routes into the forest along rivers and conduct regular patrols to monitor the forest use by the local community members. The primary users of the forest are local fisherman, whereby Rangers document individuals using the rivers and collect data to monitor the seasonal and annual trends in fish harvesting. Ranger's also monitor and document the collection of songbirds, the collecting of plant material for medicinal and other uses, and the extraction of other non-timber forest products.

1.11.3.7 Fire Prevention & Suppression



Figure 9 - RER Fire teams during a regular training session

The RER Carbon Project has a fire management program that is designed and implemented to detect and rapidly suppress any fires that may occur in the RER Project Area. Peatland fires are a significant source of carbon emissions. Since the Project began in 2016, there have been no fires in the Project Area. The last known fire was in 2014, before the start of this Project. RER and APRIL regularly monitor "hotspot" data from various sources to identify potential fire incidents that may be inside or close to the RER boundary. If a hotspot point is observed, the coordinates of the location (latitude/longitude) are immediately transferred to field teams, which check the location to determine the appropriate action.

The Project also conducts fire suppression training, real-time fire patrols and monitors remotely sensed Hotspot data, not just in the RER Project Area, but the whole of the Kampar Peninsula. Hotspot data is publicly available online from the NOAA and MODIS satellites.

The RER Project has also been purchasing specialized forest firefighting equipment that is lightweight for easy mobility in the forest. These high-pressure water pumps are ideal for moving water long distances to extinguish fires. RER has more than 15 such water pumps, 3-km of hose, and a variety of standard hand-tools to contain and control forest and land fires. In 2017, RER's forest protection team was the overall winner at the annual APRIL Firefighter Competition.

The fire prevention teams are dedicated RER staff and overseen by RER management. Like the forest protection staff, most stem from the local and surrounding areas. Overall fire management is conducted from APRIL's provincial offices in Kerinci where professional firefighting professionals closely monitor digital hotspot information. APRIL's fires teams from adjoining concessions are generally able to assist with any issues if there was a need.

In 2016, APRIL's Fire Free Village Program was implemented in all nine communities adjacent to the Kampar Peninsula, which incentivizes the community over a two-year period to avoid the use of fire in land preparation (i.e. no burn agriculture).

1.11.3.8 Conservation and Habitat Management Activities

The Project is supporting conservation and biodiversity management by not only protecting the landscape but also by evaluating and assessing its biodiversity. RER has undertaken extensive camera trapping, bird monitoring, and floristic surveys and has recorded 797 species of plants and animals. See § 1.12.6 below for more details.

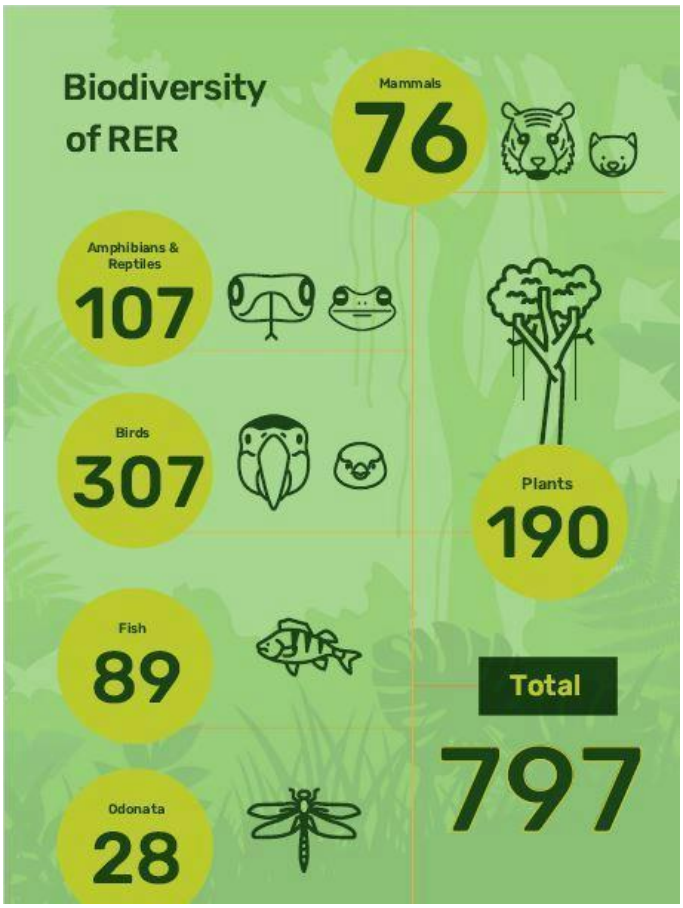


Figure 10 - Identified Plant & Animal Species in RER

In 2015, the first biodiversity baseline assessments were conducted in GCN, SMN and TBOT to identify the presence of wildlife using up to 152 camera traps on a 2 x 2 km grid and 32 transects each at 2-km length.

Since 2016, RER participated in two crucial bird monitoring programmes, including migratory raptor monitoring and the Asian Waterbird Census. Since 2017, RER began annual deployment of camera traps to further document wildlife in the forest. In 2019, the RER

team deployed a total of 76 camera traps, which cumulatively recorded 7,142 nights on the Kampar Peninsula and Padang Island.

Additionally, in 2019, the first insect survey in RER was undertaken, focusing on the Order *Odonata*, which includes dragonflies and damselflies.

In 2019, APRIL commissioned Yayasan SINTAS to survey the Kampar Peninsula, 1 of 6 priority landscapes as part of the Sumatra-Wide Tiger Survey for the Critically Endangered Sumatran Tiger (*Panthera tigris sumatera*) using protocols from the Indonesian National Tiger Recovery Program that is part of the Global Tiger Initiative. The survey of 21 separate 17x17 kilometre grid cells over eight months identified tiger presence, occupancy rate, threats and made recommendations for future management; the survey is scheduled to conclude in early 2020.

RER's management is made up of well qualified professional conservationists and supported by local staff. RER and APRIL regularly work with conservation organisations (e.g. Yayasan SINTAS, etc.) to monitor and research local wildlife. Local labour and general staff from the nearby communities are employed to assist and support the conservation work.

1.11.3.9 Community-Based Sustainable Development

The Project Community Relations teams invest considerable time and resources to working with the local communities. This ensures that traditional activities - like fishing and the gathering of forest honey - are protected, small businesses are supported, and that people are informed about the importance of the environment and biodiversity conservation.

In 2017, RER began partnering with local honey harvesters from the Kampar Peninsula. Forest honey is natural raw honey that is directly extracted from Sialang tree beehives. RER is working to assist the honey harvesters and the communities in which they live by purchasing honey, marketing and selling the product as "Madu Hutan Riau." In turn, the Project commits funds for community relations projects that include agroforestry, healthy living and hygiene standards, religious celebrations, sports activities, and community volunteering.

RER has dedicated management in staff that make up the Community relationship teams based on the Kerinci offices. They oversee all community and sustainability activity. They are supported by staff that reside in the local communities that act as liaisons between RER / APRIL and the local community, usually via WhatsApp or other social media groups.

1.11.3.10 No-burn Vegetable Farming

Through their partner BIDARA, the RER-CP works with villagers in Sangar sub-village and Segamai Village on the Kampar Peninsula to support "no-burn vegetable farming". The farming programme has been set up to prevent the risk of fire from threatening both the natural forest and surrounding Acacia fibre plantations. Land clearing with fire (slash-n-burn) is a common practice by local

farmers. APRIL and the Project aim to provide the communities living around RER with an alternative method of land preparation that will produce valuable food crops.

Farming activities are intensified on small plots of land whereby community members are organized into farming groups. Groups are initially provided with seedlings of mainly vegetable crops such as red and green chilli, red ginger, eggplant, tomato, cayenne, and green beans together with equipment and supplies like hand tools, fertilizers and shade nets. A field school is organized as a learning platform for the community to discuss problems and improve techniques for crop productivity.

In conjunction with the APRIL Community Relations team, the RER Community Relations Team oversee and manage the no-burn activities. As noted, the activity also includes BIDARA who undertake the field school activities and engage the local communities with this "extension-like" service.

1.11.4 Project Activity Participants

All of the Project's crediting activity is managed by the Riau Ecosystem Restoration programme and staff reports to APRIL management. The field management is administered through the RER and APRIL offices in Kerinci. The RER Project is overseen by dedicated management teams with dedicated staff that undertake all of the activity related to peatland restoration. This includes dam construction and monitoring of the same. Monitoring activity is also undertaken by RER and APRIL management and staff. All licensing, forest planning, human resources, peatland science and operational activity is undertaking by RER and APRIL staff, based primarily at the Kerinci offices. However, sustainability managers are primarily based in APRIL's Jakarta offices, with regular travel to Riau.

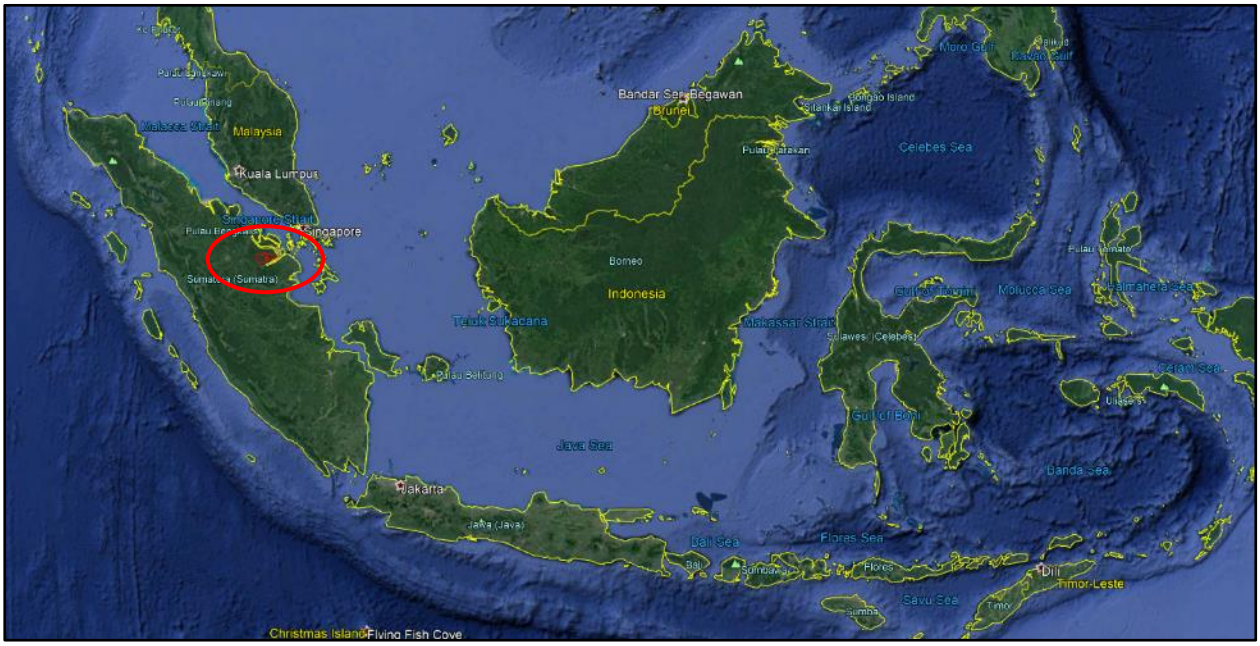
RER & APRIL have engaged third-party organisations to assist with various project activities. For example, the University of Riau was involved in peat sampling in the PT GAN block. This activity was not solely for the RER Project though, and thus they have not been listed as a project participant.

Members of the local community make up a sizable portion of the RER and APRIL on the ground staff that support the Project, including the on the ground staff that build and maintain the dams. APRIL forest mensuration teams also draw staff from the local community.

1.12 Project Location

1.12.1 Geographical Location

The Riau Ecosystem Restoration Carbon Project is located in the Republic of Indonesia, on the central, eastern side of Sumatra. It is located in the Province of Riau in the *Kabupaten* or "Regency" of Pelalawan located adjacent to the Strait of Malacca. (See Map 5).



Map 5 - RER Carbon Project located in Indonesia

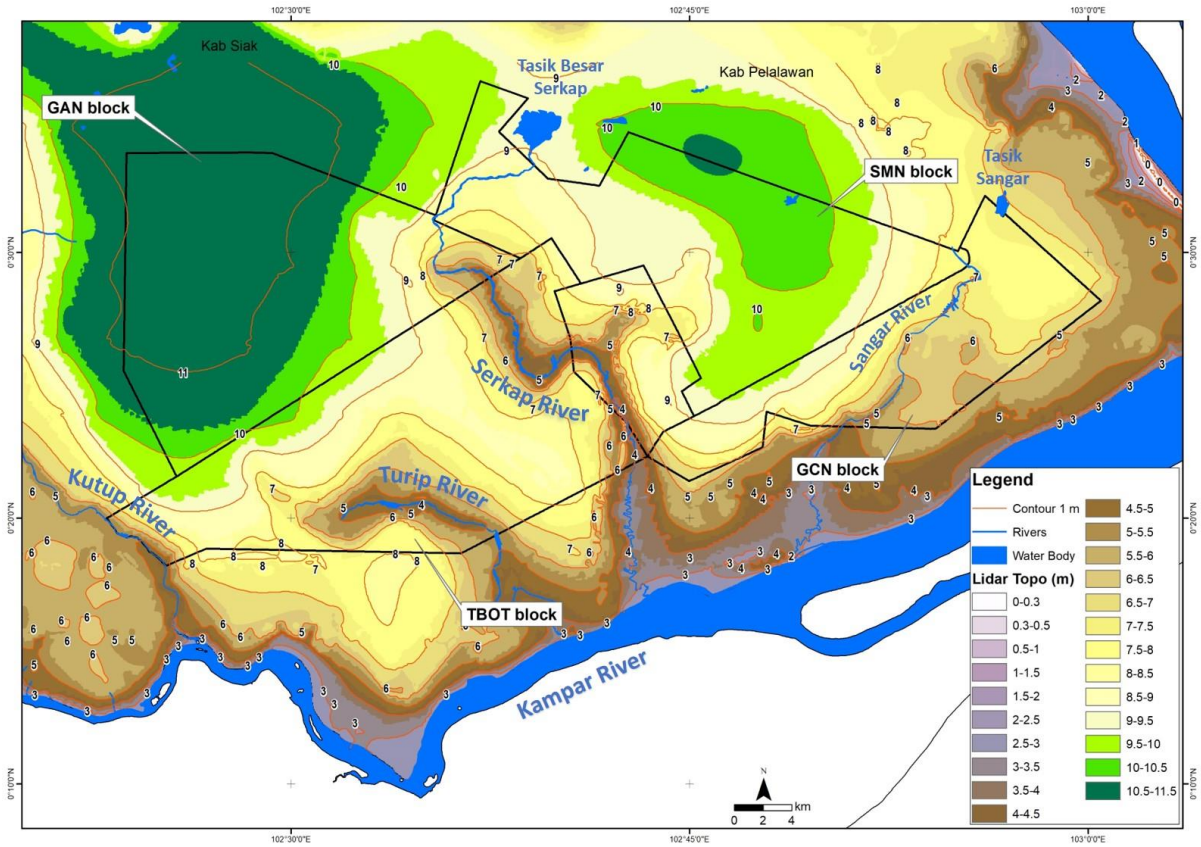
The Province of Riau (see Map 6) has a total area of 87,023 km^2 and its capital and largest city is Pekanbaru[7]. Pelalawan Regency (see Map 6) makes up 12,785 km^2 and has as its administrative centre, Pangkalan Kerinci[8]. The Project area is located 105 km from Pekanbaru and about 845 km from the capital of Indonesia, Jakarta. The closest major city to the Project Area is Singapore, which lies 130 km to the north-east across the Strait of Malacca.



Map 6- Project Area Location in Riau Province

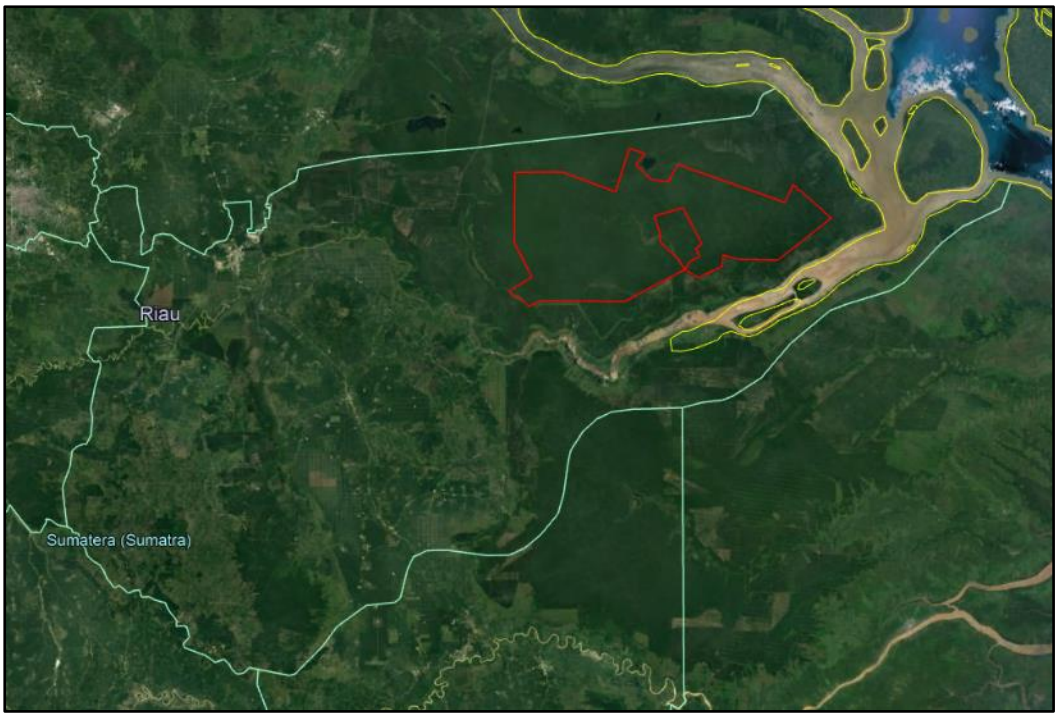
1.12.2 Geographical Boundaries

The Project itself is located on the Kampar Peninsula, which has an area of roughly 670,000 ha and is on the eastern coast of Sumatra and the eastern edge of the Pelalawan Regency. It is roughly wedge-shaped, defined by the Selat Panjang Strait to its north and east and the Kampar River, which forms its southern boundary (see Map 7). The Kampar's western boundary is partly the Siak River and is roughly composed of a broad swath of land where the mineral soils of the foothills merge into the peat soils of the coastal plain that stretches eastward to the Strait of Malacca.



Map 7- Project Area Location

The Kampar Peninsula itself is comprised almost entirely of tropical peat swamp forests. Its central core, where the Project is located, has two peat domes, the western dome being more prominent in size than the eastern dome. The edges of the Kampar are all converted lands, made up of industrial tree plantations, oil palm plantations, some communal farmlands, and degraded environments.



Map 8- Kabupaten Pelalawan and the Project location

1.12.3 Project Area

The Project Areas itself is 130,090 ha and is made up of four individual former industrial selective logging concessions. PT. Global Alam Nusantara (GAN) with 36,525 ha is located in the northwest, PT. Sinar Mutiara Nusantara (SMN) with 32,776 ha lies in the northeast, PT. Gemilang Cipta Nusantara (GCN), the smallest of the four concessions with 20,123 ha, is situated in the southeast and the largest, PT. The Best One Unitimber (TBOT) with 40,666 ha is located in the southwest (see Map 8 above).

The projects geographical coordinates are as indicated below:

Northernmost point: 0° 36' 26.95" N 102° 37' 07.98" E

Easternmost point: 0° 28' 11.24" N 103° 00' 29.10" E

Southernmost point: 0° 18' 12.28" N 102° 25' 17.42" E

Westernmost point: 0° 19' 59.92" N 102° 23' 03.75" E

1.13 Conditions Prior to Project Initiation

The conditions existing before the Project initiation perfectly matches the baseline scenario (see § 3.4 Baseline Scenario).

1.13.1 Environmental Conditions

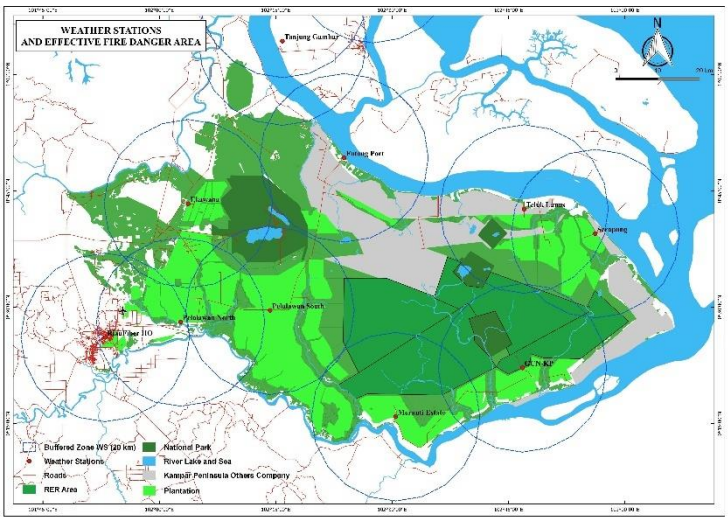
Below is a brief description of the environmental conditions in the Kampar Peninsula, in which the Project Area lies, with information regarding climate, hydrology, topography, geology & soil and a variety of landcover classes.

1.13.1.1 Altitude

The project site itself lies at an altitude of just over sea level, with the highest location in the Project area being the peat dome in the north-western part of the project area at 11.49 metres above sea level.

1.13.1.2 Climate

APRIL operates nine (9) weather stations on the Kampar Peninsula and has up to date weather data. In general, as the Project Area is located a mere 55 km north of the equator, the climate is tropical: hot, humid, and moist all of the year. Two dry periods occur every year on the Kampar Peninsula: late January to mid-March and June to September. Under the Köppen-Geiger climate classification system, it is classified as a tropical rainforest climate or *Af*.



Map 9- Weather stations on the Kampar Peninsula

1.13.1.3 Temperature

Figure 11 below shows the average monthly temperatures recorded throughout 2017, 2018 and 2019 in the RER Project Area.

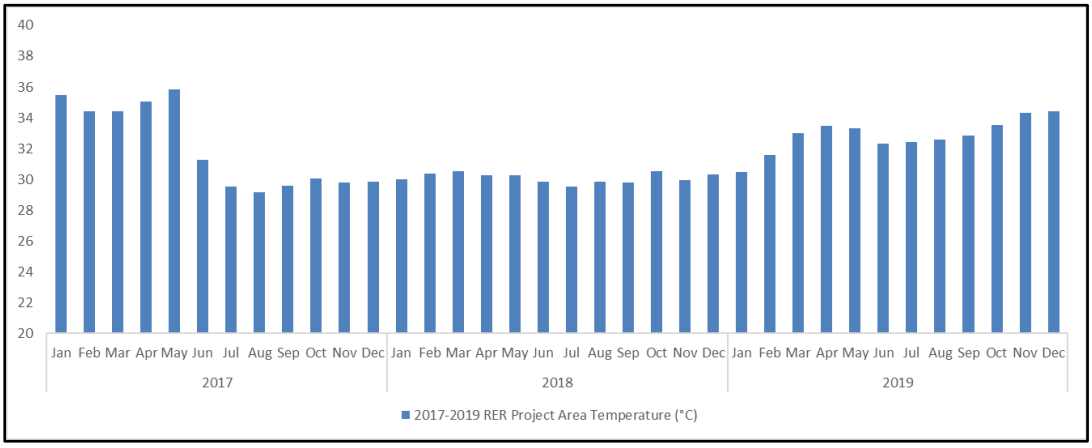


Figure 11- RER Project Area 2017-2019 Average Monthly Temperature (degrees Celsius)

1.13.1.4 Rainfall

The average annual rainfall in the RER Project Area between 2002 – 2019 is 2,136 mm, averaging 178-mm per month. Two dry seasons and two wet seasons occur each year. Dry seasons occur from January to mid-March and again from June – September. Rain season occurs from October – December and again in mid-March-May. The highest recorded monthly rainfall was 481.5 mm in November of 2002 while the lowest monthly rainfall was recorded in February 2014 with only 0.5 mm of precipitation falling. See Figure 12 below.

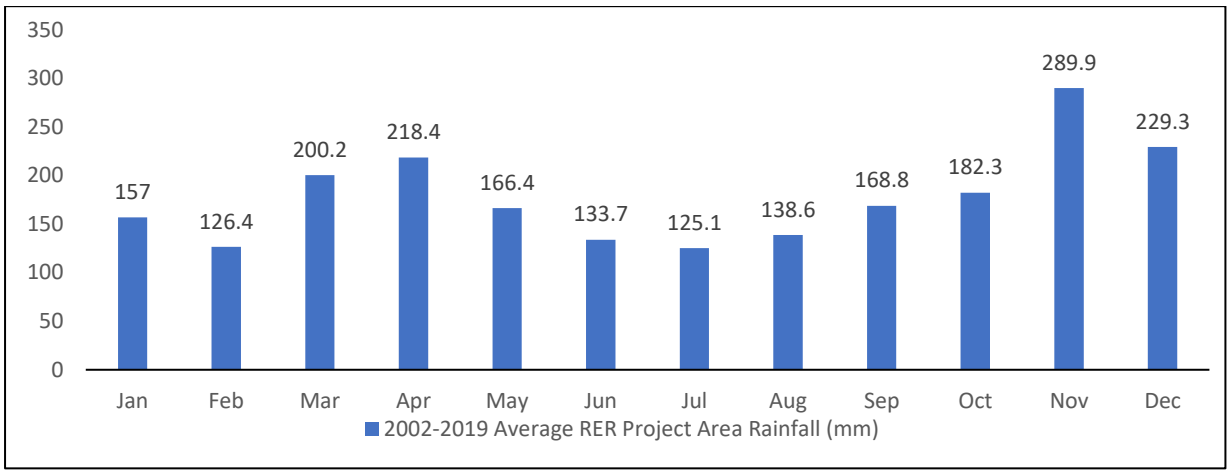


Figure 12- RER Project Area 2002-2019 Average Monthly Rainfall (mm)

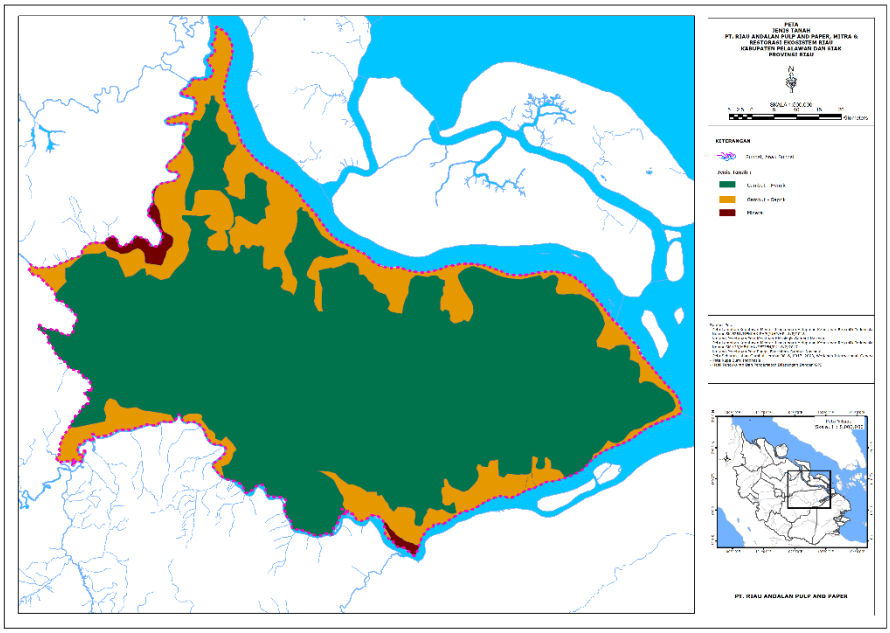
1.13.1.5 Topography

In a topographical context, the entire Kampar Peninsula is Southern Eastern Coastal Swamp. Physiographically, the Kampar peninsula (including Pelalawan district) is a coastal plain within the larger Central Sumatra basin. Pelalawan district is located in transitions between Central Sumatra and South Sumatra Basin. The northwest part is located in the Central Sumatra Basin, and the southeast part is part of the South Sumatera basin. There is no clear separation between these two basins, but it can be distinguished by the presence of Tigapuluh highland and Limau hill. Located in the southeast part of the Kampar Peninsula, RER is not impacted by the ocean waves of Malacca Strait and is formed by alluvium and swamp sediment[9].

1.13.1.6 Hydrology

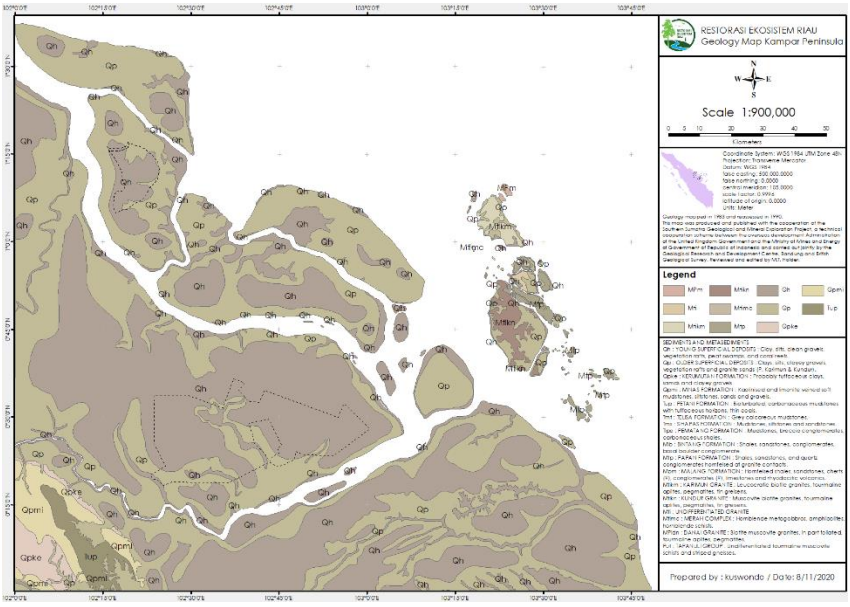
Riparian wetlands have been defined as lowland terrestrial ecotones which derive their high water tables and alluvial soil from drainage and erosion of adjacent uplands on the one side or from periodic flooding from the other[10]. The boundary of a riparian ecosystem is difficult to delineate and varies in width from 20 - 300 m from river edge, sometimes reaching 500 m. But still, riparian areas can be identified from satellite image colour gradation. In RER, riparian forest is identified by the flowing water of streams of Sangar, Turip, Kutub, and Serkap River.

1.13.1.7 Geology and Soils



Map 10 - Peat Soils of the Kampar Peninsula

RER is formed by two soil types: tropohemists-tropofibrists and troposaprists-tropohemists. Tropohemists-tropofibrists soils indicate the presence of deep peatland, while troposaprists-tropohemists soils are associated with shallow peatland. See Map 10. Direct peat depth measurement and spatial modelling performed for this assessment show that the shallowest measured peat is 2.98 m, and the deepest is 15.49 m, with an average of 8.17 m from 443 sampling plots. See also below at § 3.3.1.5. The underlying mineral soils are comprised primarily of young superficial sedimentary and meta-sedimentary deposits made up of (clay, silts, gravel, peat swamps, etc.) and to a lesser extent older superficial deposits of clay, silts, clayey gravels, vegetation rafts and granite sands. See Map 11 below.



Map 11- Geology Map of Kampar Peninsula[11]

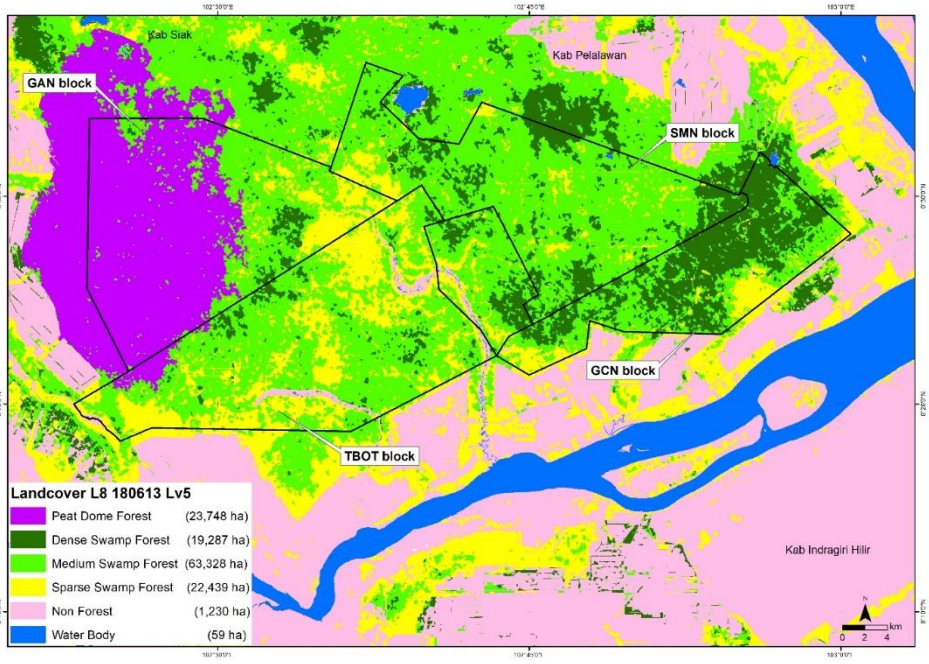
1.13.1.8 Landcover

There is not a single type of peat swamp forest but rather a gradation of forest types along a nutrient gradient. The edges of peat swamp forests are relatively nutrient-rich, whereas the centre is nutrient-poor[12]. Likewise, the forest becomes smaller (shorter) with an even canopy, moving from the edges to the centre. Kampar Peninsula landscape has two major types of forest: mixed peat swamp forest (MPSF) and pole forest (PF)[13]. The forested areas can be divided into mixed peat swamp forest and pole forest the latter of which is also known as "padangs" and found at the top of deep peat domes[14]. MPSF is a forest composition with typical vegetation of a mixture of peat swamp forest canopy cover and a xeromorphic tree structure. In contrast, the pole forest has vegetation composition with a low canopy cover and small diameter of trees, averaging less than 30 cm[15]. The floristic analysis shows that RER is mainly categorized as MPSF based on horizontal and vertical structures and low pole forest in the northwest. MPSF is dominated by trees with a height reaching 30 – 35m with trees in the mid-canopy layer having a DBH of >20cm[16,17]. The RER Project uses the Indonesian National Standard (SNI 7645:2010) for land cover classification of the dense, medium, and sparse for the mixed swamp forest and then included the pole peat swamp forest as a separate type of landcover (Peat Dome Forest) as it was floristically unique. The result is the project has five land-cover classes in RER, which include: Peat Dome Forest (23,747.7 ha), Dense MPSF (19,287.1 ha), Medium MPSF (63,327.8 ha), Sparse MPSF (22,438.6 ha), and non-forest (1,229.5 ha). Additionally, there is 59.2 ha of the area recognized as water.

1.13.1.9 Land Cover & Forest Composition

The composition of the project area is divided between the mixed peat swamp forest of varying density (105,053.5 ha), the Low Pole Peat Dome Forest (23,747.7 ha), and Non-Forest Open Areas (1,229.5 ha) as shown in Map 12.

Based on the canopy opening and the understory structure, it is possible to identify four forest classes and five land use classes, exclusive of water.



Map 12: Landcover of Project

a) **"Peat Dome Forest"** is a dense low-pole forest. These forests comprise densely stocked small trees (poles). The most common species are *Shorea spp*, *Austrobuxus nitidus*, *Campnosperma coriaceum*, *Litsea spp*, *Pandanus spp*, *Tristaniopsis merguensis* and *Calophyllum ferrugineum*. The canopy is continuous and has an average height between 15

and 23 metres. The vegetation is dense with 3,188 tree stems per hectare, the average basal area was 32.5 m^2ha, and the average dbh was 22.2 cm.

b) **"Dense Swamp Forest"** comprises of forest that has a history of light logging in the past. The canopy is dense (70+% closure) and multi-storied and has a height of 20-40m. The understory is generally dense. The species diversity is high and common species include *Pandanus*, *Shorea teysmanniana*, *Shorea uliginosa*, *Campnosperma coriaceum*, *Mangifera parvifolia* and *Syzygium chloranthum*. The trees tend to be buttressed with roots protruding above ground. The vegetation is dense with 1,514 tree stems per hectare, average basal area of 28.1 m^2/ha, and average dbh of 27.2 cm.

c) **"Medium Swamp Forest"** comprises of forest that has a history of moderately heavy logging in the past. Logging that removed the largest and most preferred tropical hardwoods using a system of canals and rails. The canopy is discontinuous ranging from 40-70% closure and has a height of 20-40m. The under-storey is generally dense. The species diversity is similar to dense forest with less volumes of commercial species. The trees tend to be buttressed. The vegetation is dense with smaller trees on average than dense forest, 1,597 tree stems per hectare, average basal area of 22.8 m2/ha, and the average dbh was 23.9 cm.

d) **"Sparse Swamp Forest"** is an open natural forest. The canopy is discontinuous with a scattering of remnant overstory trees ranging in height from 15-30 meters and natural tree regeneration that is competing with dense lianas and ferns. The species diversity is high including common swamp species with reduced numbers of commercial species, higher numbers of pioneer species with common species including *Shorea teysmanniana*, *Ilex cymose*, *Campnosperma coriaceum*, *Syzygium chloranthum*, *Pandanus*, *Madhuca motleyana*, *Shorea uliginosa*, *Austrobuxus nitidus*, and *Parastemon urophyllus*. The trees tend to be non-buttressed. The vegetation is less dense with smaller trees on average than medium forest, 1,212 tree stems per hectare, average basal area of 16.4 m^2/ha, and the average dbh was 23.2 cm. The condition is a result of a combination of canal drainage and intensive logging. This condition can also be found immediately next to parts of the rivers (Serkap and Turip).

e) **"Non-Forest"** are areas that are devoid of sufficient trees to be classified as a forest. These are open areas covered in a variety of non-tree vegetation and are located in areas where substantial logging has occurred in the past or areas where trees are generally not found (sandy riverbanks, etc.).

1.13.2 Biodiversity Conditions

The forests of the Kampar Peninsula have been degraded in the past decades since 1970. The forests in the Project Area have experienced some degree of commercial and/or illegal logging, except in the low pole forest on the peat domes where there are few commercially viable sized trees. The Project area, although remote and without permanent human habitation, nonetheless has been an area where humans have impacted the landscape, from hunting, fishing, the gathering of forest resources, and logging. These activities have all had a substantial impact on the landscape.



Figure 13- Degraded forest of the Kampar Peninsula

1.13.2.1 Floristic Species

The RER-Project Area is host to at least 190 recognized plant and tree species[18]. Of those 135 are listed on the IUCN's list of species with at least 9 listed on the IUCN Red List as globally threatened. These include several commercial wood species (i.e. *Pterocarpus indicus, Ctenolophon parvifolius,* and *Hopea ferruginea Parijs*) as well as vulnerable plant species (i.e. *Tristaniopsis littoralis* and *Gonystylus bancanus*) and recognized medicinal plants (i.e. *Eurycoma longifolia*) that are threatened from overuse.

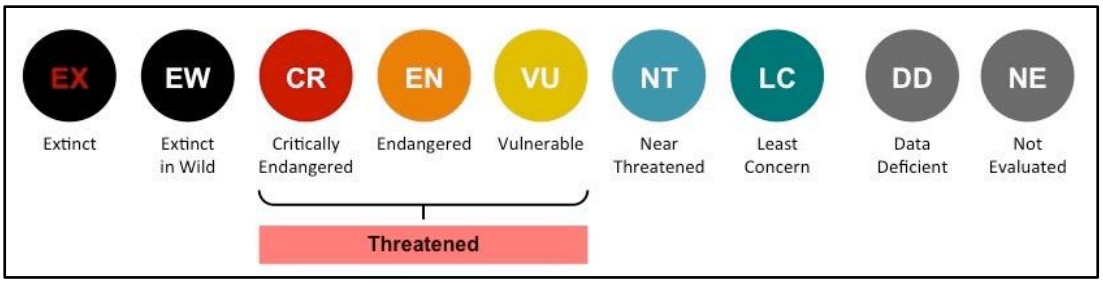


Figure 14- IUCN statuses

Table 17 below provides the protection status of the rare floristic species inventoried (as part of the forest management process and HCV assessments) and as considered by both the International Union for Conservation of Nature (IUCN) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Common Name	Scientific Name	IUCN	CITES
Anisoptera marginata	*Anisoptera marginata*	VU	
Ctenolophon parvifolius	*Ctenolophon parvifolius*	VU	
Gonystylus bancanus	*Gonystylus bancanus*	CR	II
Shorea platycarpa	*Shorea platycarpa*	CR	
Shorea teysmanniana	*Shorea teysmanniana*	EN	
Shorea uliginosa	*Shorea uliginosa*	VU	
Tetramerista glabra	*Tetramerista glabra*	VU	
Vatica pauciflora	*Vatica pauciflora*	VU	
Vatica teysmanniana	*Vatica teysmanniana*	CR	

Table 17- List of threatened plants in the Project

1.13.2.2 Fauna Species

Faunal Taxonomy

The RER-Project Area is home to a diverse array of animal species, including 76 mammals, 107 amphibians and reptiles, 89 species of fish, and 28 kinds of identified *Odonata* (dragonflies and damsel flies). Endangered species that have been observed in the Project areas include the Sumatran Tiger (*Panthera tigris sumatrae*), the Malayan Sun Bear (*Helarctos malayanus*), the Sunda Pangolin (*Manis javanica*), the Sunda Clouded Leopard (*Neofelis diardi*), and the Flat-Headed Cat (*Prionailurus planiceps*).

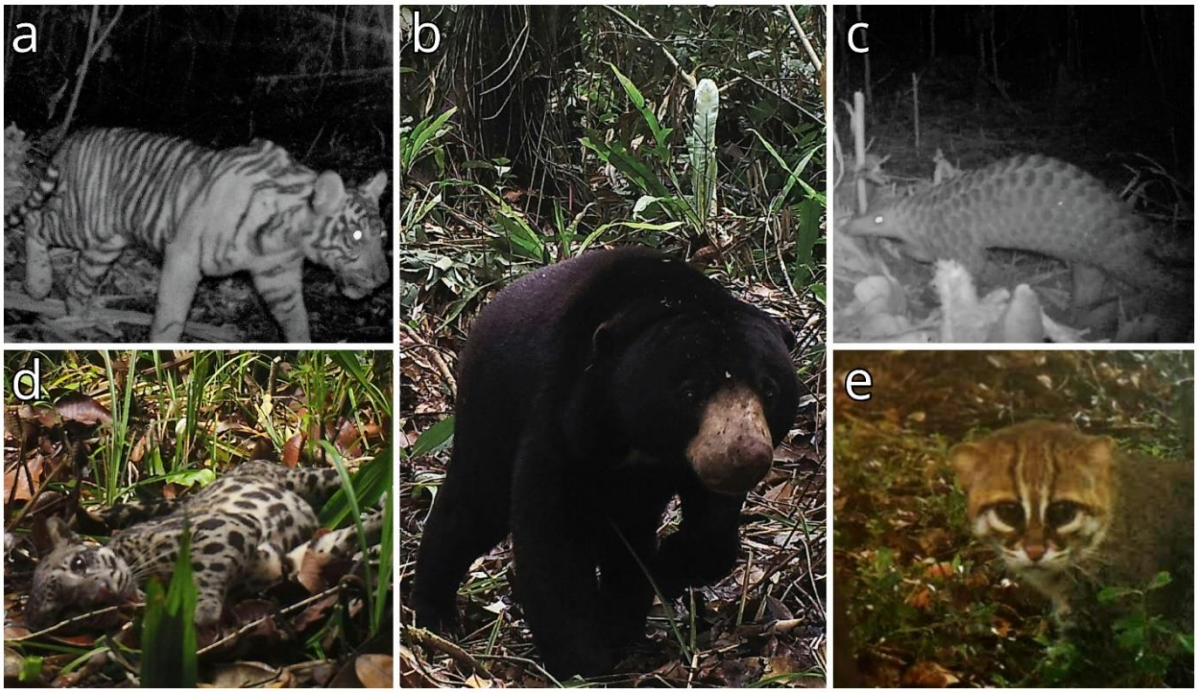


Figure 15- Photos of threatened mammals in The Project. a) Sumatran Tiger, b) Malayan Sun Bear, c) Sunda Pangolin, d) Sunda Clouded Leopard, e) Flat-Headed Cat

The tables below provide the protection status of the rare fauna species inventoried (as part of forest management process and HCV assessments) as considered by both IUCN and CITES. The two tables are divided into two classes: mammals and birds.

Common name	Scientific Name	IUCN	CITES
Agile Gibbon	*Hylobates agilis*	EN	I
Asian Small-clawed Otter	*Aonyx cinereus*	VU	I
Bearded Pig	*Sus barbatus*	VU	
Binturong	*Arctictis binturong*	VU	
East Sumatran Banded Langur	*Presbytis femoralis ssp. percura*	VU	II
Flat-headed Cat	*Prionailurus planiceps*	EN	I
Malay Tapir	*Tapirus indicus*	EN	I
Malayan Sun Bear	*Helarctos malayanus*	VU	I
Otter Civet	*Cynogale bennettii*	EN	II
Pig-tailed Macaque	*Macaca nemestrina*	EN	II
Rajah Spiny Rat	*Maxomys rajah*	VU	
Sambar Deer	*Rusa unicolor*	VU	
Silvered Langur	*Trachypithecus cristatus*	VU	II
Smooth-coated Otter	*Lutrogale perspicillata*	VU	I
Sumatran Tiger	*Panthera tigris ssp. sumatrae*	CR	I
Sunda Clouded Leopard	*Neofelis diardi*	VU	I
Sunda Pangolin	*Manis javanica*	CR	I
Sunda Slow Loris	*Nycticebus coucang*	EN	I
Whitehead's Spiny Rat	*Maxomys whiteheadi*	VU	

Table 18- List of threatened mammals in The Project

Birds

The Project has identified over 307 species of birds in the Project Area through numerous inventories, many of which have IUCN status. Threatened species include the Helmeted Hornbill (*Rhinoplax vigil*), the Wrinkled Hornbill (*Rhabdotorrhinus corrugatus*), the White-Winged Duck (*Asarcornis scutulata*), The Milky Stork (*Mycteria cinereal*) and the rarest of all storks, the Storm's Stork (*Ciconia stormi*).



Figure 16- Photos of threatened bird in The Project. a) Rhinoceros Hornbill, b) White-winged Duck, c) Storm's Stork

Common Name	Scientific Name	IUCN	CITES
Black Hornbill	*Anthracoceros malayanus*	VU	II
Black Partridge	*Melanoperdix nigra*	VU	
Bonaparte's Nightjar	*Caprimulgus concretus*	VU	
Great Hornbill	*Buceros bicornis*	VU	I
Greater Green Leafbird	*Chloropsis sonnerati*	EN	
Helmeted Hornbill	*Rhinoplax vigil*	CR	I
Hook-billed Bulbul	*Setornis criniger*	VU	
Javan Myna	*Acridotheres javanicus*	VU	
Large Green-pigeon	*Treron capellei*	VU	
Lesser Adjutant	*Leptoptilos javanicus*	VU	
Long-tailed Parakeet	*Psittacula longicauda*	VU	II
Malay Crestless Fireback	*Lophura erythrophthalma*	VU	
Milky Stork	*Mycteria cinerea*	EN	I
Rhinoceros Hornbill	*Buceros rhinoceros*	VU	II
Ruby-throated Bulbul	*Pycnonotus dispar*	VU	
Short-toed Coucal	*Centropus rectunguis*	VU	
Storm's Stork	*Ciconia stormi*	EN	
Wallace's Hawk-eagle	*Nisaetus nanus*	VU	II
White-winged Duck	*Asarcornis scutulata*	EN	I
Wreathed Hornbill	*Rhyticeros undulatus*	VU	II
Wrinkled Hornbill	*Rhabdotorrhinus corrugatus*	EN	II

Table 19- List of threatened birds in The Project

Furthermore, as the Project is an AFOLU Project, we provided the environmental conditions of the Project Area above (see § 1.13.1 – Environmental Conditions).

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

RER-CP complies with the legal compliance requirements of the VCS Standards (v4.0) § 3.1.3, which states, "Projects and the implementation of project activities shall not lead to the violation of any applicable law, regardless of whether or not that law is enforced."

The Project has been designed and implemented to comply with the applicable national laws and regulations of the Republic of Indonesia. The Project is also in compliance with applicable laws and regulations of the Province of Riau and the Regency of Pelalawan. This also includes the laws, decrees, and regulations concerning relevant aspects of carbon emission and carbon offsetting. Furthermore, the project has harmonized itself with the REDD+ National Strategy developed by the government of the Republic of Indonesia.

Applicable Treaties, Laws, Regulations & Decrees

1.14.1 International Treaties

The Project recognizes and complies with the requirements of the international treaties and agreements, including but not limited to, the following:

No.	Name of Agreement or Treaty	Date of Effect
1	Ramsar Convention on Wetlands of International Importance	21 Dec 1975
2	Convention on International Trade in Endangered Species (CITES)	01 Jul 1975
3	Rio Declaration on Environment and Development	June 1992
4	United Nations Framework Convention on Climate Change (UNFCC)	21 Mar 1994
5	Convention on Biological Diversity (CBD)	29 Dec 1993
6	United Nations Convention against Corruption (UNCAC)	14 Dec 2005
7	Kyoto Protocol (COP 3)	16 Feb 2005
8	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	11 Sept 2003
9	Bali Action Plan (COP 13)	Dec 2007
10	The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity	12 Oct 2014
11	Paris Agreement (COP 21)	04 Nov 2016

Table 20- International Treaties

1.14.2 Laws Regulations & Decrees of the Republic of Indonesia

The Project recognizes and complies with the requirements of the laws of the Republic of Indonesia and relevant government regulations, including but not limited to, the following:

No.	Name of Law, Regulation or Decree
1	Presidential Decree No.32/1990 on the Management of Protected Areas
2	Law No. 80/1957 on Ratification of International Labour Organisation Convention of Equal Remuneration for Men and Women Workers for Work of Equal Value
3	Law No. 1/1970 on Work Safety
4	Law No. 5/1990 on Conservation of Living Resources and Their Ecosystems
5	Law No. 3/1992 on Labour Social Security

6	Law No. 6/1994 concerning the Ratification of the United Nations Framework Convention on Climate Change
7	Law No. 21/1999 on Ratification of International Labour Organisation Convention on Discrimination in Respect of Employment and Occupation
8	Law No. 41/1999 on Forestry
9	Law No. 21/2000 on Labour Union
10	Law No. 13/2003 on Manpower
11	Law No. 17/2003 on State Finances
12	Law No. 2/2004 on Industrial Relations Dispute
13	Law No. 25/2004 on National Development Planning System
14	Law No. 40/2004 on National Social Security System
15	Law No. 17/2005 on National Long-Term Development Plan
16	Law No. 40/2007 on Company Law
17	Law No. 31/2009 on Meteorology, Climatology, and Geophysics
18	Law No. 32/2009 on Environmental Protection and Management
19	Government Regulation 8/1981 on Wage Protection
20	Government Regulation 14/1993 on Worker Social Security Program
21	Government Regulation No. 45/2004 on Forest Production
22	Government Regulation 6/2007 on Forest Arrangement and Formulation of Forest Management Plan as well as Forest Exploitation
23	Government Regulation No. 26/2008 on National Spatial Plan (and amendment No. 13/2017)
24	Government Regulation No. 10/2010 on Procedure of Altering the Appropriation and Function of Forest Areas
25	Government Regulation No. 15/2010 on Implementation of Spatial Structuring
26	Government Regulation No. 24/2010 on Use of Forest Areas
27	Government Regulation No. 47/2012 on Social and Environmental Responsibility of Limited Liability Companies
28	Government Regulation No. 50/2012 on Occupational Safety and Health Management System Application
29	Government Regulation No. 71/2014 on Peatland Protection and Ecosystem Management and its subsequent amendment with Government Regulation No.57/2016
30	Government Regulation No. 46/2017 on Economic Instruments in Environmental Matters

Table 21- Laws Regulations & Decrees of the Republic of Indonesia

1.14.3 Ministerial Regulations and Decrees

The Project recognizes and complies with the requirements, regulations, and decrees of the Ministry of Environment and Forestry, including but not limited to, the following:

No.	Name of Regulation or Decree
1	Ministry of Forestry Regulation No. P.30 /2009 on Mechanisms for Reducing Emissions from Deforestation and Degradation
2	Ministry of Forestry Regulation No. P.68/2009 on Organization of Demonstration Activities for Reducing Emissions from Deforestation and Degradation
3	Ministry of Environment Regulation No. 13/2010 on Environmental Management and Monitoring Effort
4	Ministry of Environment Regulation No. 16/2012 on Guidelines on the Development of Environmental Products
5	Ministry of Environment and Forestry Regulation No.P.39/Menhut-II/2013 on Local Community Development through Forestry Partnership
6	Ministry of Environment and Forestry Regulation No.P.12/Menhut-II/2014 on Types & Tariffs of Non-Tax State Revenue Applicable to the Ministry of Forestry (re carbon credit transactions)

7	Ministry of Environment and Forestry Regulation No.50/2014 on the Sale of Indonesian Certified Emission Reductions
8	Ministry of Environment and Forestry Regulation No.P.71/Menhut-II/2017

Table 22- Ministerial Regulations and Decrees

1.14.4 Laws, Regulations, and Decrees Related to Ecosystem Restoration Concessions and Management of Carbon Sequestration Activities

The following Regulations and Decrees apply specifically to the Project in regard to carbon sequestration activities and the management of the Ecosystem Restoration Licenses of the four concessions that make up the Project. The Project concessions are in compliance with the required regulations and decrees, including but not limited to, the following:

No.	Name of Regulation or Decree
1	Government Regulation No. 6/2007 on Forest Arrangement and Formulation of Forest Management Plan as well as Forest Exploitation (and its amendment No. 3/2008)
2	Ministry of Forestry Regulation No. P.20/Menhut-II/2007 on Provision and Expansion if Business Licenses for Forest Timber Utilization in Natural Forest, Business Licenses for Ecosystem Restoration and Business Licenses for Forest Plantation in Production Forest, as amended by No. P.61/2008, No.P50/2010/, No. P.26/2012 and No. P.31/Menhut-II/2014
3	Ministry of Forestry Regulation No. P.36/Menhut-II/2009 on Procedures for Licensing of Commercial Utilization of Carbon Sequestration and/or Storage in Production and Protected Forests (this established the PAN/RAP carbon license and delineates allowable activities) and as amended by MoF Decree No. P.11/2013
4	Ministry of Forestry Regulation No. P.56/Menhut-II/2009 on Business Planning for Ecosystem Restoration License, amended by No. P.24/Menhut-II/2011
5	Ministry of Forestry Regulation No. P.50/Menhut-II/2010 on Procedures for Giving and Expansion of Work Area Business (including IUPHHK Ecosystem Restoration) License
6	Ministry of Environment and Forestry Regulation 43/2013 on Boundary Arrangement
7	Ministry of Environment and Forestry Regulation No.P.8/Menhut-II/2014 on Limitation for the Allocation of the Concession Area for Business Licenses for Forest Timber Utilization in Natural Forest, Business License for Ecosystem Restoration and Business License for Forest Plantations in Production Forest
8	Ministry of Environment and Forestry Regulation No.P.64/Menhut-II/2014 on Application of Silviculture Techniques within the Ecosystem Restoration Concession License in Production Forest
9	Ministry of Environment and Forestry Regulation No.P.66/Menhut-II/2014on Procedure for Periodical Forest Inventory and Work Plan in Ecosystem Restoration License
10	Ministry of Environment and Forestry Regulation No.P.73/Menhut-II/2014 on Workplan of PAN/RAP in Production Forest
11	Ministry of Environment and Forestry Regulation No.P.74/Menhut-II/2014 on the Implementation of Silviculture Techniques in Utilization of Carbon Sequestration and/or Carbon Stock Business in Production Forests
12	Ministry of Environment and Forestry Regulation No.P.7/Menhut-II/2015 on Technical Guidelines Rendering License and Non-License in Environment and Forestry Sector in Implementation of One-Stop Service
13	Ministry of Environment and Forestry Regulation No.P.22/MENLHK/SET JEN/KUM.1/2018 on Norms, Standards, Procedures, and Criteria of One-Stop Integrated Services through Electronically in Environmental Sector

Table 23- Decrees Related to Ecosystem Restoration Concessions and Management of Carbon Sequestration Activities

The following Regulations and Decrees apply specifically to the Project regarding peatland management. The Project concessions are in compliance with the required regulations and decrees, including but not limited to, the following:

No.	Name of Regulation or Decree
1	Government Regulation No. 71/2014 on Protection and Management of Peatland Ecosystems (and amendment No 57/2016)
2	Ministry of Environment and Forestry Regulation No.P.14/MENLHK/SET JEN/KUM.1/2/2017 on Procedures for Inventory and Determination of the Future of the Function of Peat Ecosystems
3	Ministry of Environment and Forestry Regulation No.P.15/MENLHK/SET JEN/KUM.1/2/2017 on the Procedures of Water Table Measurement in the Peat Ecosystems Monitoring Point
4	Ministry of Environment and Forestry Regulation No.P.14/MENLHK/SET JEN/KUM.1/2/2017 on the Technical Guidance for Restoring the Function of Peat Ecosystems
5	Ministry of Environment and Forestry Decree No129/MenLHK/Setjen/PKL.0/2/2017 on Restoration of Degraded Peatlands
6	Ministry of Environment and Forestry Regulation No.P.16/MENLHK/SET JEN/KUM.1/3/2019 on the Enactment and Management of Peat Dome Based on the Peatland Hydrology Unit

Table 24- Decrees related to peatland management

1.14.5 Compliance with Indonesian Laws & Regulations

All production forestry concessions in Indonesia, including the RER Ecosystem Restoration (IUPHHK-RE) concessions, must comply with numerous critical legal requirements after the license is received. If a concession is unable to comply, it can be withdrawn. Requirements include:

a. Prepare 10-year work Plans (RKU). Completed and approved by the Ministry of Environment and Forestry between May 2013 and December 2016
b. Prepare Annual work Plan (RKT) based on 10-year work Plan (RKU) every year since the year RKU is approved, Completed and approved by the Provincial Environment and Forestry Service.
c. Prepare and complete formal concession boundary demarcation (Tatas-Batas). They were completed and approved by MoEF between February 2019 and October 2019.
d. Undergo Monitoring and Evaluation (MONEV) by the MoEF and have issued a MONEV certificate. All of the concessions received their first MONEV certificate in August of 2019.

The above formal requirements have been completed for all four RER concessions and are each set forth in §1.7.2 in more detail. Appendix 1 also provides copies of each license, approved RKU and approved Monitoring and Evaluation Certificate.

RER must also provide a Monthly Report of Annual Work Plan progress. This reporting is regularly submitted through an online reporting system e-restore established by MoEF. RER complies with this requirement. An additional local legal compliance is the regular reporting of environmental management and monitoring activities every 6 months to the District Environmental Service. RER provides these reports and complies with its requirements.

APRIL, and RER as an organisation within the greater APRIL group of companies that operate on the Kampar peninsula, have rigorous legal compliance systems in place. Compliance with Indonesian forestry law and regulations is handled both in the Kerinci headquarters and Jakarta offices. In Kerinci, a dedicated legal planning team ensures that every concession in Riau is up-to-date on all of its legal requirements from MoEF and the Provincial level forestry offices. One method of ensuring legal compliance is the Monitoring and Evaluation with "Scoring system" that is used by the MoEF. This system scores each concession on the implementation of legal and regulatory requirements. A copy of the Scoring is available to the auditors. One example, some indicators in the monitoring and evaluation specifically applies Forestry Regulation No. 66/Menhut-II/2015 on procedures for periodical forest inventory and work plan in Ecosystem Restoration License. This regulation is the primary regulation concerning Ecosystem Restoration concessions. The regulation itself in the preamble references most other related forestry and ER concession requirements; P. 66/2015 is subject to all of the basic forestry legal requirements. APRILs' management planning teams ensure ongoing compliance with all relevant forestry regulations.

Additionally, APRIL's Jakarta offices are where the Government Regulation teams are based. These teams also ensure compliance from a higher corporate perspective of all necessary Indonesian regulations and law. They also act as the primary interface with the MoEF regarding legal matters related to concessions, including RER.

Additionally, the RER Project maintains compliance with the relevant labour law of Indonesia. All RER employees are hired through APRIL's human resource department that also ensures it maintains compliance with Law 13/2003 Labour Law and any other associated regulations. See Below at §2.2 for more details about compliance with labour laws and worker rights.

1.15 Participation under Other GHG Programmes

1.15.1 Projects Registered (or Seeking Registration) under Other GHG Programme(s)

RER-CP is in compliance with the requirements regarding participation in other GHG programmes as mandated by the VCS Standards (v4.0) as fully set forth in § 3.19.1, which states "Project proponents shall not claim credit for the same GHG emission reduction or removals under the VCS Program and another GHG programme.

The RER-Carbon Project is not involved in any other GHG programmes, nor do the activities of the Project fall under any other emissions trading scheme or other binding limits in relation to any to GHG emissions programmes.

Additionally, the Project has not sought to generate any other type of GHG emission reductions other than VCUs and has never received any other form of GHG-related environmental credit.

1.15.2 Projects Rejected by Other GHG Programmes

RER-CP is in compliance with the requirements regarding participation in other GHG programmes as mandated by the § 3.19.7 of the VCS Standards (v4.0) in regard to application and rejection by other GHG programmes.

The RER- Carbon Project has not applied for validation under any other GHG programme, nor has it been rejected for by any other GHG programmes.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

RER-CP is in compliance with the requirements regarding participation in other GHG programs as mandated by the § 3.20.1 of the VCS Standards (v4.0) in regard to application and rejection by other GHG programs.

The RER-Carbon Project is not generating emission reduction credits in a country or region with any type of compliance mechanism.

1.16.2 Other Forms of Environmental Credit

The Project has not sought any other type of environmental credit and does not anticipate doing so in the future.

1.17 Additional Information Relevant to the Project

1.17.1 Leakage Management

Appropriate production and water table data from the Project Area will be collected, analysed and compiled upon each verification event to estimate activity shifting and ecological leakage.

Any actual or potential threat of leakage will be mitigated by the RER Carbon Project by taking active steps to reduce and remove the threat of leakage from the any displacement of planned deforestation activities and ecological leakage (see § 4.3). APRIL, along with RER Project partners have been engaging the government of Indonesia, as well as key industry players, to assist with a systemic change in industrial land-use for Acacia plantations across the country and to modify land-use practices to ensure greater sustainability. APRIL itself as plantation owner and operator has taken steps to limit the expansion and increase the sustainability of its own plantations in peatlands and refrain from harvesting natural forest areas.

1.17.2 Commercially Sensitive Information

The following is a non-exclusive list of information that the Project has deemed commercially sensitive and is not publicly available but will be made available to the auditor during validation and verification. The list includes any:

- **Financial Projections and Analysis** related to long term Project implementation
- **Digital Shape Files** of project area, proxy areas and any other GIS shape files used to delineate any areas in or around or impacting the Project
- **Classified Satellite Images** purchased or otherwise acquired and then processed for any Project Purpose
- **Original Biomass Inventories** including filed notes, hardcopies, digital copies, etc.

- **Original Community and Social Surveys** including filed notes, hardcopies, digital copies, etc.
- **Legal Agreements** between implementing partners, technical partners, communities, government
- **Project Models** used to generate carbon emission reductions and removals, including any relevant field data, remote sensing data, etc.
- **Project Budgets and Workplans**
- **Project methods and SOPs**
- **RER Organization Chart 2021**

1.17.3 Sustainable Development

The Government of Indonesia (GOI) has made a number of international commitments to sustainable development and reduction of GHG emissions.

2015 UN Sustainable Development Goals

GOI has made commitments under the UN's Sustainable Development Goal (SDG) program to address climate change issues by reducing GHG emissions in forest landscapes against a 2015 business as usual (BAU) scenario. This includes decreasing deforestation and protection of peatlands[19] under Goal 13 and Goal 15. More Specifically,

GOI SDG Goal 13 -Climate Action notes that deforestation contributed to 30% of GOI emissions and indicates a desire to reduce BAU emissions[20].

GOI indicates a Policy Direction for 2020-2030 in regard to Forest, Land and Peat that would see a "returning the function of the ecosystem and environmental services of forestry, maintaining and increasing land cover."[21]

This is coupled with:

SDG Goal 15 – Life on Land – Forest Protection which has as its goal of

a. preventing a higher rate of forest degradation and
b. incorporating private and public participation in conservation programmes.

The GOI indicated two policy directions in SDG Goal 15 for 2020-2024 and 2025-2030. Both included a goal of "decreasing Deforestation" and "continuing the peat protection policy."

The RER-CP is not a formal part of the Indonesian SDGs in the sense that the Project is not directly incorporated into the SDG programme and that none of the results from the Project will be reported in relation to the hopeful success of the GOI goals. Nonetheless, in an informal way, the RER Project in its own actions is supportive of the two SDGs. The activity of avoiding planned deforestation and of wetlands restoration are well aligned with the GOI SDGs.

The Project supports Goal 13 in its Project Activity by the blocking of the canals that assist with rewetting the peat landscape. Further, the overall act of avoiding planned deforestation supports the goal of increasing forest cover as the Project's Activity allows the *in situ* forest to naturally regrow. The limited reforestation and revegetation by the Project also assists with maintaining and increasing forest cover.

The Project also informally supports Goal 15 through avoiding deforestation that would have otherwise occurred in the Project's baseline scenario while at the same time protecting a large peatland area from the loss of much of the peatland landscape that would have happened under the same baseline scenario.

Although the RER Project does undertake monitoring of its activities, none of the Project's monitoring is directly linked to the GOI SDG programme, and there are neither any requirements to monitor and report to the SDG programme, nor are there any plans to report the activity to the GOI SDG programme.

The GOI and the RER Project have not had any direct discussions or consultations regarding the SDGs, and the Project's contribution to them is only informal.

2015 Nationally Determined Contributions under Paris Agreement

The GOI adheres to the Paris agreement, and it has been ratified by Act No. 16/2016. The GOI Submitted its first NDCs in November of 2016, and its Updated NDCs in July of 2021. Further, and pursuant to Decision 1/CP.23 paragraph 10-11 and Annex II on Talanoa Dialogue and the Guidance for Parties by COP Presidencies (27 March 2018), the Government of the Republic of Indonesia committed to a 29% reduction of national GHG emission by 2030, with 17.2% coming from the Forestry sector[22]. The only aspect included as part of the Private Sector implementation in the Talonoa Dialogue that was specifically mentioned was the "Fire-Free Village Program," which has been implemented in the Kampar Peninsula.

RER-CP's Contributions

The RER Carbon Project activities support the GOI's-NDCs. Informally at this stage, the RER Project may contribute a portion of the Project's GHG reductions and removals to the NDC goals of Indonesia, that is GHG emission reduction of 17.2% from the forestry sector. The details of that contribution are continuing to be developed. No formal agreement has been reached to date; however, discussions are ongoing. The Project is committed to avoiding any double counting so that any emission reductions that the Project achieves, and would be claimed by the GOI, would not result in tradeable VCU credits. Further, any GHG reductions or removals that were issued as VCUs would be potentially subject to corresponding adjustments as contemplated by Article 6 of the Paris Agreement. As Art. 6 rules continue to be developed in the ongoing SBSTA and COP negotiations, it remains unclear as to precisely how the accounting will be conducted. Irrespective of the outcomes, RER will adhere to any agreed-upon rules and will not engage in any double counting.

The Project's monitoring, reporting and verification program provides accurate science-based information's systems that can be used to assess contributions to GOI NDCs. Currently, there are no formal requirements that establish how the Project will monitor or report its emission reductions to the GOI. It is anticipated that the VCS Verification Reports of the Project will be provided to the relevant divisions within the Ministry of Forestry (i.e. Director General of Climate change and the senior minister in MoEF). Details regarding this exchange of information will be developed, and the Project will adhere to any legal requirements and will avoid any double counting.

Regarding the Fire Free Village Program, the RER Project is not involved in any formal monitoring or reporting of the programme to the GOI. In the event that formal monitoring and reporting requirements are implemented, the Project will follow these.

The GOI and the RER Project have only had one formal consultation regarding the NDC issues, on 14 January 2021. Additional meetings are anticipated in the near future.

1.17.4 Further Information

None

2 SAFEGUARDS[23]

2.1 No Net Harm

The RER-Carbon Project (Project) does not expect any negative environmental impacts. Because the Project Activity prevents the conversion of degraded natural forest to industrial *Acacia* plantation and assists with some rewetting of the landscape, there are no changes to the environment other than naturally occurring forest growth and the limited rehydration of approximately seven per cent of the landscape by the blocking of legacy canals. The Project will have positive outcomes for both climate change mitigation through carbon storage and the prevention of oxidation of the peat soils that would have otherwise occurred in the baseline scenario. Further, there will be positive impacts on biodiversity conservation through the preservation of critical habitats of the endemic and endangered flora and fauna. The Project is unable to identify any potential negative environment and socio-economic impact.

The Project aims to provide positive environmental, social, and biodiversity benefits. The Project Proponents do not expect any negative socio-economic impacts. Community-focused non-carbon Project Activities are aimed at increasing economic growth in the area surrounding the Project Area. Substantial local stakeholder consultations have taken place, and ongoing community outreach is in place. Importantly the Project has a robust Grievance Resolution Procedure that is part of a third-party certified grievance redress mechanism under the Programme for the Endorsement of Forest Certification (PEFC) that can assist and resolve any complaints or comments from the community. Preservation of the forest in the Project Area will not only improve local communities by the preservation of local ecosystem services, but it will also help strengthen the biodiversity and the health of forest-dwelling species-in and around the Kampar Peninsula.

The only potential negative impact that the Project has identified is concerning the objective risks to worker's safety while they work in the RER Project area. This would include encountering occupational and safety hazards during ranger patrols, during fire suppression related activities and any field-based conservation activity (i.e., canal maintenance and dam construction, restoration and replanting activity, etc.). These activities include a variety of occupational hazards and risks to the workers as the tropical peat forest field environment presents a variety of natural hazards that could lead to physical injuries.

2.2 Local Stakeholder Consultation

2.2.1 Overview of Pre-Project Consultations and Socio-Economic Study

2.2.1.1 Demographics & Local Socioeconomic Context

Province of Riau

In 2019, the Province of Riau had a total land area of 87,023.66 km^2. Of that, the Kabupaten of Pelalawan, where the Project is located, has a total land area of 12,758.45 km^2.[24] The population of Riau Province is 6,971,745 in 2019, up from 5,574,928 in 2010, with a current population density of 884.5 per km^2. Life expectancy for men in Riau Province is 69.62 years, while for women, it is 73.43 years[25]. Riau is considered a very ethnically diverse province. As of 2015, the ethnic groups in Riau consist of Malays (37.74%), Javanese (25.05%), Minangkabau (11.26%), Batak (7.31%), Banjar (3.78%), Chinese (3.72%), and Bugis (2.27%)[26].

There are 10 regencies (Kabupaten) in the province and two autonomous cities (Kota), the provincial capital is Pekanbaru and has a population of 1,121,562 in 2019.

The Province of Riau is located in the central part of Sumatra. Riau is directly adjacent to North Sumatra and the Straits of Malacca in the north, Jambi to the south, West Sumatra to the west, and the Riau Islands in the east. The province shares maritime borders with Singapore and Malaysia.

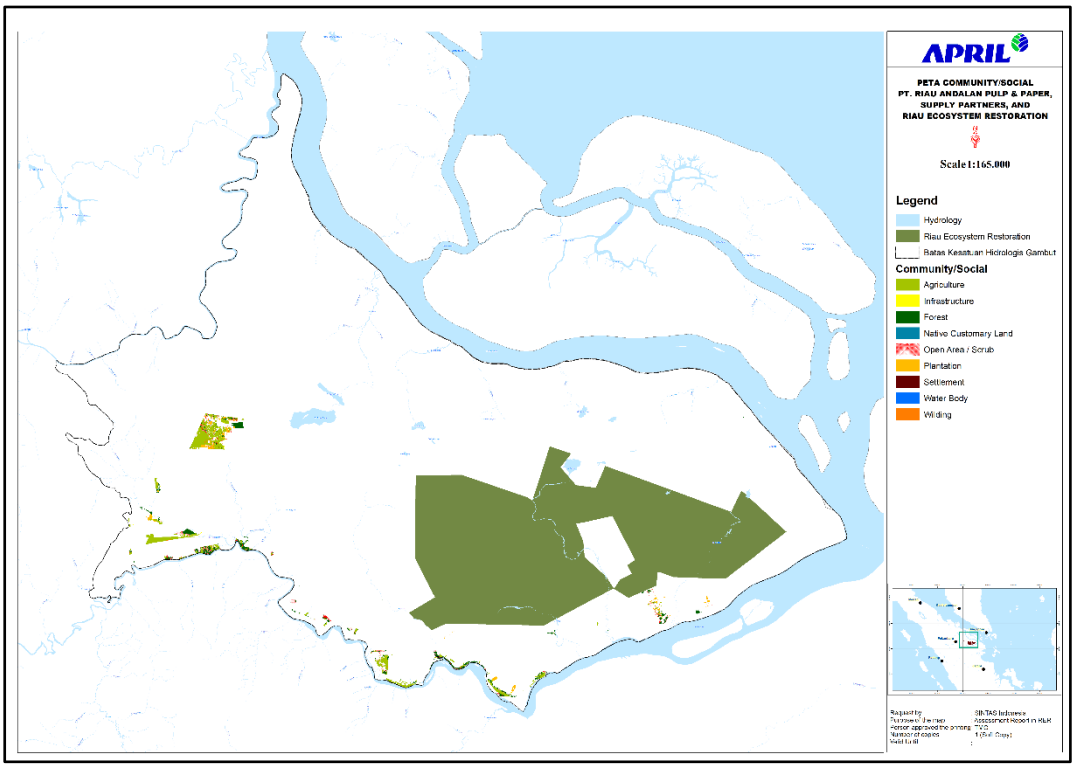
In general, the geography of Riau consists of mountains, lowlands, and islands. The mountain area lies in the western part, namely the Bukit Barisan Mountains, near the border of West Sumatra. The elevation decreases towards the east, with most of the central and eastern parts of the Province covered with low elevation peat swamp forests (lowlands). Off the eastern coast lies the Strait of Malacca, where several islands lie. The Project area lies in the eastern lowlands and along the eastern coastline.

The Province is rich in natural resources, particularly fossil fuels (oil & gas), rubber, oil palm, and fibre plantations. However, extensive past exploitation of the forest (logging, plantation forestry and conversion to oil palm plantations) has led to a substantial decline in forest cover. The Province as of 2015 was estimated to have about 1.67 million ha of natural forest cover remaining or 18.5% of landcover, while plantation forest covered about 3.58 million ha or 41.8% of landcover[27]. Fires related to community agriculture and small-holder plantation development have contributed to severe haze over the Province and trans-boundary haze affecting countries and cities to the east, such as Singapore and Kuala Lumpur, Malaysia.

Kabupaten Pelalawan and the Area Surrounding the Project

The whole landscape of RER is neighbour to nine nearby villages: Petodaan, Kuala Panduk, Teluk Binjai, Teluk Meranti, Pulau Muda, Segamai, Gambut Mutiara, Labuhan Bilik, and Serapung. All villages are situated in the southern part of RER, along the Kampar River, except Serapung Village which is located on an island off the east coast of the peninsula. The combined population of those

villages is 17,602 people, with the number of households per village ranging from 139 to 1,345. The RER-Project Area falls within Pulau Muda, Teluk Meranti, Teluk Binjai, Petodaan and Kuala Panduk village's administration.



Map 13- Community activity near the Project Area

The community in the landscape practices a mixed economy (*ekonomi rames*), where they combine several livelihood activities to fulfil their basic needs. They follow the market trends and commodity prices when they decide to choose livelihood activities. Livelihood activities are based on natural resources, and it can be grouped into four main categories: agriculture (e.g. rice & maze), plantation (e.g. sago, oil palm and rubber), fishery, and logging. Each village has its featured commodities, but the most common commodity is oil palm, coconut and rubber.

The infrastructure in the landscape is relatively weak. The road conditions in all villages are mostly unpaved, with only short sections of the road that are paved with cement. Elementary education facilities (SD, SMP, Madrasah) are available in all villages, but secondary education (SMA) is only available in Teluk Meranti Village. If the community aims to continue their education to university, they usually go to Pekanbaru, the capital city of Riau Province. All villages do not receive electricity from the government, except Teluk Meranti that receives it from 5 pm to 7 am every day. Health facilities (Puskesmas, Pustu, or Posyandu) are available in all villages in various conditions and quality.

Pre-Project Consultations and Socio-Economic Study

Since Project inception, stakeholder input has been an important goal of the Project Proponent. The RER Project undertook several studies to identify local stakeholders, identify any legal access or customary use access rights and potential conflicts, and to review and analyse socio-economic and cultural diversity among stakeholders. These studies are included in Appendices 3a-d. The RER Project does not believe that the composition of local communities has significantly altered since the Project Start Date nor does it anticipate any changes to the composition as a result of the Project's activities; both those that generate carbon off-sets and those that do not.

Stakeholder meetings and focus group discussions with the community began before the official project start date, and the opportunity for community input continues to this day through RER's dedicated Community Relations team.

The pre-project socialisation efforts were divided into four (4) differently focused meetings (1-4) and one (1) large scale socio-economic study:

- Focus Group Discussions in 5 Villages
- Stakeholder Discussions explaining the RER project concept
- Workshops for Management Synergies
- Carbon Focused meeting(s)
- Social and institutional culture study

All of the above activities were conducted under the CCB principles and guidelines of Free, Prior Informed Consent (FPIC).

These meetings and social assessment efforts are described in the tables below.

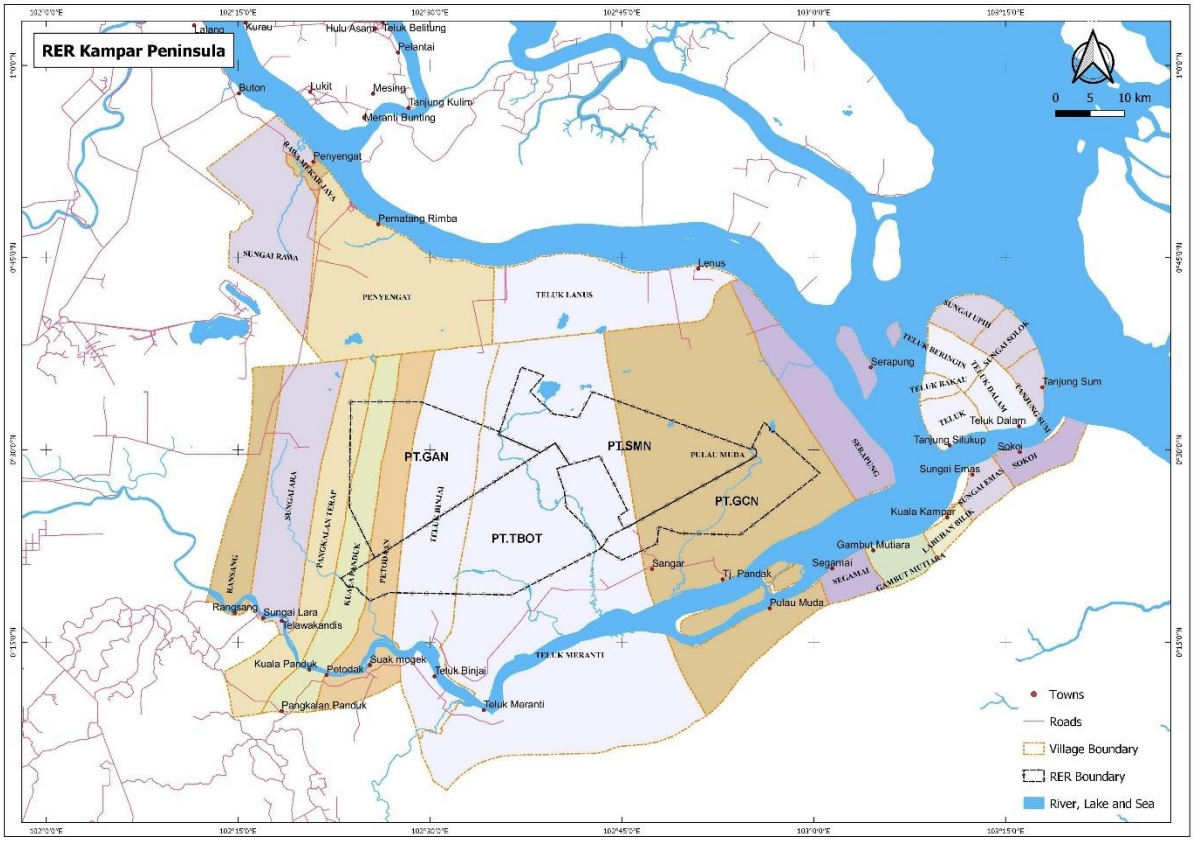
No.	Meeting	Content of Meeting	Participants
1	Focus Group Discussions (FGD)	Presentation and Q&A about the use and land rights claims of forest resources.	Government Organisations (forestry-related institutions) 5 neighbouring villages, sub-districts, districts: Teluk Meranti Village, Teluk Binjai Village, Kuala Panduk Village, Petodaan Village and Serapung Village Production Forest Management Unit (KPHP) of Tasik Besar Serkap NGO's i.e. Mitra Insani Foundation & Bidara

2	Stakeholder coordination (dates of meetings stated below)	Explanation of the RER- Restoration programme; Aims and objectives of the restoration activities. Impacts of restoration activities on social, economic, and cultural aspects. Location of RER-CP area in the Kampar Peninsula peatland landscape. The terms agreed upon by the community were then compiled into a conceptual document on the participatory management plan model for RER-CP and community restoration areas.	Government Organisations (forestry-related institutions) 5 neighbouring villages, sub-districts, districts: Teluk Meranti Village, Teluk Binjai Village, Kuala Panduk Village, Petodaan Village and Serapung Village
3	Workshop on plan sharing and towards management synergy: KPHP Tasik Besar Serkap Riau Ecosystem Restoration conducted on May 25, 2015, at the KPHP office.	This workshop is conducted to seek resolution of cases of overlapping land between RER PT. GCN and Segamai Village Forests and to synergise the parties in supporting the preservation of peatlands in the Kampar Peninsula.	RER PT. GCN, Segamai LPHD, Serapung LPHD, Mitra Insani Foundation, Project Consultants, and KPHP Tasik Besar Serkap[28]
4	Carbon meeting conducted on March 3, 2016	What will GCN and RER stand to gain in managing the area? At present, RER has not traded carbon. The carbon emission reduction (carbon) will be calculated. It needs to be highlighted: What is the purpose and purpose of the government issuing a restoration permit, what is the purpose of the company having an ER permit and the source of its money? APRIL has committed to 1ha for 1ha conservation commitment. To preserve the Kampar peat landscape so that it can extend HTI activities. RE funding source from HTI.	RER: Inra Gunawan Mr. Wawan Mr. Iqbal Mr. Eli, Frederik Project Consultants: Kusworo Adam Aziz Imam Suyudi Asra D Persada, Jamri

Table 25- Overview of socialisation efforts

Social and institutional culture study around the ecosystem restoration area of *Semenanjung Kampar*, Riau Province	
Content of Study	**Participants**
Understanding of the socio-economic and cultural aspects of the community related to their relationship with the forest.	9 villages studied, 8 villages in the Teluk Meranti subdistrict, and 1 village (Serapung) in the Kuala Kampar sub-district. The villages are as follows: 1. Petodak Village 2. Kuala Panduk village 3. Teluk Binjai Village 4. Desa Teluk Meranti 5. Pulau Muda Village 6. Segamai Village 7. Desa Gambut Mutiara 8. Labuan Bilik Village 9. Serapung Village June to August 2015 in the Pelalawan Regency, Riau.[29]

Table 26- Social and institutional culture study



Map 14- Map of villages in RER Kampar Peninsula

2.2.2 Pre Project-Consultations in the Communities

The Project has no communities that are located within the actual Project Area; however, there are nine (9) recognised villages and communities that are nearby to the Project. See Map 14. Before initiation of the Project, Stakeholder Consultations and Focus Group Discussions (FGDs) took place to socialise the RER project, mostly in Q1 and Q2 of 2016. These consultations and FGDs were meant to allow communities to evaluate the potential impacts of the Project and raise concerns

about potential negative impacts. All of the discussion took place in a culturally appropriate manner. They were conducted in the local language (Bahasa Indonesia), at 5 of the 9 village locations. Some meetings were held with members of the community and others with their local religious and political leaders. All of the stakeholder discussions and FGDs were held prior to the design of the Project and the drafting of the VCS-PD. Input that was received from the consultations and FGDs was considered and where possible input was integrated into the overall design and project implementation.

Summary of Focus Group Discussions in Teluk Meranti Village				
No	Date of Meeting	Participants' Information	Issues Reviewed & Findings	Resolution & Conclusion
1	17/02/ 2016	20 Persons - comprised of Fishermen and Fish Groups	Recruitment of workers in restoration.	RER and APRIL have continued to hire workers for the RER project for the restoration activites. RER employs 112 people on Kampar Peninsula. 110 are from Riau, while 55 persons are from the Carbon Project villages. 9 are employees, 10 are Security Rangers, 31 are Labor Supply (restoration, canal blocking, patrols), and 5 are Service Staff at Eco-Camp.
2	18/02/ 2016	14 Fishermen and farmer groups	There was a debate among the FGD participants where the men connected the Riau Ecosystem Restoration with RAPP were protested by the women who wished to focus on forest management planning.	There was much confusion by villagers in 2016 about the difference between RER and RAPP plantation management. RAPP informs on the annual work plan to harvest trees in the plantation, but the villagers could not understand why RER was not harvesting trees.
3	27/02/ 2016	10 Persons, Comprised of Fishermen and women's groups	The FGD participants questioned the extraction of wood & fish and the rules for entering the RER area.	Communities are informed that they have access to the RER area for fishing and Non-timber forest product (NTFP) collection. They are monitored, warned to ensure legal compliance but not prohibited from entry. If illegal activities are occurring, RER requests law enforcement assistance from BBKSDA or Police. See below at § 2.2.2.1 for details about the how communities are allowed access to the Project Area for collecting NTFP in a sustainable manner.
4	27/04/ 2016	68 persons. Attended by Teluk Meranti sub-district head and village government officials.	The community hopes that the allocation of resources in the area would be fair, namely they have a need for wood and fishing. RER does not prohibit this, but it will be managed together so that it is sustainability maintained.	Communication systems and protocols with fishermen in the Serkap River have been established. RER is now entering the 3rd Agreement with 20 Serkap river fisherman. Communication channels with fishermen in the Serkap River are well established and running smoothly.
			The community hopes that RER provides employment opportunities to local communities to alleviate the lack of employment.	RER and APRIL have continued to hire workers for the RER project. As noted, RER employs 112 people on Kampar Peninsula. 110 are from Riau, while 55 persons are from the Carbon Project villages. 9 are employees, 10 are Security Rangers, 31 are Labour Supply (restoration, canal blocking, patrols), and 5 are Service Staff at Eco-Camp.
			The community understood the importance of communication between the community and RER and APRIL so that they can work together.	RER Community Relations program has implemented 21 programs since 2015 and it is during these programs that issues are identified and dealt with.
			Key communication issues are about RER area & licensing issues.	RER Community Relations program has implemented 21 programs since 2015 and it is during these programs that issues are identified and dealt with. In addition, if legal issues arise (i.e. wildlife poaching) RER has conducted socialization meetings in collaboration with BBKSDA.

Table 27- Teluk Meranti Village FGDs

Summary of Focus Group Discussions in Teluk Binjai Village				
No	Date of Meeting	Participants' Information	Issues Reviewed & Findings	Resolutions and Conclusions
1	27/02/ 2016	9 Persons	The community acknowledged that activities related to the RER forest did not impact them much except for a few fishermen who caught fish in the Turip River. There should be no prohibition on fishing in the RER area, good solutions, and land without burning.	Fisherman continue to have acccess to the Project Area. Agreements have been established to ensure fishing methods are not destructive. RER has provided fisherman with nets, boat engines and reconstructed fishing huts. The formal Agreement prohibits burning, use of poison or electric shock to catch fish. This is being complied and fish catches are increasing annually.
2	19/03 /2016	10 Persons	Forest as a source of local pride. The community felt that they have no identity if it does not have a forest. The land around the village is still being planted with natural saplings.	The community has continued use of the RER forest within the limits of the law.
3	16/04/ 2016	10 Persons	Participants refused to have supervision because some of the villagers in Teluk Binjai were timber collectors and if monitoring were conducted, the villagers felt that livelihoods would be lost.	RER will continue to monitor access and post warning signs on what activities are not allowed. Communities are advised that harvesting wood is prohibited by Indonesian law in the RER Project Area.
			Some forest plants are still used on certain occasions and are still consumed by the community.	Access to the RER Project area to collect NTFP is not restricted, only monitored, and the collection of such plants is allowed. See below at § 2.2.2.1 for details about the how communities are allowed access to the Project Area for collecting NTFP in a sustainable manner.
4	27/04/ 2016	43 Persons. Attended by the village head of Teluk Binjai, Mursi Evendi, and villagers	RER firmly explained that as a non-profit-based program RER does not seek profit because RER is not a palm, mining, or HTI company seeking profit. Therefore, community involvement in restoration activities is a shared responsibility and some processes must be followed.	N/A
			The public more often expressed various disappointments with the previous company, such as the plantation company PT. RAPP. However, there were statements from the community that they would support activities to restore the forests that would be carried out by RER provided they were involved in these activities, including getting job opportunities.	RER and APRIL have continued to hire workers for the RER project. As noted above. RER employs 112 people on Kampar Peninsula. 110 are from Riau, while 55 persons are from the Carbon Project villages. 9 are employees, 10 are Security Rangers, 31 are Labor Supply (restoration, canal blocking, patrols), and 5 are Service Staff at Eco-Camp.

Table 28- Teluk Binjai Village FGDs

Summary of Focus Group Discussions in Kuala Panduk Village				
No	Date of Meeting	Participants' Information	Issues Reviewed & Findings	Resolution & Conclusion
1	19/02/ 2016	11 - Comprised of Fishermen Group	The FGD participants suggested planting Non-Timber Forest Products (NTFP) in the yard of the house.	RER/APRIL isnot opposed to this type of activity, however it is also worth noting that it has no impact on the Project Area itself. The villages are not known to have initiated any such activity to date. The Project would allow the collection of such seedlings or seeds for this activity. See below at §2.2.2.1.
2	29/02/ 2016	18 Comprised of Fishermen and Farmers Group	There was a question of whether the FGD results will be realised because so far, the community has always been sacrificed in the name of research.	RER has not made any promises to Kuala Panduk. RER Community Relations program has included annual Ramadhan celebration, providing roofing material for fisherman's huts on Kutup River, and support for Independence Day sports events.
3	28/04/ 2016	42 Persons	There was a concern that RAPP (APRIL HTI operations) was not interested in protecting the forest, but only in making material for paper production.	RER explained to the people of Kuala Panduk Village that they were not a HTI or oil palm company, but restoration company that built forests. Therefore, they are not looking for profit. RER discusses issues as they arise with village leaders.
			TBOT and employment opportunity problems for fishermen in the Kutub River located in the RER area, however, TBOT is not promising anything due to the location of PT. TBOT.	RER on Kampar Peninsula employs 112 people as employees, contract Security Rangers or Labor Supply. 55 are from the Carbon Project area villages.

Table 29- Kuala Panduk Village FGDs

Summary of Focus Group Discussions in Petodak Village				
No	**Date of Meeting**	**Participants' Information**	**Issues Reviewed & Findings**	**Resolution & Conclusion**
1	28/02/ 2016	11 Comprised of Fishermen and Farmers Group	Petodak Village does not have land to plant NTFPs and wood because it has been sold to migrants while the land across the Kampar river is included in the company's conservation area.	Petodak has total 2,206 ha of APRIL/JV concession land allocated for receiving Livelihood payments for use as *Acacia* fiber plantation (460 ha), can utilize to harvest NTFP's (1,166 ha), or have claimed (580 ha). RER concession (TBOT/GAN) cannot allocate land for Livelihood under the ER license, but residents are welcome to legally harvest NTFP's.
2	28/04/ 2016	86 Persons. Attended by Chairman of BPD Petodaan, Lukman Hakim	RER also stated firmly to the people of Petodak Village that they were not an HTI or oil palm company, but restoration company that regenerates and protects forests. Therefore, they are not looking for profit.	The issue of the status of RER is repeated and pointed out whenever the issue arrises at community meetings to contiue to be clear that RER is in the business of protecting the forest and is not HTI or oil palm.
			Chairman of Petodak, Lukman Hakim, using the local language, stated that what came was not a company that would cut down forests or plant *Acacia*, let alone palm oil, but to develop forests. Therefore, in order not to expect to ask for help even if there is a need for labour, Petodak residents are expected to accept the terms.	N/A`
			The village administration through the village head does not question the existence of restoration.	N/A
			Assistance is provided as a reward for land cultivation without burning. Until the assistance of agricultural equipment has been received by the Village Petodak. The village head will receive monthly incentives.	The APRIL Fire Free Village Program was initiated in 2015 and involves 5 initiatives within each village. Petodaan was one of 9 villages to participate and identified 409 ha of village land remain fire free. Petodaan was successful in preventing fires in 2015 and the community received an 'in-kind' reward of Rp100,000,000 in the form of community infrastructure project and 138 handtools for no-burn farming. After 3 years, Petodaan has since graduated from the FFVP and is now considered a fire resilient community.

Table 30- Petodak Village FGDs

Summary of Focus Group Discussions in Serapung Village				
No	Date of Meeting	Participants' Information	Issues Reviewed & Findings	Resolution & Conclusion
1	25/03/ 2016	11, Comprised of Men's group	Provision of tree seedlings to be planted in gardens in the village, asking permission from the government to take wood from the forest to build houses, and areca nut (Areca catechu) or betel nut plantations in the village.	RER/APRIL isnot opposed to this type of activity, however it is also worth noting that it has no impact on the Project Area itself. The villages are not known to have initiated any such activity to date. The Project would allow the collection of such seedlings or seeds for this activity. See below at §2.2.2.1.
2	21/04/ 2016	19, Comprised of Women's group	Planting wood in the village forest, mushroom cultivation, and planting tamarind (Tamarindus indica) in the village.	RER/APRIL isnot opposed to this type of activity, however it is also worth noting that it has no impact on the Project Area itself. The villages are not known to have initiated any such activity to date. The Project would allow the collection of such seedlings or seeds for this activity. See below at §2.2.2.1.
3	24/04/ 2016	11 Comprised of Community Leaders Group	Blocking canals, asked permission from the forestry service to take wood from the forest for community needs, improve technology to use the land, cultivate honeybees in the village, and take forest fruits in a way that does not damage the forest.	Since 2011, Riau province recommended to MoEF to allocate 2,000 ha of Ex-PT Alam Wana Sakti concession for Serapung Village Forest (+ 2,000 ha for Segamai). The remainder (20K ha) has become PT GCN. Bureacratic delays at Provincial level caused the MoEF to designate the Village Forest in April 2017. Six months later, unpermitted logging began in the Village Forest that was also designated as a protected deep peat area.
4	30/04/ 2016	57	Questions that arise from the community are still about the benefits of the existence of restoration for the village.	Serapung village historical economy is based on wooden boat building. After depleting the forest on Serapung island, they began harvesting forests on coastline of Kampar Peninsula, which have now become industrial fiber plantations. 2017 allocation of 2,000 ha Village Forest did not come with the right to harvest trees, but this was done illegally starting 6-months later.
			Other questions are about differences in village forests and restoration, and about who has more right to manage village forests, i.e. Lembaga Pengelolaan Hutan Desa (LPHD the Village Forest Management Agency) or the village government.	By regulation, it is the LPHD that has the right to manage the village forest.
			The question of the role of LPHD arises because the local political situation between LPHD and the village head is not well established. The village head considers the existence of LPHD management illegitimate in the absence of a letter of recognition from the governor.	The MoEF designated the village forest in April 2017 due to repeated bureacratic delays at the provincial level.
			LPHD considers their existence to be legitimate because there is a decree from the Ministry of Forestry.	Correct.
			The role of LPHD in the future will be strategic but the institutional arrangement and refinement is the right of the village and its citizens to determine. The functions and objectives of village forests and restoration are the same and are sourced from the MoEF's decrees.	The LPHD now has legal responsibilities to comply with MoEF regulations for long-term and annual forest planning, tax payments, organizational development, etc. The initial driver of the Village Forests, Yayasan Mitra Insani, has not fully supported the LPHD with this process.

			The reason why Serapung Village is being included in the target villages is because of the existence of the Serapung Village Forest which is geographically adjacent to the Segamai Village Forest and the restoration area boundary so that as a whole the landscape needs to be involved in its management.	The illegal logging in Serapung Village Forest periodically returns and spreads into the adjacent Segamai Village Forest which is immediately adjacent to PT GCN. There are many 'factions' within both villages, therefore achieving clarity to move forward is an on-going process.

Table 31- Serapung Village FGDs

2.2.2.1 Non- Timber Forest Products Explanation

Local communities around the RER project area have always been allowed to collect non-timber forest products (NTFP) and the RER Project guard posts and rangers have never prevented the access into the forest. All access into the Project Area is done via one of only a handful of access points on waterways and past the guard-posts where everyone who enters must register. There is no requirement to provide advance notice of a community member's intention to access the Project Area. However, the guard posts do maintain logs of all entries made. The daily ingress/egress logs are communicated by radio to the RER field station (located just outside of the RER Project area.

All harvesting and collection of NTFP are undertaken in a traditional manner by local communities. No commercial activity is undertaken in the area. All activity is small scale and undertaken by individuals, pairs of individuals. The Main NTFP collected from the RER Project area are rattan, palm shoots, fish, deadwood for smoking fish, pandan leaf collection, etc. (Additionally, communities would be free to collect other NTFP such as seeds, seedlings, etc.) A practical barrier to any large-scale access that could result in unsustainable harvesting, collection or access into the RER Project area is that only small aluminium craft (i.e. 5 meters or so) with small outboard motors can navigate the overgrown waterways. Larger craft are unable to access the RER Project Area. Collection of NTFP at any scale is not realistic.

The RER Project, through monitoring, maintains a "watchful eye" on all access in order to monitor practices that might be or become unsustainable. For example, early in the Project's history, RER and APRIL were aware of fishing practices that appeared unsustainable, including destructive "local fishing habits" that included the use of poisons, electricity, etc. To improve harvesting practices, RER and APRIL helped establish a local fisherman's association that included fishermen from villages that traditionally accessed the RER's waterways. Signed agreements between the fisherman and RER/APRIL were established that limited fishing to more sustainable methods. The fisherman agreed to refrain from the use of poisons, electricity, and other unsustainable methods. This agreement began in 2016 and continues to today. The fisherman (about 20+ active fisherman) report that the waterways are clean, and the quality of their catches have improved. Local species that once appeared to be absent have returned. A copy of the fisherman's agreement is included.

Another example of the RER project working to maintain sustainable NTFP activities includes an agreement with local communities, the Riau Conservation Dept. and RER to refrain from the collection of Songbirds. At the beginning of the Project, in 2016 and until 2019, communities were allowed to collect songbirds, but the practice was becoming widespread, and RER/APRIL feared that the impacts on the local bird population was increasing to unsustainable levels. Since the October 2019 agreement to cease songbird collection, the RER guard posts have not encountered any songbird collection in RER.

RER's ongoing monitoring of access to the concession also looks for poaching activity, but none has been detected.

The RER monitoring programme and ongoing engagement with local communities ensures the continued right of access to the RER Project Area for the harvesting and collection of NTFPs. It also ensures, as has been demonstrated in the past, that unsustainable practices can be identified and addressed with appropriate measures.

2.2.3 Summary of Outcomes

One important outcome of the FGD activities is the compilation of the "Conditional Acceptance Terms" from the community. It is an indicator that the community understands the existence and activities of the RER-Carbon Project. In addition, it also indicates that the community is in agreement with opportunities for RER. However, there are still requirements from the community that are requested to be fulfilled by RER and APRIL. The Conditional Acceptance Terms are in table 32.

No.	Conditional Acceptance Terms
1	Agree that forest is to be restored if it does not eliminate community rights (fishing, timber needs, and hunting).
2	Agree because the location of the Project is far from villages and dependence of the forest has been reduced.
3	Agree because much of the forests are damaged, and the forest is a sense of pride for the Malay people.
4	Agree that RER will benefit the community with labour and employment contracts.
5	Agree to preserve nature and existing wild canals must be closed.
6	Agree, but there must be openness about boundaries and licensing.
7	Agree with the terms if there are no more problems with limits.
8	Agree that GCN operates if there is a settlement from land issues on either side of the Puskopol canal which have often been sued by the Pulau Muda Village community.
9	Overlapping land claims must be resolved by surrendering the boundary land to the Segamai Village Forest[30].
10	Agree to a positive restoration area if it is beneficial for forest sustainability and the community's economy. This is because the residents of Teluk Meranti Village have been traumatised by RAPP. Damage to kinship due to the pros and cons influence of RAPP made by people from outside the Meranti Bay, including NGOs.
11	Agree, but there must be help to overcome the issue of land without burning.
12	Agree because of that there should be a GCN branch office at Teluk Meranti sub-district area so that people can easily coordinate.
13	Agree if it the Project conducts forest preservation.

Table 32- Conditional Acceptance Terms

During the consultation process, the possible impacts that the Project might have on an individual or to collective actors in terms of economics, social, and biodiversity aspects were discussed and reviewed, as can be seen from the above summary table

The details and results of the entire socialisation process can be found in "Sosialisasi Pengelolaan Kawasan" attached as a part of Appendix 3b.

2.2.4 Inclusion of Stakeholders Concerns

As part of the project design process, the RER Project, conducted the above-described meetings, workshops, stakeholder consultations and FGDs to address the concerns of the community groups. As a result of the communities' agreements and inputs that were taken into consideration, a variety of the non-carbon generating activities were established, in part to address those requests and those brought up during the stakeholder engagement process.

1) **Restore the Forest** – RER would undertake a native species nursery and revegetation program in the most degraded areas of RER to support the preservation of the forests. Local labour supports this activity.
2) **Canal blocking** – RER would block the old legacy canals to rewet the landscape in areas that have canals in place from the times of illegal logging. Local labour supports this activity.
3) **No-Burn efforts in the village with initial incentives** – the Fire Free Village Programme" was based on a written agreements with villages to not employ burning techniques to clear areas for agriculture or small-scale plantation activity in exchange for agreed-upon incentives. The written agreements are available to the auditors and indicate that incentives are financial development awards of between 50,000,000 IDR and 100,000,000 IDR (aprox. $3,550 USD –$7,100 USD). The amounts will be provided not as cash but in terms of the value of a development program or activity.
4) **No-burn vegetable gardens** –the program was established to assist villagers in learning no-burn cultivation techniques for small scale vegetable garden efforts and as a way to increase income for families.
5) **No elimination of community access to the forests**, i.e. no-one prevented from entering the forest.
6) **Active fishing groups and coordination** – Promotion of sustainable fishing activities and support to the local fishing communities.
7) **Songbird collection and medicinal plants still collected** – No policing or barring of such practices, only monitoring from a sustainability perspective.
8) ***Hutan Madu* program** – The establishment of a forest honey cooperative to support the branding and sale of locally sourced forest honey.
9) **Jobs provided to the villagers** – RER and APRIL continue to provide job opportunities to the local communities both in RER and in the surrounding APRIL concessions.

2.2.5 Ongoing Communications with Communities

APRIL and the RER-Carbon Project have a robust communication mechanism in place with the local communities. RER has dedicated community communication teams and a dedicated Community Relations Department. Regular "town hall" style meetings are held every month. This allows an ongoing connection with community members, village leaders, religious leaders, local NGOs', women's groups, school groups, teachers, and health professionals. These groups are variously distributed throughout the nine villages as not all villages have the same groups and results in a varying level of stakeholder participation. Nonetheless, RER maintains regular communications with all of the villages through the "town hall" meetings and through its company representatives that are actively engaged in WhatsApp

groups with the villages they are assigned to. The town hall meetings are used to provide updates on RER project activity, implementation, benefits to the local stakeholders as well as any appropriate legal related issues. The meetings could also be used to discuss project risks and costs.

The RER Project also reports on implementation issues, costs, community benefits, legal issues and risks through the RER website (https://www.rekoforest.org/) and through the published annual reports that are also available on the website. It is anticipated that the RER-Carbon Project will eventually publish the VCS-PD on the website as well.

As part of the ongoing outreach, the Project maintains, in addition to village specific WhatsApp group chats mentioned above, the following social media accounts to further engage stakeholders:

https://www.facebook.com/officialRER

https://twitter.com/RER_official

https://www.instagram.com/RER_Riau/

https://www.youtube.com/channel/UCotuN6jbrJqxHnoIFh0WByw

2.2.6 Communicating Relevant Laws and Regulations Covering Workers' Rights

Labour law and the associated rights of workers are governed by Indonesian laws and regulations at the national or federal level. The following laws and regulations apply specifically to workers rights in Indonesia.

No.	Name of Labour Law (i.e., Agreement/Treaty, Law & Regulation)
1	Law No. 80/1957 on Ratification of International Labour Organisation Convention of Equal Remuneration for Men and Women Workers for Work of Equal Value
2	Law No. 21/1999 on Ratification of International Labour Organisation Convention on Discrimination in Respect of Employment and Occupation
3	Law No. 1/1970 on Work Safety
4	Law No. 3/1992 on Labour Social Security
5	Law No. 21/2000 on Labour Union
6	Law No. 13/2003 on Manpower
7	Law No. 2/2004 on Industrial Relations Dispute
8	Law No. 40/2004 on National Social Security System
9	Government Regulation 8/1981 on Wage Protection
10	Government Regulation 14/1993 on Worker Social Security Program
11	Government Regulation No. 50/2012 on Occupational Safety and Health Management System Application

Table 33- Relevant las & regulations covering workers' rights

The RER Project and APRIL, as noted in §1.14 above, adheres to a broad range of Indonesian legal requirements, including relating to the labour sector. APRIL's Human Resources teams, in hiring all employees on the Kampar peninsula, follow a variety of Indonesian labour laws that relate to workers rights. These laws are outlined in §1.14 and cover issues ranging from occupational & worker safety, labour unions, social security, discrimination and equal rights issues, wage protection, etc.

Each employee at the RER Project is hired through APRIL's human resource team and has a written contract that clearly and in writing sets forth the parties' contractual arrangements. Upon being hired, each new employee is provided orientation as to expectations, requirements, and workers' rights in the APRIL group. Each individual is provided with a copy of the company Employee manual that outlines all major issues regarding employment. This includes communicating information about employee rights, anti-discrimination, timeliness of pay, HR procedures, insurance benefits, etc. As noted in the employee handbook, individual workers have the contact details for Human resources. They can contact them directly with any questions related to employment issues and the rights of employees.

Additionally, RER employees can freely associate and join the local labour union known as [SP Kahut RAPP Fiber (Forestry and Wood Labor Union RAPP Fiber). This union operates in Kerinci and is available to all employees hired under the APRIL FiberOne group, of which RER is a part of.

Occupational health and safety issues are communicated to all employees via work training programs and safety training. This is especially true of employees that operate not in an office setting but the field. APRIL/RER has regular training that includes reviewing safety issues while in the field, including first aid, use of safety equipment (i.e. life jackets, hard hats, etc.) and safety procedures. Occupational Safety and worker safety training is regularly reviewed and is certified as part of the PEFC and IFCC certification process (see also §2.5.3). Pre-operation safety briefings are also regularly used before employee's undertaking field operations.

2.2.7 Communications Regarding Validation & Verification

The RER-Project prior to the validation and verification of the project undertook several steps to communicate the process of the VCS audit to the local communities.

Pre-Validation Meetings

Upon completing the PD's drafting, the RER Project initiated a socialisation campaign in the 5 neighbouring villages and sub-districts. These meetings took place in January and February of 2021. An initial meeting was held that presented a slide show about climate change and the RER Project. The RER community relations teams also briefed the villages and sub-districts about the upcoming validation and verification process. It was explained that the VCS project was required to undergo third-party certification and that an auditor or group of auditors would be visiting the area and the project to ensure that the project described in the PD was reflected on the ground. For each of the villages and sub-districts, a follow-up meeting was held three to four weeks later so that the communities would have an opportunity to consider the presentation and raise any concerns and questions at the follow-up meetings.

One week before initiating the validation and verification field site visit, in March of 2021, a further meeting was held in Telok Meranti with representatives from the surrounding villages and subdistricts to inform them of the upcoming audit further. The meetings specifically addressed the validation and

verification audit. A discussion about the audit process was held so that it was clear that the carbon credits had to be certified by a third party to make sure that they were "real." including what aspects the RER Project the auditor and or audit team would review operations in Kerinci and the field (i.e. nursery, eco-camp, forest, etc.) and the communities.

Meetings During Validation & Verification

During the filed-site visit by the auditor in March 2021, two meetings were held in Telok Meranti with community representatives, the RER team and the auditor. One meeting was with the local Sub-District leader (the equivalent of a mayor), and the other was with about 20 plus community members made up of both men and women. At both meetings, the auditor described his role and then discussed various aspects of the Project, including but not limited to knowledge of the RER Project, the relationship between the communities and APRIL, Project Activities, and how the audit process worked. At each meeting, the auditor invited and responded to questions and comments posed by the community members.

2.3 Environmental Impacts

The Project has not undertaken any formal environmental impact assessments for the above-described project activity. The reason no formal environmental impact assessments have occurred is that there are no anticipated negative environmental impacts associated with the retention of the natural forest. By retaining and protecting the existing forest and managing ecological functions and enhancement, the Project will protect or enhance aspects of biodiversity, water quality and other ecosystem services.

Further, the only changes that will be made to the Project Area will be to:

1. replant and revegetate highly degraded areas with native vegetation only, and without the use of fertilizers (see §1.11.3.1 above)
2. block the legacy canals with hand-built dams made primarily out of natural material, i.e. locally acquired gravel and aggregate, sod, etc and to a limited extent recycled materials (see §1.11.2.3 above)
3. Introduction of monitoring equipment (i.e. subsidence poles, dipwells, automatic level loggers, and the very small amount of supporting infrastructure required for those instruments)

The above activities do not have any foreseeable negative environmental or scoio-economic impacts that would warrant a formal environmental impact assessment.

2.4 Public Comments

Project entered the VCS-Pipeline on or about 13 January 2021 and was assigned the VCS-Project No. 2403. The 30-day public comment period ended on 13 February 2021. No public comments were received.

2.5 AFOLU-Specific Safeguards

2.5.1 The socialisation of the Project and the VCS PD

A Summary of the RER-Carbon Project's VCS-PD will be translated to the local language (Bahasa Indonesia) upon its completion so that it can be provided as part of the ongoing community consultations as envisioned by the VCS Safeguards requirements (VCS Standard v.4.0 § 3.16.3). Copies of the PD Summary were provided to the 5 main village Teluk Meranti, Teluk Binjai, Petodaan, Kuala Panduk, and Pulau Muda. A copy of the RER-CP VCS PD was placed online in the RER Website and notices were provided to appropriate community leaders. The validation and verification process were also socialised within the community, and they were informed of the 30-day public comment period.

2.5.2 Identification of Local Stakeholders

The Project identified early on as local stakeholders, the 9 villages, their political and religious leaders, a variety of women's groups, local NGO's, health care practitioners, local educators, school groups, local law enforcement, district and provincial forestry officers, etc. The RER Community Development Team have regular contact with the stakeholders as noted above.

2.5.3 Risks to Local Stakeholders

The Project undertakes all reasonable efforts to avoid negative impacts on the community. The Project does not anticipate any negative economic impacts to the community as a result of the Project's activities as communities continue to have access to the forest to gather Non-timber forest products, as allowed by law. The Project itself does not create any anthropogenic risks to the community as the primary activity is simply the preservation of the forest.

Any risk that might be identified would be overcome by the socio-economic benefits that the RER Project introduces through its community development activities as outlined above. The RER Project and APRIL have established anti-discrimination and gender inclusion policies to prevent discrimination and sexual harassment. Furthermore, the RER Project also uses the same policies and standards for community engagement as APRIL. And although RER is not certified as a PEFC or Indonesian Forest Certification Co-Operation (IFCC) concession (it does not produce timber products and is thus ineligible), it nonetheless "piggybacks" on to all of the same PEFC and other sustainability requirements related to local communities and local stakeholders.

The RER management team has substantial experience in implementing land management and forestry activity under a variety of industry-specific quality marks, including PEFC, IFCC, and Singapore Green Label[31]. RER's management is not only aware of these standards, but because the RER Management team also has close connections to the management of the surrounding APRIL concessions that have been certified to these sustainable forestry standards, they are well versed in their application.

RER management also adheres to APRIL Group's operation management systems in Riau Province, Indonesia. These operations are certified under OHSAS 18001 (Safety Management Systems), ISO

9001 (Quality Management Systems), and ISO 14001 (Environment Management Systems) as well as the more up-to-date ISO 45001 (Safety Management System) certification. See Appendices 4a-d.



Figure 17- APRIL Group's operation management systems certifications

2.5.4 Ongoing Communications and Grievance Redress Mechanism

RER-CP has an ongoing communications system in place with the local communities surrounding the Project Area. The system includes local community relations officers from RER/APRIL staff in each community; they are known as the *Hubungan Masyarakat* or "*Humas*" for short. They act as the initial point of contact for any issues, grievances or otherwise. They are employed as community specialists to interface between the various local communities and RER and APRIL. They can be contacted by local officials, local community groups and villagers alike.

Additionally, the RER Project itself has a dedicated community relations team at its main office in Kerinci. This team is who would be contacted by the *Humas* in case of any grievance issues. If a grievance is logged, it would automatically begin to move through the RER/APRIL grievance redress mechanism. The current system has been established since quite some time as it is mandated for APRIL as part of its PEFC certifications; a schematic of the system is set forth below.

As APRIL Group is internationally audited by world-leading forest certification systems and rigorous, globally recognised standards, robust grievance redress mechanisms are in place. In December 2014, APRIL Group was the first Indonesian forestry company to receive sustainable forest management certification under the PEFC in conjunction with its Indonesian partner, the IFCC. APRIL Group's manufacturing operations received PEFC Chain-of-Custody certification in 2010, ensuring that all raw materials coming into the mill are from non-controversial sources. Together, SFM and Chain-of-Custody certification mean APRIL Group is now PEFC certified end-to-end throughout its supply chain. See Appendices 4e-f – SFM and Chain of Custody Certifications.

The RER community relations team additionally is responsible for working with the community to address a wide variety of issues, not just grievances. They are responsible for communicating with the local fisherman, with the community on health and education issues, etc. The community relations team is also available to speak directly to any member of the community if they wished to travel to Kerinci as the RER office is located outside of the main gated APRIL facility.



Figure 18- SFM and Chain of Custody Certifications

2.5.5 Grievance Resolution Procedure

As such, the grievance resolution procedures are implemented according to leading industry sustainability standards. They are in place to ensure that local communities and other relevant stakeholders understand the process for raising relevant issues related to RER operations. The Procedure includes guidance Project Proponents on how to handle grievances from external parties, including individuals, government organisations and non-governmental organisations, concerning the implementation of RER operations.

In resolving grievances, RER will prioritise consultative methods centred on dialogue. Any effective grievance handling must resolve or settle grievances in an efficient, timely and appropriate manner through a fair and transparent process to achieve consensual agreement between parties. Once a potential grievance has been received and assessed, further action may be taken to verify the claims. Once the grievance is confirmed, an Action Plan will be designed in consultation with concerned parties to resolve/settle it, and proper implementation will be monitored. RER will provide progress updates to relevant stakeholders and manage any follow-up action where necessary.

RER has adopted APRIL Group's publicly available Grievance Resolution Procedure:

https://sustainability.aprilasia.com/wp-content/uploads/2019/09/SOP-Grievance-Resolution-Procedure.pdf

A detailed grievance resolution procedure workflow of the Grievance Resolution Procedure is set forth below in Figure 19. The time frames established concerning the grievance procedures are:

- Claims or complaints must be attended within 15 working days of receipt of the request.
- Suggestions must be attended within 30 working days of receipt of the request.
- However, where it is not possible to provide an answer within the established frame time, the claimant must be formally informed and the reasons for the delay and the new date for reply must be given.
- The proposed mechanism will be in constant evaluation and adjustment, according to the recorded dynamics and evaluation of effectiveness.

STANDARD OPERATING PROCEDURE
SUSTAINABILITY

Grievance Resolution Procedure	Q&MIS Document ID No. : AGRO/SFM-001-PR Issue Date / Revision No : 26 August 2016/ 0 Page : 10 of 10

10.2 Appendix-2

GRIEVANCE RESOLUTION PROCEDURE WORKFLOW

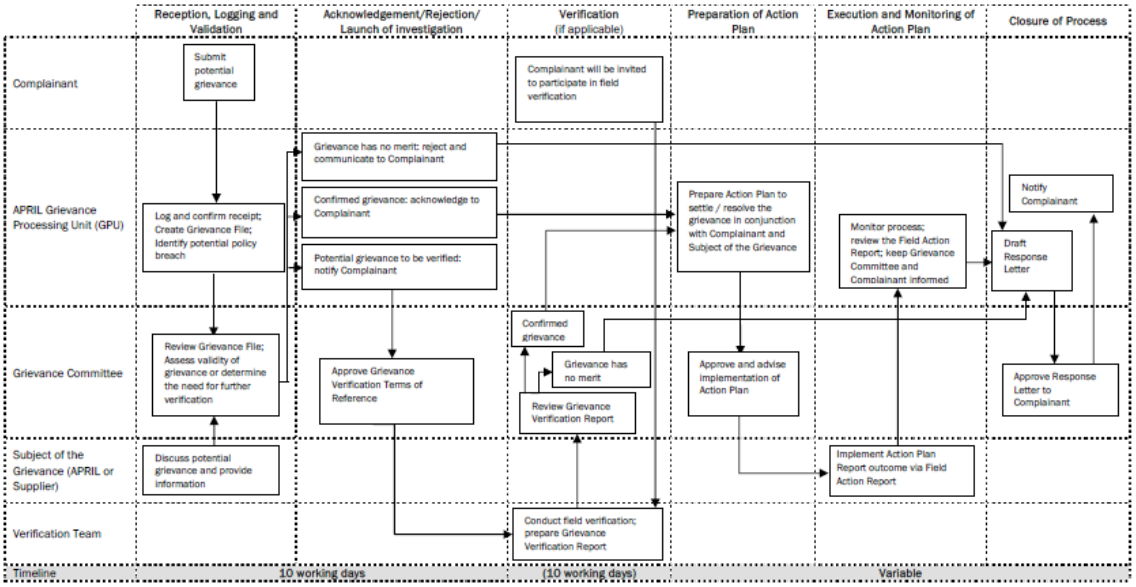


Figure 19- The Grievance Resolution Procedure

2.5.6 Worker Safety Mitigation Measures

As notes in §2.1 above, the RER Project has identified worker safety as a potential negative impact to stakeholders as fieldwork in the tropical peat swamp forest and surrounding area is potentially hazardous.

APRIL/RER have robust worker safety systems in place, both for APRIL and RER employees. There are Standard Operating Procedures in place for many work activities, and safety is always a priority in APRIL controlled area. Maintaining the safety of RER employees when in the field is a legal requirement and an obligation taken by RER and APRIL very seriously. Safety mitigation activity in the field includes two-way radios for regular radio check-ins, field-teams area always working in groups and always have first aid equipment available. When working on boats, life jackets are mandatory. Employees who operate in the field receive safety briefings and take part in safety training, including proper use of field equipment and first aid. Before undertaking any type of new field activity, employees are provided appropriate training to ensure that they can meet APRIL safety requirements. One example of this is the ongoing training that the fire mitigation teams undertake. Fire suppression is especially dangerous, and training to use the specialist firefighting equipment and proper operational procedures in a fire is regular and ongoing.

In the event of injuries in the field because they do happen, support and assistance teams can be quickly dispatched from Eco-Camp (located just outside of the RER Boundaries), which is the operational HQ and dispatch point for all ranger and fire suppression activity. Eco-Camp is well stocked

with first aid, rescue, and firefighting equipment. It also boasts river and road access to the RER-Boundaries and river access to some of the most remote parts of the Project Area. Additionally, Eco-Camp has its own helicopter landing and refuelling facilities that allow helicopter support for field teams. In the event of a serious accident, helicopter extraction can be organized with APRIL's own helicopter that is based at the Kerinci HQ.

Further, APRIL's activities in the Kampar Peninsula have been certified by both PEFC and IFCC, both of which have requirements for ensuring occupational health and safety. Although RER is not itself certified (only active forest harvesting operations can be certified), the exact safety requirements are in effect for RER as for APRIL's other forestry activity on the Kampar Peninsula.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The RER Project applies the latest version of VM0007 (version 1.6), including all applicable modules as detailed in § 4.3.1 All REDD Activity Types, 4.3.3 Planned Deforestation/ Degradation and 4.5.1 All WRC Activity Types, 4.5.2 RWE Project Activities and 4.5.3 CIW Project Activities. The below table lists all methodology components and tools used.

No.	Doc ID	Version	Issue Date	Documents Name	Abbreviation
1	VM0007	1.6	8-Sep-20	REDD+ Methodology Framework	REDD+ MF
2	VMD0015	2.2	8-Sep-20	Methods for monitoring of GHG emissions and removals in REDD and CIW projects	M-REDD
3	VMD0016	1.2	8-Sep-20	Methods for Stratification of the Project Area	X-STR
4	VMD0017	2.2	8-Sep-20	Estimation of Uncertainty for REDD+ Project Activities	X-UNC
5	VMD0046	1.1	8-Sep-20	Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities	M-PEAT
6	EB 31 Annex 16	1.0	4-May-07	CDM Tool for testing significance of GHG emissions in A/R CDM project activities	T-SIG
7	EB 35 Annex 19	1.0	19-Oct-07	CDM Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities	T-ADD
8		4.0	19-Sep-19	VCS AFOLU Non-Permanence Risk Tool	T-BAR
			BASELINE		
9	VMD0006	1.3	8-Sep-20	Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation	BL-PL
10	VMD0042	1.1	8-Sep-20	Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities	BL-PEAT
			LEAKAGE		
11	VMD0009	1.3	8-Sep-20	Estimation of emissions from activity shifting for avoiding planned deforestation/forest degradation and avoiding planned wetland degradation	LK-ASP
12	VMD0044	1.1	8-Sep-20	Estimation of emissions from ecological leakage	LK-ECO
			CARBON POOLS		
13	VMD0001	1.1	11-Oct-13	Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools	CP-AB
			EMISSIONS		
14	EB 33 Annex 16	1.0	27-Jul-07	Estimation of direct nitrous oxide emission from nitrogen fertilization	E-NA
15	VMD0013	1.2	8-Sep-20	Estimation of greenhouse gas emissions from biomass and peat burning	E-BPB

Table 34- Title and Reference of Methodology

3.2 Applicability of Methodology

As detailed below Table 35, all applicability conditions of methodology VM0007 (REDD+ MF) and its associated modules are met.

No.	Module	Applicability Condition	Comment
1	VM0007 REDD+ MF, 4.2 All Project Activities	All land areas registered under the CDM or under any other GHG program (both voluntary and compliance-oriented) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program must be monitored over time and reported in the monitoring reports.	Condition met, no part of the Project Area is under any CDM or any other GHG program (either voluntary or compliance-oriented).
2	VM0007 REDD+-MF, 4.3.1 - All REDD Activity Types	Land in the project area has qualified as forest (following the definition used by VCS; in addition, see Section 5.1.2) for at least the 10 years prior to the project start date.	Condition met. Land-use records indicate that all land subject to REDD project activities in the project area is covered by tropical forest on peatland and has qualified as such under the applicable definition for at least 10 years.
3	VM0007 REDD+ MF, 4.3.1 - All REDD Activity Types	If land within the project area is peatland or tidal wetlands and emissions from the SOC pool is deemed significant, the relevant WRC modules (see Table 3) must be applied alongside other relevant modules.	Condition met. All relevant WRC modules have been applied to estimate emissions from peat soils.
4	VM0007 REDD+ MF, 4.3.1 - All REDD Activity Types	Baseline deforestation and forest degradation in the project area fall within one or more of the following categories: Unplanned deforestation (VCS category AUDD) Planned deforestation/degradation (VCS category APD) Degradation through extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD)	Condition met. Baseline deforestation falls in the category of APD. See § 2.2.1. The project area does not include any significant unplanned deforestation or forest degradation and is not modelled in either the baseline of the project scenario.
5	VM0007 REDD+ MF, 4.3.1 - All REDD Activity Types	Leakage avoidance activities must not include: Agricultural lands that are flooded to increase production (e.g., rice paddy) Intensifying livestock production through use of feed-lots10 and/or manure lagoons.	Condition met. The Project does not promote either establishment of agriculture on flooded land or intensification of livestock production. See § 2.2.1
6	VM0007 REDD+ MF, 4.3.3 - Avoiding Planned Deforestation/ Degradation	Avoiding planned deforestation/degradation activities are applicable under the following condition: Where conversion of forest lands to a deforested condition must be legally permitted.	Condition met. See § 3.4 baseline scenario.
7	VM0007 REDD+-MF, 4.5.1 - All WRC Activity Types	WRC activities are not eligible under the following conditions: Project activities lower the water table, unless the project converts open water to tidal wetlands, or improves the hydrological connection to impounded waters. Changes in hydrology do not result in the accumulation or maintenance of SOC stock, noting that a) this pertains to projects that	Condition met. The project activities do not lower the water table (see § 1.11.2.2 & §1.11.2.3), hydrological connection of the peatland does not lead to increase of emissions outside of the Project Area (see § 4.3.4) and do not include burning of organic soil

No.	Module	Applicability Condition	Comment
		intend to sequester carbon through sedimentation and/or vegetation development and b) this does not pertain to projects that increase salinity to reduce CH4 emissions. Projects that aim to decrease CH4 emissions through increased salinity must account for any changes in SOC stocks. Hydrological connectivity of the project area with adjacent areas leads to a significant increase in GHG emissions outside the project area. Project activities include the burning of organic soil. Nitrogen fertilizer(s), such as chemical fertilizer or manure, are applied in the project area during the project crediting period.	(see § 4.2.1., § 4.2.1.2, § 4.2.3.2, § 4.2.4.2 & § 4.2.4.5) and does not include the use of fertilizers (see § 1.11.3.1-4, § 2.3, § 4.1.2 .and § 4.1.4.3).
8	VM0007 REDD+-MF, 4.5.2 RWE Project Activities General	For RWE project activities, prior to the project start date, the project area must meet the following conditions: a) The area is free of any land use that could be displaced outside the project area, as demonstrated by at least one of the following, where relevant: • The project area has been abandoned for two or more years prior to the project start date; or • Use of the project area for commercial purposes (i.e., trade) is not profitable as a result of salinity intrusion, market forces, or other factors. In addition, timber harvesting in the baseline scenario within the project area does not occur; or • Degradation of additional wetlands for new agricultural/aquacultural sites within the country will not occur or is prohibited by enforced law. OR b) The area is under a land use that could be displaced outside the project area, although in such case, baseline emissions from this land use must not be accounted for, and where degradation of additional wetlands for new agricultural/aquacultural sites within the country will not occur or is prohibited by enforced law. OR c) The area is under a land use that will continue at a similar or greater level of service or production during the project crediting period (e.g., reed or hay harvesting, collection of fuelwood, subsistence harvesting, commercial fishing).	Condition met. The project will continue at a similar or greater level of service or production during the project crediting period as all concessions that make up the Project Area are under a IUPHHK-RE License, i.e., Ecosystem Restoration License, see § 1.7.2. The license are valid until the end of the Project Crediting Period, and each concession has a long term and annual management plan (RKU/RKT) that is approved by the Indonesian Ministry of Environment and Forestry which approved activity includes restoration of the wetland ecosystem that makes up the Project Area, see § 1.7.2, § 1.9 and Appendix 1 – Copies of the Legal Documents for the four RE concessions (Licenses and Management Plans (RKU/RKT)
9	VM0007	This methodology is applicable to rewetting drained peatland (RDP) activities on project	Condition met. The project will conduct rewetting drained peatland (RDP) activities on

No.	Module	Applicability Condition	Comment
	REDD+-MF, 4.5.2 RWE Project Activities Peatland Rewetting	areas that meet the VCS definition for peatland (see VCS Program Definitions).	project areas that meet the VCS definition for peatland, see §1.13.1.7 and § 3.3.4.2.
10	VM0007 REDD+ MF, 4.5.3 CIW Project Activities	This methodology is applicable to conservation of undrained and partially drained peatland (CUPP) activities on project areas that meet the VCS definition for peatland (see VCS Program Definitions). Project activities conserving tidal wetlands may include: 1. Protecting at-risk wetlands (e.g., establishing conservation easements, establishing community supported management agreements, establishing protective government regulations, and preventing disruption of water and/ or sediment supply to wetland areas) 2. Improving water management on drained wetlands 3. Maintaining or improving water quality for seagrass meadows 4. Recharging sediment to avoid drowning of coastal wetlands 5. Creating accommodation space for wetlands migrating with sea-level rise	Condition met. The module is applied applicable because the Project has both undrained peatlands and partially drained peatlands that meet the VCS definition, see § 3.3.1.4. In regard to conserving tidal wetlands, the Project has no tidal wetlands and so this portion of the applicability condition is not applicable.
11	VM0007 REDD+ MF, Avoiding Planned Wetland Degradation (APWD)	Avoiding planned wetland degradation activities are eligible under the following condition: Conversion of intact or partially altered wetlands to a degraded condition must be legally permitted.	Condition Met: All The Project land is all designated "Production Forest" or Hutan Produksi or Production KPH (see Govt. Reg P.6/2007, Chapter 2, Article 5(1), article 9(1)(a), Chapter IV, Part One, Article 17 and as such is legally eligible for conversion to non-forest land such as would occur through selective logging or clear felling for plantation forestry activity (HTI). See also Chapter IV, Part four, Paragraph 5, Articles 37-39 of Govt. reg P. 6/2007.
12	VMD0001 CP-AB	This module is applicable to all forest types and age classes. Inclusion of the above-ground tree biomass pool as part of the project boundary is mandatory as per the framework module REDD-MF.	Condition met. The Project Area includes a variety of forest types all of which are applicable to the module (i.e. all forest types and classes applicable). Further the Project includes above ground biomass as a carbon pool.
13	VMD0001 CP-AB	Non-tree aboveground biomass must be included as part of the project boundary if the following applicability criteria are met (per framework module REDD-MF):	Condition met. Non-tree above-ground biomass is excluded because it is greater in the project scenario than in the baseline scenario, and

No.	Module	Applicability Condition	Comment
		• Stocks of non-tree aboveground biomass are greater in the baseline than in the project scenario, and • Non-tree aboveground biomass is determined to be significant (using the T-SIG module). Belowground (tree and non-tree) biomass are not required for inclusion in the project boundary because omission is conservative.	Non tree biomass was not determined to be significant he baseline scenario assumes that all-natural forest biomass will be cleared for the establishment of forest plantations, and this will logically reduce baseline biomass to zero including Non-tree above-ground biomass to zero and significantly less than in the project scenario. Furthermore, the tier 2 emission factors[32] (insert citation for Krisnawati et all (2015)) for understory is between 3.30% to 4.94% of AGB which is significantly less than the estimates of total tree biomass used in the baseline and project scenarios. Belowground tree biomass (tree roots) is included because it is allowed. Below ground non- tree biomass organic soil) is included as it is allowed. Belowground non-tree biomass (organic soil) is included because it covers the entirety of the Project Area and is allowed
14	VMD0006 BL-PL	The module is applicable for estimating the baseline emissions on forest lands (usually privately or government owned) that are legally authorized and documented to be converted to non-forest land.	Condition Met: The Project land is all designated “Production Forest” or Hutan Produksi or Production KPH (see Govt. Reg P.6/2007, Chapter 2, Article 5(1), article 9(1)(a), Chapter IV, Part One, Article 17 and as such is legally eligible for conversion to non-forest land such as would occur through selective logging or clear felling for plantation forestry activity (HTI). See also Chapter IV, Part four, Paragraph 5, Articles 37-39 of Govt. reg P. 6/2007.
15	VMD0006 BL-PL	Where, pre-project, unsustainable fuelwood collection is occurring within the project boundaries Modules BL-DFW and LK-DFW must be used to determine potential leakage.	Condition not applicable. There is no history of fuelwood collection in the project area and this activity is excluded from the baseline and project scenarios. The Project does not avoid unsustainable fuelwood collection.

No.	Module	Applicability Condition	Comment
16	VMD0009 LK-ASP	The module is applicable for estimating the leakage emissions due to activity shifting from forest lands that are legally authorised and documented to be converted to non-forest land, including activity shifting to forested peatland that is drained as a consequence of project implementation. Under these situations, displacement of baseline activities can be controlled and measured directly by monitoring the baseline deforestation agents or class of agents.	Condition met. See § 5.5 Leakage Monitoring.
17	VMD0009 LK-ASP	This tool must be used for projects in areas where planned deforestation happens on forested peatlands, regardless of the absence of peatland within the project boundaries.	Condition met– The tool is used because the Project includes areas where planned deforestation is and has happened on forested peatlands directly adjacent to the Project Area. Additionally, the tool is justified because the Project activity avoids the baseline scenario of planned deforestation of 78,425 ha of planned deforestation of forested peatlands in the Project Area.
18	VMD0009 LK-ASP	The module is mandatory if module BL-PL has been used to define the baseline, and the applicability conditions in module BL-PL must be complied with in full.	Condition met. The Project has used module BL-PL and complied to BL-PL in full.
19	VMD0013 E-BPB	This module is applicable to REDD project activities with emissions from biomass burning and REDD-WRC project activities with emissions from biomass and/or peat burning. This module is also applicable to RWE and ARR-RWE project activities with emissions from peat burning.	Condition met. RER-CP does not have any fire in its baseline because there is no significant anthropogenic burning occurring in the Project Area in the baseline as there are have been no communities that live in or adjacent to the Project Area. Nature fire risk is virtually absent in the peat swamp, as it is far too wet for lightning strikes, even in the “dry season”. The Project has not had any peat or biomass fires in the Project Area since the Project Start date so far. The Project commits to accounting all anthropogenic fire that might occur in the future with E-BPB, as required.
20	VMD0015 M-REDD	Strata as defined in the relevant baseline modules are fixed and may not be changed without baseline revision.	Condition met. Strata are fixed according to § 3.3.1.2. Strata may be revised upon baseline adjustment at year 10.

No.	Module	Applicability Condition	Comment
21	VMD0015 M-REDD	The module is mandatory for REDD, CIW-REDD, RWE-REDD and stand-alone CIW project activities.	Condition Met: The Project has applied all relevant aspects of VM0015 M-REDD in its monitoring approach as the Project falls under four categories of REDD, CIW-REDD, RWE-REDD and stand-alone CIW project activities.
22	VMD0015 M-REDD	Where selective logging is taking place in the project case: Emissions from logging may be omitted if it can be demonstrated the emissions are de minimis using Tool T-SIG. If emissions from logging are not omitted as de minimis, logging may only take place within forest management areas that possess and maintain a Forest Stewardship Council (FSC) certificate for the years when the selective logging occurs. Logging operations may only conduct selective logging that maintains a land cover that meets the definition of forest within the project boundary. All trees cut for timber extraction during logging operations must have a DBH greater than 30 cm. During logging operations, only the bole/log of the felled tree may be removed. The top/crown of the tree must remain within the forested area. The logging practices cannot include the piling and/or burning of logging slash Volume of timber harvested must be measured and monitored.	Condition not applicable. The Project does not involve selective logging or any timber harvesting because the current legal licenses for each of the areas is IUPHHK-RE License, i.e., Ecosystem Restoration License, see § 1.7.2. For selective logging to occur the concessions would have to have a license to selectively harvest timber, this would be a IUPHHK-HTR license.
23	VMD0016 X-STR	In case of REDD, above-ground biomass stratification is only used for pre-deforestation forest classes, and strata are the same in the baseline and the project scenario. Post-deforestation land uses are not stratified. Instead, average post-deforestation stock values (e.g. simple or historical area-weighted approaches are used, as per module BL-UP).	Condition met. Above-ground biomass stratification is only used for pre-deforestation forest classes, and strata are the same in the baseline and the project scenario. Post-deforestation areas are classified simply as "plantation/infrastructure".
24	VMD0016 X-STR	For peatland rewetting and conservation project activities this module must be used to delineate non-peat versus peat and to stratify the peat according to peat depth and soil emission characteristics unless it can be demonstrated that the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario are *de minimis*	Condition met. See application of X-STR in § 3.3.4.2 and 3.3.4.3.
25	VMD0016 X-STR	In the case of WRC project activities, the project boundary must be designed such that the negative effect of drainage activities that	Condition met. The Project is taking significant steps to maintain the intactness of hydrology in the project area and

No.	Module	Applicability Condition	Comment
		occur outside the project area on the project GHG benefits are minimized.	to restore hydrology in areas which have been disturbed by existing drainage. The Project is monitoring areas outside the Project are which could be under threat of disturbance in ordered to minimise potential impacts in terms of drainage. See § 5.3.2.1 (2c) Ground Water Table & Subsidence Monitoring, (2e) Dam & Canal Monitoring and (3) Leakage Monitoring.
26	VMD0017 X-UNC	The module is mandatory when using VCS methodology VM0007. It is applicable for estimating the uncertainty of estimates of emissions and removals of CO_2-e generated from REDD and WRC project activities. The module focuses on the following sources of uncertainty: Determination of rates of deforestation and degradation Uncertainty associated with estimation of stocks in carbon pools and changes in carbon stocks Uncertainty associated with estimation of peat emissions Uncertainty in assessment of project emissions	Condition met. X-UNC has been used throughout to estimate uncertainties associated with this Project. See § 5.6 Uncertainty Monitoring.
27	VMD0017 X-UNC	Where an uncertainty value is not known or cannot be simply calculated, then a project must justify that it is using an indisputably conservative number and an uncertainty of 0% may be used for this component.	Condition met. In all cases where an uncertainty value is not known or cannot be simply calculated, the Project provides a justification that the value used is an indisputably conservative number (or an IPCC default value as instructed by VM0007.
28	VMD0017 X-UNC	Guidance on uncertainty – a precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value shall be targeted. This is especially important in terms of project planning for measurement of carbon stocks; enough measurement plots should be included to achieve this precision level across the measured stocks.	Condition met. Uncertainty requirements have been taken into account in project planning and carbon stock calculations as per See § 5.6 Uncertainty Monitoring.
29	VMD0042 BL-PEAT	This module is applicable to RDP and CUPP activities on project areas that meet the VCS definition for peatland. The scope of this module is limited to domed peatlands in the tropical climate zone.	Condition met. See #8 above.
30	VMD0042 BL-PEAT	It must be demonstrated by using the latest version of the CDM A/R methodological tool: "Tool for testing significance of GHG emissions in A/R CDM project activities" (T-SIG) that N_2O emissions in the project scenario are not significant, or it must be demonstrated that	Condition met. GHG emissions (specifically N_2O) are excluded from the baseline and project scenarios. The potential emissions sources are fire and nitrogenous fertilizer

No.	Module	Applicability Condition	Comment
		N_2O emissions will not increase in the project scenario compared to the baseline scenario, and therefore N_2O emissions need not be accounted for.	applications, which are both assumed to be absent in both the baseline and project scenarios. Therefore, the net GHG emissions from both the baseline and project scenarios are estimated to be zero which is less than 5% of the total decreases in carbon pools and increases in emissions and less than 5% of net anthropogenic removals by sinks.
31	VMD0042 BL-PEAT	In the baseline scenario, the peatland must be (partially) drained. At project start, the peatland may still be undrained	Condition met. The baseline scenario is of industrial pulpwood plantation in peatsoil that requires substantial water table management (i.e. lowering). At the start of the project the vast majority of the Project Area remained undrained. See § 3.4 baseline scenario and §4.1 Baseline Emissions.
32	VMD0044 LK-ECO	Leakage caused by hydrological connectivity is avoided by project design and site selection, as outlined in Chapter 5 (Procedures of VMD0044).	Condition met. Ecological Leakage does not occur in the Project. See application of LK-ECO in § 4.3.4 Estimation of Emissions from Ecological Leakage.
33	VMD0046 M-PEAT	This module is applicable to RDP and CUPP activities as defined in the VCS Standard.	Condition met: The Project is one where some peatlands are rewetted, i.e. Restoration of Drained Peatlands a.k.a. Restoring Wetlands Ecosystems (RWE). The Project is one where the partially drained peatland is preserved i.e., Conservation of undrained and partially drained peatlands (CUPP) a.k.a. Conservation of Intact Wetlands (CIW)
34	VMD0046 M-PEAT	The project area must meet the VCS definition for peatland. This module is limited to domed peatlands in the tropical climate zone.	This project area is located in and area with layering of naturally accumulating organic matter (peat). The Project is located in a tropical climate zone and on a wetlands forest peat dome system.
35	VMD0046 M-PEAT	Furthermore, the following applicability conditions apply: It must be demonstrated using tool T-SIG that N_2O emissions in the project scenario are not significant, or it must be demonstrated that	Conditions Met: The baseline and project scenarios exclude emissions from fire and so N_2O emissions from fire are not calculated. Furthermore, N_2O emissions in

No.	Module	Applicability Condition	Comment
		N_2O emissions will not increase in the project scenario compared to the baseline scenario, and therefore N_2O emissions need not be accounted for.	the baseline assessment are entirely the result of the application of fertilizers to plantations. The project scenario excluded all plantation development and result in the elimination of all N_2O emissions from fertilizer, thus N_2O emissions will not increase.
36	VMD0046 M-PEAT	In the baseline scenario the peatland must be drained or partially drained.	Condition Met: Under the baseline scenario, the peatland area would have been drained for Acacia plantation activity.
37	VMD0046 M-PEAT	At project start the peatland may still be undrained.	Condition met: at the project start date the project area was not drained for industrial plantation activity and was only partially drained in less than 10,000 ha of the Project Area. See §4.1.5.1
38	VMD0046 M-PEAT	It must be demonstrated using Module LK-ECO that ecological leakage must not occur	Condition Met: Per § 4.3.4, Ecological Leakage does not occur in this Project and all measures have been taken to ensure Ecological Leakage remains = 0. [LK-ECO]
39	T-SIG EB 31	The tool shall be used in the application of an A/R CDM approved methodology to an A/R CDM project activity: To determine which decreases in carbon pools and increases in emissions of the greenhouse gases measured in CO_2 equivalents that result from the implementation of the A/R project activity, are insignificant and can be neglected. b) To ensure that it is valid to neglect decreases in carbon pools and increases in GHG emissions by sources stated as being insignificant in the applicability conditions of an A/R CDM methodology.	Condition met. T-Sig was used to guide the selection of GHG emissions and carbon pools.
40	T-ADD EB 35 Annex 19	Forestation of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if the law is not enforced.	Condition Met – The Project included “Step 0” of the Tool as an additional procedure as part of the stepwise additionality analysis mandated by T-ADD as set forth in § 3.6
41	T-ADD EB 35 Annex 19	This tool is not applicable to small - scale afforestation and reforestation project activities.	Condition not applicable
42	E-NA EB 33 Annex 16	This tool is not applicable when: • A/R CDM project activities are implemented on wetlands. • Flooding irrigation or any flood has occurred within period of 3 months from date of fertilization.	Condition not applicable Project activities do not apply any nitrogenous fertilizer, and project activities are implemented on wetlands.

Table 35- Summary of applicability conditions

3.3 Project Boundary

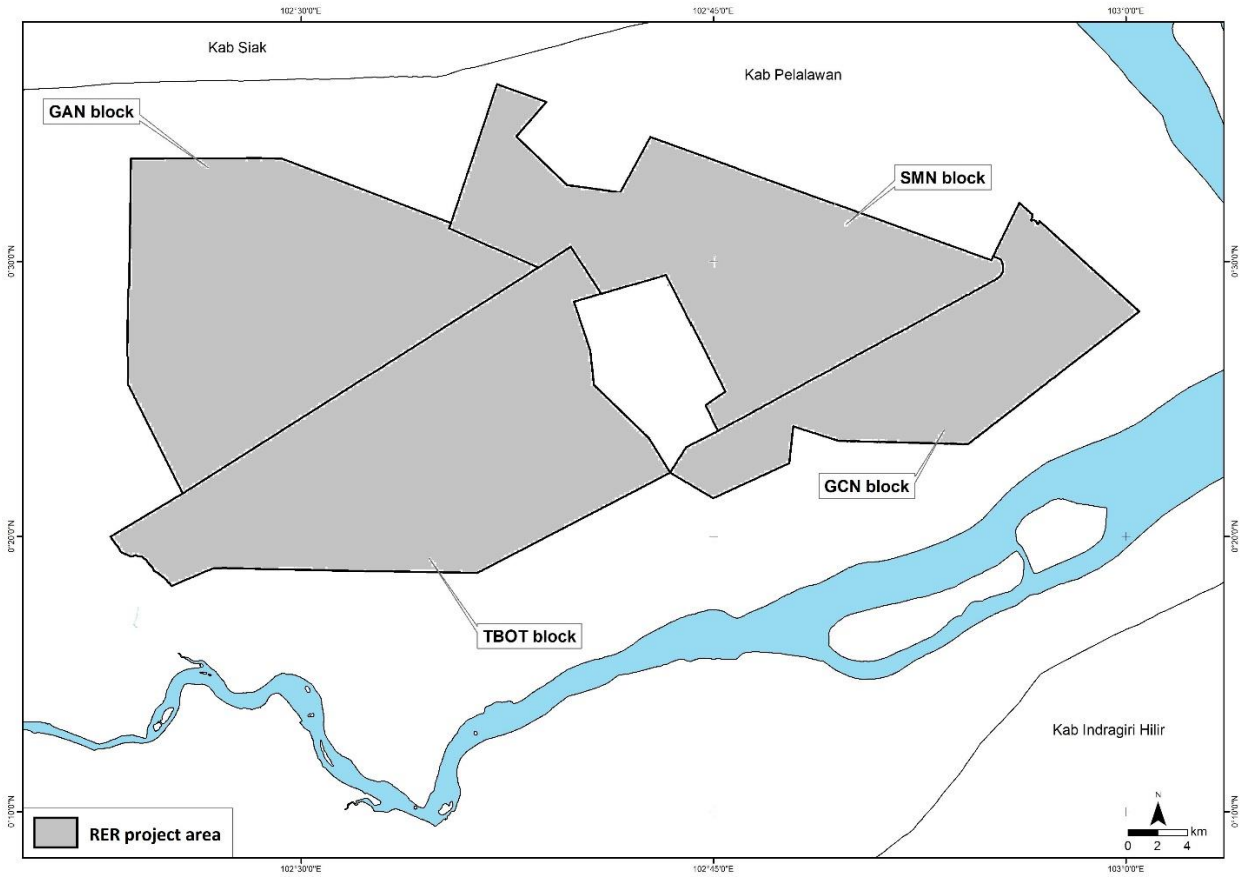
3.3.1 General

The Project area includes all lands areas encompassed within the legal boundaries of the following four Indonesian Forestry concessions located on the Island of Sumatra and the Province of Riau. Togeth they are cumulatively referred to as Riau Ecosystem Restoration Carbon Project (RER-CP and consist of:

1. PT. Gemilang Cipta Nusantara (GCN) – License/Decree No; SK.395/Menhut-II/2012
2. PT. The Best One Unitimber (TBOT) – License/Decree No.: SK.747/Menhut-II/2014
3. PT. Sinar Mutiara Nusantra (SMN) – License/Decree No.: SK.162/Menhut-II/2014
4. PT. Global Alam Nusantara (GAN) – License/Decree No.: SK.230/Menhut-II/2014

The areas of the 4 concessions that make up the Project area are PT. Gemilang Cipta Nusantara (20,123 ha), PT. The Best One Unitimber (40,666 ha), PT. Sinar Mutiara Nusantra (32,776 ha) and PT. Global Alam Nusantara (36,525 ha). The total land area is 130,090 hectares. The four concessions are granted by the Ministry of Forestry under an Ecosystem Restoration license which is described in section §1.7 Ownership. The Project area is shown in the map below.

The geographical boundaries are derived from legally mandated boundary survey and whose coordinates have been captured in GIS. The boundary surveys (SK Tata Batas) are listed in the tables of §1.7.2 Approval of Ownership Documentation and a physical copy of the same will be provided to the auditor upon request. A digital copy of all of the concession boundary data in GIS format will be made available to the Project's auditor, which will be separate from the mandatory Project Area .kml file. The project area contains no land areas registered under the CDM or any other GHG program. The Project boundaries are fixed and will not change over the lifetime of the Project.



Map 15- Boundary map of the Project area with the boundaries of the four concessions

3.3.2 REDD and WRC Boundaries

The overall purpose of section 3.3.3 is to describe the REDD and WRC activity boundaries. This is achieved by first stratifying the project area into discrete, relatively homogenous units from which the boundaries of eligible activities can be determined. All of the REDD activity takes place in an area that has qualified as a forest for more than 10 years prior to the start date of the Project; it has qualified as part of the Indonesian forestry estate, and specifically as production forest. (See below at §3.5.3.1 and Maps 27 & 28). WRC activity in the RER Project Area takes place on peat swamp forests that are internationally recognised as such[33], and by the Indonesian government in their national peatland maps.

3.3.3 Spatial Boundary of the Project Area

The Project Area, in order to clarify boundaries of project activities was required to be stratified into discrete units of land that have relatively homogeneous emission and/or carbon stock characteristics (per VCS methodology VMD0016 - X-STR). This includes stratification by:

- Aboveground biomass (AGB) & vegetation types
- Soil types (peat or non-peat soils)
- Peat thickness and peat depletion time (PDT)

- Peat drainage status

The following sub-sections bellow, § 3.3.4.1 (AGB stratification), §3.3.4.2 (BGB stratification) and § 3.3.4.3 (drained peatland stratification) describe the various spatial boundaries of the Project Area in much greater detail in order to clearly map out the boundaries of each project category and subsequent project activity.

3.3.3.1 Above-ground Biomass (AGB) Stratification

A. **Mapping of vegetation cover types**

In order to classify the above ground carbon stock, the Project Area was stratified into homogeneous classes based on characteristics of the landcover. Remotely sensed imagery assisted with the delineation of the project area based on the various vegetation types and structures as well as land cover features. Additionally, on the ground field data was used to verify and quantify above-ground biomass (AGB) and carbon (C) in each stratum. All of the data, satellite imagery and actual field data were subsequently calibrated and cross-checked and re-calibrated as necessary. Figure 20 sets forth the process used by the Project for stratification of AGB.

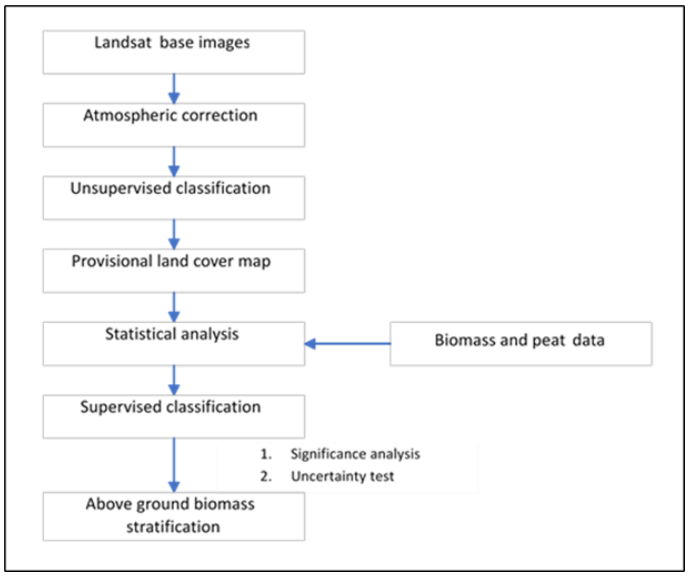


Figure 20- Above-ground stratification process

Spectral data from 18 May 2013 Landsat imagery - number L8 180612 Lv5, downloaded from the USGS online database was used to map the land cover classes. The land cover class analysis was conducted using supervised classification with training points using 169 inventory plots. In addition, the Peat Dome Forest in PT. GAN was identified as a unique and distinct ecosystem being discernible from its spectral signature and texture from the satellite image and observed in the field during flyovers. The data acquisition, pre-processing, classification and accuracy assessment methods followed the steps outlined in §4.1.1.

Satellite images used for the process of stratification and AGB analyses are provided in Table 36. The result of the stratification exercise based on the field data and combined Landsat analyses is provided in Map 16 and Table 36.

No	Satellite sensor	ID	Dated
1	Landsat 8	LC81260602019138LGN00	18 June, 2013

Table 36- Satellite imagery used for stratification

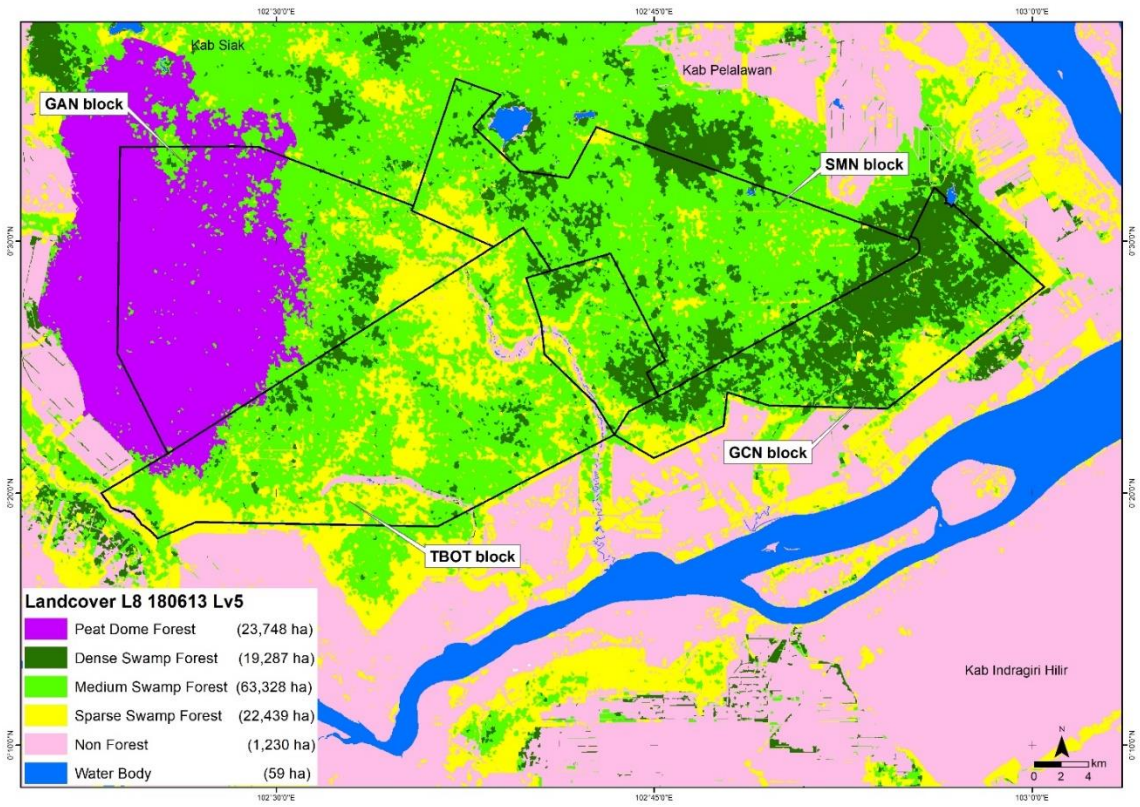
No	Vegetation type	Hectares	%
1	Peat Dome Forest	23,748	18.3
2	Dense Swamp Forest	19,287	14.8
3	Medium Swamp Forest	63,328	48.7
4	Sparse Swamp Forest	22,439	17.2
5	Non-Forest	1,230	0.9
6	Water Bodies	59	0.0
7	Total Area	130,090	100.0

Table 37- Land cover of the project area based on the Landsat and PALSAR analyses

B. Biomass estimation using forest inventory

Above ground biomass was sampled using 169 sampling plots[34] distributed across the project area (both randomly and systematically along 34 transects crossing the project area). The plot data was used to calculate the mean AGB for each stratum.

All landcover types were statistically significantly different and had biomass means more than 20% different from each other. As per VCS methodology module VMD0016 (X-STR), all strata with means were separated.



Map 16- Stratification of the project area based on the Landsat analyses

For the purposes of AGB stratification, we have combined Peat Dome Forest, Dense Swamp Forest, Medium Swamp Forest, and Sparse Swamp Forest into a single class called Swamp Forest Vegetation. Non-Forest and Water Bodies have been combined into the classification of “Non-forest vegetation” (see Map 16 and Table 38).

No.	Vegetation type	Hectares (ha)	%

1	Forest vegetation	128,801	99
2	Non-forest vegetation	1,289	1
3	Total	130,090	100

Table 38- Final AGB stratification summary of the project area

As mandated by the VCS methodology VM0007 in module VMD0015 (M-REDD), the classification accuracy must be at least 90%. The suitability of the classification was assessed using standard ANOVA and Scheffé's method (single-step multiple comparison procedure) for testing *post hoc* differences between means.

The ANOVA indicates that the model (stratification) was significant at 95% confidence level.

ANOVA							
Source	SS	df	MS	F	F_% CL95	Significant Diff	R^2
Model	1,707,579	3	569,193	284	2.66	Yes	84%
Error	331,191	165	2,007				
Total	2,038,769	168					

Table 39- ANOVA test for stratification model

The Scheffé analysis demonstrated that all post hoc differences between means were significant at 95% confidence level.

Scheffé Analysis			
Forest Type	N	SS	Avg.
Peat Dome Forest	10	28,142	199.3
Dense Swamp Forest	50	93,500	150.3
Medium Swamp Forest	92	89,076	112.7
Sparse Swamp Forest	17	120,473	78.4
	SSE	331,191	
	MSE	1,995	
	p	0.05	
	k	3	
	N	169	
	F(p, k-1, N-k)	3.05	

Pair Wise Differences Between Sample Means				
Forest Type	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest
Peat Dome Forest		49.0	86.6	120.9
Dense Swamp Forest			37.6	71.9
Medium Swamp Forest				34.3
Sparse Swamp Forest				

Table 40- Scheffé Analysis

Scheffé Comparison Values				
Forest Type	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest
Peat Dome Forest		38.2	36.7	44.0
Dense Swamp Forest			19.4	31.0
Medium Swamp Forest				29.1

Sparse Swamp Forest				
Significant Differences				
Forest Type	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest
Peat Dome Forest		Yes	Yes	Yes
Dense Swamp Forest			Yes	Yes
Medium Swamp Forest				Yes
Sparse Swamp Forest				

Table 41- Scheffé Comparison Values and Significant Differences

All forestry classifications are statistically significantly different at 95% confidence level as is recommended from each other as is recommended in the IPCC Good Practice Guidance 2003[35]. Furthermore, alternative forest classifications were used, and none of these classifications were able to meet the 95% confidence level threshold. The level of uncertainty was found to be 8.6% which comports with the requirements of VSC methodology VM0007 and module VMD0017 (X-UNC).

C. AGB carbon stock estimation

Using the AGB map of the Project Area, carbon stock was quantified for each stratum. Project equation 1 is derived from equation 1 of module VMD0001 CP-AB.

$$C_{AB\_tree,sp,i} = \sum_{j}^{S} \sum_{l=1}^{N_{j,sp,i}} f_j(X, Y...) * CF_j \quad (1)$$

Where:

$C_{AB\_tree,sp,i}$ = Carbon stock in aboveground biomass of trees in plot *sp* in stratum *i*; t C

CF_j = Carbon fraction of biomass for species group *j*; t C t^{-1} d.m.

$f_j(X,Y..)$ = Aboveground biomass of trees based on allometric equation for species group *j* based on measured tree variable(s); t. d.m. $tree^{-1}$

i = *1, 2, 3, …M* strata

j = *1, 2, 3 … S* tree species

l = *1, 2, 3, …* $N_{j,sp,i}$ sequence number of individual trees of species group *j* in sample plot *sp* in stratum *i*

The AGB carbon stock of the Project Area was found to be 7,768,160 t.C for the forest stratum. We assume there is no above-ground forest-related carbon for the non-forest stratum. AGB carbon stock stratification in the Project Area at the beginning of the Project is set forth in Map 16, and the calculation results for each stratum is provided in Table 42 below.

Strata	Strata Area (ha)	Average AGB (t. ha^{-1})	Total AGB C Stock (t C)
Peat Dome Forest	23,748	199.3	2,224,471
Dense Swamp Forest	19,287	150.3	1,362,461
Medium Swamp Forest	63,328	112.7	3,354,410
Sparse Swamp Forest	22,439	78.4	826,819

Non-Forest and Water Bodies	1,289	0	0
Total	130,090		7,768,160

Table 42- AGB carbon stock in the Project Area at the project start

3.3.3.2 Below-ground Biomass (BGB) Stratification

A. **Stratification of Peatland and Non-Peatland**

The Kampar Peninsula is almost entirely made up of a complete peat dome formation. This is confirmed by both the Government peatland maps[36] and multiple peat surveys that have been conducted.

The RER project boundaries are located entirely within this peat landscape. Peat depth measurements have been taken at three points in time:

- The initial carbon survey conducted in 2015 comprised of 293 plots.
- University of Riau (UNRI) conducted a soil survey across the Kampar Peninsula in 2019. 32 plots of the UNRI survey were located in PT GAN and were used for this analysis.
- In September 2020, RER-CP conducted its own supplementary soil survey of 118 peat soil cores comprising of 18 samples in PT GAN, 20 samples PT SMN, 52 samples in PT TBOT and 28 samples in PT GCN.

In total, 443 points within the project boundaries, and peat depth values have ranged from 298 cm (which is an outlier) to 1,549 cm. We can safely assume that 100% of the project area is covered in peat soils and that there are no significant areas where peat is less than 0.5m (i.e. mineral soils).

B. **Stratification of Peat Thickness and PDT**

The main peatland stratification tasks for the RER Project involves the stratification of peat according to peat depth and peat characteristics per VMD0016 (X-STR). Peatland covers the whole landscape area. Our calculations indicate that no areas exist within the Project where the crediting period exceeds the peat depletion time (PDT). However, for the sake of conservatism and to avoid all doubt peat will be stratified according to peat soil depth at 50cm strata from 350cm up to 1500cm.

The rate of peat depletion in the project area was calculated based on the following, which are then each considered in more detail below:

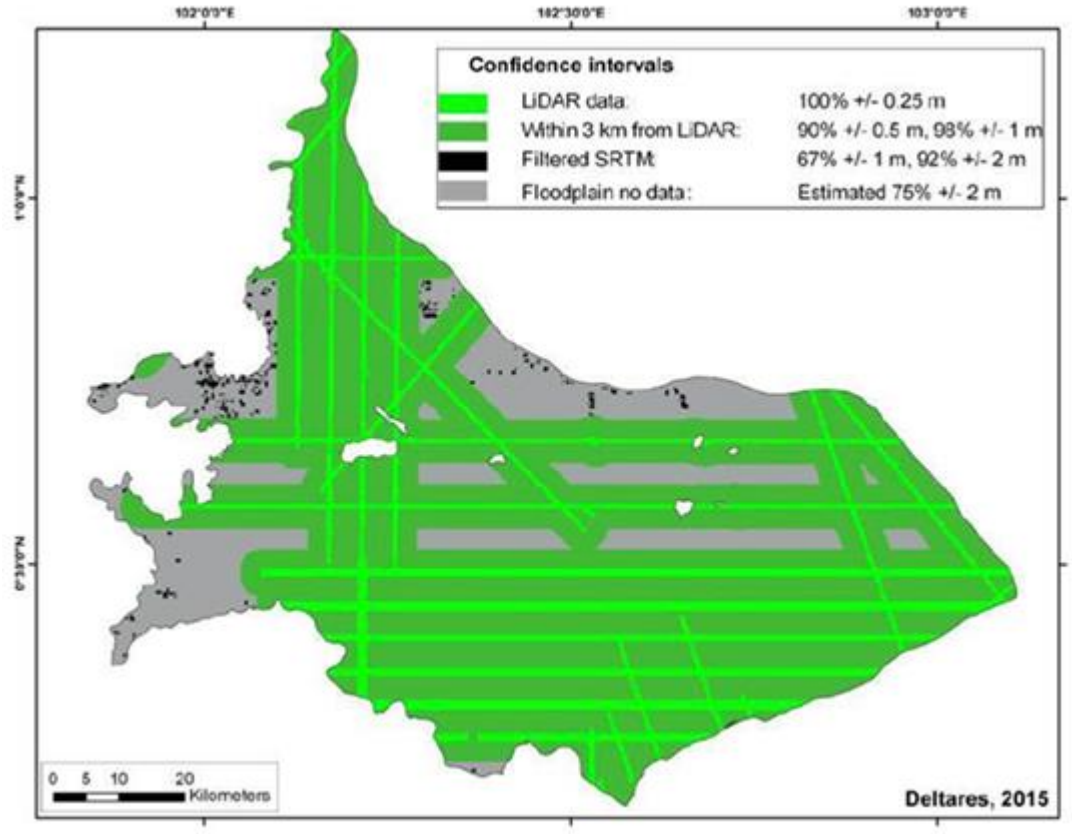
- Surface elevation;
- Peat thickness;
- Drainability elevation limit; and
- Subsidence related to microbial decomposition and burning.

Digital Elevation Model and Drainability Elevation Limit

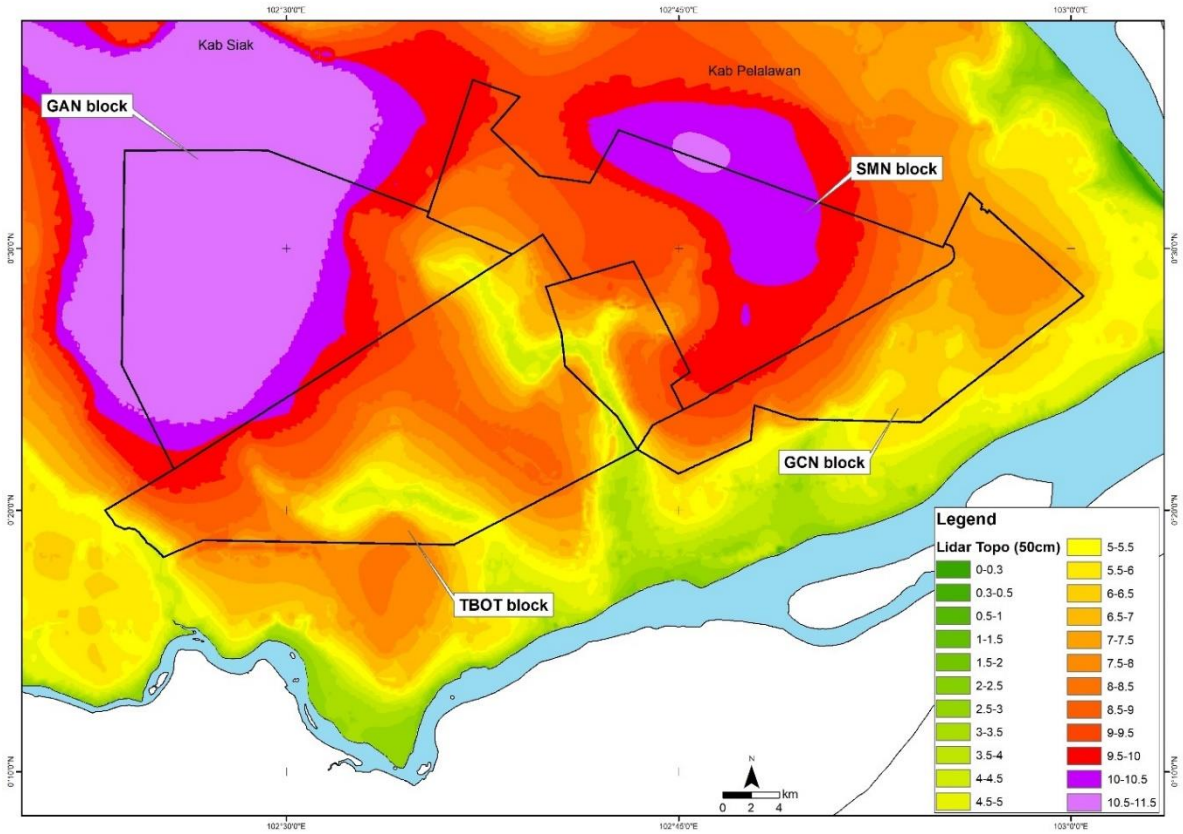
The deforestation agents in the baseline scenario were conservatively assumed to not practice mechanical pumping. The result is that any thickness of peat that would be lost is restricted by the Drainability Elevation Limit (DEL) – the elevation at which the peat cannot be drained any further

without mechanical pumping, defined by the water level in the closest water body. As subsidence proceeds over time and the land surfaces eventually reach the DEL, additional drainage will nonetheless be avoided as the remainder of the peat layers will remain waterlogged. For the purposes of the RER Project, the DEL will be set at sea level, i.e. 0.0m altitude.

To create a surface elevation map (Digital Elevation Model, DEM), LiDAR data was used from a survey that was conducted by Deltares Indonesia[37], an independent institute for applied research in the field of water and subsurface. Strip lines of LiDAR images were collected with strip spacing between individual LiDAR flight lines for the LiDAR data ranging between 5 and 10 km (See Map 17). The elevation model has been generated through inverse distance interpolation using the LiDAR strip data, the filtered and corrected SRTM-30 data, and contour lines based on interpretation of LiDAR strip data. Accuracy is estimated to be a) within 0.25 m, on the LiDAR strip data; b) within 0.5 - 1.0 m, 3 km from LiDAR strip data; and c) within 2.0 m, more than 3 km from LiDAR strip data. Approximately 90% of the project area is located on the LiDAR strip data or within 3km of LiDAR strip data.



Map 17- LiDAR data collection on the Kampar Peninsula



Map 18- Digital elevation model of the project area

Given that 100% of the peat is at or above the DEL, we assume that 100% of the peatlands are available for microbial decomposition and burning.

Peat thickness

To determine peat thickness, data from 3 peatland surveys were combined.

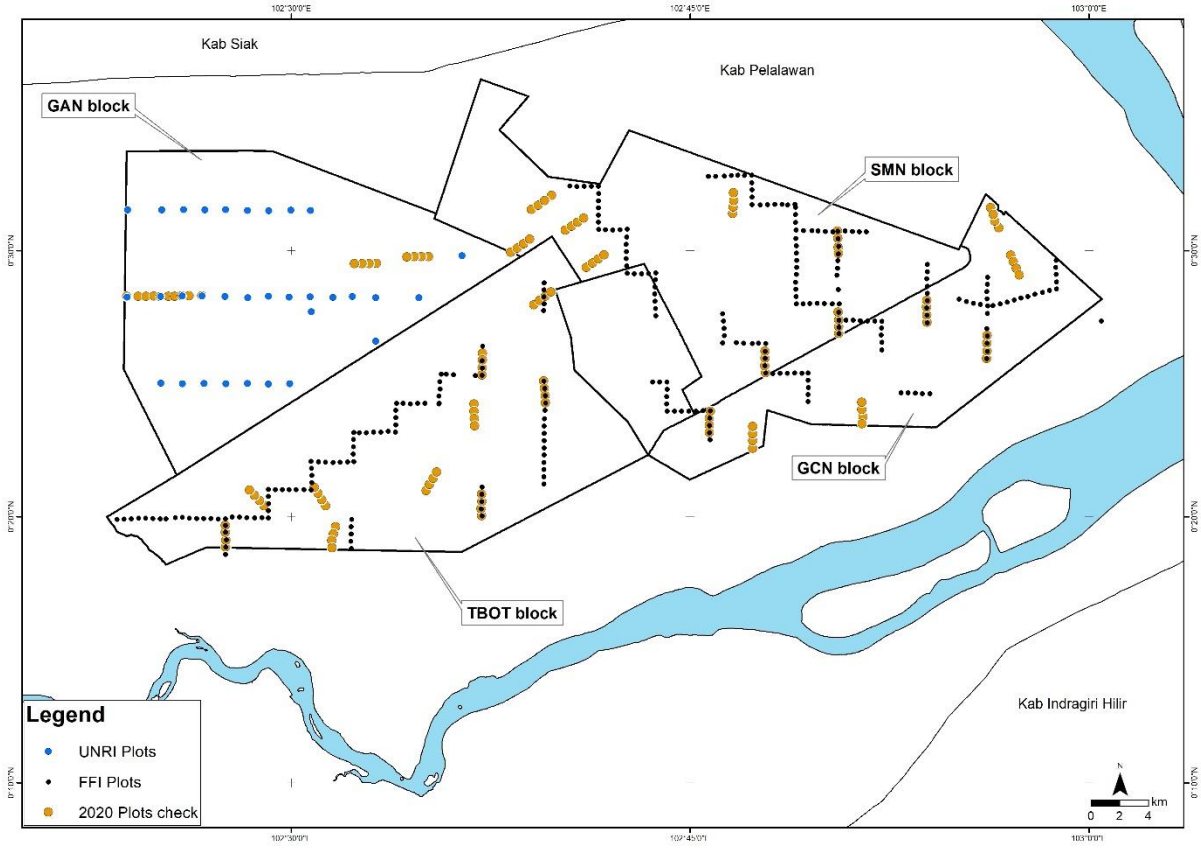
1. Initial Peat Survey. The Project conducted a peat auger soil survey of GCN, TBOT and SMN blocks in 2015 comprising 292 peat depth measurements. The peat depths of the plots ranged from 2.98m to greater than 11.0m (11.0m was the maximum of the peat auger length). Sample locations were selected using a systematic location of transects across the landscape. The transects were orientated in a north-south direction with up to 5 peatland sample plots measured at a spacing of 200m between plots.

Descriptive	GCN	TBOT	SMN	RER ERCs
Minimum	5.25	2.98	7.35	2.98
Maximum	9.90	11.00	10.79	11.00
Mean	7.56	7.19	8.88	7.89
95% CI	0.11	0.12	0.07	0.07
N	80	109	103	292

Table 43- Peat Depth Values from Initial Peat Survey (all values in meters)

2. University of Riau Survey. The University of Riau conducted a peat depth survey in 2019 of the whole Kampar Peninsula. A total of 32 plots were located in the GAN block. The peat depths of the plots averaged 11.31m and ranged from 5.96m to greater than 15.49m. Sample locations were selected using a systematic design of 3 east-west transects.
3. 2020 Peat Survey. RER-CP conducted a peat auger soil survey of GAN, GCN, TBOT and SMN blocks in 2020 comprising 118 peat soil samples. These plots were taken to verify the earlier surveys for the presence or absence of peat and peat thickness and soil characteristics in the visited locations as shown from soil samplings.

In total, 443 peat soil depth measurements have been collected throughout the RER project area using peat augers. See Map 19 below. A record of these sample points and their respective depths and soil characteristics is shown in Appendix 9 – Peat Inventories of the Project Area.



Map 19- Map of peatland soil surveys

This sampling design fulfils the requirements described in the VCS methodology VM0007 modules VMD0042 (M-PEAT) and VMD0016 (X-STR). Peat thickness was then modelled based on spatial interpolation (Kriging method) of inputs from peat thickness points.

A peat depth model was then derived from the peat depth sample points as follows. Project equation 2 derived from the regression line of Figure 21:

$$Peat\ Depth\ (cm) = 94.997 * Altitude\ (m) \quad (2)$$

The ANOVA indicates that the regression model (stratification) was significant at 95% confidence level.

ANOVA						
Source	SS	df	MS	F	F_% CL95	Significant Diff
Regression	304,411,438	1	569,193	284	2.66	Yes
Error	4,424,410	442	2,007			
Total	308,835,848	443				

Table 44- ANOVA test for regressions model (stratification)

The coefficient estimate was significant at 95% confidence level.

Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
94.99692	0.544747897	174.3869	0	93.9263	96.06753

Table 45- Coefficient estimate of ANOVA test

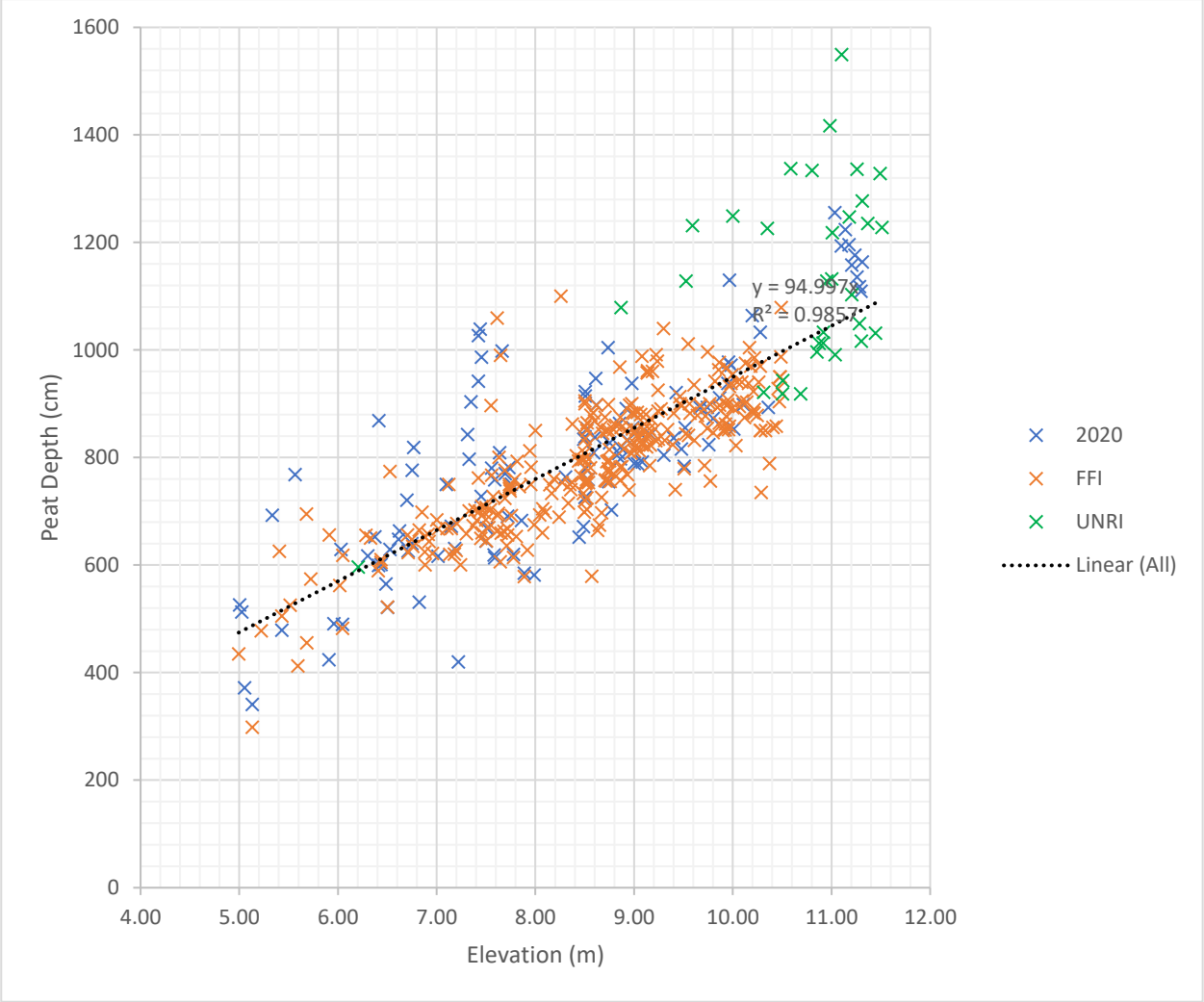


Figure 21- Peat Depth (m) Against Elevation (m) Graph

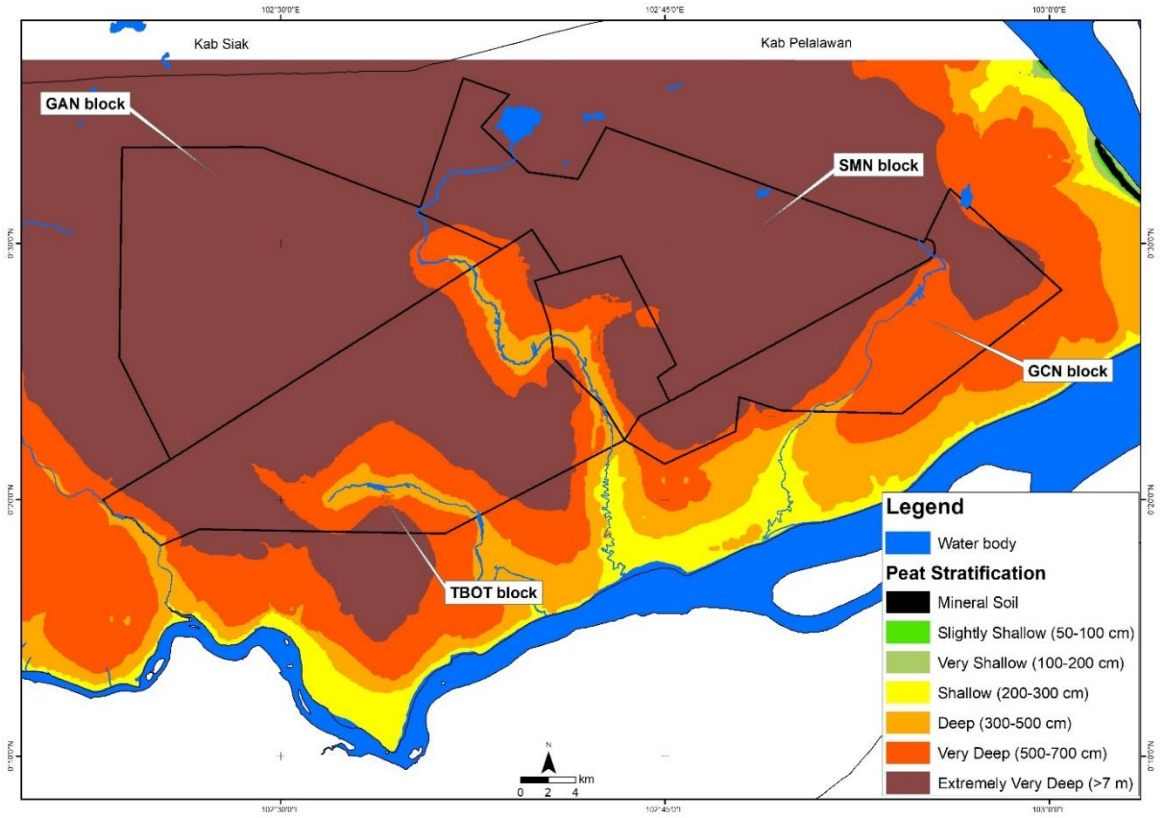
The peat depth model and the regression parameters are significant at 95% confidence level and provide an accurate and precise predictor of peat soil depth in accordance with X-UNC.

A peat depth map was then generated from the altitude map by estimating peat depth as a function of peat altitude at each point of the digital terrain model. As per VCS module VMD0016 (X-STR), our initial analysis indicated that the entire peatland in the Project Area must be stratified. Stratification by peat

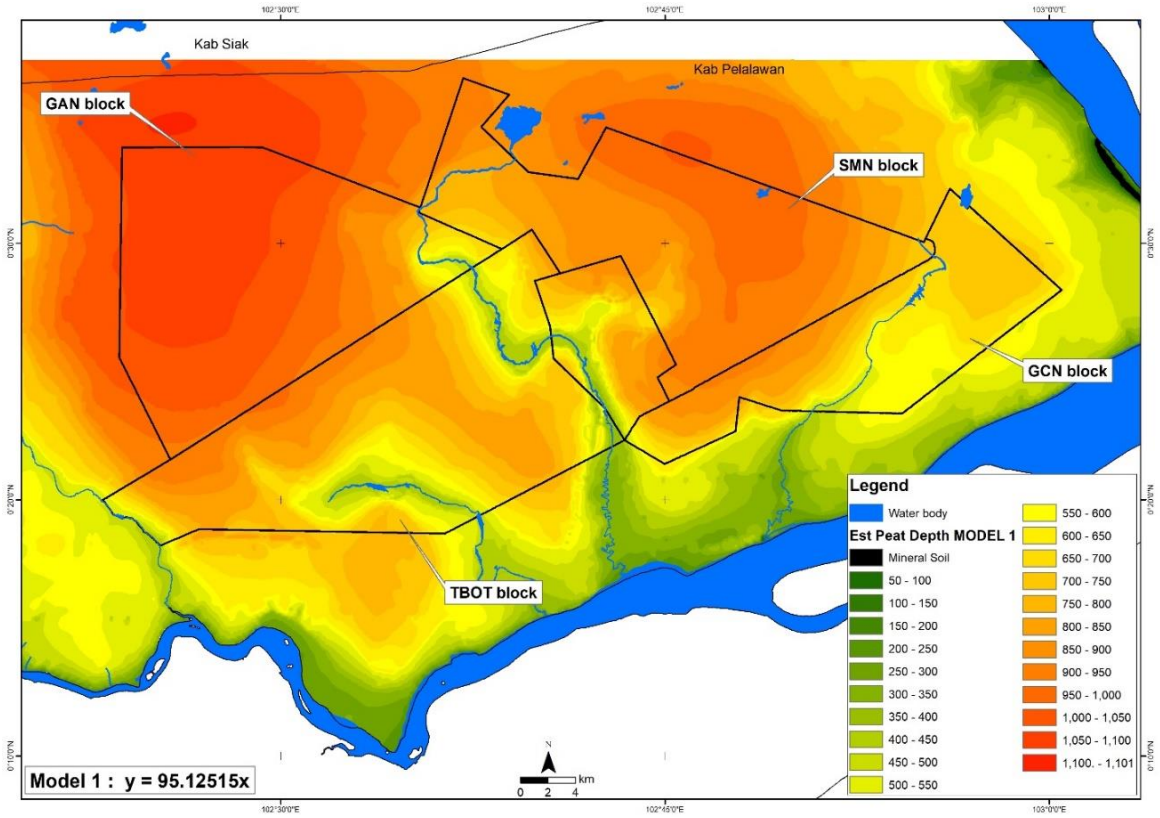
thickness at a 50 cm resolution was. The project area was stratified into 3 classes, as presented in Table 46 and Map 20.

Peat Depth Class (SNI)	Peat Depth (cm)	Total (ha)	PT. GAN (ha)	PT. GCN (ha)	PT. SMN (ha)	PT. TBOT (ha)
Deep	350-400	190	0	0	0	190
	400-450	1,776	0	5	0	1,771
	450-500	2,170	148	184	0	1,837
Very Deep	500-550	3,650	247	651	0	2,751
	550-600	5,732	373	3,024	0	2,335
	600-650	6,260	498	2,482	4	3,275
	650-700	6,476	496	2,981	290	2,709
Extremely very deep	700-750	12,999	330	5,431	1,180	6,058
	750-800	9,111	380	999	2,631	5,101
	800-850	15,844	816	2,133	4,516	8,379
	850-900	13,902	1,781	1,781	7,105	3,235
	900-950	15,651	2,845	452	9,595	2,760
	950-1000	12,599	5,049	0	7,285	264
	1000-1050	9,525	9,355	0	170	0
	1050-1100	14,205	14,205	0	0	0
Total		130,090.00	36,524.90	20123.30	32,776.30	40,665.50

Table 46- Peat thickness stratification of the project area



Map 20- Final peat stratification of the project area



Map 21- Peat thickness stratification of the project area (estimated at 50cm resolution)

Peat depletion time (PDT)

A peat depletion time (PDT) table was created. The resulting PDT table was based on the above peat thickness map, the DEM, the DEL and the calculated peat subsidence in the baseline scenario (see § 3.4). Table 47 sets forth the calculation of the Project Area PDT stratification. Project equation 3 is derived from equation 23 of module VMD0016 X-STR.

$$tPDT - BSL_i = \frac{Depth_{peat-BSL_i}}{Rate_{peatlost-BSL_i}} \quad (3)$$

Where:

tPDT-BSL,i Peat depletion time in the baseline scenario in stratum i in years elapsed since the project start (yr)

Depth peat-BSL,i Average peat depth in the baseline scenario in stratum i at project start (m). In this case = peat thickness available for microbial decomposition

Rate peat loss-BSL,i Rate of peat loss due to subsidence and peat burning in the baseline scenario in stratum i; (m yr-1)

Peat Depth Class (SNI)	Peat Depth (cm)	PDT Range (years)	Area (ha)	% of the peat area	% of the project area

Deep	350-400	91-104	190.2	0%	0%
Very Deep	400-450	104-117	1,776.30	1%	1%
	450-500	117-130	2,170.10	2%	2%
	500-550	130-143	3,649.90	3%	3%
	550-600	143-156	5,732.10	4%	4%
	600-650	156-169	6,259.80	5%	5%
	650-700	169-182	6,475.80	5%	5%
Extremely Very Deep	700-750	182-195	12,998.60	10%	10%
	750-800	195-208	9,110.60	7%	7%
	800-850	208-221	15,843.70	12%	12%
	850-900	221-234	13,902.20	11%	11%
	900-950	234-247	15,651.50	12%	12%
	950-1000	247-260	12,598.90	10%	10%
	1000-1050	260-273	9,525.10	7%	7%
	1050-1100	273-286	14,205.30	11%	11%
Total			130,090.	100%	100%

Table 47- Summary of the PDT stratification of the project area

0% of the peatland in the project area are expected to deplete before reaching the end of the 57-year crediting period, 100% are likely to exceed the peat depletion time of 100 years.

Areas by Peat Depth Start of Project - by Baseline Development Area (ha)									
	Years of Project Development and Conservation Areas (ha)								
Peat depth (cm)	2016	2017	2018	2019	2020	2021	2022	Conservation Area (ha)	Total Area (ha)
350-400	0	0	0	0	0	0	0	190	190
400-450	12	22	0	23	2	0	0	1,718	1,776
450-500	115	183	0	306	35	2	0	1,527	2,170
500-550	339	678	104	758	188	47	0	1,534	3,650
550-600	433	2,526	723	560	230	145	0	1,116	5,732
600-650	873	1,283	1,386	721	566	305	0	1,125	6,260
650-700	854	714	1,389	866	868	339	0	1,446	6,476
700-750	2,098	1,474	1,500	2,182	4,201	98	0	1,446	12,999
750-800	1,845	2,060	915	1,039	2,028	154	0	1,069	9,111
800-850	2,925	2,696	2,943	3,087	2,541	103	31	1,519	15,844
850-900	1,473	847	3,731	3,931	1,465	22	369	2,063	13,902
900-950	4,049	1,665	2,902	2,523	2,609	6	802	1,094	15,651
950-1000	63	88	248	106	2	0	7	12,086	12,599
1000-1050	0	0	0	0	0	0	0	9,525	9,525
1050-1100	0	0	0	0	0	0	0	14,205	14,205
Total	15,079	14,236	15,841	16,103	14,735	1,223	1,209	51,664	130,090

Table 48 - Summary of PDT Stratification of the Project Area

C. **Peat carbon stock**

Based on the Ministry of Agriculture, the total peatland area in Indonesia is 14.9 million Ha. The peatland area in Riau Province is about 26% of the total peatlands of Indonesia[38] [39] estimated the carbon stock in the peatland in Riau in the range from 5.35 to 16.23 Gt C (19.6 to 59.6 Gt CO_2-eq), and the medium estimate is 11.11 Gt C (40.8 Gt CO_2-eq).

This author used Carbon density (C_d) value of 52.08 Kg C m^3 of peat for estimating carbon stock in Riau Province. This was derived from bulk density estimate for peat of 0.093 $g.cm^{-3}$ and peat carbon content of 56%[40] [41] [42].

Project equation 4 is from Warren (2017). The formula used to calculate carbon stock in peat (C peat) is as follows:

$$C_{peat} = V * C_d \text{ (Source: Warren } et\ al. \text{ 2017)} \quad (4)$$

Where: C_{peat} = carbon stock in peat (kg C)

V = peat volume (m^3) or peat area (m^2) * peat depth (m)

C_d = carbon density (Kg C m^{-3}), a product of bulk density and carbon content

C_d for Riau = 52.08 Kg C m^{-3}

Peat Depth Class (SNI)	Peat Depth (cm)	Area (ha)	Volume (m3)	Carbon Stock (tonnes C)	
Deep Peat	350-400	190	7,133,289	371,502	9,671,470
	400-450	1,776	75,493,330	3,931,693	
	450-500	2,170	103,077,496	5,368,276	
Very Deep	500-550	3,650	191,622,099	9,979,679	70,285,576
	550-600	5,732	329,596,626	17,165,392	
	600-650	6,260	391,235,013	20,375,519	
	650-700	6,476	437,115,691	22,764,985	
Extremely Very Deep	700-750	12,999	942,397,355	49,080,054	487,029,188
	750-800	9,111	706,068,634	36,772,054	
	800-850	15,844	1,307,104,008	68,073,977	
	850-900	13,902	1,216,443,095	63,352,356	
	900-950	15,651	1,447,759,936	75,399,337	
	950-1000	12,599	1,228,393,719	63,974,745	
	1000-1050	9,525	976,326,199	50,847,068	
	1050-1100	14,205	1,527,065,972	79,529,596	
Total		130,090	10,886,832,462	566,986,235	

Table 49- Peat carbon stock in the project area at the project start

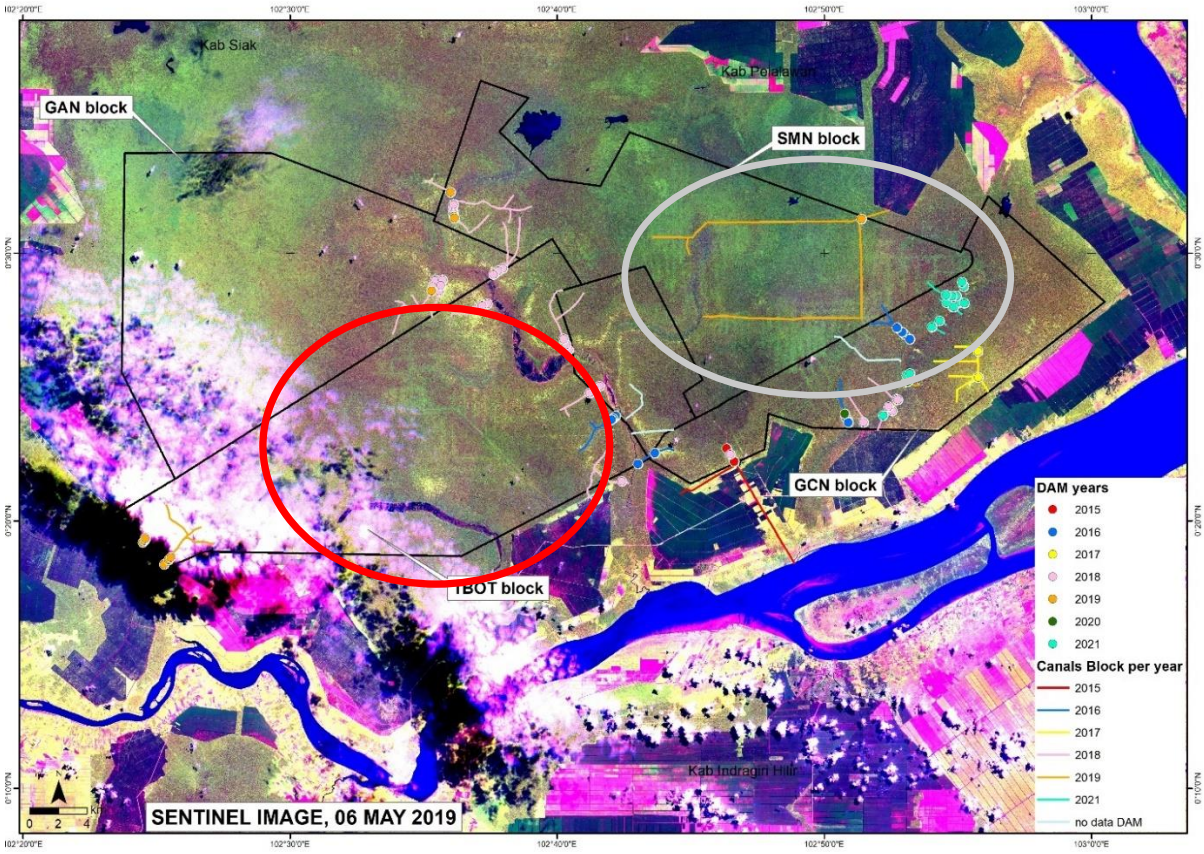
The combined carbon stock of the Project Area for above ground biomass from trees and below ground carbon stock from peat is estimated to be 574,754,394 tonnes of carbon.

3.3.3.3 Stratification of Drained Peat and Non-Drained Peatland

A. Identification of canal locations[43]

Not all the Project Area has been drained, only those areas where canals have been established prior to commencement of the project have been drained.

Satellite imagery and ground-truthing activity in the RER Project Area has shown that there are 146 km of legacy canals from prior selective logging operations. Both legal and illegal logging activities took place on the Kampar and in the RER Project area. Earth observation systems clearly show the tell-tale straight lines of the canals and rails. The rails were often used to bring sawn logs to the canals and radiate out from the canals, as shown in Map 22 and the SMN block in as outlined by the blue oval.



Map 22- Canals and kuda kuda Rail Systems: Canals are coloured; extensive rail system circled in red in PT. TBOT; blue circle shows rail systems radiating from canals in PT. SMN

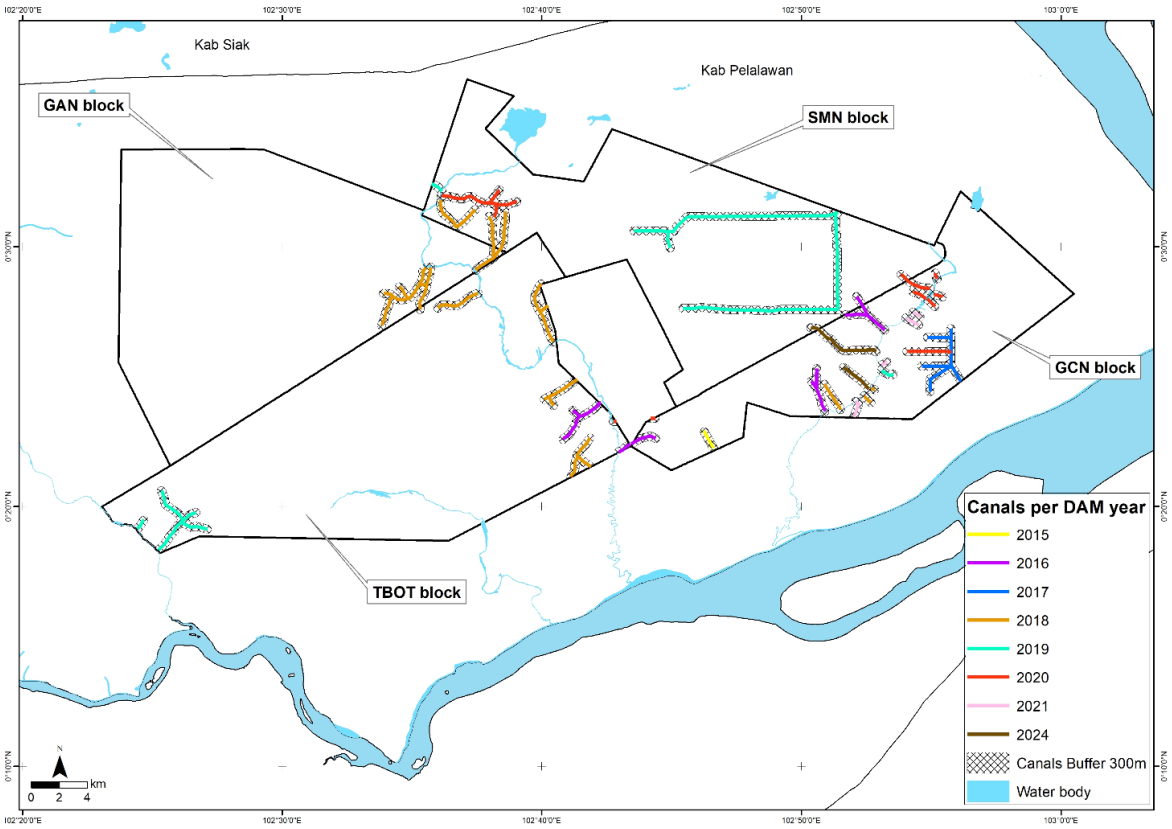
These railways, or tram lines, are the remnants of past (hand logging systems) activities. In the TBOT concession, there are clear indications of rail lines that were not used in conjunction with canals but as the primary method of transporting the logs towards the Kampar River. The red oval highlights these extensive rail systems. Typically, wooden rail systems were used in low-cost operations, but metal rails

were also used, including in the RER Project area as can be seen from Figure 22. These old disused rail lines continue to be *in situ* and show up in remote sensing imagery. They should not be confused with the mapped legacy canals.



Figure 22- a.) Kuda kuda rails from logging activity, circa 2007 b.) Metal rails in TBOTcirca 2007, and c.) Close-up of the 2007 TBOT sign.

A map of the areas with the location of these "legacy" canals at the commencement of the Project is shown in Map 23 below.



Map 23- Maps of canal buffer boundaries, location of legacy canals and planned damming operations by year

B. Estimation of drained peatland area

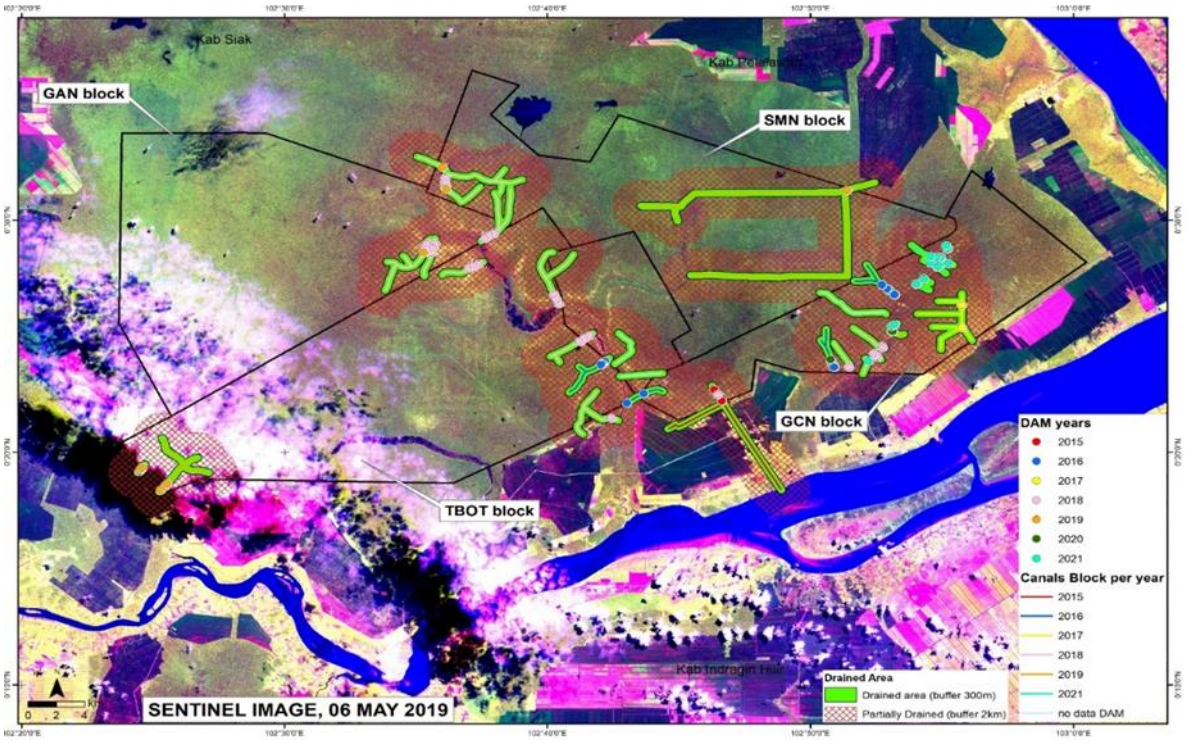
The total length of the legacy canals at the commencement of the Project was 146 km. The canals are assumed to have drained an area of approximately 300m on either side, see; Evans et al (2019). Rates and spatial variability of peat subsidence in Acacia plantation and forest landscapes in Sumatra, Indonesia. Geoderma 338, p 410–421. The drained areas around the canal at the program commencement are shown in Map 23 above. The estimated area of drained and undrained land at project commencement is shown in Table 50 below.

No.	Drainage status	Hectares (ha)	%
1	Drained	9,106	7.0
2	Undrained	120,984	93.0
3	Total	130,090	100.0

Table 50- Final drained area stratification summary of the project area

The baseline scenario assumes these "legacy canals" would be replaced by plantation management canals. In the baseline, the drained area expands substantially until the plantations are fully developed.

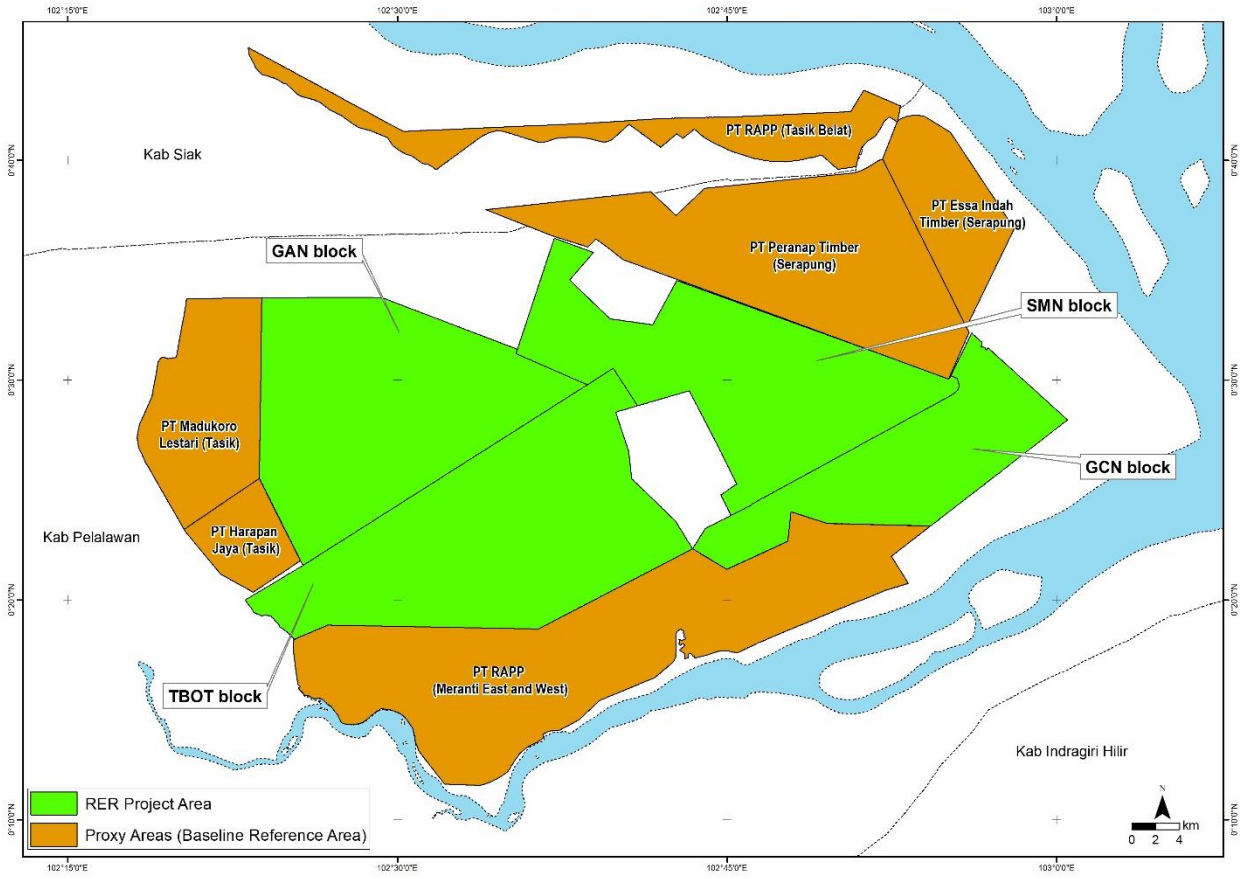
Under the Project, dams have been created to block the canals and raise the water table and rewet the peatlands (the opposite of what happens in the baseline). The location of existing Project dams established between 2016[44] and 2019 plus planned dams for 2020-2022 are shown in Map 24. A more detailed description of the canal blocking for the baseline and project scenarios is described in chapter 4.



Map 24 – Boundary map of drained areas at project commencement

3.3.3.4 Baseline Reference Area

The Project has identified a deforestation rate for the baseline by using a proxy reference area based on the allowed Proxy reference approach of VMD0006 BL-PL section 1.3. The reference area is made up of 6 nearby concessions (all on the Kampar Peninsula), where similar plantation conversion activity has occurred in the Baseline Period. See section 4.1.1 of the PD for more details regarding the proxy area approach for calculating Baseline Emissions. Below is a map of the Baseline Reference Area based on the proxy areas.



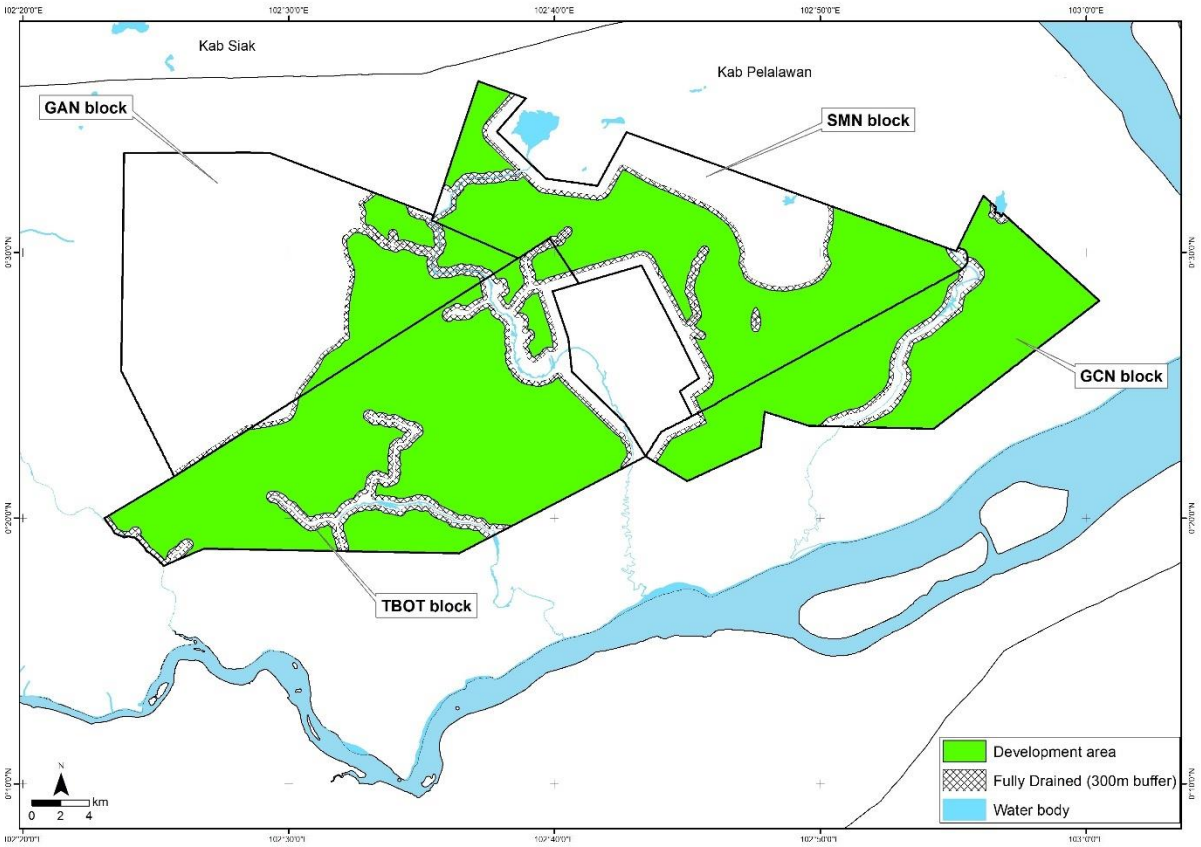
Map 25 - Baseline Reference Area

3.3.4 Definition of REDD and WRC Boundaries

3.3.4.1 REDD boundaries

The three deforestation and forest degradation avoiding project activities identified in VM0007 V1.6 and AUDD, AD and APD. For this project, AUDD and AD activities are not included for reasons specified in section 1.

The project only includes Avoiding Planned Deforestation (APD) and applies to all forested land within the plantation development ("development area") within the geographical boundaries of the project. The APD boundaries are generated by intersecting the forest area stratification boundaries with the planned plantation development boundaries and identifying all areas of forest subject to planned deforestation.



Map 26- Boundary map of the REDD project activity within the Project boundaries

The REDD is 78,425 ha, of which 78,396 ha was covered in forest for the 10-year period prior to commencement of the project.

REDD and Non-REDD Areas within Plantation Development Area			
Block	Non-REDD	REDD	Total
PT GAN	0	6,480	6,480
PT GCN	24	17,516	17,541
PT SMN	2	21,234	21,236
PT TBOT	3	33,166	33,169
Total	**29**	**78,396**	**78,425**

Table 51- REDD and Non-REDD Areas within Plantation Development Area

The Total Area of Deforestation, $A_{planned,i}$ (BL-PL), from Avoiding Planned Deforestation (APD) under the project is estimated to be 78,396 ha

3.3.4.2 WRC boundaries

The area within the geographic boundaries consists entirely of lands that are permanently saturated in their natural state. This meets the definition of wetlands as described in IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Chapter 7 Wetlands.

The all soils within the Project boundary are peatlands, which are organic soils greater than 50cm in depth, as classified by the Ministry of Agriculture (MoA)'s as defined in the Indonesian National Standard (SNI) 7925 regarding peatland mapping (National Standardization Agency, 2013). Therefore,

the entire landscape within the Project geographical boundaries are classified as wetlands with peatland soil. The area is located outside of the tidal zone and is not classified as "tidal wetlands", rather the whole of the area within the geographic of the project are classified as "peatland".

From the commencement of the baseline period to the project start date (2006-2016), parts of the area within the geographic boundary were drained by canals that had been developed prior to 2006. These historical canals are referred to as "legacy canals". During the 2006-2016 period, no further canal construction was observed.

The drainage status of the lands at the commencement of the project are summarized below:

Concession	Drained by legacy canals	Not drained by legacy canals	Total
PT GAN	793	35,732	**36,525**
PT GCN	2981	17,142	**20,123**
PT SMN	3339	29,437	**32,776**
PT TBOT	1993	38,673	**40,666**
Total	**9106**	**120,984**	**130,090**

Table 52- Drainage status of lands at project commencement

WRC Activity Types

The WRC activities include:

1. **RWE**: Rewetting / restoration of all areas drained by legacy canals. Under the project scenario, all drained areas will be restored, principally by damming of the legacy canals, which will result in stopping of drainage though the canal and a virtual return to natural water flow systems. The areas of this WRC activity are derived directly from the drained peatland stratification boundary.
2. **CIW**: Avoided peatland drainage associated with avoided planned plantation development. Under the baseline scenario, canals will be established to support land clearing and plantation management resulting in complete drainage of the planned plantation development area. The CIW boundaries are generated by intersecting the planned plantation development boundaries and the RWE boundaries and identifying all undrained areas subject to planned deforestation.

The total areas of RWE and CIW activities are shown in the table below:

WRC Categories	Area (ha)
RWE	9106.4
CIW	71,773.1
Does not qualify for WRC	49,210.4
Total	**130,089.9**

Table 53- Total areas of RWE & CIW activities

3.3.4.3 REDD / WRC activity boundaries

The project area has been classified into WRC categories as follows[45]:

Baseline Scenario		Project Activities	WRC Categories	Area (ha)
Pre-project condition	Land cover			
Drained peatland	Non-forest with planned plantation development	Peatland rewetting and restoration	RWE	24.5
	Non-forest with no planned plantation development	Peatland rewetting and restoration	RWE	90.0
	Forest with planned deforestation	Peatland rewetting and restoration combined with avoiding deforestation	RWE+REDD	6,627.8
	Forest with no planned deforestation	Peatland rewetting and restoration	RWE	2,364.1
Undrained peatland	Non-forest with planned plantation development	Avoiding drainage	CIW	5.1
	Non-forest with no planned plantation development	Non-development	Does not qualify for WRC	1,169.2
	Forest with planned deforestation	Avoiding drainage combined with avoiding deforestation	CIW+REDD	71,768.0
	Forest with no planned deforestation	Conservation of the forest area	Does not qualify for WRC	48,041.2
Total area				130,089.9

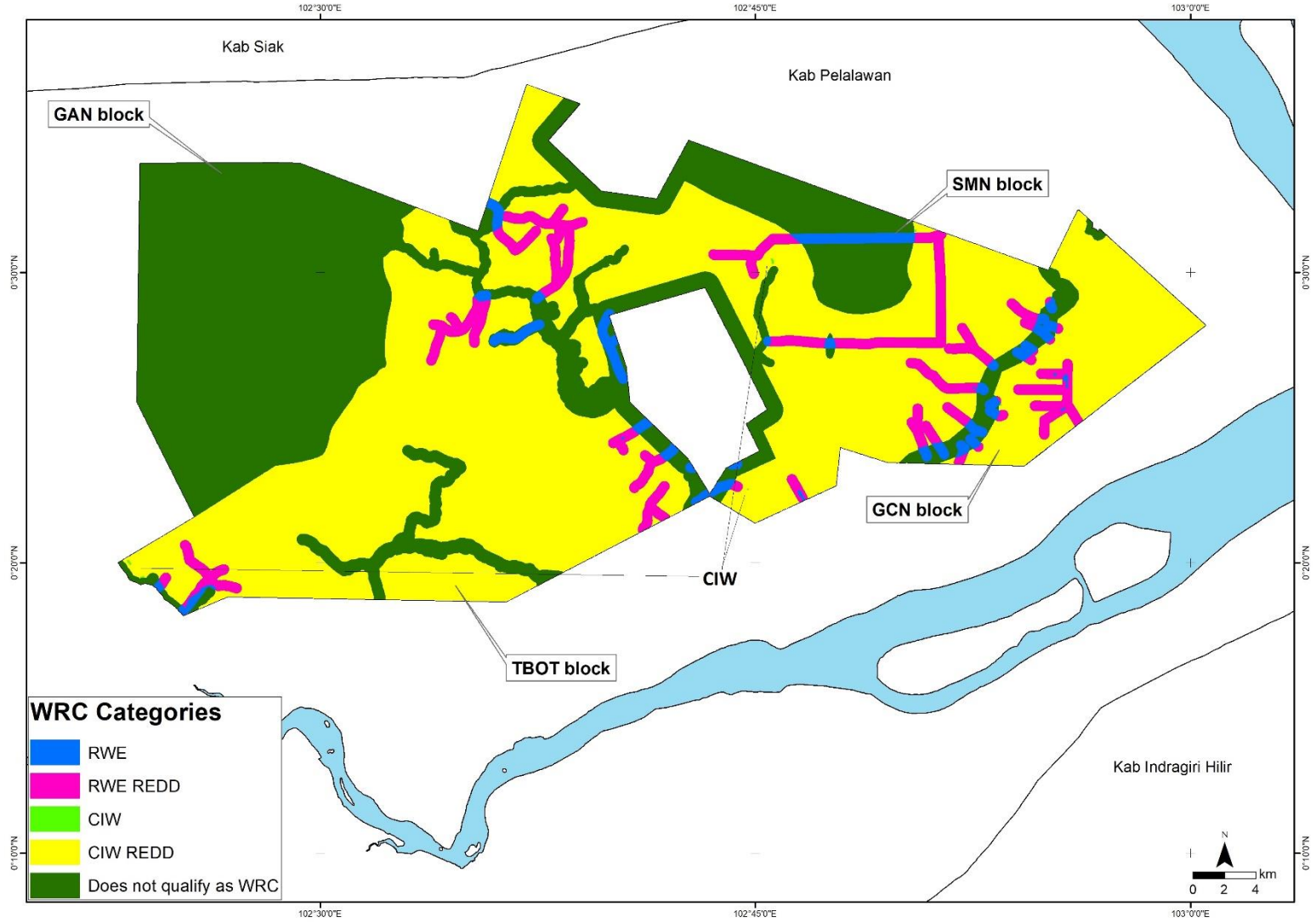
Table 54- REDD / WRC activity boundaries

Together the project area encompasses 4 WRC and combined categories:

WRC category	Area (ha)
RWE	2,478.6
RWE+REDD	6,627.8
CIW	5.1
CIW+REDD	71,768.1
Not eligible for WRC	49,210.4
Total	130,090.0

Table 55- Classification of WRC categories of project area

The map of all 4 WRC and combined categories project activities is shown below.



Map 27- Boundary map of all 4 WRC combined categories and project activities

3.3.5 Temporal boundary

The temporal boundaries of the RER Project are as follows.

- 10-year Historical reference period: 01 January 2006 to 31 December 2015
- 57-year Project crediting period: 17 June 2016 to 23 July 2072
- Baseline update period: Every 10 years
- Duration of Monitoring Periods: Monitoring will occur at least every five years but may occur as frequently as annually. The actual validation monitoring periods will however always be in annual increments but may be pro-rated (by month or day) depending on what part of the year the actual monitoring for verification takes place.

3.3.6 Carbon pools

3.3.6.1 Carbon Pools Included in the Project

Table 56 describes carbon pools included in the RER Project.

Carbon Pool	In/excluded	Justification
Above-ground tree biomass	Included	Mandatory pool in REDD project activities
Above-ground non-tree biomass	Excluded	Non-tree biomass carbon pool is expected to increase in the project scenario compared to the baseline, and therefore can be conservatively omitted.
Belowground biomass	Included	Carbon stock in this pool is expected to increase in the project scenario compared to the baseline.
Litter on mineral soil	Excluded	It is conservatively excluded. However, litter carbon pools and their stock changes may be monitored in the future.
Litter on peatland	Excluded	This pool is not mandatory for peatland. As the litter carbon pool is expected to increase in the project scenario compared to the baseline, it is therefore conservatively omitted.
Dead wood	Excluded	This pool is not mandatory for either mineral soil or peatland. As the dead wood carbon pool is expected to increase in the project scenario compared to the baseline, it is therefore conservatively omitted.
Mineral soil carbon pool	Excluded	This carbon pool does not exist with the project boundary and thus omitted as emissions are *de minimus.*
Peat carbon pool	Included	Carbon stock in this pool is expected to increase in the project scenario compared to the baseline.
Wood products	Excluded	This pool is mandatory only where the process of deforestation involves timber harvesting for commercial markets.

Table 56- Summary of carbon pools

3.3.6.2 Carbon Pool Significance

Most exclusions were implemented on the basis of conservatism which is permitted under VM0007. No significance tests were necessary because, as described in the above Sub-subsection, all carbon pools not included in the baseline and project scenario have been shown either to increase more or decrease less in the Project relative to the baseline scenario or in the alternative, they have been conservatively excluded. The Project has included all mandatory carbon pools, and all other required sources of GHG emissions have either been included or conservatively excluded.

Mineral soil carbon pool was excluded because this carbon pool does not exist within the project boundary. Because mineral soil carbon is estimated to be zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the total terrestrial carbon pool as specified in T-SIG, and its exclusion is explicitly permitted by the methodology

3.3.7 Sources of GHG Emissions

Table 57 describe sources of GHG emissions included in the RER Project.

Source		Gas	Included?	Justification/explanation
Baseline scenario	Deforestation	CO_2	Yes	Above-ground biomass losses as a result of deforestation are included
	Forest degradation	CO_2	Yes	If forest degradation occurs in the project scenario, it will be accounted for. Values will be calculated using forest degradation emission factors.
	Biomass burning	CO_2	No	Above-ground biomass losses as a result of fire are conservatively assumed zero (see comment below)
		CH_4	No	Above-ground biomass losses as a result of fire are conservatively assumed zero (see comment below)
		N_2O	No	Above ground biomass losses as a result of fire are conservatively assumed zero (see comment below)
		No fires have been observed in the baseline to date and fire is assumed to be zero in the baseline and GHG from fires are conservatively omitted. Because measured biomass burning is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the biomass pool as specified in T-SIG.		
	Combustion of fossil fuels	CO_2	No	Combustion of fossil fuels is not included (see comment below)
		CH_4	No	Combustion of fossil fuels is not included (see comment below)
		N_2O	No	Combustion of fossil fuels is not included (See comment below)
		Combustion of fossil fuels is not included and CO2 from combustion of fuels is conservatively omitted as permitted under VM0007.		
	Use of fertilisers	CO_2	No	Potential emissions are negligible and are excluded as per VM0007.
		CH_4	No	Potential emissions are negligible and are excluded as per VM0007.
		N_2O	No	Acacia species are nitrogen fixing species and no nitrogenous fertilizers are used in Acacia plantation management. N_2O emissions from fertilizer applications are

Source		Gas	Included?	Justification/explanation
				excluded in baseline scenario. Conservatively omitted as permitted under VM0007. Because measured nitrogenous fertilizer use is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the pool as specified in T-SIG.
	Microbial decomposition	CO_2	Yes	All drained peatland is considered a CO_2 emissions source. However, Emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively be omitted as per BL-PEAT – Section 5.3. Initially, IPCC default factors will be used for the baseline and Project to estimate emissions, later in the project measurements will be performed to develop site-specific emission models, and if needed, in the reference regions for the baseline
		CH_4	Yes	IPCC default factors will be used to estimate CH_4 emissions in the baseline and Project. All drained peatland is considered a CH_4 emissions source. However, emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively be omitted as per BL-PEAT – Section 5.3.
		N_2O	No	Excluded as per applicability condition in module BL-PEAT
	Water bodies	CO_2	No	All organic carbon lost in waterways is recorded as DOC.
		DOC	Yes	DOC values for 'drained' and 'undrained' peatlands (IPCC) are used to calculate the differences in carbon losses between baseline and Project.
		CH_4	No	CH_4 emissions from water bodies are included
		N_2O	No	N_2O emissions from water bodies are included

Table 57- GHG sources included in the REDD project boundary

3.4 Baseline Scenario

The baseline scenario of the RER-Carbon Project, its justification and key assumptions is set forth in detail in §3.5 Additionality below as part of the description of the "Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality. The baseline scenario of the Project is **industrial plantation of *Acacia crassicarpa*** as described in §3.5 below. Additional background details of historical land use in Riau Province supporting the baseline scenario are set forth below, as well as a brief description of how the Baseline Scenario of *Acacia* plantation activity would have been implemented.

The difference between peat carbon stock in the project scenario and the baseline scenario at t=100 is estimated as follows. Project equations 5 to 9 are from equations 5 to 9 of VMD0016 X-STR.

$$\left(\sum_{i=0}^{M_{WPS}}(C_{WPS,i,t100} \times A_{WPS,i,t100}) - \left(\left(\sum_{i=0}^{M_{BSL}}(\boldsymbol{C_{BSL,i,t100}} \times \boldsymbol{A_{BSL,i,t100}})\right)\right) \times \boldsymbol{LKF}\right) \geq 1.05 \times \sum_{i=0}^{M_{BSL}}(C_{BSL,i,t100} \times A_{BSL,i,t100}) \quad (5)$$

For organic soil:

$$C_{WPS,i,t100} = Depth_{peat\text{-}WPS,i,t100} \times C_{vol\_lower,WPS,i,t100} \times 10 \quad (6)$$

$$C_{BSL,i,t100} = Depth_{peat\text{-}BSL,i,t100} \times C_{vol\_lower,BSL,i,t100} \times 10 \quad (7)$$

(For $C_{BSL,i,t0}$ substitute t_0 for t_{100})

$$Depth_{peat-BSL,i,t100} = Depth_{peat-BSL,1,t0} - Sub_{initial-BSL,i} - \sum_{t=1}^{t=100} Rate_{peatloss-BSL,i,t} \quad (8)$$

$$Depth_{peat-WPS,i,t100} = Depth_{peat-WPS,1,t0} - \sum_{t=1}^{t=100} Rate_{peatloss-WPS,i,t} \quad (9)$$

Where:

$C_{WPS\text{-}BSL,i,t100}$	Difference between soil organic carbon stock in the project scenario and baseline scenario in stratum i at t = 100 (t C)
$C_{WPS,i,t100}$	Soil organic carbon stock in the project scenario in stratum i at t = 100 (t C ha^{-1})
$C_{BSL,i,t100}$	Soil organic carbon stock in the baseline scenario in stratum i at t = 100 (t C ha^{-1})
$A_{WPS,i,t100}$	Area of project stratum i at t = 100 (ha)
$A_{BSL,i,t100}$	Area of baseline stratum i at t = 100 (ha)
LKF	Leakage Factor (unitless)
$Depth_{peat\text{-}BSL,i,t100}$	Average peat depth in the baseline scenario in stratum i at t = 100 (m)
$Depth_{peat\text{-}WPS,i,t100}$	Average peat depth in the project scenario in stratum i at t = 100 (m)
$Depth_{peat\text{-}BSL,i,t0}$	Average peat depth in the baseline scenario in stratum i at project start (m)
$Depth_{peat\text{-}WPS,i,t0}$	Average peat depth in the project scenario in stratum i at project start (m)
$Sub_{initial\text{-}BSL,i}$	Subsidence in the initial years after drainage in stratum i, deemed 0 for RDP projects (m)

$Rate_{peatloss\text{-}BSL,i,t}$	Rate of peat loss due to subsidence and fire in the baseline scenario in stratum *i* in year *t*; a conservative (low) value may be applied that remains constant over time; Subsidence in the initial years after drainage is not included in this rate (m yr^{-1})
$Rate_{peatloss\text{-}WPS,i,t}$	Rate of peat loss due to subsidence and fire in the project scenario in stratum *i* in year *t*; alternatively, a conservative (high) value may be applied that remains constant over time (m yr^{-1})
$C_{vol\_lower,WPS,i,t100}$	Volumetric carbon content of the peat below the water table in the project scenario in stratum *i* at *t* = 100; in case of RDP projects, this is the same as $C_{vol\_lower,BSL}$ (kg C m^{-3})
$C_{vol\_lower,BSL,i,t100}$	Volumetric carbon content of the peat below the water table in the baseline scenario in stratum *i* at *t* = 100 (kg C m^{-3})
t_{100}	100 years since project start
10	Conversion from kg m^{-2} to t ha^{-1}

Step 1. Under the baseline scenario, successive changes of peat carbon stock within each stratum were calculated over 100 years. (see Table 58) The method for calculating the dynamics of carbon stock over time under the baseline scenario is given in § 3.4

Step 2. Under the project scenario, successive changes of peat carbon stock within each stratum were calculated over 100 years. (see Table 58). The method for calculating the dynamics of carbon stock over time under the project scenario is given in § 3.4.

The differences in peat carbon stocks are shown in Table 58 below:

Peat Depth Class (SNI)	Peat Depth	Area peat at t=100 baseline		Area peat at t=100 project	
	(cm)	Area (ha)	Carbon stock (t C)	Area (ha)	Carbon stock (t C)
Non-peat	0-50	32	4,161	0	0
Slightly Shallow	50-100	367	143,317	0	0
	100-150	1,423	926,179	0	0
	150-200	3,576	3,258,790	0	0
Shallow	200-250	4,761	5,578,428	0	0
	250-300	4,967	7,114,351	0	0
Deep	300-350	8,159	13,809,299	0	0
	350-400	10,307	20,130,362	190	371,502
	400-450	13,052	28,888,416	1,776	3,931,693
	450-500	14,192	35,109,271	2,170	5,368,276
Very Deep	500-0550	15,067	41,197,167	3,650	9,979,679
	550-600	8,372	25,071,831	5,732	17,165,392
	600-650	1,362	4,432,894	6,260	20,375,519
	650-700	1,446	5,083,371	6,476	22,764,985

Extremely Very Deep	700-750	1,446	5,459,528	12,999	49,080,054
	750-800	1,069	4,315,755	9,111	36,772,054
	800-850	1,519	6,526,142	15,844	68,073,977
	850-900	2,063	9,399,796	13,902	63,352,356
	900-950	1,094	5,270,544	15,651	75,399,337
	950-1000	12,086	61,369,648	12,599	63,974,745
	1000-1050	9,525	50,847,068	9,525	50,847,068
	1050-1100	14,205	79,529,596	14,205	79,529,596
Total		130,090	413,465,913	130,090	566,986,235

Table 58- Differences in peat carbon stocks

The table above demonstrates that there is significant depletion of peat in terms of carbon stock which is greater than 5%.

Step 3. All areas that show a positive peat carbon stock difference between the baseline and project scenarios at t=100 was delineated as the area eligible for crediting.

Eligible areas for crediting from WRC activities, based on the spatial analysis, is 78,425 ha or 66%. The area eligible for crediting is identical to the plantation development area.

Description	Area	
	(ha)	(percent)
Project area	130,090	100%
Peatland area within the project boundary	130,090	100%
Area eligible for crediting	78,425	60%
Area not eligible for crediting	51,664	40%

Table 59- Summary of the area eligible for crediting from WRC activities

3.4.1 History of Land Use Change in Riau in the Pre-Baseline and Baseline Period

Historical data on industrial *Acacia* plantation concessions in Riau exhibits a similar pattern from 1990 to 2010; large areas of the Production Forest Estate, being split up and licensed to a range of companies producing similar commodities. Each is managing an area on average, <70,000 ha. In Riau Province, 1,587,000 ha of land has been allocated for forest plantation concessions (IUPHHK-HT a.k.a. HTI), of which 68% is in peatlands.

Within the context of the Kampar peninsula, *Acacia* plantations are the dominant type of forestry activity. By 2014, 294,227 ha, or nearly 43% of the peninsula, had been converted to feedstock plantations, of which *Acacia* accounted for 31% of the Kampar peninsula and nearly 72% of the allowable plantation area[46]. Acacia plantations surrounds the RER-Carbon Project Area.

All of the current *Acaia* plantation operations on the Kampar, as they are part of the Production Forest estate, were once selective logging concessions and then legally converted to industrial plantation estates as allowed by Indonesian law[47]. Government Regulation 6/2007 at Article 38,

section 1 states explicitly that utilisation of the timber forest products includes the utilisation of a silviculture system and section 2 discusses how that is done by way of "land preparation, seeding, planting, maintenance, harvesting, and marketing. Sect-3 specifically indicates that the "utilisation of timber forest product in HTI is done in unproductive production forest."

Below at table 60 is an overview of all of the HTI concessions in Riau, the size of their concessions and the percentage on peat versus mineral soils.

Company	Land Area		
	Total	Mineral Soil	Peat Soil
CV ALAM LESTARI	4,790	0	4,790
CV BHAKTI PRAJA MULIA	5,854	0	5,854
CV HARAPAN JAYA	5,054	0	5,054
CV MUTIARA LESTARI	3,970	79	3,891
CV PUTRI LINDUNG BULAN	2,100	2,100	0
KUD BINA JAYA LANGGAM	1,908	601	1,307
PT. ARARA ABADI	298,124	146,591	151,532
PT. ARTELINDO WIRATAMA	10,232	10,232	0
PT. BALAI KAYANG MANDIRI	16,184	0	16,184
PT. BINA DAYA BENTALA	20,085	0	20,085
PT. BINA DAYA BINTARA	7,696	0	7,696
PT. BINA DUTA LAKSANA	24,661	0	24,661
PT. BUKIT BATU HUTANI ALAM	32,510	0	32,510
PT. BUKIT BATUBUH SEI INDAH	14,604	14,604	0
PT. BUKIT RAYA PELALAWAN	3,896	0	3,896
PT. CITRA SUMBER SEJAHTERA	15,423	15,423	0
PT. EKAWANA LESTARI DARMA	9,485	0	9,485
PT. LESTARI ASRI JAYA	24	24	0
PT. MADUKORO	14,872	0	14,872
PT. MERBAU PELALAWAN LESTARI	6,472	1,146	5,326
PT. MITRA HUTANI JAYA	9,689	0	9,689
PT. MITRA KEMBANG SELARAS	14,737	861	13,876
PT. MITRA TANI NUSA SEJATI	7,617	0	7,617
PT. NUSA PRIMA MANUNGGAL	4,242	3,436	806
PT. NUSA WANA RAYA	25,374	25,374	0
PT. NUSANTARA SENTOSA RAYA (DH.SIAK RY TBR)	22,816	19,466	3,350
PT. PERANAP TIMBER (DH. PTUNISERAYA)	32,831	0	32,831
PT. PERAWANG SUKSES PERKASA	54,459	54,459	0
PT. PERKASA BARU	13,139	0	13,139
PT. PUTRA RIAU PERKASA	16,594	0	16,594
PT. RIAU ABADI LESTARI	15,554	14,079	1,474
PT. RIAU ANDALAN PULP & PAPER	338,946	131,906	207,040
PT. RIAU INDO AGROPALMA	9,671	0	9,671
PT. RIMBA LAZUARDI	20,862	20,862	0
PT. RIMBA MANDAU LESTARI	5,604	0	5,604
PT. RIMBA MUTIARA PERMAI	8,069	0	8,069
PT. RIMBA PERANAP INDAH	14,160	14,160	0
PT. RIMBA ROKAN LESTARI	11,345	0	11,345
PT. RUAS UTAMA JAYA	40,369	0	40,369
PT. SARI HIJAU MUTIARA	16,854	11,895	4,959
PT. SATRIA PERKASA AGUNG (SK 19)	10,235	0	10,235
PT. SATRIA PERKASA AGUNG (SK 244)	76,898	278	76,620
PT. SATRIA PERKASA AGUNG UNIT (SK 102)	11,867	0	11,867

PT. SEKATO PRATAMA MAKMUR	46,087	0	46,087
PT. SELARAS ABADI UTAMA	24,742	63	24,679
PT. SERAYA SUMBER LESTARI	19,850	0	19,850
PT. SINAR BELANTARA INDAH	472	472	0
PT. SUMATERA RIANG LESTARI	152,822	2,921	149,901
PT. SUMATERA SILVA LESTARI	8,293	8,293	0
PT. SUNTARA GAJAPATI	34,811	0	34,811
PT. TRIOMAS FDI	9,687	0	9,687
PT. TUAH NEGERI	1,587	0	1,587
PT. WANANUGRAHA BINALESTARI	8,030	8,030	0
PT. WIRA KARYA SAKTI	1,604	1,096	508
Total	1,587,862	508,451	1,079,411
Percentage	100%	32%	68%
Source: KLHK website			

Table 60- List of HTI companies in Riau Province as of 2019.

During the baseline timeframe (2006-2015), there was intense competitive pressure on the forests to convert unproductive logging concessions to industrial plantations to be used as feedstock for the three very large-scale pulp and paper mills in eastern Riau: Indah Kiat Pulp & Paper, Andritz Pulp & Paper and PT. Riau Pulp & Paper; all located adjacent to the Kampar Peninsula.

Although other land-use activities take place on the Kampar Peninsula before and during the baseline period, such as industrial oil palm plantations, small-holder oil palm plantations, minimal selective logging, and some very limited agriculture activities by small-holders / local communities, they are not credible baseline activities. This is mainly due to the legal status of the Production Forest; it is not legally applicable to be used for oil palm and agriculture activity. Continued selective logging is also not a credible alternative. The selective logging concessions become unproductive over time and after they have been logged over. This occurs in the pre-baseline and baseline period.

Additional historical information concerning the land-use history of Riau and the Kampar Peninsula, the credibility of the alternatives and a detailed legal analysis of the alternatives can be found in step 1 of the additionality analysis in §3.5 below.

Industrial *Acacia* plantations are a very commercially viable activity in the Kampar Peninsula, primarily because there are, as noted above, three large scale pulp and paper mills that create large scale demand for feedstock.

Conversion of Production Forest Estate from selective logging to industrial plantation was widespread during the pre-baseline and baseline period. In fact, one of the four concession, PT GCN, formerly by PT Agam Sempurna, had already been converted to an HTI license in 2004. In the 2007/2008 timeframe, PT TBOT was still a selective logging concession, but its activity was winding down because it was no longer a productive concession; it was not profitable.

In 2010/2011, the Project Proponent was aware that there was an application for the PT. GCN (formerly by PT Agam Sempurna) by PT. Surya Alam Perkasa to the Ministry of Forestry to acquire that concession to be used as HTI, as allowed by Indonesian law. This application was made before APRIL asked the Ministry of Forestry to acquire PT. GCN as an ER concession. The request for the

HTI license for PT. Surya Alam Perkasa was rejected and subsequently APRIL[48] requested an ER license.

Implementation of the Baseline Scenario

The Project Proponent believes that the baseline scenario of the four concessions would have been that they would be acquired as HTI licenses, cleared for and planted with *Acacia*. The peat landscape would have required the construction of necessary infrastructure such as roads, canals, drainage canals, water table management systems, camp infrastructure, etc.

It is assumed that acquisition of all of the concession in a relatively similar time frame would have allowed a plantation development plan that allowed for the development of the concessions over a seven-year period with a 5-year harvesting regime. Following Indonesian forestry law and regulations, it would result in an estimated 78,425 hectares of land developed into plantation and infrastructure and the protection of 51,664 hectares of land for non-production. It is assumed that all-natural forest on the development areas would be cleared and drained for plantation development. This would result in considerable land-use change, as shown in Table 61 and Table 62 below. A map showing the yearly development blocks of the baseline scenario is shown in Map 29. The water table management systems would have led to the ongoing drainage of the plantation areas and widespread loss of peat through oxidation and subsidence.

APRIL's plantation management teams created the land use change and the plantation development scenario that is the foundation of the Baseline Scenario and described in Table 61 and 61 by applying their substantial expertise in plantation development. They followed APRIL's standard plantation development models as well as all required Indonesia forestry regulations.

The Project Proponent believes that the deforestation rate would have been comparable to what took place in the Kampar Peninsula under the baseline scenario. A detailed analysis of the projected deforestation rate of 8.24% is set forth below in §4.1.2.

	Block	Land Cover Type	Land Cover 2022							
			Total	*Acacia* Plantation	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest	Bare Land	Water Body
	PT. GAN	*Acacia* Plantation	0	0	0	0	0	0	0	0
		Peat Dome Forest	22,770	19	22,751	0	0	0	0	0
		Dense Swamp Forest	1,086	934	0	152	0	0	0	0
		Medium Swamp Forest	9,306	3,155	0	0	6,151	0	0	0
		Sparse Swamp Forest	3,342	2,373	0	0	0	969	0	0
		Bare Land	22	0	0	0	0	0	22	0
	PT. GCN	*Acacia* Plantation	0	0	0	0	0	0	0	0
		Dense Swamp Forest	10,435	8,799	0	1,636	0	0	0	0
		Medium Swamp Forest	7,221	6,505	0	0	716	0	0	0
		Sparse Swamp Forest	2,421	2,213	0	0	0	209	0	0
		Bare Land	46	24	0	0	0	0	22	0
		Water Body	0	0	0	0	0	0	0	0
	PT. SMN	*Acacia* Plantation	0	0	0	0	0	0	0	0
		Dense Swamp Forest	5,979	3,892	0	2,087	0	0	0	0
		Medium Swamp Forest	23,775	15,056	0	0	8,719	0	0	0
		Sparse Swamp Forest	2,992	2,286	0	0	0	706	0	0
		Bare Land	11	2	0	0	0	0	9	0
		Water Body	19	0	0	0	0	0	0	19
	PT. TBOT	*Acacia* Plantation	0	0	0	0	0	0	0	0
		Dense Swamp Forest	978	904	74	0	0	0	0	0
		Medium Swamp Forest	1,788	1,512	0	276	0	0	0	0
		Sparse Swamp Forest	23,026	19,656	0	0	3,369	0	0	0
		Bare Land	13,684	11,094	0	0	0	2,590	0	0
		Dense Swamp Forest	1,151	3	0	0	0	0	1,148	0
		Water Body	40	0	0	0	0	0	0	40
Total			130,090	78,425	22,825	4,151	18,955	4,474	1,200	59

	Land-use change type
	Conversion to plantation or infrastructure
	No land-use change

Table 61- Baseline Scenario Land use change by block within the project area

Land Cover 2016	Land Cover 2022							
	Total	*Acacia* Plantation	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest	Bare land	Water Body
Acacia Plantation	0	0	0	0	0	0	0	0
Peat Dome	23,748	923	22,825	0	0	0	0	0
Dense swamp forest	19,287	15,136	0	4,151	0	0	0	0
Medium swamp forest	63,328	44,372	0	0	18,955	0	0	0
Sparse swamp forest	22,439	17,965	0	0	0	4,474	0	0
Non-Forest	1,230	30	0	0	0	0	1,200	0
Water Body	59	0	0	0	0	0	0	59
Total	130,090	78,425	22,825	4,151	18,955	4,474	1,200	59
	Land-use change type							
	Conversion to plantation or infrastructure							
	No land-use change							

Table 62- Land-use change within the project area under baseline

3.5 Additionality

3.5.1 Scope

The assessment and demonstration of additionality and the identification and justification of the baseline scenario are described herein using the CDM executive board approved additionality tool:

1. A/R Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (Version 01) (T-ADD)

as per the instructions within the VM0007 Methodology, version 1.6.

3.5.2 Procedure

According to the additionality tool, the following four out of five steps have been applied.

STEP 0. Preliminary screening based on the starting date of the A/R project activity

STEP 1. Identification of alternative scenarios to the project activity

STEP 2. Barrier analysis

STEP 3. Investment analysis (this step was not required)

STEP 4. Common practice analysis

The procedure is summarized in the indicative flowchart presented in Figure 23. For the specific detail regarding the individual steps, please refer to the below text.

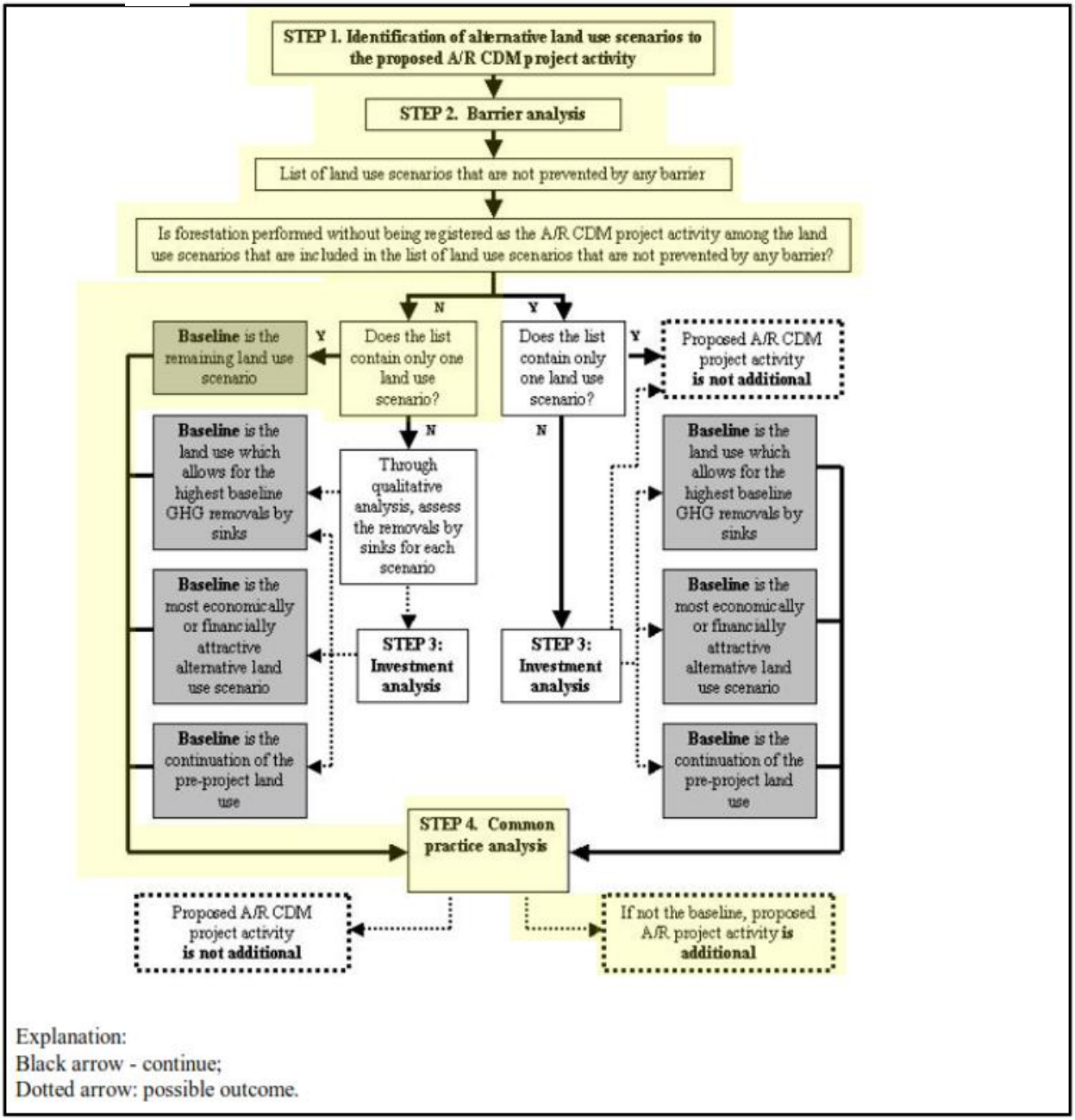


Figure 23- Path of Analysis chosen by the Project

3.5.3 Justification of the Baseline Scenario and Additionality

Step 0. Preliminary Screening Based on the Starting Date of the A/R project activity

Provide evidence that the starting date of the project activity was after 31 December 1999	The Project's start date is 17 June 2016. Additionally, the first of the four Ecosystem Restoration (IUPHHK-RE) concession licenses were granted on 24 July 2012. Subsequent licenses for the other three IUPHHK-RE concession licenses all occurred in 2014 (18 February, 14 March and 18 September respectively), see § 1.7- Ownership for further licensing details. These dates are all after 31 December 1999.
Provide evidence that the incentive from the planned sale of emission reductions was seriously considered in the decision to proceed with the project activity. This evidence shall be based on (preferably official, legal, and/or other corporate) documentation that was available to third parties at, or prior to, the start of the project activity.	The evidence that the incentive from the planned sale of emission reductions were seriously considered in the decision to proceed with the project activity is proved by the § "1.7 Ownership", as the IUPHHK-RE concession licenses (acquired in 2012 & 2014) explicitly allow for the capture and sale of carbon. Further, the Project Owner entered into contractual arrangements before the Project start date to undertake carbon development activities including a carbon assessment report. The planning of the assessment began in Q4 2014 and preliminary field surveys were conducted during the months of April-December 2015[49]

Table 63- Preliminary screening based on the starting date of the A/R project activity

STEP 1. Identification of Alternative Land-Use Scenarios to the proposed Project Activity

This step serves to identify alternative land-use scenarios to the proposed project activity that could be the baseline scenario through the following sub-steps

Sub-step 1a. Identify credible alternative land-use scenarios to the proposed project activity

The Project was able to identify six (6) possible major credible alternative land-use scenarios that could have occurred on the land within the Project boundary. They are industrial Acacia plantation, the continuation of the pre-project activity – commercial selective logging, industrial oil palm plantation, smallholder oil palm plantation, smallholder oil palm plantation, protected forest without the benefit of carbon finance (i.e. National Park or other protected areas), and mineral or fossil fuel extraction. The scenarios were compiled after a review of current land-use activity in and around the Kampar Peninsula. The results are the most likely "without project" land-use scenario in the Project Area and are described below.

3.5.3.1 Major land-use Scenarios

Alternative 1. Industrial *Acacia* Plantation

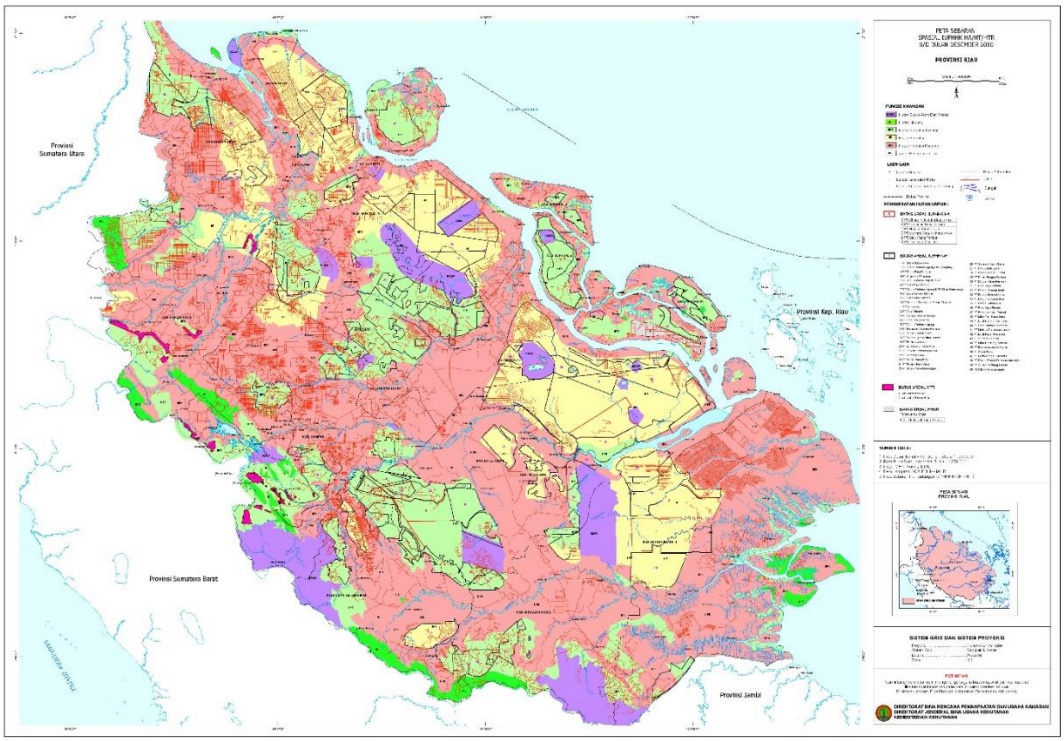
The four concessions are all converted individually or together into fast-growing *Acacia crassicarpa* industrial agroforestry plantations and are done according to Indonesian law and Ministry of Forestry regulations and decrees.

Industrial *Acacia* planting currently takes place on the Kampar Peninsula and in nearby areas. It is the most common land-use activity on the Kampar Peninsula and is the second most common land-use activity in the Province of Riau.

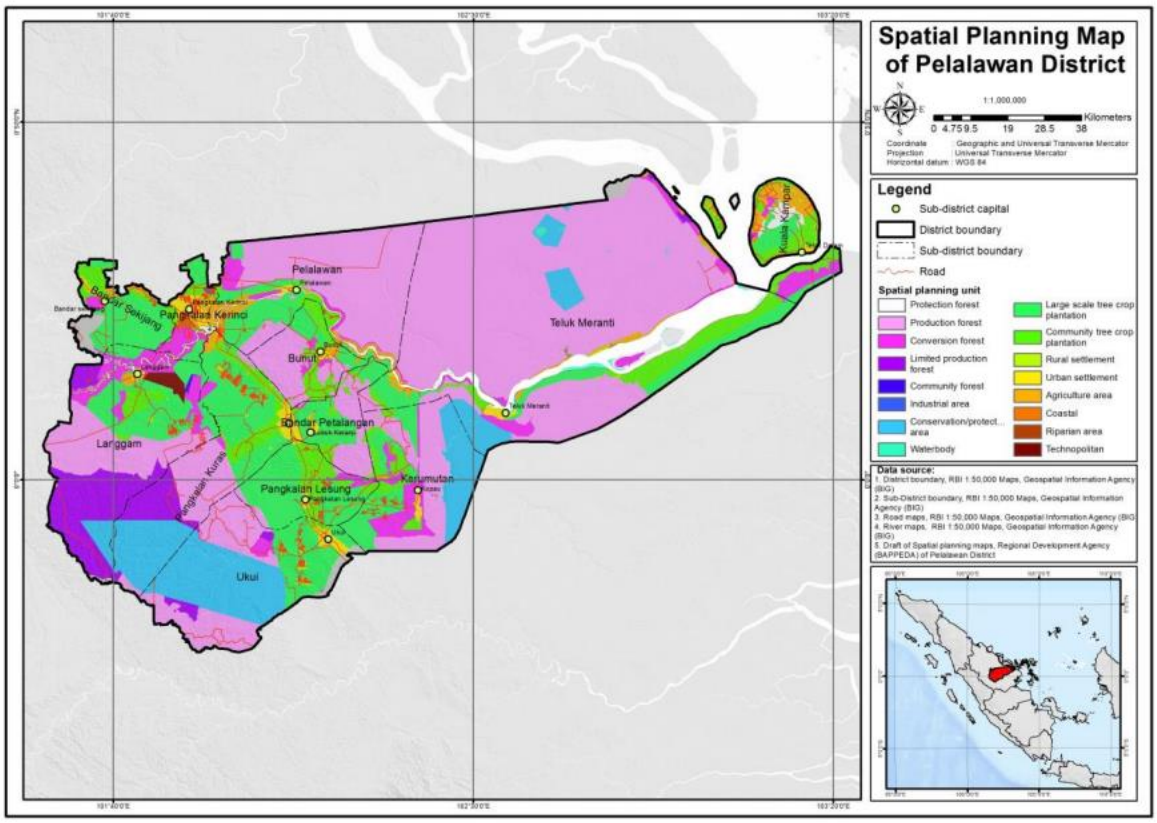
Sectoral Overview

Fast-growing *Acacia crassicarpa* is a common industrial plantation species, and its use in the pulp and paper industry as a feedstock forms the backbone of land-use of lowland peatlands land-use in Indonesia[50]. Typically, it is grown in 4-to-6-year rotations with the harvested wood products being used for paper and pulp products. Industrial plantation activities have historically required ongoing and continuous maintenance of water tables in the peatlands to between 40-80 cm depth[51]. Areas of industrial *Acacia* plantations have grown rapidly in Indonesia over the past decade, and development was approved by the Ministry of Environment and Forestry development plans: from 10 million ha in 2010 to 13 million ha in 2014[52].

Within the context of Riau Province, and specifically the Kampar peninsula, *Acacia* plantations are the dominant type of forestry activity. By 2014, 294,227 ha, or nearly 43% of the peninsula had been converted to feedstock plantations, of which *Acacia* accounted for 31% of the Kampar peninsula and nearly 72% of the allowable plantation area[53]. The entire RER-Carbon Project Area is surrounded by *Acacia* plantations.



Map 28- Riau Province Spatial Planning Map (2010) showing Hutan Produksi or Production Forest area in yellow



Map 29- Current (2019) Spatial Planning Map of Pelalawan District showing Hutan Produksi or Production Forest Area in Purple

The credibility of the proposed land-use scenario of industrial *Acacia* plantation is supported by the following seven points (a-g).

No.	Source of Credibility	Explanation
a.	National Forestry Policy	The Republic of Indonesia has had as a matter of national forestry policy a written Basic Forestry Law in place since 1967 (i.e. Law No. 5/1967), and today it is based upon Forestry Law No. 41/1999. Further forestry regulations and decrees establish conditions pertaining to the management and use of the production forests for timber plantations, in particular, are Ministry of Forestry (MoF) Regulation No.P.19/Menhut-II/2007 and P.62/Menhut-II/2008. Substantial Reformation of the forestry sector came in 2015 with Ministry of Environment & Forestry (MoEF) Regulation No. P.32/2015. Presidential Instruction 10/2011 sought to slow development of concession on peatlands. However, from 2007, including the baseline period of 2006-2015, there was a 77% increase of new plantations on peatlands in Riau province primarily on what was legally considered as secondary forest[54]. By the timePresidential Instruction 10/2011 to limit the development of new plantation concession on peatland was instituted, the momentum of plantation development activity was already in existence.
b.	Economic Trends	The pulpwood sector in Indonesia in 2014 produced 5.36 million tonnes of Pulpwood (for the pulp and paper industry), of which Riau Province made up 4.21 million tonnes– much of that was from the Kampar region. Most of Indonesia's pulpwood production takes place in 4 provinces on the Island of Sumatra. In 2014 75% of Indonesian pulp production was based in Riau Province. By 2018 the pulp sector had increased in Indonesia to 7.62 million tonnes, of which more than 50%

		was still based in Riau[55]. In 2014 the total Indonesian paper and pulp industry were worth USD $2.6 billion, and by 2018 it had grown to USD $6.2 billion[56].
c.	Land-use Records	The entire RER Carbon Project Area has since more than 10 years prior to the Project Start Date been designated as hutan produksi, or production forest, See Map 28 above.
d.	Current Land-use Activity	The entire RER Carbon Project Area continues to be designated as hutan produksi, or production forest. See Map 29 above.
e.	Past Land-use Activity	The four concessions that make up the Project Area were all Hak Pengusahaan Hutan (HPH) or selective logging concessions in the past. These types of concessions, in peatlands, after they have been logged over and depleted of commercial stems, are often converted to industrial plantation activity or Hutan Tanaman Industri (HTI). That is the case for all of the current HTI concessions in the region surrounding the Project. Prior to the existence of the IUPHHK-RE license (the ecosystem restoration license, the only legal option for Hutan Produksi was to maintain selective logging (HPH) or conduct forestry plantation (HTI) activity).
f.	Enforced Mandatory Regulations	The government of the Republic of Indonesia had in place at the time forestry laws and regulations. In 2012-2014, when HTI conversion would have begun on the Project Area, forestry laws and regulations would have been generally enforced. Large scale operators, more or less, followed government regulations and requirements.
g.	Common Practice	Industrial *Acacia* plantation activity is by far the most extensive commercial activity located in the immediate around the RER-CP. The Project Area is surrounded by similar *Acacia* plantations, and this land-use activity is the most common activity on the Kampar Peninsula.

Table 64- Credibility of the proposed land-use scenario of industrial *Acacia* plantation

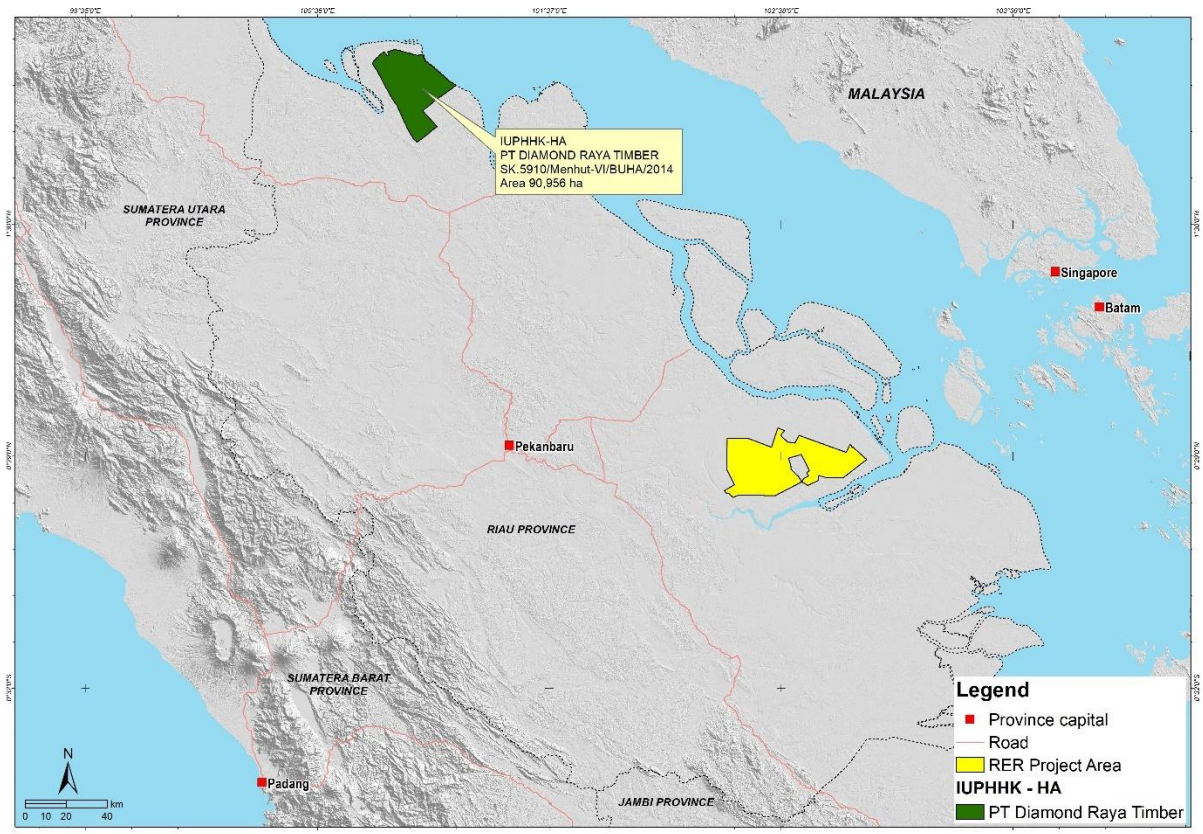
Conclusion:

The ongoing expansion of industrial-scale *Acacia* plantations under the regime of Hutan Tanaman Industri (HTI) across Indonesia and in Riau Province has already created large areas of converted peatland forests, demonstrating that industrial *Acacia* plantation is a credible and realistic scenario and should be considered as a plausible alternative scenario to the RER Carbon Project.

Alternative 2 - Continuation of the Pre-Project Land-use - Commercial Selective Logging

The four concessions, either individually or together, remain as Hak Pengusahaan Hutan (HPH) for selective logging. All selective logging is conducted according to Indonesian law and the Ministry of Forestry regulations and decrees.

Selective logging historically was undertaken on the Kampar Peninsula and in nearby areas. Limited selective logging continues in the Province of Riau.



Map 30- Map of active HPH Concessions in Riau Province (2015)

Sectoral Overview

Commercial forestry began to develop in Riau Province rapidly in the late 1970s as east-west branch roads from the newly completed "Trans-Sumatran Highway" were built. As large areas of land came under government control just before this time, state-run or private companies began the development of commercial logging, with 2.6 million hectares of logging concessions designated as Hak Pengusahaan Hutan (HPH) being granted in 1975. The expansion was rapid, and in 1979 there was 5.1 million ha of HPH concessions, and by 1987 this had risen to 6.1 million ha. Legally during those years, selective logging was practiced with diameter limitations on felling; these restrictions were not always adhered to[57].

Today, none of the peatlands in the Kampar Peninsula is subject to active commercial logging. Selective logging operations continue in a limited manner in Riau Province (i.e. Diamond Raya Timber in North-East Riau Province). However, many of the commercially valuable large-diameter trees in Riau were harvested between the '70s and the early 2000s. This is also true of the Kampar Peninsula.

The credibility of the proposed land-use scenario of commercial selective logging is supported by the following seven points (a-g).

No.	Source of Credibility	Explanation
a.	National Forestry Policy	The Republic of Indonesia has had a national forestry policy the Basic Forestry Law in place since 1967 (i.e. Law No. 5/1967), and today it is based upon Forestry Law No. 41/1999. Further forestry regulations and decrees establish conditions pertaining to the management and use of the production forests for selective logging. Reformation of the forestry sector came in 2015 with the Ministry of Environment & Forestry (MoEF[58]) Regulation No. P.32/2015
b.	Economic Trends	The commercial selective logging industry in the Province of Riau has been on the decline since before the Project began. In 2014 only 116 million m^3 of plywood was produced in Riau Province. And by 2018, that amount had almost halved to 63.8 m^3 of plywood from the Province[59].
c.	Land-use Records	The entire RER Carbon Project Area has since more than 10 years prior to the Project Start Date been designated as hutan produksi, or production forest. See Map 28 above.
d.	Current Land-use Activity	The entire RER Carbon Project Area continues to be designated as hutan produksi, or production forest. See Map 29 above.
e.	Past Land-use Activity	The four concessions that make up the Project Area were all HPH logging concessions in the past.
g.	Common Practice	Historically commercial selective logging, before the rise of the pulp and paper industry, was the dominant forest product in the Province of Riau. Selective logging existed at the time the Project was acquiring the four concessions, and when the Project Started in the Province of Riau, its extent was limited and continues to be so today.

Table 65- Credibility of the proposed land-use scenario of commercial selective logging

Significant changes to the forestry laws and enforcement of the same have made legal and illegal commercial logging much less feasible. In the past, timber companies were not required to establish and implement long term management plans ensuring the sustainability of forests. The forests of Riau were harvested in an unsustainable manner. As a result, the remaining natural forest areas have little commercially viable timber within allowable diameter sizes. HPH activities have moved away from the area or have instead shifted to HTI.

Conclusion:

Commercial selective logging remains as a legal possibility, as all the RER-CP concession areas were designated as HPH before the start of the Project. Commercial selective logging would face substantial barriers (described below in Step 3). However, in 2012-2014 when the Project was acquiring its current licenses, selective logging was a credible and realistic scenario and should be considered as a plausible alternative to the RER Carbon Project.

Alternative 3 - Industrial Oil Palm Plantation

The four concessions, either individually or together, are converted to industrial oil palm plantations. All of the activities required for oil palm farming and harvesting are done according to Indonesian regulations and laws.

Sectoral Overview

Large scale industrial oil palm (*Elaeis guineensis*) plantation is one of the more common non-forest commodity land-uses of lowland peatlands in all of Indonesia[60], irrespective of the fact that peat soils are less than ideal for its cultivation, especially as very deep peat is known to have adverse effects on yields[61].

Oil palm expansion has become one of the most notable drivers of deforestation in Indonesia in the first two decades of the 21st century, mainly to serve the global demand for palm oil products for oils and biofuels[62]. It has been estimated that, between 1975 and 2005 alone, around 40 million ha of forests in Indonesia were converted into oil palm plantations[63].

Industrial oil palm expansion has taken place almost exclusively in areas that are outside of the designated forest estates, which are instead designated as Area Pennggunann Lain (APL) or Other Land Utilization. Alternatively, oil palm production can take place in forest estates that are slated for conversion and designated as Hutan Produksi Konversi (HPK) or Conversion Production Forests. None of the RER-CP is or ever has been designated as APL or HPK.

The credibility of the proposed land-use scenario of industrial oil palm plantation activity is supported by the following seven points (a-g).

No.	Source of Credibility	Explanation
a.	National Agrarian Policy and Related Oil Palm Law	The Republic of Indonesia has had as a matter of national policy a written Basic Agrarian Practices in place as law since 1960 (i.e. Law No. 5/1960). Today palm oil concession laws and regulations are based upon Indonesian Laws No. 39/2014 (regarding Plantations) and Ministry of Agriculture Regulations No 98/2013(Licensing of Plantations). Further agriculture regulations and decrees establish conditions pertaining to the management and use of the palm oil plantations, pricing of CPO products, etc. Reformation came about in 2014 because of the great potential in national economic development played by crude palm oil.
b.	Economic Trends	The world's palm oil production is dominated by Indonesia and Malaysia, which supply 85-95% of the world's total supply. Indonesia is the world's largest producer and exporter of palm oil, and it contributed around USD

		$23 Billion in foreign exchange to Indonesia in 2017[64]. Indonesian oil palm sector grew from 22.5 million tonnes of palm oil in 2010 to 417.7 million tonnes in 2020[65].
c.	Land-use Records	The entire RER Carbon Project Area has since more than 10 years prior to the Project Start Date and has been designated as hutan produksi, or production forest. See Map 28 above.
d.	Current Land-use Activity	The entire RER Carbon Project Area continues to be designated as hutan produksi, or production forest. See Map 29. None of the peat domes on the Kampar have been converted to oil palm plantations. The average peat thickness of industrial oil palm directly plantations on the Kampar Peninsula and surrounding the Project Area is 3.2 m[66]. Currently, there is one Industrial oil palm plantations on the northern boundary of the Kampar Peninsula. It is approximately 20 km from RER. There are no oil palm concessions which are adjacent to the RER-Project Area. Processing facilities are somewhat further away.
e.	Past Land-use Activity	The four concessions that make up the Project Area were all historically selective logging concessions in the past.
f.	Enforced Mandatory Regulations	The government of the Republic of Indonesia has in place the above agricultural laws and regulations. Large scale operators, more or less, followed government regulations and requirements.
g.	Common Practice	In 2015, the Kampar Peninsula, Industrial oil palm plantations covered 35,767 ha or 5.2% of the peninsula and made up 11.9% of the total plantation area[67].

Table 66- Credibility of the proposed land-use scenario of industrial oil palm plantation

Conclusion:

Industrial-scale oil palm plantation is a possibility in the Project area, and it is found nearby to the Project Area. In theory, the Project Area can produce crude palm oil products, and processing facilities are not out of reach. Although this type of scenario might face specific barriers (described below in Step 3), in 2012-2014, when the Project was acquiring its current licenses, it was a credible and realistic scenario. It should be considered as a plausible alternative to the RER Carbon Project.

Alternative 4 - Smallholder Oil Palm Plantations

The four concessions either together or separately, either legally or illegally, would convert some or all of the Project Area to smallholder oil palm production. This type of land-use often includes the burning of the landscape by the smallholder to prepare for the planting of the oil palm seedlings and is highly destructive to flora and fauna.

Sectoral Overview

Smallholder oil palm plantations followed in the footsteps of the large-scale plantations, to a great extent as part of the Transmigrasi policies, and by 2010 about 412,000 households were engaged in small scale oil palm production in Riau Province. At that same time in 2010, the share of registered smallholders in Riau province was 73 percent, while those of Central Kalimantan and East Kalimantan were 14 percent and 23 percent, respectively[68].

The credibility of the proposed land-use scenario of smallholder oil palm plantations is supported by the following seven points (a-g).

No.	Source of Credibility	Explanation
a.	National Agrarian Policy and Related Oil Palm Law	The Republic of Indonesia has had as a matter of national forestry policy a written Basic Agrarian Practices in place as law since 1960 (i.e. Law No. 5/1960). Today palm oil concession laws and regulations are based upon Indonesian Laws No. 39/2014 (re Plantations) and Ministry of Agriculture Regulations No 98/2013(Licensing of Plantations). Further agriculture regulations and decrees establish conditions pertaining to the management and use of the palm oil plantations, pricing of CPO products, etc. Reformation came about in 2014 because of the great potential in national economic development played by crude palm oil.
b.	Economic Trends	Indonesia is the world's largest producer and exporter of palm oil, and it contributed around USD $23 Billion in foreign exchange to Indonesia in 2017[69]. Indonesian oil palm sector grew from 22.5 million tons of palm oil in 2010 to 417.7 million tons in 2020[70].
c.	Land-use Records	The entire RER Carbon Project Area has since more than 10 years prior to the Project Start Date and has been designated as hutan produksi, or production forest. See Map 28 above.
d.	Current Land-use Activity	The entire RER Carbon Project Area continues to be designated as hutan produksi, or production forest. See Map 29. None of the peat domes on the Kampar have been converted to smallholder oil palm plantations. Smallholder plantations in the Kampar tend to be differentiated from their larger industrials neighbours in that they generally are situated closest to the rivers and at the lowest elevation levels. Peat depth levels on the smallholder plantations are typically at lower elevations than on peat domes and typically on shallow peat averaging 2.8 meters[71]. CPO Processing facilities are not far from the Project Area.
e.	Past Land-use Activity	The four concessions that make up the Project Area were all historically selective logging concessions in the past. There is no history of smallholder oil palm plantation activity in the actual Project Area, i.e. abandoned or overgrown plantations.
f.	Enforced Mandatory Regulations	The government of the Republic of Indonesia has in place the above agricultural laws and regulations. Smallholder operators do not typically concern themselves with government regulations and requirements.
g.	Common Practice	In the Kampar Peninsula, smallholder oil palm production as land-use consists of 57,862 ha and makes up 7.2% of the peninsular landscape as a whole and 16.4% of the oil palm plantation area[72]. In Riau Province, there is extensive evidence of smallholder oil palm production on former forested land, converted legally, semi-legally, and illegally. The Tesso Nilo National Park (former HPH areas converted to a national park) and other older HPH area in Riau Province have lost substantial forest cover as a result of the illegal conversion by smallholders to oil palm production. There is also plenty of legal smallholder production, as land for this type of activity has often been granted to individual farmers from the local Kabupaten at the district or regency level.

Table 67- Credibility of the proposed land-use scenario of smallholder oil palm plantations

Conclusion:

Smallholder oil palm plantation is a possibility in the Project area, and it is found nearby to the Project Area. In theory, the Project Area is able to produce crude palm oil products, and processing facilities are not out of reach. In 2012-2014, when the Project was acquiring its current licenses, the above analysis demonstrates that smallholder plantation activity was a credible and realistic scenario and should be considered as a plausible alternative scenario to the RER Carbon Project.

Alternative 5 - Protected Forests Without the Benefit of Carbon Crediting

The four concessions, either individually or together, are converted from hutan produksi to protection forests such as a national park or reserve area without the ability to receive finance from carbon sequestration activity.

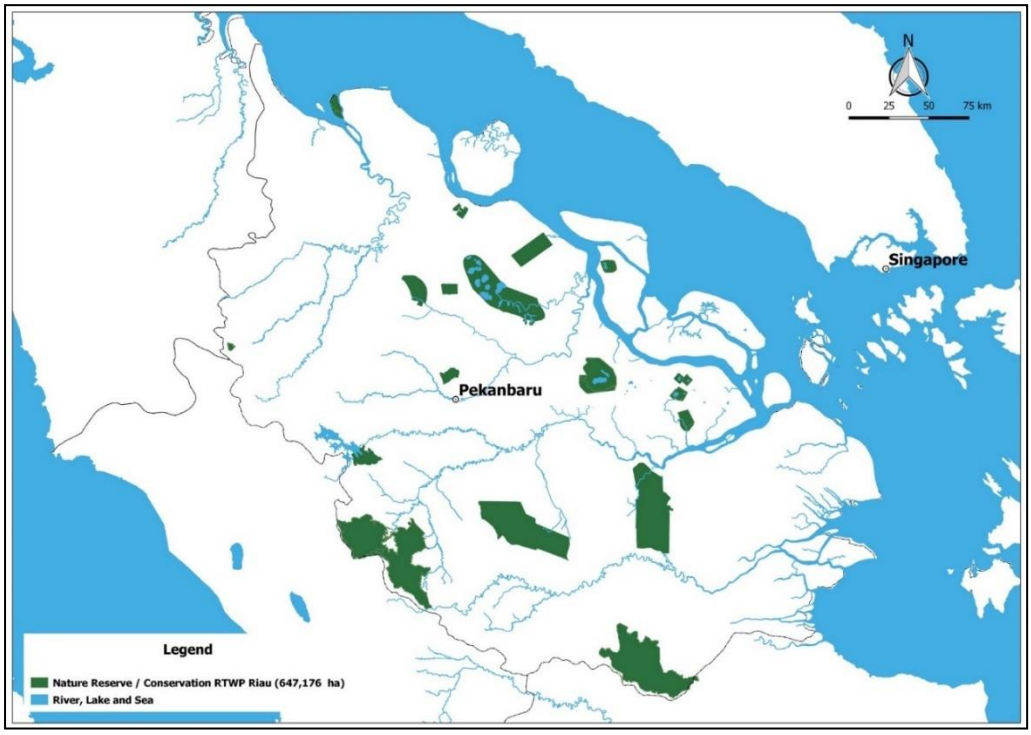
Sectoral Overview

Forested areas in Indonesia can legally be protected through the formal creation of a protected area, although it is not common. The possibility of protection without exploitation is considered further below.

No.	Source of Credibility	Explanation
a.	National Policy Related to Protected Areas	Official government regulations outline the legal framework for conservation management that is used in Indonesia, such as Law no. 5/1990, which defines a national park, Government Regulations on Conservation and Protected Areas (Regulation No. 68/1998), and the Special Directive on the Management of National Parks (attachment to Decree No. 129/Kpts/DJ-VI/1996), or the 1995 Directive for Determining the Zonation of a National Park. Implementation is the responsibility of the Ministry of Forestry through the Directorate General of Forest Protection and Nature Conservation. New regulations were made with Ministerial Decree P.19/Menhut-II/2004 on collaborative management of nature reserves and protected areas and Ministerial Decree P.56/Menhut-II/2006 on guidelines for zoning of national parks which provide a legal basis for the allocation of special use zones within national parks.
b.	Economic Trends	National parks and reserves in Indonesia are maintained as part of the government's effort to protect the "public good," but the government's ability to allocate sufficient budget is limited. In 2009 Indonesia, for example, the government budget for national conservation is low, which is about USD $2-5 per hectare of NP area[73].
c.	Land-use Records	The entire RER Carbon Project Area has since more than 10 years prior to the Project Start Date and has been designated as *hutan produksi*, or production forest. See Map 28 above.
d.	Current Land-use Activity	The entire RER Carbon Project Area continues to be designated as *hutan produksi*, or production forest. See Map 29 above. None of the peat domes on the Kampar prior to the initiation of the Project had been converted to a national park or other protected areas.
e.	Past Land-use Activity	The four concessions that make up the Project Area were all historically selective logging concessions in the past. There is no history of protected areas in the actual Project Area. Examples of national parks do exist within the Province of Riau.
f.	Enforced Mandatory Regulations	The government of the Republic of Indonesia has in place the above laws and regulations concerning national parks and reserves. Although these areas receive legal status and protection, on the ground enforcement is often nominal.
g.	Common Practice	In the Kampar Peninsula there is one national park Zamrud National Park (31,480 ha) and proclaimed on 22 July 2016) and three small wildlife reserves Tasik Belat proclaimed in 1999 (2,529 ha), Tasik Besar Serkap proclaimed in 1986 (3,200 ha) and Tasik Besar proclaimed in 1986 (6,900 ha). In the years prior to the Project, several protected areas have been created in the Province of Riau, Including the Tesso Nilo National Park (1000 km2), the Kerumutan Wild Life Sanctuary (120,000 ha), the Bukit Tiga Puluh National Park (144,000 ha), the Sultan Syarif Kasim Forest Park (7,000 ha) and of course the largest of them all, Giam Siak

		Kecil-Bukit Batu Bioreserve (705,271 ha). See the below Map 31 for Protected Areas and National Parks in the Province of Riau.

Table 68- Credibility of the proposed land-use scenario of protected forests without carbon crediting



Map 31- Nature Reserves and Conservation Areas in the Province of Riau

Conclusion:

Protection areas without carbon financing exist as a possibility in the Kampar Peninsula. Although this type of scenario might face certain barriers (described below in Step 3). However, in 2012-2014, when the Project was acquiring its current licenses, it was a credible and realistic scenario. It should continue to be considered as a plausible alternative to the RER Carbon Project.

Alternative 6 - Mining and Fossil Fuel Extraction

Some or all of the four concessions would be converted to mining concession or fossil fuel extraction.

Sectoral Overview

Riau Province contains Indonesia's most significant set of oil fields. The Minas field in the north-central part of Riau, is the largest oil block in Indonesia. The output from that field alone makes up 20-25% of current annual oil production for the whole of Indonesia. Further, the Rokan block, Indonesia's second-largest crude oil field by production, is also in Riau province. Formerly a Chevron concession, it was recently awarded to Pertamina. Pertamina, in early 2019 announced that it had found additional oil reserves in the Province that will lead to further future production[74]. Within the Kampar Peninsula itself, there are two oil production blocks, the one closest to the Project Area is exploratory, and a larger one that is further to the North West is producing oil and gas at scale.

Riau Province also undertakes some coal mining production, most of which is used for local energy production. Most notable is the PT. Samantaka Batubara Concessions (15,000 ha) in the southern part of the Province in Kabupaten Indragiri Hulu. The mine partly spills across into the bordering Province of Jambi via open-pit mining. The majority of other mining activity in Riau takes place in the western highlands.

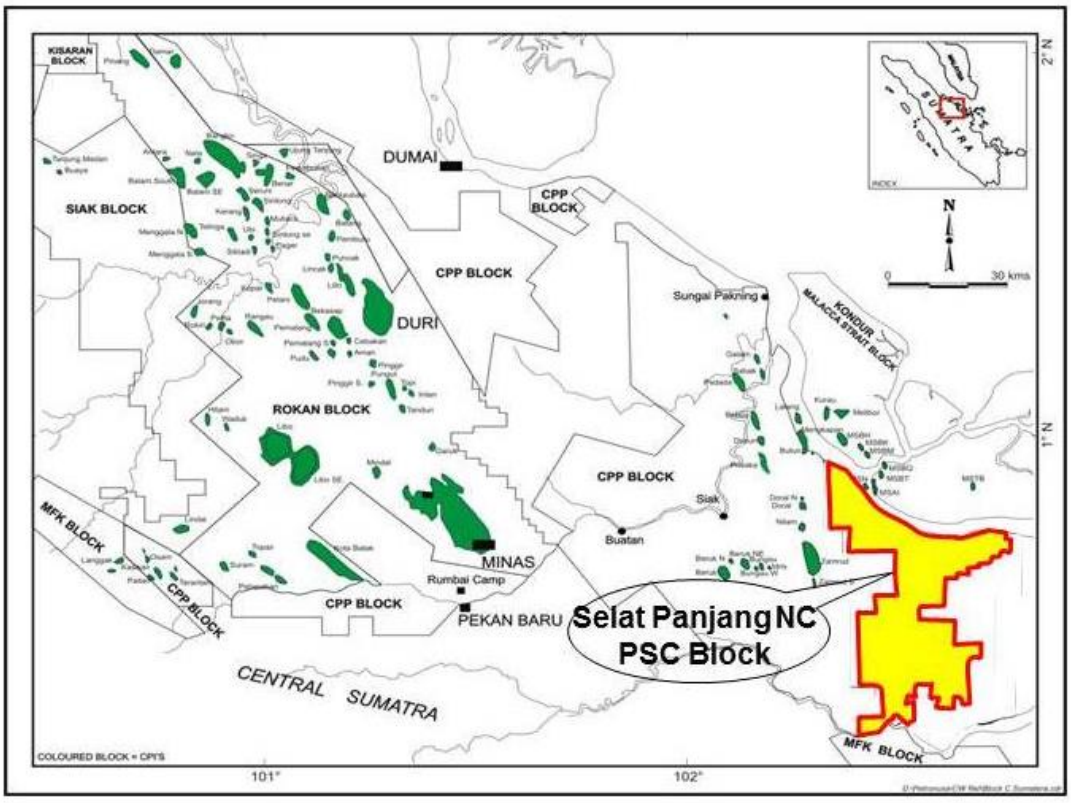
While there is no mining on the Kampar Peninsula itself, there is some on the nearby Riau islands; where there are some limited sand mining and bauxite mining operations undertaken at scale. Furthermore, in areas surrounding the Kampar and throughout other parts of the Province, it is understood that there is limited artisanal sand, bauxite, gold, and silver mining. These artisanal operations are limited in scope and are not conducted under any type of government regulations.

The credibility of the proposed land-use scenario is supported by the following seven points (a-g).

No.	Source of Credibility	Explanation
a.	National Policy Related to Mining and Fossil Fuel Extraction	The law governing the mining sector in Indonesia is the Law on Mineral and Coal Mining No. 4 of 2009 (The Mining Law). This law replaced the previous mining law (Law No. 11 of 1967). The main objective of the current Mining Law is to support sustainable national development[75]. Indonesia's oil and gas sector is regulated mainly by Law No. 22 of 2001 regarding Oil and Natural Gas (the "Oil and Gas Law"). Oil and gas business activities classified as upstream, i.e. exploration and exploitation, are further regulated by Government Regulation No. 35 of 2004, as lastly amended by Government Regulation No. 55 of 2009 regarding Upstream Oil and Natural Gas Business Activities. Downstream business activities, such as processing, transportation, storage, and trading, are regulated by Government Regulation No. 36 of 2004 regarding Downstream Oil and Natural Gas Business Activities, as amended by Government Regulation No. 30 of 2009.
b.	Economic Trends	Indonesia's mineral reserves are ranked fifth for gold, seventh for copper, sixth for nickel, second for tin, sixth for bauxite, and 10th for coal[76]. With the significant production of some of the world's most vital commodities, Indonesia continues to be a key player in the global mining industry. The fossil fuel sector, and the oil sector, in particular, saw its peak in the early to late 1990s. Although Indonesia has seen production declines since the early 2000s, oil production has remained steady with the discovery of new fields. In Riau Province, refining capacity has also become limited as it has not been able to keep up with production from new fields in the Province.

c.	Land-use Records	The entire RER Carbon Project Area has since more than 10 years prior to the Project Start Date and has been designated as hutan produksi, or production forest. There are no mining permits on the Kampar or within several hundred kilometres. There are however two oil fields on the western side of the Kampar; the Coastal Plains Pekenbaru or CPP block, owned by Chevron (formerly Caltex) until 2002, and then through a joint venture with PT. Pertamina and the Riau Province owned company PT. Bumi Siak Pusako (BSP) [77]. This was the case at the time of the licensing of the four concessions. The CCP block has been producing oil and gas since the 1950's, and numerous wells are located in and around the Zamrud National Park less than 20 kilometres from the north western boundary of the Project Area; these are known as the Zamrud field[78]. Additionally, an exploratory unconventional oil and gas field sits directly to the west of the project area, the Selat Panjang field. This area started oil exploration in 1989, and limited production commenced in early 1994.
d.	Current Land-use Activity	The entire RER Carbon Project Area continues to be designated as hutan produksi, or production forest. See map 29. None of the peat domes on the Kampar are being mined. There is no exploratory mining being conducted on the Kampar. There is, however, substantial fossil fuel extraction that has been *in situ* since the 1950s in the CPP Block, most notably around Zamrud Lake. Since 1994, limited production exists in the northern part of the Selat Panjang field (see Map 32 below), this site is limited, and according to company reports produces only an estimated at 300 bopd. Sugih Energy (the majority stakeholder) estimates that there are 30 years' worth of reserves at the Selat Panjang field[79]. Other than this area, there has been no active oil production or exploration of the Kampar, and according to the Ministry of Energy and Mineral Resources, there are no other known fossil fuel exploratory blocks in the Project Area[80]. Substantial oil exploration and production in Riau have generally focused on the Rokan, Duri, and Minas fields in the central north part of the Province.
e.	Past Land-use Activity	The four concessions that make up the Project Area were all historically selective logging concessions in the past. There is no known history of mining in the actual Project Area. Fossil fuel extraction has been underway since the 1950s, and exploratory unconventional oil and gas has been under production since 1994 to the west of the Project Area.
f.	Enforced Mandatory Regulations	Mining is not currently legally permissible in the RER Project Area without a valid government license. Industrial-scale mining and fossil fuel extraction licenses are controlled by a complex set of laws that would restrict the area that can be mined and which also outline the compensation arrangements which must be paid to the concession holder (assuming there is one) and to the state. The above-described laws regulate the mining and fossil fuel extraction industries. These laws are generally enforced.
g.	Common Practice	In Riau Province, the vast majority of mining activity takes place in the west of the Province in the highlands and mountainous regions. There is no mining on the Kampar Peninsula There is substantial oil production to the west of the Kampar as part of the South Sumatra Basin, and there is ongoing limited development directly west of the Project Area. The vast majority of the Province's fossil fuel extraction, however, takes place at fields at a significant distance from the Kampar; the most notable and productive are at the Duri block, the Rokan Block, the Siak Block, and the Minas blocks, all of which are north-west of the Project Area[81]. See Map 32.

Table 69- Credibility of the proposed land-use scenario of mining and fossil fuel extraction



Map 32- Fossil Fuel (oil & gas) production west of the Kampar

Conclusion

Fossil fuel extraction continues to take place in Kampar and is a credible alternative from a land-use perspective. Mining, however, on an industrial scale is absent from the Kampar Peninsula, and although common in Riau Province, is not a credible land-use alternative in the Project Area.

3.5.3.2 Minor Land-use Scenarios – Not Credible

In addition to the above major land-use scenarios, RER-CP has identified several other minor land-use scenarios, which were also considered, including smallholder agriculture[82], infrastructure development, industrial aquaculture, eco-tourism, industrial agriculture, i.e. cut-flower production, tobacco farming, fruit orchards, etc. However, all of these minor scenarios lacked either credibility or actual precedent at any scale and thus are not further considered in this analysis.

The Outcome of Sub-Step 1a.

The following Alternative Scenarios are deemed to be the most credible and feasible:

Alt. No.:	Alternative Scenario:	A Credible Scenario
Alternative 1.	Industrial *Acacia* Plantation	YES
Alternative 2.	Pre-Project Activity – Commercial Selective Logging	YES
Alternative 3	Industrial Oil Palm Plantation	YES
Alternative 4.	Smallholder Oil Palm Plantations	YES
Alternative 5	Protected Forests without the Benefit of Carbon Crediting	YES
Alternative 6	Mining and Fossil Fuel Extraction	Mining NO – Fossil Fuels YES

Table 70- Outcome of Sub-Step 1a

The above Alternative Scenarios are deemed to be the most credible land-use activities and most feasible after conducting the analysis required by Step 1, Sub-step 1a.

Sub-step 1b. Consistency of Credible Land-use Scenarios with Enforced Mandatory Applicable Laws and Regulations

The above six (6) major land-use scenarios identified under Sub-step 1 are next considered in the context of the applicability of Indonesian law and related legal regulations. A principal consideration in this portion of the analysis is that the entire project area had been designated as Hutan Produksi, or "production forest" by the Indonesian government for many years before the initiation of the Project and all four of the concessions making up the Project Area were selective logging concessions designated as Hak Pengusahaan Hutan (or HPH) for selective logging.

Alternative 1. Industrial *Acacia* Plantation: The four concessions are all converted individually or together into fast-growing *Acacia crassicarpa* industrial plantations. The Project Area as Production Forestry can legally change to Hutan Tanaman Industri (HTI) or industrial forest plantations.

Alternative 2 - Continuation of the Pre-Project land-use - Commercial Selective Logging: The four concessions either individually or together, remain as Hak Pengusahaan Hutan (or HPH) for selective logging.

Alternative 3 - Industrial Oil Palm Plantation: The four concessions, either individually or together, are converted to industrial oil palm plantations.

Alternative 4 - Smallholder Oil Palm Plantations: The four concessions either together or separately, either legally or illegally, would convert some or all of the Project Area to smallholder oil palm production.

Alternative 5 - Protected Forests without the Benefit of Carbon Crediting: The four concessions either individually or together, are converted from hutan produksi to protection forest such as a national park without the ability to receive finance from carbon sequestration activity

Alternative 6 – Mining and Fossil Fuel Extraction: Some or all of the four concessions would be converted to fossil fuel extraction.

The six alternative scenarios are considered with respect to mandatory applicable laws and regulations.

Alternative	Scenario	Enforced Regulations
Alternative 1.	Industrial *Acacia* Plantation	This land-use scenario is legal and permissible. It is the most common land-use activities on the Kampar Peninsula. Hutan Produksi forest estate can by law only be used for HPH, HTI or ecosystem restoration activity. HTI can legally be done so long as there is adherence to the relevant laws of the Republic of Indonesia: principally by the Forestry Laws No. 41/1999, 19/2004, the Ministry of Environment and Forestry Decree No. 31/2014 and a host of related supporting regulations and decrees. This land-use activity is currently being conducted legally on the Kampar Peninsula. Its implementation in the Project area would not have been, a violation of Indonesian Forestry laws and regulations.
Alternative 2.	Commercial Selective Logging	This land-use scenario is legal and permissible. It is not currently being conducted on the Kampar Peninsula. Commercial selective logging, however, could occur under the original HPH license granted to the four concessions that make up the Project Area and would be legally permissible. This type of activity would be principally governed by Forestry Law No. 41/1999, 19/2004, and subsequent Indonesian Ministry of Environment and Forestry decrees and regulations.
Alternative 3	Industrial Oil Palm Plantation	This land-use is not legally permitted as oil palm may not legally be established on land that has been designated as Hutan Produksi or production forest. Although it is not impossible to remove a particular area from the forest estate under Indonesian law, it could only be done pursuant to regulations that are set forth under Government Decree PP No. 60/2012. Further, this is only possible in areas that are designated as Hutan Produksi Konversi (HPK) or "Conversion Production Forests. This is not the case with the Project Area. As a result of the legal barrier, this land-use scenario is untenable and, as such, is excluded from further consideration.
Alternative 4.	Smallholder Oil Palm Plantations	As noted above, oil palm plantations are not legally permitted as oil palm may not legally be established on land that has been designated as Hutan Produksi or production forest. Although some smallholder palm-plantations do exist on the fringes of the Kampar Peninsula, none exist at the higher elevations of the project area. As a result of the legal barrier, it is also untenable and, as such, as an alternative land-use scenario it is excluded from further consideration.
Alternative 5.	Protected Forests Without benefit of Carbon Crediting	Forest land could be legally converted to some type of protected or conservation forest. However, this is a legally complex and challenging process that is governed and regulated by a wide variety of laws in Indonesia. The likelihood of this process being successful remains fairly low, but it can be done legally.
Alternative 6.	Mininig & Fossil Fuel Extraction	Currently, there is legal fossil fuel extraction on the Kampar Peninsula, and in areas that are close to the Project Area. All the extractive activity is done with legal permits from the Ministry of Mining and Energy, and it is possible to legally acquire new licenses to allow this type of activity, however unlikely.

Table 71- Six alternative scenarios with respect to mandatory applicable laws and regulations

Conclusion: Alternatives one, two, five, and six all have applicable enforced mandatory legislation and regulations. Alternative three and four would violate applicable enforced mandatory legislation and regulations; as such, these alternatives are excluded.

3.6.5.2 Outcome of Sub-Step 1b.

Alternative three & four are non-compliant: As the baseline, alternative three and four, **industrial oil palm production and smallholder oil palm production,** do not comply with mandatory enforced legislation. Although there is substantial non-compliance in regard to smallholder oil palm plantations, it is not in this part of the Province of Riau. Non-compliance of that sort does not feature on the Kampar Peninsula in a way that would make it a feasible baseline scenario. Alternatives three and four are removed from the list of realistic and credible baseline scenarios.

Below is the list of remaining realistic and credible baseline scenarios.

Alt. No.	Remaining Realistic and Credible Baseline Scenarios:
Alternative 1.	Industrial *Acacia* Plantation
Alternative 2.	Continuation of Pre-Project Activity - Conventional Selective Logging
Alternative 5.	Protected Forests Without benefit of Carbon Crediting
Alternative 6.	Mining & Fossil Fuel Extraction

Table 72- List of remaining realistic and credible baseline scenarios

As there are four remaining alternative scenarios, the analysis will proceed to Step 2, the Barrier analysis.

STEP 2. Barriers analysis

STEP 2. Barriers analysis

This step serves to identify barriers and to assess which of the land use scenarios identified in the sub-step 1b are not prevented by these barriers.

Sub-step 2a: Identification of barriers that would prevent the implementation of at least one alternative land use scenarios

The RER Project had identified five (5) main barriers that would have prevented the project activity that was present when the project was initially conceived as a carbon project (before the start date) and at the time when the Project Owner was working to acquire the newly created IUPHHKE-RE license for the four concessions.

Barrier 1. Investment Barriers (2011-2015)

At the time when the RER Project was conceived and was planned (i.e. from the acquisition of the licensing phase to the beginning of the project activities), no other similar (i.e. non VCS AFOLU) projects had been successfully completed at the time with private finance. Similar activities were being planned and contemplated. Some were being attempted with private finance (e.g. Infinite Earth, Orangutan Foundation International and Gazprom supported the Rimba Raya Biodiversity Reserve REDD Project), and some were being undertaken with grants, and international donor

funding (i.e. PT. REKI (Hutan Harapan), which began in 2007 and has struggled with funding, business development and securing the forest from threats). It was widely understood at the time (2011-2015) that the international voluntary carbon markets were a nascent business model, with no success stories in Indonesia. After 2012/2013, project financing in Indonesia was challenging to acquire for REDD+ projects[83].

The voluntary carbon markets in 2007-2009 saw its "hey-days", particularly in Indonesia, the years after the signing of the Bali Accords in 2007. The UNCCC negotiations in subsequent years failed to produce market-based rules for REDD+ and the talks were mired in technical debates and disagreements between major actors. Voluntary carbon prices peaked in 2008 at USD $7.3 per tonne, but only 6 years later in 2014, the average price was USD $3.8/ tonne[84]. Voluntary Carbon prices continued to fall in 2015 to USD $3.26/ tonne. In 2016 prices were at USD $3.10/ tonne and prices have hovered at slightly above USD $3/tonne since then[85]. The regulated carbon sector under the UN CDM scheme saw even more significant drops with prices had peaked to nearly EUR €30/tonne in 2008 and plunged to the rock bottom price of EUR €0.12/tonne by mid-2014. By 2011 and 2012, private equity investments in forest carbon projects were becoming difficult to source. By the time the RER Project received its licenses, there was limited appetite for investment into forest carbon projects. As noted above, the price of carbon had also substantially dropped in value so that in the voluntary carbon space such that institutional financing was difficult to source; project money dried up. There was little appetite for forestry projects, with or without carbon.

Additionally, debt funding for a forest project without viable commercial revenue was not available, both in the international markets nor by Indonesian banks. When the RER Project was acquiring its license in 2012-2014, no Indonesian or international bank was willing to fund forestry projects with no projected revenue; after nearly five years of concerted efforts by a variety of project developers in Indonesia, the REDD+ space was littered with failed projects and not a single REDD+ credit had originated. Banks and institutional lenders saw forest projects as a dead-end with no future.

Conclusion. The RER Project, along with the strong downward trend in the voluntary carbon markets, faced significant financial barriers as it was not able to access traditional project funding and did not have access to regular debt funding from banks or commercial lending institutions. A forestry project with no carbon crediting would be unable to acquire capital.

Barrier 2. Institutional Barriers

Institutional barriers in Indonesia, such as competing land rights and bureaucratic processes acted as substantial institutional barriers.

Conclusion. Institutional barriers existed in Indonesia that made the implementation of REDD+ projects unpredictable from a business perspective.

Barrier 3. Technological Barrier (2011-15)

Undertaking REDD+ type projects that effectively could reduce carbon emission, either with or without the origination of carbon credits, was a difficult process in Indonesia. Carbon accounting and the science of how to apply it was initially at a low level in the period after the COP 13 and through 2015. There was no approved methodology to reduce carbon emissions available at the time the project was being licensed. The only two applicable peat methodologies to Indonesia, VM00027 (July 2014) were, and VM0007's (March 2015) only became approved after the RER Project became licensed. At the time of the Project's start date, both were untried and had not resulted in a validated project.

Local knowledge of REDD+ and peatland conservation was challenging to come by, and experts and non-local consultants, often from overseas, were generally the rule of the day; certainly, there was little to no local expertise in Riau Province. The Project Owners had no local forest-carbon staff at the beginning of the Project, and all of the local persons engaged in the Project had to be trained to undertake the Project activities or else suitable experts had to be sourced, usually from overseas.

Another challenge was developing appropriate methods for measurement and monitoring conservation of forest carbon, sustainable forest management, and carbon stock enhancement; capacity building and institutional arrangement for sub-national level and addressing leakage[86]; these techniques simply did not exist when the Project was being licensed and were in a nascent stage at the Project's start date.

Conclusion: The lack of an approved methodology in the years when the project was being licensed, a lack of local staff knowledgeable about REDD, forest carbon and peatland conservation constituted an additional barrier to the Project.

Barrier 4. Barriers Related to Local Conditions (2011-2016)

There were barriers to the implementation of any carbon-based project, whether or not it involved receiving funding from the sale of carbon credits as civil society and local populations were distrustful of the REDD+ process[87]. Considerable opposition existed by local and international civil society groups who were opposed to REDD+. In particular indigenous rights groups, Climate Action Network (Europe), Friends of the Earth International[88] , and many Indonesian NGOs actively worked against the REDD+ mechanisms. Indonesia's civil society opposition led to the formation of Climate Justice Now!, a public advocacy coalition that strongly advocated against REDD+ and regularly demonstrated against the FCPF, REDD+, and the World Bank support of REDD. The active campaigns in Indonesia against REDD+ mobilized substantial opposition to REDD+ and forest carbon projects in Indonesia[89]. Furthermore, the Project Owner of RER-CP experienced substantial hostility from Indonesian civil society groups in any efforts related to forest conservation.

Additional local barriers and conditions existed in that there was general disdain and disregard for conservation areas. Local populations and farmers felt that if there was an area of forest that was not being used, that they had a right to use the area. In Riau Province, this often led to the illegal or

partially legal conversion of "unused forests" to oil palm. Conservation areas, bio-reserves, or national parks were scorned and, as a general rule, succumbed to substantial encroachment, mostly from small holder oil palm agriculturists. The process of burning the forest to clear it for oil palm by smallholders was relentless. The outcomes in Tesso Nilo, Harapan, and Giam Siak Kecil - Bukit Batu Reserve are all stark reminders of this[90].

Conclusion: The Project faced strong objections and distrust from local communities and local and international civil society groups. If implemented without the benefit of carbon financing, long term protection would not be feasible.

Barrier 5. Barriers Due to Prevailing Practice

First of its Kind. This Project acknowledges that generating emission reduction credits from a private forest concession owner that has industrial forestry plantations, and pulpwood processing as its primary business model has never been implemented in Indonesia. It is one of the "first of its kind." When the original ER licenses were acquired, there were no successful REDD+ projects of any kind in Indonesia. When the Project started its activities in early 2016, there was not a single successfully validated REDD+ project in Indonesia. Since the introduction of the REDD+ concept in Indonesia around 2007, and despite many REDD+ project development efforts, there are currently only three other validated AFOLU carbon origination projects of any kind (CDM or otherwise) in the Republic of Indonesia. Two APD projects were set up specifically by non-forestry companies (Katingan and South Sumatra Merang) and one coastal mangrove reforestation NGO project (Aceh). This Project is a ground-breaking project, and when it is approved, it will be only the third avoided deforestation REDD+ project in the last decade to succeed in the Republic of Indonesia. When the concept of the Project was first proposed, it was widely panned by the press, communities, and civil society organizations and held to be an exercise in "greenwashing" in order to "land-bank" the project area for future HTI development.

Conclusion: The Project has faced barriers as a "first of its kind" project; no forestry company has ever managed to successfully conserve a large-scale peat swamp forest or any type of forest in Indonesia for a prolonged period of time.

Outcome of Step 2a: List of barriers that may prevent one or more land use scenarios identified in the step 1b.

Five main Barriers were identified:

1. Investment Barriers
2. Institutional Barriers;
3. Technological Barriers;
4. Barriers due to Local Conditions Barriers;
5. Barriers due to prevailing practices.

Sub-step 2b: Show that the identified barriers would not prevent the implementation of proposed at least one of the alternative land-use scenarios (except the proposed project activity)

The following analysis reviews whether there exist barriers that do not prevent the implementation of at least one of the alternative land-use scenarios.

Activity	Identified Barriers
Industrial *Acacia* Plantation	Since the Project's initiation and even further back, the land has been legally eligible for the establishment of *Acacia* plantation. The land has desirable characteristics for industrial plantation activity; it is well located in relation to paper and pulp processing facilities, it already is a partially drained peat-landscape, and it had been gazetted as production forestry, which means, in turn, it could be legally converted to HTI production. The success and prosperity of the industry mean that there was adequate ability to receive traditional debt financing for this activity as it was profitable and part of the Indonesian national development strategy. There was an adequate workforce available and considerable local community support for the activity as it provided for many local jobs.
Conclusion:	There are no barriers to this type of land-use.
Continuation of Pre-Project Activity - Commercial Selective Logging	Although legally permissible, commercial selective logging is commercially and ecologically impractical on the Project Area, largely in part due to the fact that the area was logged both legally and illegally in the decades between 1970-2010. The result is that the vast majority of exploitable species and trees with commercial value have been removed (Further barriers arise from the more recent Indonesian MoF and MOEF regulatory requirements of forest management, forest planning, and enforcement of the same. With the lack of trees of commercial value, the high cost of doing business in the much more regulated forestry sector, the difficulty of accessing timber markets without legal certifications, and the lack of nearby processing facilities all create substantial barriers to this as a possible land-use. Furthermore, it is doubtful that commercial timber sourced frompeat-swamp forests would be an attractive product in today's more environmentally conscious timber markets.
Conclusion:	Commercial selective logging faces an inability to acquire capital, regulatory barriers, but most importantly, barriers based on local conditions, i.e. commercial timber of insufficient quantity and located on deep peat. It is therefore not a credible alternative land-use scenario
Protected Forests without Benefit of Carbon Crediting	The creation of a protected forest in the manner of a National Park, although perhaps legally feasible, is not likely. The Tesso Nilo NP in central Riau which lost 79% of its forest cover in just 16 years to encroachment by locals, despite being primarily hemmed in by private concessions and being formally "protected".
Conclusion:	Because of the identified barriers, such as lack of funding, lack of local community support, and a strong likelihood of encroachment, this land-use scenario is deemed not credible.
Mining & Fossil Fuel Extraction	The most substantial barrier to mining activity in the Kampar is the lack of known mineral deposits in the Project Area and the considerable peat overburden. The Project area is unsuitable for mineral extraction. This is further confirmed by the absence of mineral extraction on the Kampar Peninsula, including small scale artisanal mining. Mining is not considered a credible alternative land-use activity of the Project Area. Current fossil fuel extraction on the Kampar Peninsula is limited by licensing from the Ministry of Mining and Energy. Outside of the nearby PCC block, only exploratory activity has been undertaken at the nearby Selat Panjang Block with a limited production of 300 barrels per day. There are no known further developments that would suggest that the Project Area could be licensed for fossil fuel extraction. Furthermore, oil extraction closest to the Project Area is a capital-intensive activity with and only undertaken when substantial returns can be projected, which is not the case in the Project Area. The lacklustre performance of the Selat Panjang block, which remains to this day, over 25 years after it was licensed as a small exploratory block strongly suggest that there are no commercially viable oil and gas reserves in the Project Area or that drilling in that area is warranted.
Conclusion:	Fossil fuel production is not considered a credible alternative land-use activity of the Project Area because of the identified barriers: lack of a license and no proven fossil fuel reserves in the Project Area.

Table 73- Analysis reviews of identified barriers

In conclusion, significant barriers prevent the realization of all but a single credible land use scenario: industrial *Acacia* plantation.

Sub-Step 2c. Determination of baseline scenario (if allowed by the barrier analysis)

The alternative baseline scenario of Protected Forests (without the benefit of carbon financing) is included in list from Sub-step 2a, but is in fact prevented by the identified barriers. Subsequent to the analysis of Sub-step 2b, there is only one remaining land use scenario, that of industrial Acacia plantation activity.

The A/R Methodological tool therefore indicates to continue the analysis with Step 4: Common Practice test[91]

STEP 3. Investment analysis

Because a single credible land use scenario was identified through the analytical steps described above, a detailed investment analysis is not required by the A/R Methodological tool[92]. Nonetheless, an investment analysis was prepared by the Project Owner and its result are available for review during the validation audit. The results further support the below conclusion in regard to additionality. The results support the identification of industrial *Acacia* plantation as being the most likely and most profitable use on the areas legally classified as production forest.

STEP 4. Common practice analysis.

Analyse the extent to which "similar forestation activities to the one proposed as the project activity have been implemented or are currently underway. Similar forestation activities are defined as that which are of similar scale, take place in a comparable environment, inter alia, with respect to the regulatory framework and are undertaken in the relevant geographical area, subject to guidance by the underlying methodology. Other registered A/R CDM project activities shall not be included in the analysis[93].

At the Project Start Date, it was not a common practice in Indonesia for the government to have intact forest land designated for production that is not being commercially exploited and generating some type of taxable income. Prior to the possibility of an Ecosystem Restoration license, there was no option to maintain *hutan produksi*, or production forest as anything else but as selective logging or plantation activities. A concession owner who was unable to make the concession productive would see his license revoked by the Ministry of Forestry.

Successful REDD+ projects before the implementation of the RER Carbon Project were unknown. Although there were efforts to undertake REDD+ in Riau Province before the implementation of the Project, none were successful. Furthermore, efforts to preserve forest landscapes, such as the Tesso Nilo National Park and Giam Siak Kecil Biosphere Reserve, are examples of government-funded activities or public-private partnerships. These types of actors were often faced with conflicts with local governments and local communities as they were perceived as taking land away from the people and not contributing to local government coffers. They are subject to substantial

encroachment and a lack of protection. Within Indonesia, there are also some examples of small donor backed conservation projects or where a large corporate in the extractive industries are paying for restoration costs of sites as reparations for areas damaged as part of their operations. Sometimes this occurs nearby active operations, and sometimes it occurs in other locations. These types of activities are not widespread and are typically limited in size and scope.

The only APD / WRC projects that are comparable is the Sumatra Merang Peatland Project in South Sumatra, however at 22,000 ha, the RER Project is 83% larger and covers a more complex landscape. The only comparable project to the RER Project in all of Indonesia is the Katingan Peatland Restoration & Conservation Project, a VCS APD project in Central Kalimantan. There are no other avoided deforestation projects that have succeeded in Indonesia. The RER Project based on its scope and scale is not a common project activity.

Conclusion

The Project is considered additional, and the above analysis has determined that the baseline scenario is the conversion of HPH forest to HTI industrial *Acacia* plantation.

3.6 Methodology Deviations

3.6.1 First Methodology Deviation/alteration

The RER Project has temporarily deviated from the peat depth measurement requirements of VMD0016 – Methods for Stratification of the Project Area (X-STR) ver 1.2 because it was not available at the time the Project undertook its peat depth sampling efforts.

The current methodology: **VMD0016 – Methods for Stratification of the Project Area (X-STR) ver 1.2** states:

"To create a peat depth map, depth measurements must be conducted in a systematic way along transects that cover the peatland. Starting from the margin (or boundary) of the peatland, the initial distance between depth observations along transects must not be greater than 100 m with a Distance between transects must be 200 m at maximum. When two subsequent depth observations along a transect fulfill the required depth criteria by a margin of at least 50 cm, the distance between transects and observation points can be raised to 500 m (4 measurements per km). Transects must cross the entire terrain of the peatland and must be initiated from opposed margins."

Versus

The old methodology **VMD0016 – Methods for Stratification of the Project Area (X-STR) ver 1.1** states

"The height model must be combined with data from peat corings to generate a spatially explicit map of peat strata that fulfil the above requirements. The required peat depth at each sampling location must be determined with a resolution of at least 0.5 m using a peat corer or auger (such as an Eijkelkamp corer). Peat coring locations must be selected using representative random sampling or systematic sampling. It is acceptable to conduct corings along transects that run perpendicular to the perimeter of the peat dome. Sampling intervals must range from 500 to 1500 m depending on the size of the peat dome, terrain accessibility, observed peat thickness and the observed slope in subsequent peat thickness assessments along the transect."

The Project is temporarily deviating from the peat depth map requirements contained in X-STR ver 1.2 because the Project relied on X-STR ver 1.1 (valid until 08 March 2021) to conduct all field measurements for peat depth mapping as ver 1.2 was not available until 08 September 2020, many months after the fieldwork was conducted. The Project, however, will update its peat map and mapping process at the 10-year baseline re-adjustment.

What RER-CP did when it undertook peat measurements per X-STR ver 1.1:

a. in a systematic sampling manner;
b. using a staircase transect system;
c. Sampling intervals of 500 m was generally used, but never more than 1,500 m; and
d. Sampling resolution accuracy was 50cm.

What is Required by X-STR v. 1.2:

a. Transect must start at project boundary
b. initial distance between depth observations along transects must not be greater than 100 m
c. initia depth accuracy of at least 50 cm for tropical peat
d. When two subsequent depth observations along a transect fulfill the required depth criteria by a margin of at least 50 cm, the distance between transects and observation points can be raised to 500 m x 500 m (1 measurement represent 25 Ha or 4 measurements per km^2) and would require 5,200 peat depth samples.
e. Transects must cross the entire terrain of the peatland and must be initiated from opposed margins

The differences between the two versions will not impact the RER Project because the entire project area is on deep peat (see Map 28) in a peat dome. The new requirements will not affect the conservativeness of the measurements used because of the deep peat. The Peat Depth measurements are used to determine the peat depletion timeline (PDT) which in turn is used to determine when peat subsidence will be greater than the peat in a specific part of the project area. This is especially important if the peat is shallow or where there is mineral soils in the project area and no peat. In the case of RER-CP, the entire project area is in peat that is mostly very deep (500-700 cm). Only a very small percentage is deep peat (300-500cm).

The deviation only relates to the procedure for measurements of the peat depth and does not relate to any other part of the methodology. In any case, with the peat being as thick asit is in the Project Area, the peat would not be depleted in the first ten years (i.e. until the first baseline re-assessment). The accuracy of the emission reductions are not affected by this deviation. And in any case, the Project can update the peat map ta the Baseline re-assessment in 2025. The temporary deviation is also appropriate as it is not reasonable to have the Project reassess its peat map where it is clear that such a re-assessment will have no impact whatsoever on the GHG emission reductions or removals.

The Project has not undertaken any other deviations from the VM0007 methodology or any of the related modules relating to the criteria and procedures for monitoring or measurement.

3.6.2 Second Methodology Deviation/alteration

The Project has opted to exclude a number of emissions from the Baseline and the Project. These omissions might be considered deviations/alterations from the methodology. VM0007 and its modules allow for the exclusions, however, for transparency purposes, the Project has opted to include these exclusions in this section. All of the exclusions are conservative and only relate to the measurement of emissions, they do not relate to any other aspect of the methodology. They are set forth below.

3.6.2.1 Exclusion of emissions from excluded in the baseline and project that deviate from VM0007

Emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively be omitted as per BL-PEAT – Section 5.3. These exclusions, as they are only in the baseline, are conservative because they do not increase any project emissions.

3.6.2.2 Carbon pools excluded in the baseline and project that deviate from VM0007

Carbon Pool	In/excluded	Justification
Above-ground non-tree biomass	Excluded	Non-tree biomass carbon pool is expected to increase in the project scenario compared to the baseline, and therefore can be conservatively omitted as permitted under VM0007.
Litter on mineral soil	Excluded	It is conservatively excluded as permitted under VM0007 where inclusion is optional. However, litter carbon pools and their stock changes may be monitored in the future.
Litter on peatland	Excluded	It is conservatively excluded as permitted under VM0007 where inclusion is optional. As the litter carbon pool is expected to increase in the project scenario compared to the baseline, it is therefore conservatively omitted.
`Deadwood	Excluded	It is conservatively excluded as permitted under VM0007 where inclusion is optional. This pool is not mandatory for either mineral soil or peatland. As the dead wood carbon pool is expected to increase in the project scenario compared to the baseline, it is therefore conservatively omitted.

Table 74 Carbon pools excluded in the baseline and Project

3.6.2.3 GHG Sources excluded in the baseline and project that deviate from VM0007

REDD GHG sources in the baseline

GHG Sources	Gas	In/excluded	Justification
Burning of woody biomass	CO_2	Excluded	Above-ground biomass losses as a result of fire are conservatively assumed zero
	CH_4	Excluded	Above-ground biomass losses as a result of fire are conservatively assumed zero
	N_2O	Excluded	Above ground biomass losses as a result of fire are conservatively assumed zero
	No fires have been observed in the baseline to date and fire is assumed to be zero in the baseline and GHG from fires are conservatively omitted. Because measured biomass burning is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the biomass pool as specified in T-SIG.		

Combustion of fossil fuels	CO_2	Excluded	Combustion of fossil fuels is not included and CO_2 from combustion of fuels is conservatively omitted as permitted under VM0007.
Use of fertilizers	N_2O	Excluded	Acacia species are nitrogen fixing species and no nitrogenous fertilizers are used in Acacia plantation management. N_2O emissions from fertilizer applications are excluded in baseline scenario. Conservatively omitted as permitted under VM0007.

Table 75 – REDD GHG sources in the Baseline that are excluded

REDD GHG sources in the project

As noted in the below tables, the Project will monitor combustion and will report any such emissions as they occur.

GHG Sources	Gas	In/excluded	Justification
Burning of woody biomass	CO_2	Excluded	Above-ground biomass losses as a result of fire are conservatively assumed zero.
	CH_4	Excluded	
	N_2O	Excluded	
	No fires have been observed in the baseline to date and fire is assumed to be zero in the project and GHG from fires are conservatively omitted. Because measured biomass burning is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the biomass pool as specified in T-SIG. However, fires will be monitored and included if they occur in the future.		
Combustion of fossil fuels	CO_2	Excluded	Combustion of fossil fuels is not included and CO_2 from combustion of fuels is conservatively omitted as permitted under VM0007.
Use of fertilizers	N_2O	Excluded	Use of fertilizers is not planned for the project activities. N_2O emissions from fertilizer applications are excluded in project scenario. Conservatively omitted as permitted under VM0007.

Table 76- REDD GHG sources in the Project that are excluded

WRC GHG sources in the baseline

GHG Sources	Gas	In/excluded	Justification
Peat combustion	CO_2	Excluded	Above-ground biomass losses as a result of fire are conservatively assumed zero.
	CH_4	Excluded	
	N_2O	Excluded	
	No fires have been observed in the baseline to date and fire is assumed to be zero in the project and GHG from fires are conservatively omitted. Because measured biomass burning is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the biomass pool as specified in T-SIG. However, fires will be monitored and included if they occur in the future.		
Combustion of fossil fuels	CO_2	Excluded	Combustion of fossil fuels is not included and GHG emissions from combustion of fuels is conservatively omitted as permitted under VM0007.
	CH_4	Excluded	
	N_2O	Excluded	

Table 77 - WRC GHG sources in the Baseline that are excluded

WRC GHG sources in the project

GHG Sources	Gas	In/excluded	Justification
Peat combustion	CO_2	Excluded	Above-ground biomass losses as a result of fire are conservatively assumed zero.
	CH_4	Excluded	
	N_2O	Excluded	
	No fires have been observed in the baseline to date and fire is assumed to be zero in the project and GHG from fires are conservatively omitted. Because measured biomass burning is zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the biomass pool as specified in T-SIG. However, fires will be monitored and included if they occur in the future.		
Combustion of fossil fuels	CO_2	Excluded	Combustion of fossil fuels is not included and GHG emissions from combustion of fuels is conservatively omitted as permitted under VM0007.
	CH_4	Excluded	
	N_2O	Excluded	

Table 78 - WRC GHG sources in the Project that are excluded

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The Project has used VM0007 (REDD-MF), VMD0006 (BL-PL) and VMD0042 (BL-PEAT) to assess the Project's baseline.

Overarching Baseline Approach

In order to determine baseline emissions for both modules, the Project must establish two baseline areas:

First the Project must establish the Baseline reference region or Proxy Area as per §5 Part 1 of BP-PL and §5.1.2 of PL-PEAT). This needs to be done first because the Project does not have a government approved management plan for deforestation.

Secondly the Project must establish the baseline project area which will describe the "annual area of land deforested". This is done per §5 Part 1, steps 1-1 through 1.6 of BL-PL); this will establish the baseline project area that will be deforested, and it will also be the area where peat related emissions will occur. It will also establish the boundaries for the four Project Activities.

Only after the Project has established the two baseline areas can it begin to calculate "baseline carbon stock change for PL-PL pursuant to §5, Part 2 and begin "assessing GHG emissions" (per §5.2 of BL-PEAT). For BL-PL, §5 Part 2 is followed and for BL-PEAT, § 5.2 is followed. For BL-PEAT, the Project is also required to take consideration of a set of General Procedures and Assumptions from §5.1.1; these are described below at §4.1.2.

The flowchart below describes the process the Project used.

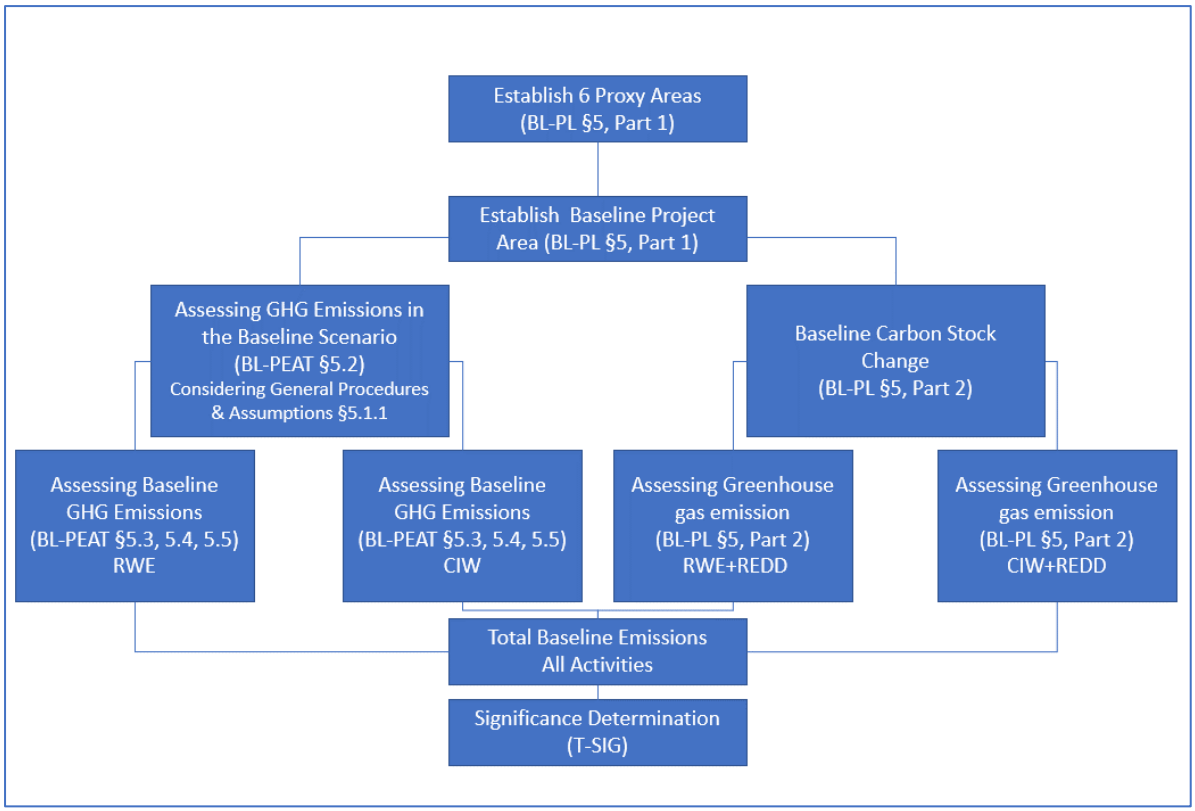


Figure 24 - Flowchart of how Project Established the Baseline

4.1.1 Proxy Areas

Using the module VMD0006 (BL-PL), a total of 6 suitable proxy areas were identified (see Table 79 and Map 33). This is required for both BL-PL and BL-PEAT in as there is no fixed management plan to determine the rate of deforestation, thus a process set forth in BL-PL, §5 Part 1 is used to do this. BL-PEAT at §5.2 also requires the use of a proxy analysis.

Reference region	Area in Ha	Province	Concession Grant Date	Peat %
PT. RAPP (Tasik Belat)	11,339	Riau	2009	100%
PT. Peranap Timber (Serapung)	32,527		2002	
PT. Essa Indah Timber (Serapung)	10,023		2003	
PT. Madukoro Lestari (Tasik)	14,903		2003	
PT. Harapan Jaya (Tasik)	5,084		2003	
PT. RAPP (Meranti East and West)	44,170		2009	
RER	130,090		2012-2014	

Table 79- Summary of suitable reference regions

Concession	Area in Ha	Province	Concession Grant Date	Peat %
PT. Gemilang Cipta Nusantara	20,123	Riau	2012	100%
PT. Sinar Mutiara Nusantara	32,776		2014	
PT. The Best One Unitimber	40,666		2014	
PT. Global Alam Nusantara	36,525		2014	
Total	130,090			

Table 80- Summary of RER Project concession areas

Process to Select the Proxy Areas

4.1.1.1 Satellite Imagery Analysis

The initial selection of proxy locations was conducted by using proprietary APRIL information regarding its plantation concessions and APRIL supply partner plantation concessions. This proprietary data included actual deforestation records, management plans (RKUs RKTs, and other proprietary plantation management documentation), plantation area registers, forest inventory data, and plantation and infrastructure survey maps, and plantation survey records. The harvesting plans of all of these concessions (and subsequent harvesting rates) have been verified by data from the Indonesian Ministry of Environment and Forestry and ensure that in addition to the below satellite imagery analysis that the deforestation rates of the proxy areas are accurate.

A) Data acquisition

For each concession, Landsat Thematic Mapper (TM), Landsat Data was downloaded from the US Geological Survey (USGS) online database13, including Landsat Thematic Mapper (TM), Landsat 5 Enhanced TM Plus (ETM+) or Landsat 8 Operational Land Imager (OLI). Geometric corrections and orthorectification was applied to all Level 1 Landsat data sourced from USGS applying SRTM DEM data and precision ground control points, in accordance with all standards provided by the GOFC-GOLD 2013 Handbook.

B) Landsat pre-processing

Multi-year satellite data were analysed using Google Earth Engine to get nearly cloud-free data. For time-step 1, imagery from the concession grant date was downloaded. For time-step 2, imagery from the last year of forest development was downloaded. Multi-year satellite data were analysed using Google Earth Engine to identify cloud-free image coverage for the start year. Due to Landsat's long revisit time and the high level of cloud cover in Indonesia, a compromise had to be made between cloud cover and the imagery acquisition date's proximity to the concession grant and development completion dates.

C) Landsat classification

To increase the accuracy of the classification, the Project Area boundaries were overlaid on the Landsat imagery, and all spectral data outside the relevant area of interest was removed from further analysis.

To determine the land cover types using Landsat data the algorithm was developed following a decision tree logic[94] of two land cover types which were generated by using: i) canopy cover percentage[95], and ii) based on supervised classification using support vector machine. The canopy cover percentage was calculated as a function of the Enhanced Vegetation Index[96]. An 'optimized' vegetation index designed to enhance the vegetation signal with improved sensitivity in high biomass regions and improved vegetation monitoring through a de-coupling of the canopy

background signal and a reduction in atmosphere influences. Finally, the noises due to the cloud effect were corrected by taking the output from the analysis using the satellite imagery from the previous time step.

Two path/row Landsat scenes were used, 1) Path/row 126/60 for Madukoro Lestari, Harapan Jaya, and Meranti; 2) Path/row 126/60 and 126/59 for Peranap Timber, Essa Indah Timber, and Tasik Belat. All Landsat details are set forth in Tables 81-86 below.

All images for the proxy analysis were used to get nearly 100% cloud-free images. The satellite images shown are for both pre- and post-plantation to represent the median values within the historical reference period (1 Jan 2006 to 31 Dec 2015).

The mosaic Landsat images used were cloud-free. Finally, an accuracy assessment was run on each of the maps to ensure that the overall classification accuracy (i.e. forest vs non-forest) was at least 90%. The overall classification accuracy was then calculated using project equation 10. This was obtained by comparing the unprocessed Landsat data and high-resolution imagery from Google Earth (when available).

$$Overall\ Classification\ Accuracy = \frac{Number\ of\ Pixels\ Classified\ Correctly}{Total\ Number\ of\ Classified\ Pixels} \quad (10)$$

All accuracy estimates for the maps were satisfactory with the average accuracy being 94.8%.

Further, the concession boundaries were overlaid onto the satellite images, and images outside of the boundaries were masked to improve the classification of land cover. The canopy cover map and training data (forest classifications from plots assessed in the field) were then analysed using supervised classification machine learning algorithms to classify into forests, degraded forests and non-forest. The information was further classified against the company spatial database (Python Base) to verify land cover classifications. It should be noted here that actual planted areas have been ground surveyed in the field to a high level of accuracy, so the deforestation estimates are of a high level of accuracy (sub-meter level). The process used to prepare the satellite imagery is also set forth in Figure 25 below. This process is consistent for all 6 proxy area maps.

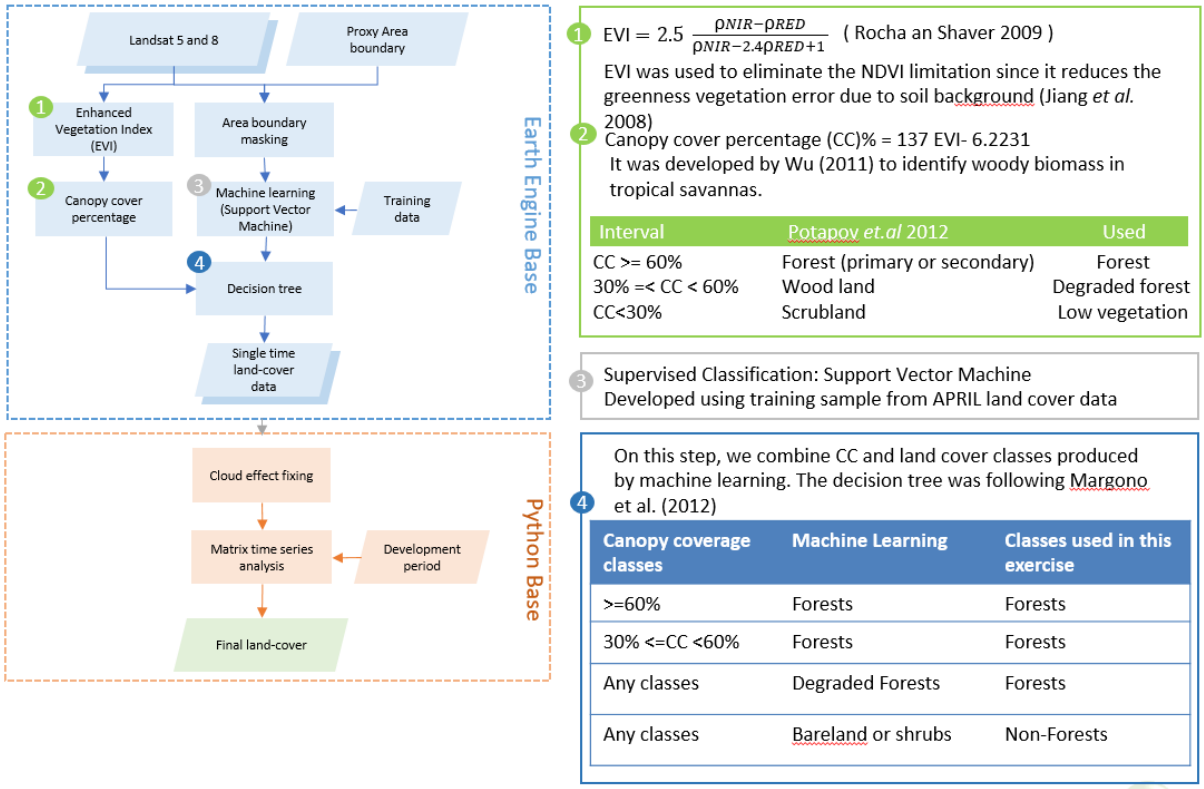
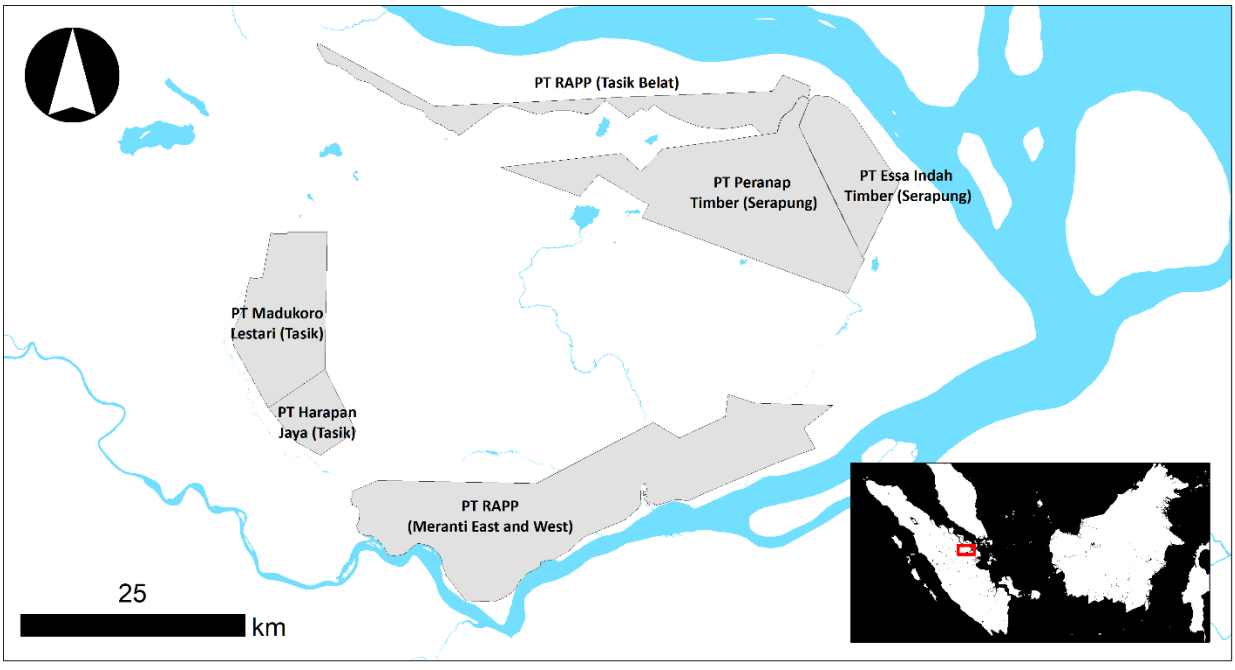


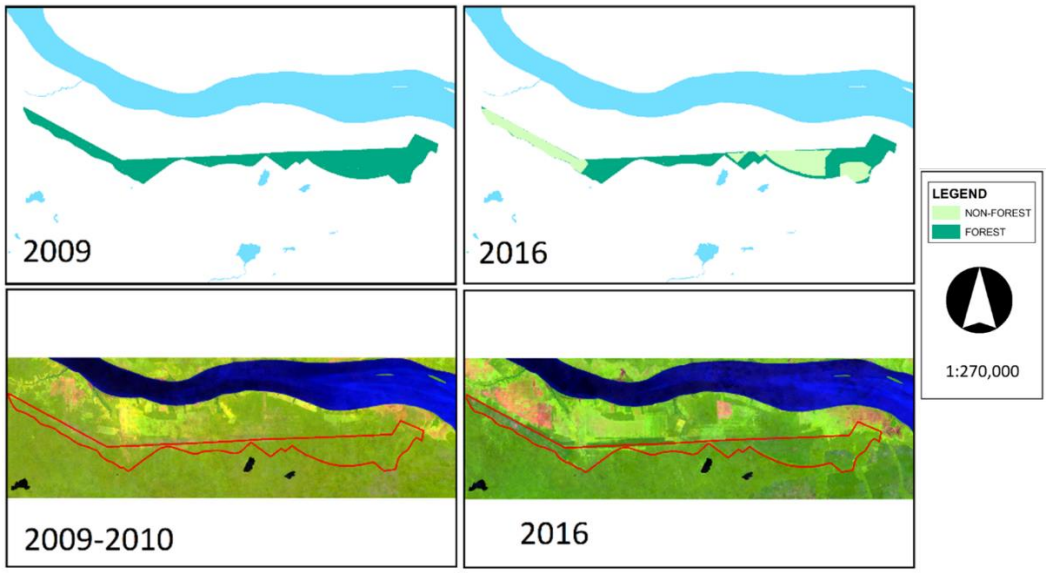
Figure 25- The process flow used to prepare satellite imagery for proxy area analysis



Map 33- Geographic location of the 6 proxy reference regions for the baseline deforestation rate calculation

All 6 proxy areas share the same landscape as RER Project Area, located on the geological landscape, share the same soil types (100% peatland), have similar topography (flat and low altitude) and are all within the same range of land areas as the 4 RER concessions.

A) **PT. RAPP** (Tasik Belat) is located to the north of the RER project area and is a long thin strip of land that runs from east to west. The concession was granted in 2009 and is 11,339 hectares. In 2011 the concession contained 11,323 hectares of natural or secondary forest and by 2016 this had been reduced to 6,233 hectares through planned deforestation.



Map 34 Land cover maps (top) and satellite data (bottom) for PT. RAPP (Tasik Belat)

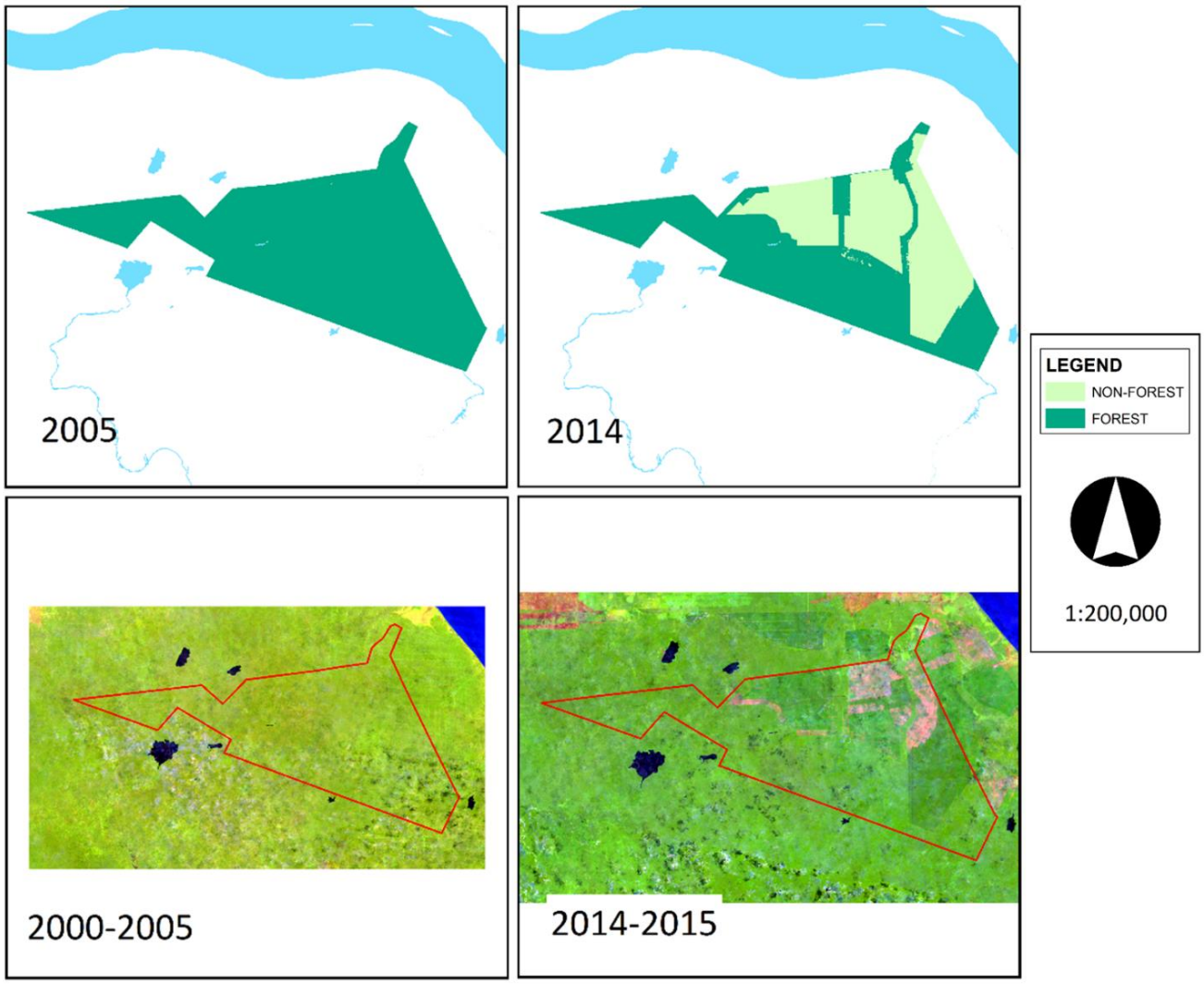
Mosaic satellite data used for the above land use classification is listed below in Table 81.

Concession	PT. RAPP			
Sector	Tasik Belat			
Time	Before plantation establishment			
Year	2009-2010			
Satellite	Landsat 5			
Path/ Row	126/60 & 126/59			
Image ID/ Date	Image ID	Date	Image ID	Date
	LT05_126059_20090130	30/01/2009	LT05_126059_20090911	11/09/2009
	LT05_126060_20090215	15/02/2009	LT05_126059_20090927	27/09/2009
	LT05_126059_20090215	15/02/2009	LT05_126060_20091013	13/10/2009
	LT05_126059_20090404	04/04/2009	LT05_126059_20091013	13/10/2009
	LT05_126059_20090522	22/05/2009	LT05_126059_20091029	29/10/2009
	LT05_126059_20090607	07/06/2009	LT05_126059_20091216	16/12/2009
	LT05_126059_20090623	23/06/2009	LT05_126059_20100117	17/01/2010
	LT05_126060_20090709	09/07/2009	LT05_126059_20100202	02/02/2010
	LT05_126059_20090709	09/07/2009	LT05_126059_20100914	14/09/2010
	LT05_126060_20090725	25/07/2009	LT05_126060_20101016	16/10/2010
	LT05_126060_20090826	26/08/2009	LT05_126059_20101016	16/10/2010
	After plantation establishment			
	2016			
	Landsat 8			
	126/60 & 126/59			
	Image ID	Date	Image ID	Date
	LC08_126059_20160118	18/01/2016	LC08_126059_20160712	12/07/2016
	LC08_126060_20160203	03/02/2016	LC08_126060_20160813	13/08/2016
	LC08_126059_20160306	06/03/2016	LC08_126059_20160813	13/08/2016
	LC08_126060_20160407	07/04/2016	LC08_126059_20160829	29/08/2016
	LC08_126059_20160407	07/04/2016	LC08_126059_20160914	14/09/2016
	LC08_126059_20160423	23/04/2016	LC08_126060_20160930	30/09/2016

	LC08_126060_20160509	09/05/2016	LC08_126059_20160930	30/09/2016
	LC08_126059_20160509	09/05/2016	LC08_126060_20161016	16/10/2016
	LC08_126059_20160525	25/05/2016	LC08_126060_20161117	17/11/2016
	LC08_126059_20160610	10/06/2016	LC08_126059_20161117	17/11/2016
	LC08_126060_20160626	26/06/2016	LC08_126060_20161203	03/12/2016
	LC08_126059_20160626	26/06/2016	LC08_126060_20161219	19/12/2016
	LC08_126060_20160712	12/07/2016	LC08_126059_20161219	19/12/2016

Table 81- Satellite Imagery Details for PT. RAPP (Tasik Belat)

B) **PT. Peranap Timber** (Serapung) is located to the north east of the RER project area and is a triangular block of land. The concession was granted in 2002 and is 32,527 hectares. In 2006 the concession contained 32,526 hectares of natural forest and by 2014 this had been reduced to 19,515 hectares through planned deforestation.



Map 35- Land cover maps (top) and satellite data (bottom) for PT. Peranap Timber (Serapung)

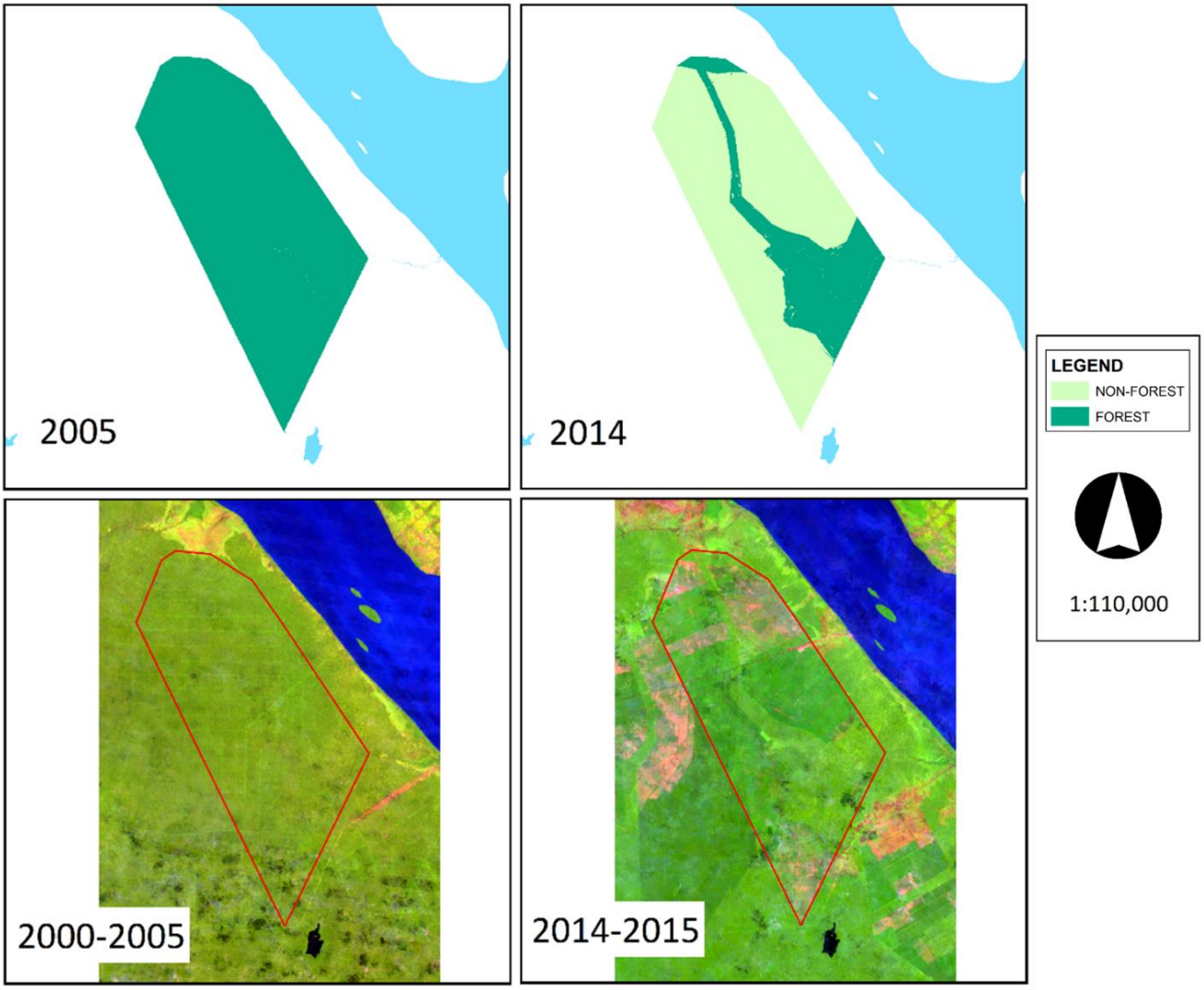
Mosaic satellite data used for the above land use classification is listed below in Table 82.

Concession	PT. Peranap Timber			
Sector	Serapung			
Time	Before plantation establishment			
Year	2000-2005			
Satellite	Landsat 5			
Path/ Row	126/60 & 126/59			
Image ID/ Date	Image ID	Date	Image ID	Date
	LT05_126060_20000122	22/01/2000	LT05_126060_20010719	19/07/2001
	LT05_126059_20000122	22/01/2000	LT05_126059_20010719	19/07/2001
	LT05_126059_20000207	07/02/2000	LT05_126059_20010804	04/08/2001
	LT05_126060_20000223	23/02/2000	LT05_126060_20010905	05/09/2001
	LT05_126059_20000223	23/02/2000	LT05_126059_20010905	05/09/2001
	LT05_126059_20000310	10/03/2000	LT05_126060_20010921	21/09/2001
	LT05_126059_20000411	01/04/2000	LT05_126059_20010921	21/09/2001
	LT05_126060_20000427	27/04/2000	LT05_126059_20031130	30/11/2003
	LT05_126059_20000427	27/04/2000	LT05_126059_20040218	18/02/2004
	LT05_126060_20000513	13/05/2000	LT05_126060_20040321	21/03/2004
	LT05_126059_20000513	13/05/2000	LT05_126059_20040321	21/03/2004
	LT05_126060_20000529	29/05/2000	LT05_126059_20040406	06/04/2004
	LT05_126059_20000529	29/05/2000	LT05_126059_20040422	22/04/2004
	LT05_126060_20000614	14/06/2000	LT05_126060_20040508	08/05/2004
	LT05_126059_20000614	14/06/2000	LT05_126059_20040508	08/05/2004
	LT05_126060_20000630	30/06/2000	LT05_126060_20040625	25/06/2004
	LT05_126059_20000630	30/06/2000	LT05_126059_20040625	25/06/2004
	LT05_126060_20000716	16/07/2000	LT05_126059_20040727	27/07/2004
	LT05_126059_20000716	16/07/2000	LT05_126059_20040812	12/08/2004
	LT05_126060_20000817	17/08/2000	LT05_126059_20041015	15/10/2004
	LT05_126059_20000817	17/08/2000	LT05_126059_20041218	18/12/2004
	LT05_126059_20000902	02/09/2000	LT05_126060_20050220	20/02/2005
	LT05_126060_20001004	04/10/2000	LT05_126059_20050220	20/02/2005
	LT05_126059_20001004	04/10/2000	LT05_126059_20050308	08/03/2005
	LT05_126060_20001020	20/10/2000	LT05_126059_20050324	24/03/2005
	LT05_126059_20001020	20/10/2000	LT05_126059_20050409	09/04/2005
	LT05_126059_20001105	05/11/2000	LT05_126059_20050425	25/04/2005
	LT05_126059_20001207	07/12/2000	LT05_126059_20050511	11/05/2005
	LT05_126059_20010108	08/01/2001	LT05_126060_20050612	12/06/2005
	LT05_126059_20010124	24/01/2001	LT05_126059_20050612	12/06/2005
	LT05_126059_20010313	13/03/2001	LT05_126059_20050628	28/06/2005
	LT05_126060_20010329	29/03/2001	LT05_126059_20050714	14/07/2005
	LT05_126059_20010329	29/03/2001	LT05_126059_20050730	30/07/2005
	LT05_126059_20010414	14/04/2001	LT05_126059_20050815	15/08/2005
	LT05_126059_20010516	16/05/2001	LT05_126059_20050831	31/08/2005
	LT05_126060_20010601	01/06/2001	LT05_126059_20050916	16/09/2005
	LT05_126059_20010601	01/06/2001	LT05_126059_20051002	02/10/2005
	LT05_126060_20010703	03/07/2001	LT05_126059_20051018	18/10/2005
	LT05_126059_20010703	03/07/2001		
	After plantation establishment			
	2014-2015			
	Landsat 8			
	126/60 & 126/59			
	Image ID	Date	Image ID	Date
	LC08_126059_20140112	12/01/2014	LC08_126059_20141214	14/12/2014
	LC08_126059_20140128	28/01/2014	LC08_126059_20150115	15/01/2015
	LC08_126059_20140213	13/02/2014	LC08_126059_20150131	31/01/2015
	LC08_126059_20140301	01/03/2014	LC08_126059_20150216	16/02/2015
	LC08_126060_20140402	02/04/2014	LC08_126060_20150320	20/03/2015
	LC08_126059_20140402	02/04/2014	LC08_126059_20150405	05/04/2015

	LC08_126059_20140504	04/05/2014	LC08_126060_20150421	21/04/2015
	LC08_126059_20140520	20/05/2014	LC08_126059_20150421	21/04/2015
	LC08_126060_20140621	21/06/2014	LC08_126059_20150507	07/05/2015
	LC08_126059_20140621	21/06/2014	LC08_126060_20150608	08/06/2015
	LC08_126060_20140707	07/07/2014	LC08_126059_20150624	24/06/2015
	LC08_126059_20140707	07/07/2014	LC08_126060_20150710	10/07/2015
	LC08_126060_20140723	23/07/2014	LC08_126059_20150710	10/07/2015
	LC08_126059_20140723	23/07/2014	LC08_126059_20150726	26/07/2015
	LC08_126060_20140808	08/08/2014	LC08_126059_20150827	27/08/2015
	LC08_126059_20140808	08/08/2014	LC08_126060_20150912	12/09/2015
	LC08_126059_20140824	24/08/2014	LC08_126059_20150912	12/09/2015
	LC08_126060_20141011	11/10/2014	LC08_126059_20151014	14/10/2015
	LC08_126059_20141011	11/10/2014	LC08_126059_20151030	30/10/2015
	LC08_126059_20141112	12/11/2014	LC08_126059_20151201	01/12/2015
	LC08_126059_20141128	28/11/2014	LC08_126059_20151217	17/12/2015
	LC08_126060_20141214	14/12/2014		

Table 82- Satellite Imagery Details for PT. Peranap Timber (Serapung)

C) **PT. Essa Indah Timber** (Serapung) is located to the north east of the RER project area and is an oblong block of land that is oriented north to south. The concession was granted in 2003 and is 10,023 hectares. In 2006 the concession contained 10,023 hectares of natural forest and by 2014 this had been reduced to 2,753 hectares through planned deforestation.



Map 36- Land cover maps (top) and satellite data (bottom) for PT. Essa Indah Timber (Serapung)

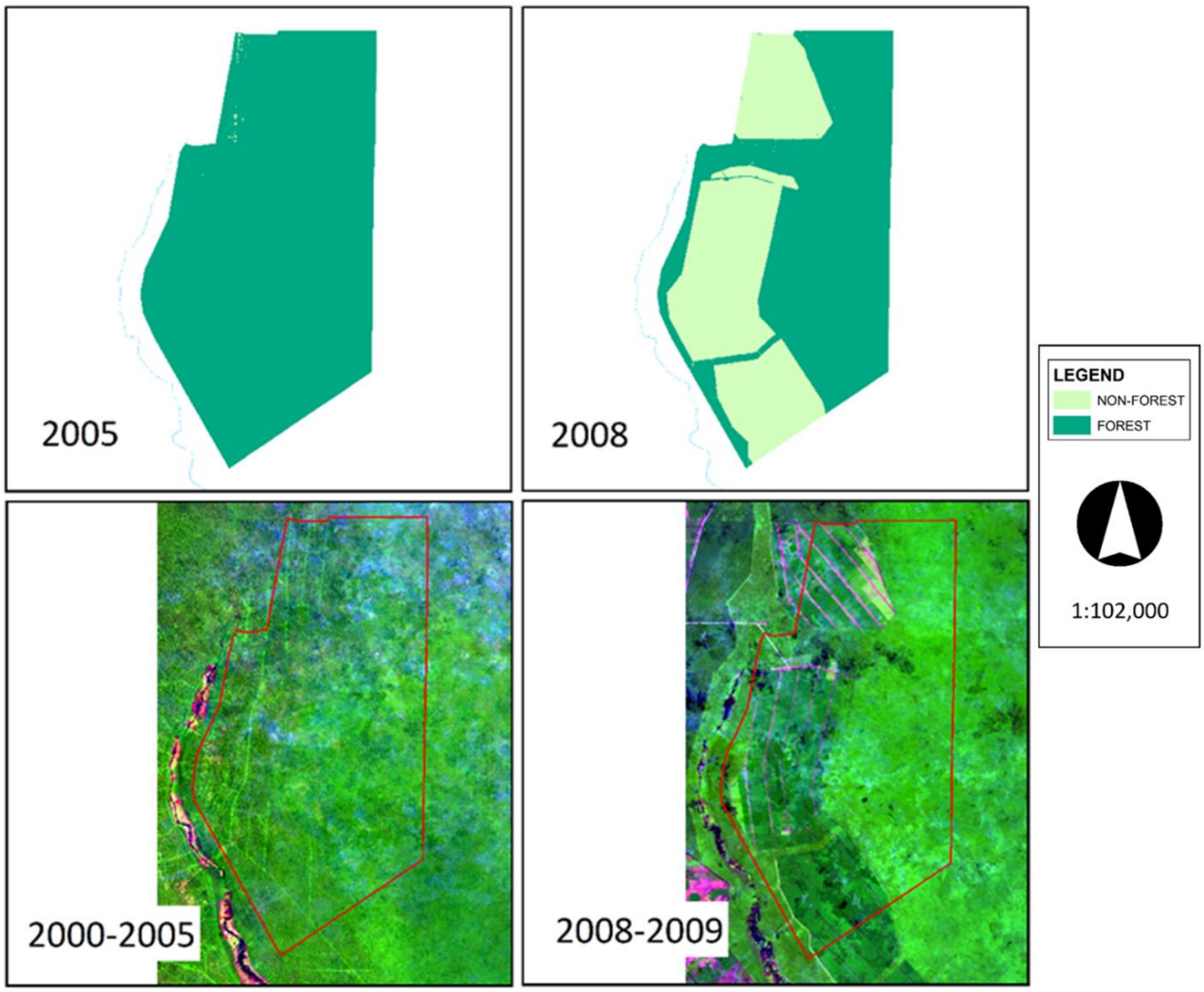
Mosaic satellite data used for the above land use classification is listed below in Table 83.

Concession	PT. Essa Indah Timber			
Sector	Serapung			
Time	Before plantation establishment			
Year	2000-2005			
Satellite	Landsat 5			
Path/ Row	126/60 & 126/59			
	Image ID	Date	Image ID	Date
Image ID/ Date	LT05_126060_20000122	22/01/2000	LT05_126060_20010719	19/07/2001
	LT05_126059_20000122	22/01/2000	LT05_126059_20010719	19/07/2001
	LT05_126059_20000207	07/02/2000	LT05_126059_20010804	04/08/2001
	LT05_126060_20000223	23/02/2000	LT05_126060_20010905	05/09/2001
	LT05_126059_20000223	23/02/2000	LT05_126059_20010905	05/09/2001
	LT05_126059_20000310	10/03/2000	LT05_126060_20010921	21/09/2001
	LT05_126059_20000411	01/04/2000	LT05_126059_20010921	21/09/2001
	LT05_126060_20000427	27/04/2000	LT05_126059_20031130	30/11/2003
	LT05_126059_20000427	27/04/2000	LT05_126059_20040218	18/02/2004
	LT05_126060_20000513	13/05/2000	LT05_126060_20040321	21/03/2004
	LT05_126059_20000513	13/05/2000	LT05_126059_20040321	21/03/2004
	LT05_126060_20000529	29/05/2000	LT05_126059_20040406	06/04/2004
	LT05_126059_20000529	29/05/2000	LT05_126059_20040422	22/04/2004
	LT05_126060_20000614	14/06/2000	LT05_126060_20040508	08/05/2004
	LT05_126059_20000614	14/06/2000	LT05_126059_20040508	08/05/2004
	LT05_126060_20000630	30/06/2000	LT05_126060_20040625	25/06/2004
	LT05_126059_20000630	30/06/2000	LT05_126059_20040625	25/06/2004
	LT05_126060_20000716	16/07/2000	LT05_126059_20040727	27/07/2004
	LT05_126059_20000716	16/07/2000	LT05_126059_20040812	12/08/2004
	LT05_126060_20000817	17/08/2000	LT05_126059_20041015	15/10/2004
	LT05_126059_20000817	17/08/2000	LT05_126059_20041218	18/12/2004
	LT05_126059_20000902	02/09/2000	LT05_126060_20050220	20/02/2005
	LT05_126060_20001004	04/10/2000	LT05_126059_20050220	20/02/2005
	LT05_126059_20001004	04/10/2000	LT05_126059_20050308	08/03/2005
	LT05_126060_20001020	20/10/2000	LT05_126059_20050324	24/03/2005
	LT05_126059_20001020	20/10/2000	LT05_126059_20050409	09/04/2005
	LT05_126059_20001105	05/11/2000	LT05_126059_20050425	25/04/2005
	LT05_126059_20001207	07/12/2000	LT05_126059_20050511	11/05/2005
	LT05_126059_20010108	08/01/2001	LT05_126060_20050612	12/06/2005
	LT05_126059_20010124	24/01/2001	LT05_126059_20050612	12/06/2005
	LT05_126059_20010313	13/03/2001	LT05_126059_20050628	28/06/2005
	LT05_126060_20010329	29/03/2001	LT05_126059_20050714	14/07/2005
	LT05_126059_20010329	29/03/2001	LT05_126059_20050730	30/07/2005
	LT05_126059_20010414	14/04/2001	LT05_126059_20050815	15/08/2005
	LT05_126059_20010516	16/05/2001	LT05_126059_20050831	31/08/2005
	LT05_126060_20010601	01/06/2001	LT05_126059_20050916	16/09/2005
	LT05_126059_20010601	01/06/2001	LT05_126059_20051002	02/10/2005
	LT05_126060_20010703	03/07/2001	LT05_126059_20051018	18/10/2005
	LT05_126059_20010703	03/07/2001		
	After plantation establishment			
	2014-2015			
	Landsat 8			
	126/60 & 126/59			
	Image ID	Date	Image ID	Date

	LC08_126059_20140112	12/01/2014	LC08_126059_20141214	14/12/2014
	LC08_126059_20140128	28/01/2014	LC08_126059_20150115	15/01/2015
	LC08_126059_20140213	13/02/2014	LC08_126059_20150131	31/01/2015
	LC08_126059_20140301	01/03/2014	LC08_126059_20150216	16/02/2015
	LC08_126060_20140402	02/04/2014	LC08_126060_20150320	20/03/2015
	LC08_126059_20140402	02/04/2014	LC08_126059_20150405	05/04/2015
	LC08_126059_20140504	04/05/2014	LC08_126060_20150421	21/04/2015
	LC08_126059_20140520	20/05/2014	LC08_126059_20150421	21/04/2015
	LC08_126060_20140621	21/06/2014	LC08_126059_20150507	07/05/2015
	LC08_126059_20140621	21/06/2014	LC08_126060_20150608	08/06/2015
	LC08_126060_20140707	07/07/2014	LC08_126059_20150624	24/06/2015
	LC08_126059_20140707	07/07/2014	LC08_126060_20150710	10/07/2015
	LC08_126060_20140723	23/07/2014	LC08_126059_20150710	10/07/2015
	LC08_126059_20140723	23/07/2014	LC08_126059_20150726	26/07/2015
	LC08_126060_20140808	08/08/2014	LC08_126059_20150827	27/08/2015
	LC08_126059_20140808	08/08/2014	LC08_126060_20150912	12/09/2015
	LC08_126059_20140824	24/08/2014	LC08_126059_20150912	12/09/2015
	LC08_126060_20141011	11/10/2014	LC08_126059_20151014	14/10/2015
	LC08_126059_20141011	11/10/2014	LC08_126059_20151030	30/10/2015
	LC08_126059_20141112	12/11/2014	LC08_126059_20151201	01/12/2015
	LC08_126059_20141128	28/11/2014	LC08_126059_20151217	17/12/2015
	LC08_126060_20141214	14/12/2014		

Table 83- Satellite Imagery Details for for PT. Essa Indah Timber (Serapung

D) **PT. Madukoro Lestari** (Tasik) is located to the west of the RER project area and is an oblong block of land-oriented east to west. The concession was granted in 2003 and was 14,903 hectares. In 2006, the concession contained 14,889 hectares of natural forest and by 2008 this had been reduced to 8,642 hectares through planned deforestation.



Map 37- Land cover maps (top) and satellite data (bottom) for PT. Madukoro Lestari (Tasik)

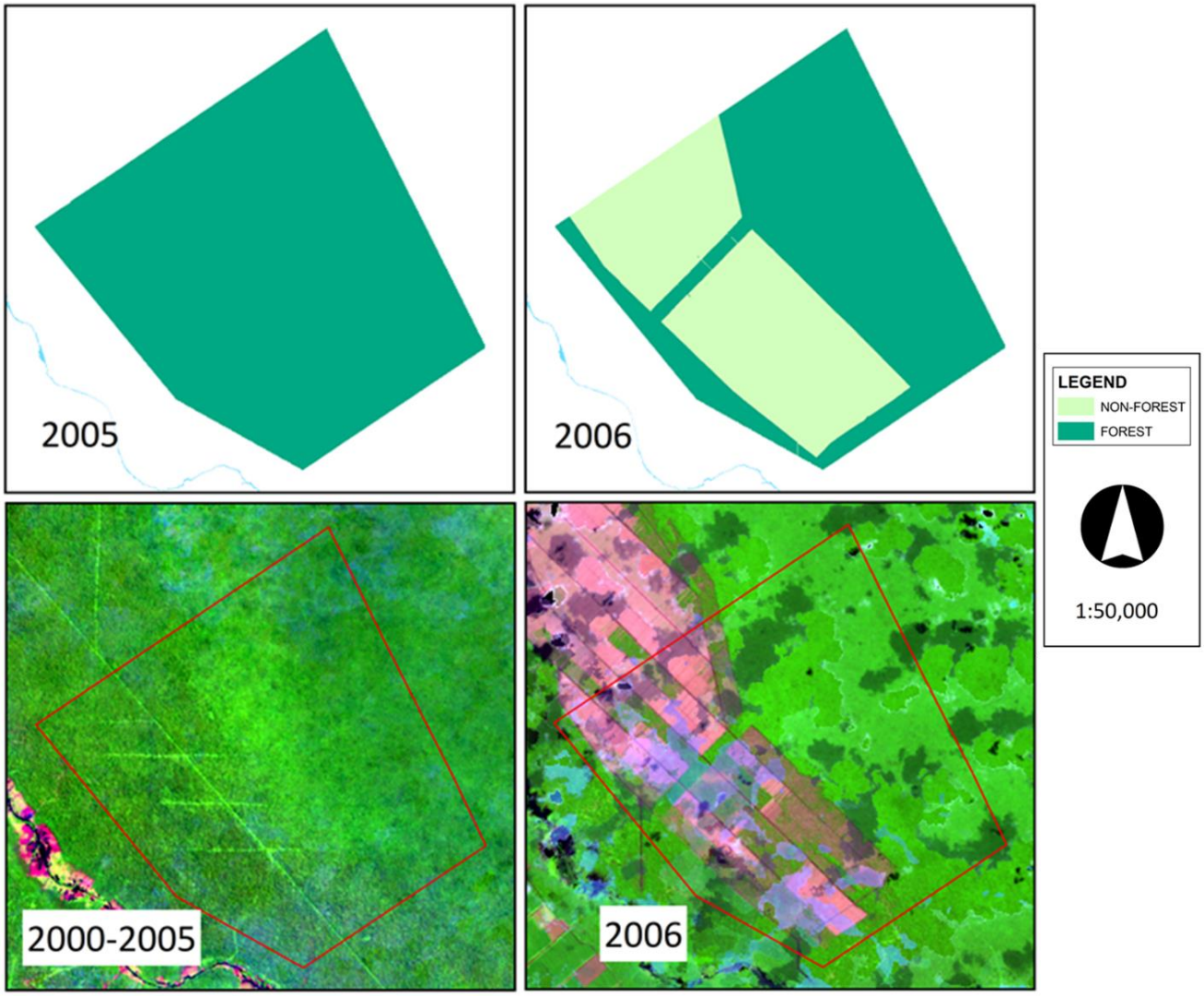
Mosaic satellite data used for the above land use classification is listed below in Table 84.

Concession	PT. Madukoro Lestari			
Sector	Tasik			
Time	Before plantation establishment			
Year	2000-2005			
Satellite	Landsat 5			
Path/ Row	126/60			
Image ID/ Date	Image ID	Date	Image ID	Date
	LT05_126060_20000122	22/01/2000	LT05_126060_20010329	29/03/2001
	LT05_126060_20000223	23/02/2000	LT05_126060_20010601	01/06/2001
	LT05_126060_20000427	27/04/2000	LT05_126060_20010703	03/07/2001
	LT05_126060_20000513	13/05/2000	LT05_126060_20010719	19/07/2001
	LT05_126060_20000529	29/05/2000	LT05_126060_20010905	05/09/2001
	LT05_126060_20000614	14/06/2000	LT05_126060_20010921	21/09/2001
	LT05_126060_20000630	30/06/2000	LT05_126060_20040321	21/03/2004

	LT05_126060_20000716	16/07/2000	LT05_126060_20040508	08/05/2004
	LT05_126060_20000817	17/08/2000	LT05_126060_20040625	25/06/2004
	LT05_126060_20001004	04/10/2000	LT05_126060_20050220	20/02/2005
	LT05_126060_20001020	20/10/2000	LT05_126060_20050612	12/06/2005
	After plantation establishment			
	2008-2009			
	Landsat 5			
	126/60			
	Image ID	Date	Image ID	Date
	LT05_126060_20080503	03/05/2008	LT05_126060_20090709	09/07/2009
	LT05_126060_20080519	19/05/2008	LT05_126060_20090725	25/07/2009
	LT05_126060_20080722	22/07/2008	LT05_126060_20090826	26/08/2009
	LT05_126060_20081127	27/11/2008	LT05_126060_20091013	13/10/2009
	LT05_126060_20090215	15/02/2009		

Table 84- Satellite Imagery Details for PT. Madukoro Lestari (Tasik)

E) **PT. Harapan Jaya** (Tasik) is located to the west of the RER project area and is a diamond shaped block of land. The concession was granted in 2003 and is 5,084 hectares. In 2006 the concession contained 5,084 hectares of natural forest and in one year this had been reduced to 2,980 hectares through planned deforestation.



Map 38- Land cover maps (top) and satellite data (bottom) for PT. Harapan Jaya (Tasik)

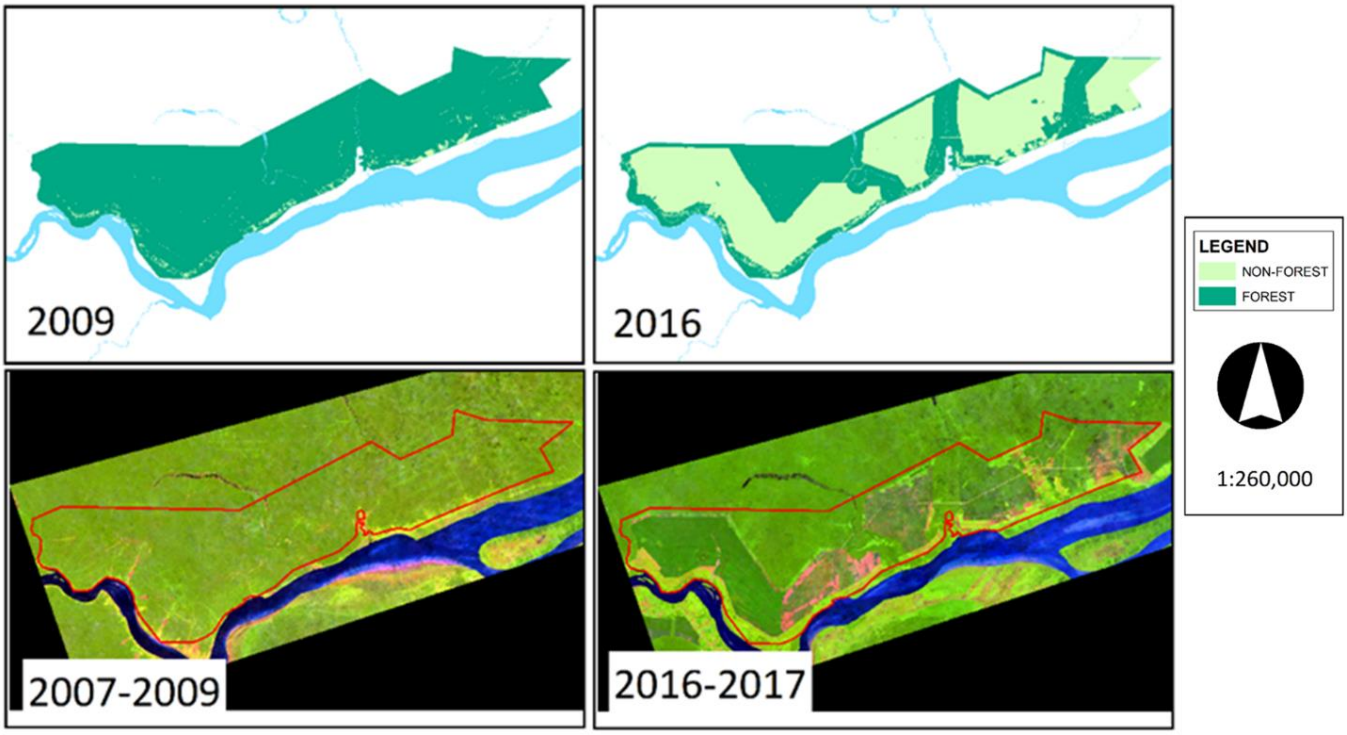
Mosaic satellite data used for the above land use classification is listed below in Table 85.

Concession	PT Harapan Jaya			
Sector	Tasik			
Time	Before plantation establishment			
Year	2000-2005			
Satellite	Landsat 5			
Path/ Row	126/60			
Image ID/ Date	Image ID	Date	Image ID	Date
	LT05_126060_20000122	22/01/2000	LT05_126060_20010329	29/03/2001
	LT05_126060_20000223	23/02/2000	LT05_126060_20010601	01/06/2001
	LT05_126060_20000427	27/04/2000	LT05_126060_20010703	03/07/2001
	LT05_126060_20000513	13/05/2000	LT05_126060_20010719	19/07/2001
	LT05_126060_20000529	29/05/2000	LT05_126060_20010905	05/09/2001
	LT05_126060_20000614	14/06/2000	LT05_126060_20010921	21/09/2001
	LT05_126060_20000630	30/06/2000	LT05_126060_20040321	21/03/2004
	LT05_126060_20000716	16/07/2000	LT05_126060_20040508	08/05/2004
	LT05_126060_20000817	17/08/2000	LT05_126060_20040625	25/06/2004
	LT05_126060_20001004	04/10/2000	LT05_126060_20050220	20/02/2005
	LT05_126060_20001020	20/10/2000	LT05_126060_20050612	12/06/2005

	After plantation establishment			
	2006			
	Landsat 5			
	126/60			
	Image ID	Date	Image ID	Date
	LT05_126060_20061208	08/12/2006	LT05_126060_20060530	30/05/2006
	LT05_126060_20060428	28/04/2006	LT05_126060_20061005	05/10/2006

Table 85- Satellite Imagery Details for PT. Harapan Jaya (Tasik)

F) **PT. RAPP** (Meranti East and West) is located to the south of the RER project area and strip of land-oriented east to west. The concession was granted in 2009 and was 44,170 hectares. In 2009 the concession contained 43,299 hectares of natural forest and by 2016 this had been reduced to 17,146 hectares through planned deforestation.



Map 39- Satellite and land cover maps for PT. RAPP (Meranti East and West)

Mosaic satellite data used for the above land use classification is listed below in Table 86.

Concession	PT. RAPP			
Sector	Meranti East and West			
Time	Before plantation establishment			
Year	2007-2009			
Satellite	Landsat 5			
Path/ Row	126/60			
Image ID/ Date	Image ID	Date	Image ID	Date
	LT05_126060_20070501	01/05/2007	LT05_126060_20081127	27/11/2008
	LT05_126060_20070618	18/06/2007	LT05_126060_20090215	15/02/2009
	LT05_126060_20070922	22/09/2007	LT05_126060_20090709	09/07/2009
	LT05_126060_20080503	03/05/2008	LT05_126060_20090725	25/07/2009
	LT05_126060_20080519	19/05/2008	LT05_126060_20090826	26/08/2009
	LT05_126060_20080722	22/07/2008	LT05_126060_20091013	13/10/2009
	After plantation establishment			
	2016-2017			
	Landsat 8			
	126/60			
	Image ID	Date	Image ID	Date
	LC08_126060_20160203	03/02/2016	LC08_126060_20161117	17/11/2016
	LC08_126060_20160407	07/04/2016	LC08_126060_20161203	03/12/2016
	LC08_126060_20160509	09/05/2016	LC08_126060_20161219	19/12/2016
	LC08_126060_20160626	26/06/2016	LC08_126060_20171019	19/05/2017
	LC08_126060_20160712	12/07/2016	LC08_126060_20170528	28/05/2017
	LC08_126060_20160813	13/08/2016	LC08_126060_20170613	13/06/2017
	LC08_126060_20160930	30/09/2016	LC08_126060_20170816	16/08/2017
	LC08_126060_20161016	16/10/2016	LC08_126060_20171003	03/10/2017

Table 86- Satellite Imagery Details PT. RAPP (Meranti East and West)

4.1.2 General Procedures and Assumptions

VMD0042 (BL-PEAT) § 5.1.1 requires that a set of "General Procedures and Assumptions" are followed in assessing Baseline emissions; the Project makes additional assumptions as well related to the APD component of the Project.

The Projects baseline emissions and carbon stock assumptions were assessed based on an analysis of the likeliest baseline scenario. Accounted emissions resulted from the following:

- Avoided deforestation
- Avoided microbial peat decomposition
- Avoided organic carbon dissolved from water bodies

The Project assumes that no non-human-induced rewetting of the peatland would have occurred under the baseline scenario. Examples of such rewetting includes:

- Avoided wetland degradation through avoided drainage and avoided plantation development.
- Dike or canal collapses, which would have closed naturally over time, and
- Any progressive subsidence resulting in a raising of relative depths in the water table, increasingly thinner aerobic layers, and reduced CO2 emission rates.

All assumptions made by the Project team are based on expert assessments taking into account verifiable scientific experience for the local area and published scientific documentation available. All such assumptions were made on a conservative basis.

The Project also has assumed that the baseline deforesting agent would perform regular maintenance of canals for drainage and transportation purposes.

Emissions from peat exposed to aerobic decomposition by spreading or piling following the establishment or maintenance of ditches are conservatively be omitted as per BL-PEAT – Section 5.3.

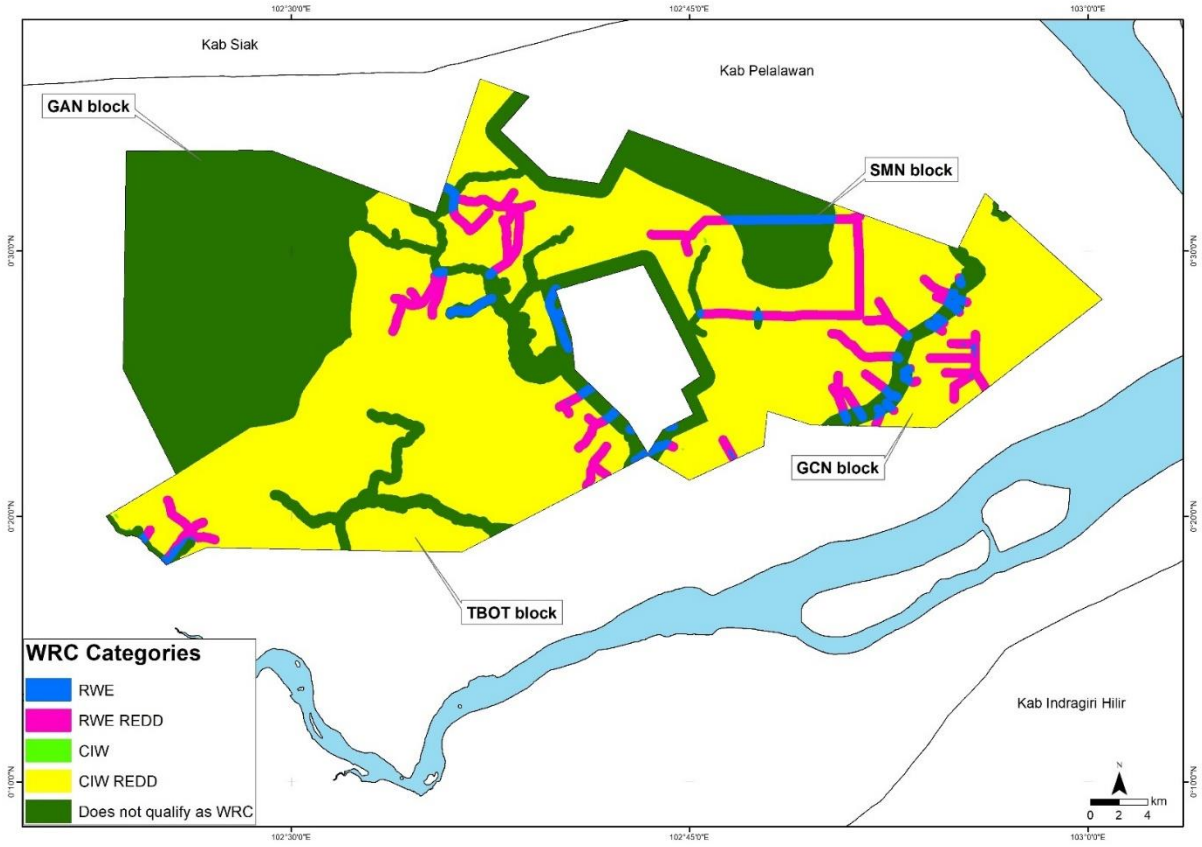
The Project assumed because of the known fire record for the Project Area that no uncontrolled burning of peat would occur in the Project Area. These emissions are not accounted for since the loss is insignificant. It was therefore considered conservative to omit GHG emissions from biomass burning in the baseline.

Baseline emissions have been calculated on an annual basis. This has been done as baseline changes in land cover classes and drainage status during the project lifetime determines (changes in) emissions of CO_2, CH_4 and N_2O.

The Project has followed the requirements of VM0007 v1.6 § 5.4.2 and included N_2O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in table 7, § 5.4.2 of VM0007 v1.6.is set forth in §4.1.4.1.

4.1.3 Description of Project Activities

As a result of the Project reporting separate Project Activities, separate baseline emissions calculations have been prepared for each of the 4 separate project activities that would occur in comparison to the baseline scenario.



Map 40- The Four Project Activities

The Project will undertake the following activities

1. **RWE** – Restoration of drained peatland with no avoiding planned deforestation.
2. **RWE+REDD** - Restoration of drained peatland with avoiding planned deforestation.
3. **CIW** – Avoiding wetland degradation with no avoiding planned deforestation.
4. **CIW+REDD** - Avoiding wetland degradation with avoiding planned deforestation.

All the area developed into plantations under the baseline scenario in any given year is expected to be clear-felled of all forest cover, then drained (if not drained already) and converted to plantations. Where legacy canals exist, it is assumed that these are to be replaced by the plantation drainage canals in the baseline scenario area (a.k.a. plantation development area) and retained outside of the plantation development areas.

Quantification of GHG emissions from microbial decompositions of peat and water bodies in peatlands has been carried out by using a spatially and temporally explicit approach. Each baseline stratum as set out in Table 87 was discretized into parcels of the smallest land or water body unit with relatively uniform combinations of spatial variables as given in Table 87. Temporal discretization has been used by sequencing the calculation into 1-year time-steps, while temporal variables determine the sequence of strata changes. Temporal variability of GHG emission parameters and temporal restrictions to GHG emissions are presented in Table 87. The

schematization assures the proper use of GHG emission parameters at the correct spatial location and the correct time.

Variables	Description
(A) Spatial Variables	
(A1) Soil type	Distinction between peat or non-peat. This is used to exclude all non-peat parcels from GHG calculation. In the RER Project, there are no non-peat parcels so this requirement is redundant.
(A2) Initial peat thickness available for microbial decompositions	Derived from DEM and Peat Thickness maps. These maps are used to determine the initial condition for subsequent calculations of the remaining peat layer available for microbial decompositions. In the RER project, there are no non-peat parcels and so this requirement is redundant.
(A3) Initial stratum	Stratum of the corresponding parcel at the project start date (as derived in § 4.4 before conversion into baseline stratum takes effect. This is used to determine the correct emission factor for the corresponding parcel for the duration before B1 and B2 (in this table, below) take effect.
(B) Temporal Variables	
(B1) Year of drainage	Determines the onset of conversion from the initial stratum to the drained stratum and sets all the drainage-related parameters/variables accordingly, such as initial consolidations, bulk density changes, etc. This does not take effect if the initial stratum of the parcel is already drained. Together with B2, this is used to determine the correct Emission Factor for the corresponding parcel.
(B2) Year of deforestation/ planting of the baseline land cover	Determines the onset of conversion of initial stratum to deforested/planted stratum. Together with B1, this is used to determine the correct Emission Factor for the corresponding parcel.
(B3) PDT	The Peat Depletion Timeline (PDT) is the period that it takes to deplete the remaining peat layer by microbial decomposition (conservatively will be assumed that PDT is reached once the remaining peat layer has reached 20 cm). Once the PDT is reached in each stratum, all GHG emissions in that stratum are set to zero.

Table 87- Variables used in the schematization of quantification of GHG emissions from microbial decompositions of peatland dissolved organic carbon from water bodies in peatlands in the baseline scenario.

4.1.4 Baseline Emissions from REDD (BL-PL)

The methods for estimating net carbon stock changes and GHG emissions from planned deforestation under the baseline scenario are described in module BL-PL §5 Part 1.

4.1.4.1 Part 1 - Calculating annual area of planned deforestation.

Step 1.1 - Identification of agent of planned deforestation

A proxy analysis has been conducted to verify that the baseline rate of deforestation is consistent with other plantation developments of similar size and operational characteristics.

Pursuant to §5, part1.3 of VMD0006 (BL-PL), and because the Project Area does not have a verifiable plan for the rate of deforestation, the proxy method for determination of the deforestation rate was implemented. A minimum of 6 proxy areas is required to determine the baseline rate of deforestation. Further, pursuant to §5, part 1.5 of VMD0006 at least 5 proxy areas must be used to demonstrate the risk of abandonment.

Pursuant to §5, part 1.3 of VMD0006, all proxy areas must meet the following criteria:

- Land conversion practices shall be the same as those used by the baseline agent or class of agent;
- The post-deforestation land use shall be the same in the reference regions as expected in the Project Area under business as usual;
- The reference regions shall have the same management and land use rights type as the proposed Project Area under business as usual;
- If suitable sites exist they shall be in the immediate area of the Project; if an insufficient number of sites exists in the immediate area of the project, sites shall be identified elsewhere in the same country as the project; if an insufficient number of sites exists in the country, sites shall be identified in neighbouring countries;
- Agents of deforestation in reference regions must have deforested their land under the same criteria that the project lands must follow (legally permissible and suitable for conversion);
- Deforestation in the reference region shall have occurred within the 10 years prior to the baseline period; and
- The three following conditions shall be met:
    - The forest types surrounding the reference region or in the reference region prior to deforestation shall be in the same proportion as in the Project Area (±20%).
    - Soil types that are suitable for the land-use practice used by the agent of deforestation in the Project Area must be present in the reference region in the same proportion as the Project Area (±20%). The ratio of slope classes “gentle” (slope<15%) to “steep” (slope≥15%) in the reference regions shall be (±20%) the same as the ratio in the Project Area.
    - Elevation classes (500m classes) in the reference region shall be in the same proportion as in the Project Area (±20%).

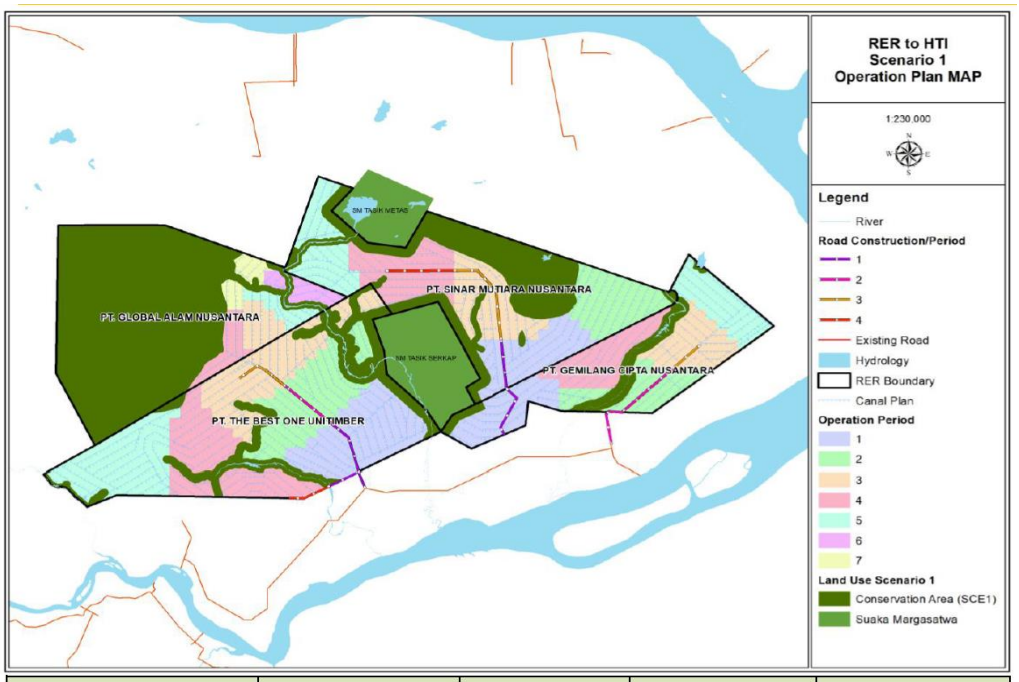
The reference areas selected were all concessions operated by APRIL Group, which were located on the Kampar Peninsula immediately adjacent to and surrounding the RER Project Area. They were all pulp and paper concessions in Indonesia whose licenses were granted between 2000 and 2010. Using the peat depth map for Kampar Peninsula[97], the pulp and paper concessions with similar peat proportions as the Project Area were identified (see table 79 above and table 88 below). The deforestation agents in this case are the forest plantation companies in Indonesia who manage IUPHHK-HT licenses for the development of plantations. There are numerous companies of this type in Sumatra, Kalimantan and Papua. In Riau Province alone there are 54 companies[98] operating IUPHHK-HT licenses (see table 60 above). APRIL has also prepared a LiDAR-based DEM for the Kampar Peninsula and this has been analysed to confirm that the concessions have met the slope and elevation requirements. To determine which of the remaining concessions met the forest type and forest cover percentage criteria, medium-resolution satellite imagery was used. Table 88 shows proxy area requirements based on the Project Area’s land cover.

Project area	Reference region Requirement
89.8% forest cover	At least 79.1% forest cover
100% peat	At least 80% peat
100% of area in the 0-500m class	At least 80% of the area must fall in the 0-500m class
100% of area has “gentle” (slope<15%) slopes	At least 80% of the area must have “gentle” slopes

Table 88- Reference region selection criteria

Step 1.2. - Area of planned deforestation

The area of planned deforestation is described in section 3.3.3 called “REDD and WRC boundaries”. This area applies to all forested land within the plantation development (“development area”) within the geographical boundaries of the project. The APD boundaries are generated by intersecting the forest area stratification boundaries with the planned plantation development boundaries and identifying all areas of forest subject to planned deforestation. The specific areas for planned deforestation RWE+REDD and CIW+REDD activities are described in sections 4.1.7 and 4.1.9 respectively.



Land use	PT.GCN		PT.SMN		PT.TBOT		PT.GAN	
	Ha	%	Ha	%	Ha	%	Ha	%
Protection Zone	**2,583**	**13%**	**11,539**	**35%**	**7,497**	**18%**	**30,045**	**82%**
Buffer Zone SM	417	2%	3,293	10%	1,042	3%	-	0%
Riparian Zone	2,166	11%	1,442	4%	6,204	15%	1,451	4%
Peat Dome (Gov)	-	0%	6,804	21%	251	1%	28,594	78%
Production Zone	**17,541**	**87%**	**21,238**	**65%**	**33,169**	**82%**	**6,480**	**18%**
Plantation Area	17,541	87%	21,238	65%	33,169	82%	6,480	18%
TOTAL	**20,123**	**100%**	**32,776**	**100%**	**40,666**	**100%**	**36,525**	**100%**

Map 41 -Plantation Development Program RER to HTI Operation Plan Map

Step 1.3. - Rate of planned deforestation

The Project has prepared a baseline plan for the development of plantations based on:

1. Allocation of land to conservation area as required by law. This includes the complete protection of primary Peat Dome Forest in PT. GAN concession, the allocation of legally mandated buffer zones around protection areas adjacent to the RER Project Area, and the establishment of large riparian zones around rivers, streams, and other significant water bodies.
2. Identification of development areas, outside of the conservation areas, for conversion to forest plantation and its associated infrastructure. This maximum size of development area within each forest concession was limited to less than 90% of total land area to allow for the establishment of minimum area of conservation areas.
3. 7-year development plan based on a logical development sequence across all 4 concessions. The development sequence starts in the centre and south of the Project Area, and then progresses north and east/west in large incremental steps. This reflects the requirement to develop the plantations in conjunction with infrastructure starting from one point and then developing infrastructure and plantations on a sequential basis. The plantations are likely to be managed on a 5-year rotation, but a further 2 years was expected to be needed to complete the development of the most distant areas.

The baseline management plan is a valid and reasonable proposition, meeting Indonesian legal requirements, permissible under the regulations, practical in terms of plantation siting and practical implementation, and technically feasible from an operational perspective.

Using the module BL-PL, a total of 6 suitable proxy areas were identified (see Table 89).

Reference Region	Area in ha	Deforestation Rate (%/year)	Concession Grant Date	Timestep 1 date	Forest at Timestep 1 (ha)	Timestep 2 date	Forest at Timestep 2 (ha)
PT. RAPP (Tasik Belat)	11,339	7.28%	2009	2011	11,352	2016	6,400
PT. Peranap Timber (Serapung)	32,527	4.30%	2002	2006	32,343	2014	19,762
PT. Essa Indah Timber (Serapung)	10,023	7.60%	2003	2006	9,822	2014	2,966
PT. Madukoro Lestari (Tasik)	14,903	13.55%	2003	2006	14,867	2008	8,810
PT. Harapan Jaya (Tasik)	5,084	41.21%	2003	2006	5,061	2006	2,965
PT. RAPP (Meranti East and West)	44,170	6.54%	2009	2009	32,363	2016	15,290
Average		**8.46**					
RER Project Area	130,090	8.24	2016	2016	128,801	2023	43,097

Table 89- Summary of suitable reference regions

The baseline deforestation rate was calculated using project equation 11. The equation originated from equation 4 of module VMD0006 BL-PL.

$$D\%_{planned,i,t} = \left(\sum_{pn=1}^{n^*} \left(D\%_{pn} / Yrs_{pn} \right) \right) / n \quad (11)$$

Where:

$D\%_{planned,i,t}$	Projected annual proportion of land that will be deforested in stratum I during year t. If actual annual proportion is known and documented (e.g. 25% per year for 4 years), set to proportion; %
$D\%_{pn}$	Percent of deforestation in land parcel pn etc of a reference region as a result of planned deforestation as defined in this module; %
Yrs_{pn}	Number of years over which deforestation occurred in land parcel pn in reference region; years
n	Total number of land parcels examined
pn	1, 2, 3, …n land parcels examined in reference region
i	1, 2, 3, …M strata

The average projected annual deforestation rate for the proxy areas was estimated to be 7.6%. As noted above, all of these concessions have been developed by the APRIL group in areas adjacent to the RER project. The identical methods were used for planning plantation development, and this has resulted in similar deforestation rates in the proxy plantations as was calculated for the RER Project baseline.

Step 1.4 - Likelihood of planned deforestation

Since all pulpwood plantation concessions are zoned for deforestation, are under the legal control of the concessionaire, for the duration of the concession license, the "likelihood of deforestation" (L-Di) is assumed to be equal to 100%. Proprietary concession management documents controlled by APRIL are also available to provide further proof of this.

Step 1.5 - Risk of abandonment

To assess the risk of abandonment, 6 proxy areas with concession grants dating from at least ten years before the Project Start Date were selected using the criteria outlined in §5 part 1.5 of VMD0006 v1.3 and undertaking the analysis set forth in § 4.3.2.3. Landsat 5 TM, Landsat 7 ETM+, and Landsat 8 OLI imagery was downloaded for three time-steps and visually analysed to determine if any areas were abandoned for forest regrowth. All 6 proxy areas showed clear signs of continued deforestation and plantation activities for all three time-steps. Furthermore, APRIL has "directly applicable existing data" generated from its own and its supply partner's operating records that show that none of the proxy areas have been abandoned. Additional verified management, operational and financial records are available to support this position. Therefore, the VMD0006 v1.2 (BL-PL) module is applicable to this Project.

Step 1.6 - Annual area of deforestation

The annual area of deforestation in the RER Project baseline is 8.2% over 7 years; although the annual deforestation in the baseline plan varies year on year to accommodate practical

considerations of plantation development and on the ground constraints. The annual area of deforestation in the baseline can be validated using project equation 12 applied to both the baseline and the proxy areas. Project equation 12 was obtained from equation 5 of module VMD0006 BL-PL.

$$AA_{planned,i,t} = \left(A_{planned,i} * D\%_{planned,i,t}\right) * L - D_i \quad (12)$$

Where:

$AA_{planned,i,t,}$	Annual area of baseline planned deforestation for stratum *i* at time *t*; ha
$D\%_{planned,i,t}$	Projected annual proportion of land that will be deforested in stratum *i* during year *t*. If actual annual proportion is known and documented (e.g. 25% per year for 4 years), set to proportion; %
$A_{planned,i,}$	Total area of planned deforestation over the baseline period for stratum *i*; ha
$L\text{-}D_i$	Likelihood of deforestation for stratum *i*; %

The annual rate of deforestation is expected to be 8.24%, which is in line with the average rate of deforestation of the proxy areas 8.46% and in the middle of the range of deforestation rates of the 6 proxy areas, between 4.3%-41.21%.

Based on this information, we assume the Baseline Plantation Development programme (see table 90 below) prepared by the Project Proponents for the RER baseline is valid, reasonable, verifiable, similar to other concession areas in the area, and justified.

Plantation Development Program					
Year	Gross development area (ha)				
	Total	GAN	GCN	SMN	TBOT
2016	15,079	0	3,582	4,365	7,132
2017	14,236	0	3,306	4,461	6,469
2018	15,841	1,499	3,513	4,276	6,552
2019	16,103	1,528	3,626	4,388	6,561
2020	14,735	1,020	3,513	3,746	6,455
2021	1,223	1,223	0	0	0
2022	1,209	1,209	0	0	0
Total Gross Planted Area	78,425	6,480	17,541	21,236	33,169
Other Land Uses					
Buffer Zones	4,751	0	417	3,292	1,042
Riparian Zones	11,264	1450.81	2165.65	1443.4	6204.11
Protect Peat Dome	35,649	28,594	0	6,804	251
Total Conservation Area	51,664	30,045	2,583	11,540	7,497
Total Concession Areas	130,090	36,525	20,123	32,776	40,666

Table 90- Baseline Plantation Development Program

Note that the rate of deforestation in the 7-year development plan above is entirely within the predicted planned deforestation rates documented in the Proxy Area Assessment in section 4.1.2.2 above.

4.1.4.2 Part 2 - Baseline Carbon Stock Change

The Project next applies Part 2 – Baseline Carbon Stock Change as per VMD0006 (BL-PL). For terrestrial carbon pools, stock changes in each pool are calculated by subtracting post-deforestation carbon stocks from forest carbon stocks using project equations 14 to 19, which were respectively attained from equations 6 to 11 of VMD0006 BL-PL.

$$\Delta C_{AB_{tree},i} = C_{AB_{tree_{bsl}},i} - C_{AB_{tree_{post}},i} \quad (14)$$

$$\Delta C_{AB_{non-tree},i} = C_{AB_{non-tree_{bsl}},i} - C_{AB_{non-tree_{post}},i} \quad (15)$$

$$\Delta C_{BB\_tree,i} = C_{BB_{tree_{bsl}},i} - C_{BB_{tree_{post}},i} \quad (16)$$

$$\Delta C_{BB_{non-tree},i} = C_{BB_{non}-tree,bsl,i} - C_{BB_{non}-tree,post,i} \quad (17)$$

$$\Delta C_{DW,i} = C_{DW,bsl,i} - C_{DW,post,i} \quad (18)$$

$$\Delta C_{LI,i} = C_{LI,bsl,i} - C_{LI,post,i} \quad (19)$$

Where:

$\Delta C_{AB\_tree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{AB\_tree,bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{AB\_tree,post,i}$	Post-deforestation carbon stock in aboveground tree biomass in stratum i; t CO_2-e ha^{-1}
$\Delta C_{BB\_tree,i}$	Baseline carbon stock change in belowground tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{BB\_tree,bsl,i}$	Forest carbon stock in belowground tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{BB\_tree,post,i}$	Post-deforestation carbon stock in belowground tree biomass in stratum i; t CO_2-e ha^{-1}
$\Delta C_{AB\_non-tree,i}$	Baseline carbon stock change in aboveground non-tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{AB\_non-tree,bsl,i}$	Forest carbon stock in aboveground non-tree vegetation in stratum i; t CO_2-e ha^{-1}
$C_{AB\_non-tree,post,i}$	Post-deforestation carbon stock in aboveground non-tree vegetation in stratum i; t CO_2-e ha^{-1}
$\Delta C_{BB\_non-tree,i}$	Baseline carbon stock change in belowground non-tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{BB\_nontree,bsl,i}$	Forest carbon stock in belowground non-tree biomass in stratum i; t CO_2-e ha^{-1}
$C_{BB\_nontree,post,i}$	Post-deforestation carbon stock in belowground non-tree biomass in stratum i; t CO_2-e ha^{-1}
$\Delta C_{DW,i}$	Baseline carbon stock change in dead wood in stratum i; t CO_2-e ha^{-1}
$C_{DW,bsl,i}$	Forest carbon stock in dead wood in stratum i; t CO_2-e ha^{-1}
$C_{DW,post,i}$	Post-deforestation carbon stock in dead wood in stratum i; t CO_2-e ha^{-1}
$\Delta C_{LI,i}$	Baseline carbon stock change in litter in stratum i; t CO_2-e ha^{-1}
$C_{LI,bsl,i}$	Forest carbon stock in litter in stratum i; t CO_2-e ha^{-1}
$C_{LI,post,i}$	Post-deforestation carbon stock in litter in stratum i; t CO_2-e ha^{-1}
$\Delta C_{SOC,i}$	Baseline carbon stock change in soil organic carbon in stratum i; t CO_2-e ha^{-1}
$C_{SOC,bsl,i}$	Forest carbon stock in soil organic carbon in stratum i; t CO_2-e ha^{-1}
i	1, 2, 3, … M strata

Note that non-tree vegetation/biomass, deadwood, and litter are not included in the project. Soil organic carbon is not calculated for APWD-REDD projects under this methodology.

Stock changes in above ground biomass are emitted at the time of deforestation. Following deforestation, emissions from below ground biomass are calculated as being emitted at an annual rate of 10% of stock change for 10 years. Project equation 20 is acquired from equation 13 of VMD0006 BL-PL.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} \times (\Delta C_{AB_{tree},i} - \Delta C_{WP,i} + \Delta C_{AB_{non-tree},i} + \Delta C_{LI,i}) \quad (20)$$
$$+(\sum_{t-10}^{t} AA_{planned,i,t}) \times (\Delta C_{BB_{tree},i} + \Delta C_{BB_{non-tree},i} + \Delta C_{DW,i}) * \left(\frac{1}{10}\right)$$
$$+(\sum_{t-20}^{t} AA_{planned,i,t}) \times \left(C_{WP100,i}\right) * \left(\frac{1}{20}\right)$$

Note that wood products pool, non-tree vegetation/biomass, deadwood, and litter are not included in the project. Soil organic carbon is not calculated for APWD-REDD projects under this methodology.

4.1.4.3 Emissions Calculations from Planned Deforestation (REDD)

The baseline net GHG emissions from terrestrial carbon pools for planned deforestation are calculated as follows:

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t} \right) \quad (13)$$

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned deforestation up to year t^*; t CO_2-e
$\Delta C_{BSL,i,t}$	Net carbon stock changes in all pools in the baseline stratum i in year t; t CO_2-e
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i in year t; t CO_2-e yr^{-1}
i	1, 2, 3, … M strata
t	1, 2, 3, … t^* years elapsed since the projected start of the project activity

Project equation 13 is obtained from equation 1 of module VMD0006 BL-PL.

In this project, we do not include emissions from fossil fuel emissions or biomass burning. However, we assume that fertilizer will be applied to plantation areas in the baseline scenario only and assume that some N_2O emissions would occur. Nonetheless, as VM0007 in table 7 at §5.4.2, indicates, we should include N_2O as a carbon pool but it may be excluded from the accounting if it is "excluded from the baseline" so long as fertilizer use is not enhanced as a leakage avoidance mechanism. As such §5, Part 3 of PL-PL Green House Gas Emissions is not used.

In order to calculate the emissions from deforestation we use the following approach:

Determine the annual area of planned plantation development and associated deforestation for RWE+REDD and CIW+REDD baseline scenarios by land cover strata. The land-use change and associated deforestation for the whole project area is summarized in the table below.

Land Cover Strata	Description	Area Beginning	Area Baseline	Land-Use Change
		(ha)		
Acacia Plantation	***Acacia* Plantation and associated infrastructure on drained peatland. This stratum represents typical** *Acacia* plantations on peatland in Indonesia. For this stratum, drainage is required, and forest covers are removed if present. *Acacia* planting starts in the same year as deforestation. The development of drainage constructions is assumed to happen just before- or at the same year as the deforestation/planting.	0	78,425	78,425

Peat Dome Forest	***Peatlands cover in high-density peat dome forests.*** Most of this forest type is allocated for conservation, but some areas will be cleared for plantation development.	23,748	22,825	-923
Dense Swamp Forest	***Peatlands cover in high-density natural forests.*** Most of this forest type is allocated for conversion to *Acacia* plantation, but some areas will be retained for conservation in riparian zones and buffer zones.	19,287	4,151	-15,136
Medium Swamp Forest	***Peatlands cover in medium-density / moderately degraded natural forests.*** Most of this forest type is allocated for conversion to *Acacia* plantation, but some areas will be retained for conservation in riparian zones and buffer zones.	63,328	18,955	-44,373
Sparse Swamp Forest	***Peatlands cover in low density / highly degraded natural forests***. Most of this forest type is allocated for conversion to *Acacia* plantation, but some areas will be retained for conservation in riparian zones and buffer zones.	22,439	4,474	-17,965
Non-Forest	***Non-Forest.*** This stratum represents peatlands where forest covers have been removed, i.e. bareland. It is assumed that this stratum remains largely unchanged since the project start date, although it is likely to naturally regenerate itself.	1,230	1,200	-30
Water Body	***Water bodies***. This stratum represents lakes and rivers. Rivers and lakes remain unchanged during the project period.	59	59	0
Total		130,090	130,090	0

Table 91- Land-Use Change of all Stratum

4. We calculate the quantity of the average per hectare above ground biomass (AGB) and its CO_2 equivalent GHG emissions from the cleared forest using the forest inventory data. This is reported separately and summarised below. The conversion factor for biomass weight to molecular carbon weight is 0.47[99] and the conversion factor for molecular carbon to CO_2E is 3.667[100]. The total above ground biomass emissions in CO_2E from deforestation is calculated by multiplying the area of each land cover stratum deforested each year by the average AGB for the stratum.

Land Cover Strata	Average AGB		
	($t.ha^{-1}$)	($t.C.ha^{-1}$)	($t.CO_2E.ha^{-1}$)
Peat Dome Forest	199.3	93.7	343.5
Dense Swamp Forest	150.3	70.6	259.0
Medium Swamp Forest	112.7	53.0	194.2
Sparse Swamp Forest	78.4	36.8	135.1
Non-Forest and Water Bodies	0	0.0	0.0

Table 92- Average AGB of all Stratum

5. The below ground biomass emissions in CO_2E are calculated by multiplying the above ground biomass estimate for each of each land cover stratum deforested by the appropriate root to shoot ratio. This is described in the table below. The total below ground biomass emissions in CO_2E from deforestation is calculated by multiplying the area of each land cover stratum deforested by the average AGB for the stratum.

Forest type	Root to shoot ratio
Dense Swamp Forest	30.54%
Medium Swamp Forest	28.24%
Sparse Swamp Forest	28.24%
Peat Dome Forest	30.54%
Source: Krisnawati et al. (2015). Standard Methods for Estimating Greenhouse Gas Emissions from Forests and Peatlands in Indonesia (Version 2). Table 2-3. Indonesian National Carbon Accounting System.	

Table 93- Root to shoot ratio of different forest types

Land Cover Strata	Average BGB		
	($t.ha^{-1}$)	($t.C.ha^{-1}$)	($t.CO_2E.ha^{-1}$)
Peat Dome Forest	60.9	28.6	104.9
Dense Swamp Forest	45.9	21.6	79.1
Medium Swamp Forest	31.8	15.0	54.9
Sparse Swamp Forest	22.1	10.4	38.2
Non-Forest and Water Bodies	0.0	0.0	0.0

Table 94- Average BGB of all Stratum

4.1.5 Baseline Emissions from WRC (BL-PEAT)

The methods for estimating net carbon stock changes and assessing GHG emissions in the baseline scenario from WRC activities (RWE and CIW) are described in Module BL-PEAT, §5.2 through §5.5 and are set forth below.

4.1.5.1 Area of drained peat at project commencement

At the commencement of the project, a total of 146 km of legacy canals, covering were in place in the RER project area. This drained approximately 9,106.4 ha of peatland. The drainage status at the commencement of the project is described in section 3.3.4.3 entitled “Stratification of Drained Peat and Non-Drained Peatland”. These areas are stratified into RWE and RWE-REDD areas respectively and the areas are described in sections 4.1.6 and 4.1.7 respectively.

4.1.5.2 Area of peat drained by plantation development

Canal type	Density (m/ha)	Width (m)	Area (m^2/ha)
Main canal	1.87	12	22.14
Branch canal	12.12	7.64	92.57
Perimeter canal	0.50	5.42	2.71
Large field drains	12.50	2.00	25.00
Small field drains	53.33	1.2	64.00

Source: APRIL Planning Department

Table 95- The dimensions and density of new canals created during the baseline development

1. The development plan for the 4 concessions has been developed as one contiguous block and with an integrated operational plan. The plantation development is planned to cover 7

years, starting in the southern-central part of the concessions, and progressing south to north, and expanding east and west.

2. Division of the *Acacia* plantation area of each assumed agent's concession into 7 planting years (termed Blok RKT, *Rencana Kerja Tahunan*) over the four concessions, resulting in 20 Major blocks in the Project Area.
3. It is assumed all the natural forest areas within the development area will be clear-felled and developed into either plantation or infrastructure.

Block	Total (ha)	Conservation Area	Baseline Development Programme Areas							
			Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
PT. GAN	36,525	30,045	6,480	0	0	1,499	1,528	1,020	1,223	1,209
PT. GCN	20,123	2,583	17,541	3,582	3,306	3,513	3,626	3,513	0	0
PT. SMN	32,776	11,540	21,236	4,365	4,461	4,276	4,388	3,746	0	0
PT. TBOT	40,666	7,497	33,169	7,132	6,469	6,552	6,561	6,455	0	0
Total	130,090	51,664	78,426	15,079	14,236	15,841	16,103	14,735	1,223	1,209

Table 96- Baseline area table

Year	Legacy Canals		Plantation Canals and Drains						All Canals and Drains	
	Length	Area	Main canals	Branch canals	Perimeter canals	Large field drains	Small field drains	Area	Length	Area
	(km)	(ha)	(km)					(ha)	(km)	(ha)
2014	146.0	2.9	0	0	0	0	0	0	146.0	2.9
2015	146.0	2.9	0	0	0	0	0	0	146.0	2.9
2016	121.2	2.4	28.2	182.8	7.5	188.5	804.2	31.7	1,332.3	34.1
2017	91.6	1.8	54.7	355.4	14.6	366.4	1,563.5	61.2	2,446.2	63.0
2018	57.6	1.2	84.3	547.4	22.6	564.4	2,408.3	94.0	3,684.6	95.2
2019	36.7	0.7	114.4	742.6	30.6	765.7	3,267.1	127.0	4,957.1	127.8
2020	2.4	0.0	141.9	921.2	38.0	949.9	4,053.0	157.7	6,106.4	157.8
2021	0.0	0.0	144.2	936.0	38.6	965.2	4,118.2	159.6	6,202.2	159.6
2022	0.0	0.0	146.4	950.7	39.2	980.3	4,182.7	162.1	6,299.3	162.1
2023	0.0	0.0	146.4	950.7	39.2	980.3	4,182.7	162.1	6,299.3	162.1
2024	0.0	0.0	146.4	950.7	39.2	980.3	4,182.7	162.1	6,299.3	162.1
2025 – 2072	0.0	0.0	146.4	950.7	39.2	980.3	4,182.7	162.1	6,299.3	162.1

Table 97- Baseline Plantation canals and Drains area table

4.1.5.3 Assessing Baseline Greenhouse Gas Emissions from Terrestrial Carbon Pools from Peatland Rewetting and Conservation Projects

The Project applies VMD0042 (BL-PEAT) in assessing GHG emissions in the baseline scenario according to §5.2 of the module for RWE and CIW activity.

The Project also notes that it has followed the requirements of VM0007 v1.6 § 5.4.2 and included N_2O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in table 7, § 5.4.2 of VM0007 v1.6.

Emissions Calculations for RWE and CIW

Total Baseline Emissions from Peatlands

The baseline net GHG emissions from peat in the baseline are calculated as follows: Project equations 21 - 24 originated from equations 1 - 4 of VMD006 BL-PEAT.

$$GHG_{BSL-PEAT} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} (A_{peatsoil-BSL,i,t} \times GHG_{peatsoil-BSL,i,t} + A_{ditch-BSL,i,t} \times GHG_{peatditch-BSL,i,t} + A_{peastburn-BSL,i,t} \times GHG_{peatburn-BSL,i,t}) \quad (21)$$

Where:

$GHG_{BSL-PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{peatsoil-BSL,i,t}$	GHG emissions from the peat soil within the project boundary in the baseline scenario in stratum i at year t (t CO_2e ha^{-1} yr^{-1})
$GHG_{peatditch-BSL,i,t}$	GHG emissions from water bodies in the baseline scenario in stratum i at year t (t CO_2e ha^{-1} yr^{-1})
$GHG_{peatburn-BSL,i,t}$	GHG emissions from burning of peat in the base line scenario in stratum i at year t (t CO_2e ha^{-1} yr^{-1})
$A_{peatsoil-BSL,i,t}$	Area of peatland (not open water, not burnt) in stratum i in year t in the baseline scenario (ha)
$A_{ditch-BSL,i,t}$	Area of ditch and other open water in stratum i in year t in the baseline scenario (ha)
$A_{peatburn-BSL,i,t}$	Area of peat burnt in stratum i in year t in the baseline scenario (ha)
i	1, 2, 3 …M strata in the baseline scenario (unitless)
t	1, 2, 3, … t^* times elapsed since the project start (yr)

For all strata i where the project duration exceeds the peat depletion time (PDT or t_{PDT}), for $t > t_{PDT-BSL,i}$ the following applies:

$$GHG_{peatsoil-BSL,i,t} = 0 \quad (22)$$

$$GHG_{peatditch-BSL,i,t} = 0 \quad (23)$$

$$GHG_{peatburn-BSL,i,t} = 0 \quad (24)$$

Where:

$t_{PDT-BSL,i}$	Peat Depletion Time in the baseline scenario in stratum i in years elapsed since the project start; estimated in Module *X-STR* (yr)
$GHG_{peatsoil-BSL,i,t}$	GHG emissions from the peat soil within the project boundary in the baseline scenario in stratum i at year t (t CO_2e ha^{-1} yr^{-1})
$GHG_{peatditch-BSL,i,t}$	GHG emissions from water bodies at year t (t CO_2e ha^{-1} yr^{-1})
$GHG_{peatburn-BSL,i,t}$	GHG emissions from burning of peat in the base line scenario in stratum i at year t (t CO_2e ha^{-1} yr^{-1})
i	1, 2, 3 …M_{BSL} strata in the baseline scenario (unitless)
t	1, 2, 3, … t^* time elapsed since the project start (yr)

In this baseline, we include net GHG emissions from peatland degradation and from ditches. We do not include emissions from peat burning because it is considered optional.[101].

Baseline Emissions from Peat Drainage

GHG emissions from the peat soil per stratum as a result of drainage in the baseline scenario are estimated as per project equation 25, obtained from equation 6 of VMD0042 BL-PEAT:

$$GHG_{proxy\text{-}BSL,i,t} = GHG_{proxy\text{-}CO2,i,t} + GHG_{proxy\text{-}CH4,i,t} \quad (25)$$

Where:

$GHG_{proxy\text{-}BSL,i,t}$	GHG emissions in relation to the chosen proxy in the baseline scenario in stratum *i* at year *t* (t CO_2e ha^{-1} yr^{-1})
$GHG_{proxy\text{-}CO2,i,t}$	Emission of CO_2 in relation to the chosen proxy in stratum *i* at year *t* (t CO_2e ha^{-1} yr^{-1})
$GHG_{proxy\text{-}CH4,i,t}$	Emission of CH_4 in relation to the chosen proxy in stratum *i* at year *t*; can conservatively be omitted in the baseline scenario (t CO_2e ha^{-1} yr^{-1})
i	1, 2, 3 …M_{BSL} strata[5] in the baseline scenario (unitless)
t	1, 2, 3, … *t** time elapsed since the project start (yr)

The annual emissions of CO_2 and CH_4 from drained peat soil are estimated using the IPCC allometrics.

Land Use	GHG	Emission factor	
Fully drained peatland areas	CO_2-C	20	tonnes CO_2-C ha^{-1} yr^{-1}
	CH_4	2.7	kg CH_4 ha^{-1} yr^{-1}
Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].			

Table 98- Emission factors from drained peat soil

Baseline GHG emissions from ditches and other open water bodies in peatlands

GHG emissions from ditches and other water bodies in the baseline are derived on the basis of ditched area and area of open water combined with an emission factor as per project equation 26 obtained from equation 7 of VMD0042 BL-PEAT:

$$GHG_{peatditch\text{-}BSL,i,t} = GHG_{peatditch\text{-}CO2,i,t} + GHG_{peatditch\text{-}CH4,i,t}) \quad (26)$$

Where:

$GHG_{peatditch\text{-}BSL,i,t}$	GHG emissions from ditch and other open water stratum *i* at year *t* in the baseline scenario (t CO_2e $ha^{-1}yr^{-1}$)
$GHG_{peatditch\text{-}CO2,i,t}$	Emission of CO_2 from ditch and open water stratum *i* at year *t* in the baseline scenario (t CO_2e $ha^{-1}yr^{-1}$)
$GHG_{peatditch\text{-}CH4,i,t}$	Emission of CH_4 from ditch and open water stratum *i* at year *t* in the baseline scenario (t CO_2e $ha^{-1}yr^{-1}$)
i	1, 2, 3 …M_{BSL} strata[6] in the baseline scenario (unitless)
t	1, 2, 3, … *t** time elapsed since the project start (yr)

The annual emissions of dissolved organic carbon (DOC) and CH_4 from ditches and other open water bodies are estimated using IPCC allometrics.

Land Use	GHG	Emission factor	
Surface area of canals	Degradation	CH_4	2,259
	Dissolved Organic Carbon	DOC	0.82
Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].			

Table 99- Emission factors from surface area of canals

DOC is then converted to CO_2E by multiplication using the CO_2 to molecular C conversion factor of 3.667[102] .

4.1.6 Baseline Emissions – RWE

4.1.6.1 Baseline emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

The RWE activity encompasses landscapes that have been drained by legacy canals and which will be rewetted by a program of canal blocking. There is no planned deforestation under this scenario because the areas are either in non-forest or are forested without any planned deforestation.

Under the baseline, the canals will be retained (in contrast to blocking under the project scenario) resulting in peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The area of drained peatland in the RWE activity is 2,478.6 hectares.

Year	Drained area estimates ($A_{peatsoil\text{-}BSL,l,t}$)	
	Area drained by legacy canals	Area drained by plantation canals
2006	2,479	0

2007	2,479	0
2008	2,479	0
2009	2,479	0
2010	2,479	0
2011	2,479	0
2012	2,479	0
2013	2,479	0
2014	2,479	0
2015	2,479	0
2016	2,479	0
2017	2,479	0
2018	2,479	0
2019	2,479	0
2020	2,479	0
2021	2,479	0
2022	2,479	0
2023	2,479	0
2024	2,479	0
2025 – 2072	2,479	0

Table 100- Areas of drained land and surface areas of drains in the baseline

The surface area of the canals in RWE activity is as follows:

Year	Surface area of drainage canals (ha) ($A_{ditch-BSL,i,t}$)	
	Surface Area of Legacy Canals (ha)	Surface Area of Plantation Canals (ha)
2014	37.6	0.0
2015	37.6	0.0
2016	37.6	0.0
2017	37.6	0.0
2018	37.6	0.0
2019	37.6	0.0
2020	37.6	0.0
2021	37.6	0.0
2022	37.6	0.0
2023	37.6	0.0
2024	37.6	0.0
2025 – 2072	37.6	0.0

Table 101- Canal surface area statistics

Baseline emissions from peat soil

Baseline GHG emissions from peat soils ($GH_{proxy-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{proxy-BSLi,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	181,966	181,779	187
2007	181,966	181,779	187
2008	181,966	181,779	187
2009	181,966	181,779	187
2010	181,966	181,779	187

2011	181,966	181,779	187
2012	181,966	181,779	187
2013	181,966	181,779	187
2014	181,966	181,779	187
2015	181,966	181,779	187
2016	181,966	181,779	187
2017	181,966	181,779	187
2018	181,966	181,779	187
2019	181,966	181,779	187
2020	181,966	181,779	187
2021	181,966	181,779	187
2022	181,966	181,779	187
2023	181,966	181,779	187
2024	181,966	181,779	187
2025 – 2071	181,966	181,779	187
2072	181,966	181,779	187

Table 102- Baseline GHG emissions from peat soils

Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands ($GH_{peatditch-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	498	23	475
2007	498	23	475
2008	498	23	475
2009	498	23	475
2010	498	23	475
2011	498	23	475
2012	498	23	475
2013	498	23	475
2014	498	23	475
2015	498	23	475
2016	498	23	475
2017	498	23	475
2018	498	23	475
2019	498	23	475
2020	498	23	475
2021	498	23	475
2022	498	23	475
2023	498	23	475
2024	498	23	475
2025 – 2072	498	23	475

Table 103- Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 ver 1.6 at table 9 in section 5.4.4 also indicates that “it is conservative to exclude”.

4.1.7 Baseline Emissions - RWE+REDD

4.1.7.1 Baseline emissions from deforestation

Area of land deforested in baseline

The RWE+REDD activity encompasses landscapes that have been drained by legacy canals and which will be rewetted by a program of canal blocking. 100% of the RWE+REDD area will have planned deforestation under this scenario.

The area of land planned for deforestation and conversion to plantations under RWE+REDD is 6,627.8 hectares.

Land Cover Strata	Areas converted to plantations by land cover and year ($A_{planned,i}$)							
	Planting Year							
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Peat dome	0.0	0.0	0.0	0.0	1.8	0.0	0.0	1.8
Dense swamp forest	49.7	229.4	170.5	574.5	78.0	0.0	0.0	1,102.2
Medium swamp forest	626.2	682.0	684.2	340.1	319.3	13.0	0.0	2,664.7
Sparse swamp forest	446.5	434.0	679.5	39.7	1,161.2	98.2	0.0	2,859.1
Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,122.4	1,345.5	1,534.2	954.3	1,560.3	111.2	0.0	6,627.8

Table 104- Areas converted to plantations by land cover and year in the baseline

The annual areas of land planned for deforestation and conversion to plantations under RWE+REDD were calculated by concession license are shown in the table below:

Concession	Land Cover Strata	Areas converted to plantations by concession, land cover and year ($A_{planned,i}$)							
		Planting Year							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
PT GAN	Peat dome	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Dense swamp forest	0.0	0.0	34.7	0.0	0.0	0.0	0.0	34.8
	Medium swamp forest	0.0	0.0	68.1	2.0	0.6	13.0	0.0	83.7
	Sparse swamp forest	0.0	0.0	340.8	0.8	152.3	98.2	0.0	592.1
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT GCN	Dense swamp forest	11.6	142.8	105.0	563.7	0.0	0.0	0.0	823.2
	Medium swamp forest	23.3	193.6	178.8	237.4	0.0	0.0	0.0	633.2
	Sparse swamp forest	95.6	352.8	136.6	18.1	0.0	0.0	0.0	603.1
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT SMN	Dense swamp forest	36.1	86.6	30.7	10.8	75.9	0.0	0.0	240.1
	Medium swamp forest	259.1	488.4	434.8	100.7	259.1	0.0	0.0	1,542.2
	Sparse swamp forest	68.3	81.2	162.2	20.8	590.7	0.0	0.0	923.2
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PT TBOT	Peat dome	0.0	0.0	0.0	0.0	1.8	0.0	0.0	1.8
	Dense swamp forest	2.1	0.0	0.0	0.0	2.1	0.0	0.0	4.2
	Medium swamp forest	343.7	0.0	2.5	0.0	59.5	0.0	0.0	405.7
	Sparse swamp forest	282.6	0.0	39.9	0.0	418.2	0.0	0.0	740.8
	Non-Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		1,122.4	1,345.5	1,534.2	954.3	1,560.3	111.2	0.0	6,627.8

Table 105- Areas converted to plantations by concession, land cover and year in RWE+REDD scenarios

Changes in terrestrial above ground tree carbon pools in the baseline

The carbon stock changes in above ground biomass are calculated according to the methods described in 4.1.3.2 and summarized in the table below.

Above ground tree carbon stock in the baseline ($C_{AB\_tree\_bsl,i}$)							
Year	Above ground tree biomass in baseline ($C_{AB\_tree\_bsl,i}$)				Baseline carbon stock change in above ground biomass		
	Peat dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	AGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{AB\_tree\_bsl,i}$)
Pre-2016	352	165,662	300,315	224,156			
2016	352	158,189	229,747	189,148	113,048	53,133	194,838
2017	352	123,704	152,882	155,125	145,374	68,326	250,551
2018	352	98,081	75,774	101,849	156,006	73,323	268,874
2019	352	11,728	37,442	98,738	127,796	60,064	220,254
2020	0	0	1,461	7,698	139,102	65,378	239,741
2021	0	0	0	0	9,159	4,305	15,785
2022	0	0	0	0	0	0	0
Total					690,485	324,528	1,190,044

Table 106- Above ground tree carbon stock in the baseline

Changes in terrestrial below ground tree carbon pools in the baseline

The carbon stock changes in below ground biomass are calculated according to the methods described in 4.1.3.2 and summarized in the table below.

Below ground tree carbon stock in the baseline ($C_{BB\_tree\_bsl,i}$)							
Year	Below ground tree biomass in baseline ($C_{BB\_tree\_bsl,i}$)				Baseline carbon stock change in below ground biomass		
	Peat dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	BGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB\_tree\_bsl,i}$)
Pre-2016	108	50,594	84,795	63,291			
2016	108	48,311	64,870	53,407	32,092	15,083	55,310
2017	108	37,779	43,167	43,800	41,842	19,666	72,114
2018	108	29,954	21,395	28,757	44,639	20,980	76,935
2019	108	3,582	10,572	27,879	38,074	17,895	65,620
2020	0	0	412	2,174	39,554	18,591	68,172
2021	0	0	0	0	2,586	1,215	4,457
Total					198,787	93,430	342,608

Table 107- Below ground tree carbon stock in the baseline

The GHG emissions from depletion of BGB is shown in the table below.

Below ground tree carbon stock depletion ($C_{BB\_tree\_bsl,i}$)													
Year	Annual below ground biomass by depletion year ()										Baseline carbon stock change in below ground biomass		
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	AGB (t)	CO_2-C (t)	CO2-E (t) ($\Delta C_{BB\_tree\_bsl,i}$)
2016	3,209										3,209	1,508	5,531
2017	4,184	3,209									7,393	3,475	12,742
2018	4,464	4,184	3,209								11,857	5,573	20,436
2019	3,807	4,464	4,184	3,209							15,665	7,362	26,998
2020	3,955	3,807	4,464	4,184	3,209						19,620	9,221	33,815
2021	259	3,955	3,807	4,464	4,184	3,209					19,879	9,343	34,261
2022	0	259	3,955	3,807	4,464	4,184	3,209				19,879	9,343	34,261
2023	0	0	259	3,955	3,807	4,464	4,184	3,209			19,879	9,343	34,261
2024	0	0	0	259	3,955	3,807	4,464	4,184	3,209		19,879	9,343	34,261
2025	0	0	0	0	259	3,955	3,807	4,464	4,184	3,209	19,879	9,343	34,261
2026	0	0	0	0	0	259	3,955	3,807	4,464	4,184	16,670	7,835	28,730
2027	0	0	0	0	0	0	259	3,955	3,807	4,464	12,485	5,868	21,518
2028	0	0	0	0	0	0	0	259	3,955	3,807	8,021	3,770	13,825
2029	0	0	0	0	0	0	0	0	259	3,955	4,214	1,981	7,263
2030	0	0	0	0	0	0	0	0	0	259	259	122	446
2031 - 2072	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	19,879	19,879	19,879	19,879	19,879	19,879	19,879	19,879	19,879	19,879	198,787	93,430	342,608

Table 108- Below ground tree carbon stock depletion

Greenhouse Gas Emissions from deforestation in the baseline

The Project has followed the requirements of VM0007 v1.6 § 5.4.2 and included N20 as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in table 7, § 5.4.2 of VM0007 v1.6.

4.1.7.2 Baseline emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

The RWE+REDD activity encompasses landscapes that have been drained by legacy canals and which will be rewetted by a program of canal blocking.

Under the baseline, the legacy canals will be replaced by a plantation drainage canals (in contrast to blocking under the project scenario) resulting in continued peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The annual areas area of land planned for deforestation and conversion to plantations under RWE+REDD is 6,627.8 hectares.

Year	Drained area estimates (ha) ($A_{peatsoil-BSL,l,t}$)	
	Area drained by legacy canals	Area drained by plantation canals
2006	6,628	0
2007	6,628	0
2008	6,628	0
2009	6,628	0
2010	6,628	0
2011	6,628	0
2012	6,628	0
2013	6,628	0
2014	6,628	0
2015	6,628	0
2016	5,505	1,122
2017	4,160	2,468
2018	2,626	4,002
2019	1,671	4,956
2020	111	6,517
2021	0	6,628
2022	0	6,628
2023	0	6,628
2024	0	6,628
2025 – 2072	0	6,628

Table 109- Drained area estimates of legacy & plantation canals

The surface area of the canals in RWE+REDD activity is as follows:

Year	Surface area of drainage canals (ha) ($A_{ditch-BSL,i,t}$)	
	Surface Area of Legacy Canals (ha)	Surface Area of Plantation Canals (ha)
2014	21.7	0.0
2015	21.7	2.3
2016	18.0	5.1
2017	13.6	8.3
2018	8.6	10.2
2019	5.5	13.5
2020	0.4	13.7
2021	0.0	13.7
2022	0.0	13.7
2023	0.0	13.7
2024	0.0	13.7
2025 - 2072	0.0	13.7

Table 110- Canal surface area statistics

Baseline emissions from peat soil

Baseline GHG emissions from peat soils ($GH_{proxy-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{proxy-BSLi,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	486,587	486,086	501
2007	486,587	486,086	501
2008	486,587	486,086	501
2009	486,587	486,086	501
2010	486,587	486,086	501
2011	486,587	486,086	501
2012	486,587	486,086	501
2013	486,587	486,086	501
2014	486,587	486,086	501
2015	486,587	486,086	501
2016	486,587	486,086	501
2017	486,587	486,086	501
2018	486,587	486,086	501
2019	486,587	486,086	501
2020	486,587	486,086	501
2021	486,587	486,086	501
2022	486,587	486,086	501
2023	486,587	486,086	501
2024	486,587	486,086	501
2025 - 2072	486,587	486,086	501

Table 111- Baseline GHG emissions from peat soils

Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands ($GH_{peatditch-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	1,437	65	1,372
2007	1,437	65	1,372
2008	1,437	65	1,372
2009	1,437	65	1,372
2010	1,437	65	1,372
2011	1,437	65	1,372
2012	1,437	65	1,372
2013	1,437	65	1,372
2014	1,437	65	1,372
2015	1,437	65	1,372
2016	1,591	72	1,518
2017	1,532	70	1,462
2018	1,450	66	1,384
2019	1,248	57	1,191
2020	1,255	57	1,198
2021	932	42	889
2022	908	41	866
2023	908	41	866
2024	908	41	866
2025 - 2072	908	41	866

Table 112- Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 ver 1.6 at table 9 in section 5.4.4 also indicates that "it is conservative to exclude".

4.1.8 Baseline Emissions – CIW

4.1.8.1 Baseline emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

The CIW activity encompasses landscapes that are undrained, and which will be avoiding drainage under the project. The area has no forest cover and is therefore ineligible for REDD.

Under the baseline, canals will be built, and the area drained resulting in peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The area of avoided wetland drainage in the CIW activity is 5.1 hectares.

The length of canals and the surface area of the canals from avoided wetland drainage in CIW activity is as follows:

Year	Drained area estimates (ha) ($A_{peatsoil-BSL,l,t}$)	
	Area drained by legacy canals	Area drained by plantation canals
2006	0	0
2007	0	0
2008	0	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0
2013	0	0
2014	0	0
2015	0	0
2016	0	0
2017	0	2
2018	0	3
2019	0	3
2020	0	5
2021	0	5
2022	0	5
2023	0	5
2024	0	5
2025 - 2072	0	5

Table 113- Areas of drained land and surface areas of drains

The surface area of the canals in CIW activity is as follows:

Year	Surface area of drainage canals (ha) ($A_{ditch-BSL,i,t}$)	
	Surface Area of Legacy Canals (ha)	Surface Area of Plantation Canals (ha)
2014	0.000	0.000
2015	0.000	0.000
2016	0.000	0.001
2017	0.000	0.003
2018	0.000	0.007
2019	0.000	0.007
2020	0.000	0.011
2021	0.000	0.011
2022	0.000	0.011
2023	0.000	0.011
2024	0.000	0.011
2025 - 2072	0.000	0.011

Table 114- Canal surface area statistics

Baseline emissions from peat soil

Baseline emissions from peat soil Baseline GHG emissions from peat soils ($GH_{proxy-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{proxy-BSLi,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	18	18	0
2017	120	120	0
2018	239	239	0
2019	239	239	0
2020	376	375	0
2021	376	375	0
2022	376	375	0
2023	376	375	0
2024	376	375	0
2025 - 2072	376	375	0

Table 115- Baseline GHG emissions from peat soils

Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands ($GH_{peatditch-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	1	0	1
2021	1	0	1
2022	1	0	1
2023	1	0	1
2024	1	0	1
2025 - 2072	1	0	1

Table 116- GHG emissions from ditches and other open water bodies in peatlands

Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 ver 1.6 at table 9 in section 5.4.4 also indicates that "it is conservative to exclude".

4.1.9 Baseline Emissions - CIW+REDD

4.1.9.1 Baseline emissions from deforestation

Area of land deforested in the baseline

The CIW+REDD activity encompasses landscapes that are undrained and which 100% of the area will be avoiding wetland drainage and avoiding deforestation under the project.

The total area of land planned for drainage, deforestation and conversion to plantations under RWE+REDD is 71,768.0 hectares. The area of land planned for deforestation and conversion to plantations under CIW+REDD is shown in the table below.

Land Cover Strata	Areas converted to plantations by land cover and year ($A_{planned,i}$)							
	Planting Year							
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Peat dome	0.0	0.0	0.0	18.8	902.1	0.0	0.0	920.9
Dense swamp forest	2,632.2	2,201.5	3,070.8	3,699.0	2,351.4	8.9	70.0	14,033.7
Medium swamp forest	9,468.4	6,908.8	8,374.7	8,707.5	6,953.8	467.6	826.8	41,707.6
Sparse swamp forest	1,846.3	3,777.6	2,846.1	2,722.8	2,965.1	635.4	312.6	15,105.8
Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	13,946.9	12,887.8	14,291.7	15,148.0	13,172.4	1,111.9	1,209.4	71,768.0

Table 117- Areas converted to plantations by land cover and year in the baseline

The annual areas of land planned for deforestation and conversion to plantations under CIW+REDD by concession license are shown in the table below:

Concession	Land Cover Strata	Areas converted to plantations by concession, land cover and year ($A_{planned,i}$)							
		Planting Year							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
PT GAN	Peat dome	0.0	0.0	0.0	18.8	0.0	0.0	0.0	18.8
	Dense swamp forest	0.0	0.0	379.6	440.0	0.3	8.9	70.0	898.8
	Medium swamp forest	0.0	0.0	465.5	1,022.9	288.3	467.6	826.8	3,071.2
	Sparse swamp forest	0.0	0.0	210.6	43.6	578.2	635.4	312.6	1,780.4
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT GCN	Dense swamp forest	1,124.0	997.5	1,888.4	1,934.0	2,031.5	0.0	0.0	7,975.4

	Medium swamp forest	1,636.4	1,078.0	976.8	856.9	1,324.1	0.0	0.0	5,872.1
	Sparse swamp forest	682.4	539.3	214.5	15.6	157.7	0.0	0.0	1,609.5
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT SMN	Dense swamp forest	1,014.3	1,128.1	306.0	1,031.1	172.1	0.0	0.0	3,651.6
	Medium swamp forest	2,799.7	2,480.7	3,041.9	3,130.1	2,061.5	0.0	0.0	13,513.8
	Sparse swamp forest	187.4	195.5	299.2	94.0	586.9	0.0	0.0	1,363.0
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT TBOT	Peat dome	0.0	0.0	0.0	0.0	902.1	0.0	0.0	902.1
	Dense swamp forest	494.0	75.9	496.8	293.9	147.4	0.0	0.0	1,508.0
	Medium swamp forest	5,032.3	3,350.1	3,890.5	3,697.6	3,280.0	0.0	0.0	19,250.6
	Sparse swamp forest	976.5	3,042.8	2,121.8	2,569.7	1,642.2	0.0	0.0	10,352.9
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		13,947	12,888	14,292	15,148	13,172	1,112	1,209	71,768.0

Table 118- Areas converted to plantations by concession, land cover and year

Changes in terrestrial above ground tree carbon pools in the baseline

The carbon stock changes in above ground biomass are calculated according to the methods described above in §4.1.3.2 and summarized in the table below.

Above ground tree carbon stock in the baseline ($C_{AB\_tree\_bsl,i}$)							
Year	Above ground tree biomass in baseline ($C_{AB\_tree\_bsl,i}$)				Baseline carbon stock change in above ground biomass		
	Peat dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	AGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{AB\_tree\_bsl,i}$)
Pre-2016	183,529	2,109,272	4,700,449	1,184,296			
2016	183,529	1,713,648	3,633,361	1,039,546	1,607,462	755,507	2,770,444
2017	183,529	1,382,766	2,854,742	743,383	1,405,664	660,662	2,422,648
2018	183,529	921,224	1,910,908	520,247	1,628,511	765,400	2,806,723
2019	179,790	365,268	929,576	306,781	1,754,494	824,612	3,023,853
2020	0	11,860	145,877	74,320	1,549,357	728,198	2,670,301
2021	0	10,520	93,179	24,508	103,851	48,810	178,985
2022	0	0	0	0	128,207	60,257	220,963
Total					8,177,545	3,843,446	14,093,918

Table 119- Changes in above ground tree carbon stock in the baseline

Changes in terrestrial below ground tree carbon pools in the baseline

The carbon stock changes in below ground biomass are calculated according to the methods described in §4.1.3.2 and summarized in the table below.

Below ground tree carbon stock in the baseline ($C_{BB\_tree\_bsl,i}$)

Year	Below ground tree biomass in baseline ($C_{BB\_tree\_bsl,i}$)				Baseline carbon stock change in below ground biomass		
	Peat dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	BGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB\_tree\_bsl,i}$)
Pre-2016	56,050	644,177	1,327,186	334,389			
2016	56,050	523,352	1,025,890	293,519	462,990	217,606	797,959
2017	56,050	422,300	806,045	209,896	404,520	190,124	697,186
2018	56,050	281,344	539,551	146,893	470,453	221,113	810,821
2019	54,908	111,554	262,468	86,620	508,287	238,895	876,028
2020	0	3,622	41,189	20,984	449,755	211,385	775,149
2021	0	3,213	26,309	6,920	29,353	13,796	50,590
2022	0	0	0	0	36,442	17,128	62,807
Total					2,361,802	1,110,047	4,070,542

Table 120- Changes in below ground tree carbon stock in the baseline

The GHG emissions from depletion of BGB is shown in the table below.

Below ground tree carbon stock depletion ($C_{BB\_tree\_bsl,i}$)													
Year	Annual below ground biomass by depletion year ()										Baseline carbon stock change in below ground biomass		
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	AGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB\_tree\_bsl,i}$)
2016	46,299										46,299	21,761	79,796
2017	40,452	46,299									86,751	40,773	149,515
2018	47,045	40,452	46,299								133,796	62,884	230,597
2019	50,829	47,045	40,452	46,299							184,625	86,774	318,200
2020	44,976	50,829	47,045	40,452	46,299						229,601	107,912	395,714
2021	2,935	44,976	50,829	47,045	40,452	46,299					232,536	109,292	400,773
2022	3,644	2,935	44,976	50,829	47,045	40,452	46,299				236,180	111,005	407,054
2023	0	3,644	2,935	44,976	50,829	47,045	40,452	46,299			236,180	111,005	407,054
2024	0	0	3,644	2,935	44,976	50,829	47,045	40,452	46,299		236,180	111,005	407,054
2025	0	0	0	3,644	2,935	44,976	50,829	47,045	40,452	46,299	236,180	111,005	407,054
2026	0	0	0	0	3,644	2,935	44,976	50,829	47,045	40,452	189,881	89,244	327,258
2027	0	0	0	0	0	3,644	2,935	44,976	50,829	47,045	149,429	70,232	257,540
2028	0	0	0	0	0	0	3,644	2,935	44,976	50,829	102,384	48,120	176,457
2029	0	0	0	0	0	0	0	3,644	2,935	44,976	51,555	24,231	88,855
2030	0	0	0	0	0	0	0	0	3,644	2,935	6,580	3,092	11,340
2031	0	0	0	0	0	0	0	0	0	3,644	3,644	1,713	6,281
2032 - 2072	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	236,180	236,180	236,180	236,180	236,180	236,180	236,180	236,180	236,180	236,180	2,361,802	1,110,047	4,070,542

Table 121- Below ground tree carbon stock depletion

Greenhouse Gas Emissions from deforestation in the baseline

The Project has followed the requirements of VM0007 v1.6 § 5.4.2 and included N_2O as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in table 7, § 5.4.2 of VM0007 v1.6.

4.1.9.2 Baseline emissions from peat

Areas of drained land and surface areas of drains in the baseline

The CIW+REDD activity encompasses landscapes that are undrained, and which will be avoiding drainage under the project. The area has forest cover which will be 100% cleared for plantation development.

Under the baseline, canals will be built, and the area drained resulting in peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The area of avoided wetland drainage in the CIW+REDD activity is 71,768.0 hectares.

The length of canals and the surface area of the canals from avoided wetland drainage in CIW activity is as follows:

Year	Drained area estimates (ha) ($A_{peatsoil-BSL,l,t}$)	
	Area drained by legacy canals	Area drained by plantation canals
2006	0	0
2007	0	0
2008	0	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0
2013	0	0
2014	0	0
2015	0	0
2016	0	13,947
2017	0	26,835
2018	0	41,126
2019	0	56,274
2020	0	69,447
2021	0	70,559
2022	0	71,768
2023	0	71,768
2024	0	71,768
2025 - 2072	0	71,768

Table 122- Drained area estimates of legacy & plantation canals

The surface area of the canals in CIW+REDD activity is as follows:

Year	Surface area of drainage canals (ha) ($A_{ditch-BSL,i,t}$)	
	Surface Area of Legacy Canals (ha)	Surface Area of Plantation Canals (ha)
2014	0	0.0
2015	0	0.0
2016	0	28.8
2017	0	55.5
2018	0	85.0
2019	0	116.3
2020	0	143.5
2021	0	145.8
2022	0	148.3
2023	0	148.3
2024	0	148.3
2025 - 2072	0	148.3

Table 123- Canal surface area statistics

Baseline emissions from peat soil

Baseline GHG emissions from peat soils ($GH_{proxy-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{proxy-BSLi,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	1,023,922	1,022,867	1,054
2017	1,970,090	1,968,062	2,029
2018	3,019,322	3,016,212	3,109
2019	4,131,421	4,127,167	4,254
2020	5,098,478	5,093,228	5,250
2021	5,180,107	5,174,773	5,334
2022	5,268,894	5,263,469	5,426
2023	5,268,894	5,263,469	5,426
2024	5,268,894	5,263,469	5,426
2025 - 2072	5,268,894	5,263,469	5,426

Table 124- Baseline GHG emissions from peat soils

Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands ($GH_{peatditch-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	1,910	87	1,823
2017	3,675	167	3,508
2018	5,632	256	5,376
2019	7,707	350	7,357
2020	9,510	432	9,079
2021	9,663	439	9,224
2022	9,828	446	9,382
2023	9,828	446	9,382
2024	9,828	446	9,382
2025 - 2072	9,828	446	9,382

Table 125- Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 ver 1.6 at table 9 in section 5.4.4 also indicates that "it is conservative to exclude".

4.1.10 Total Baseline Emissions – All Activities

4.1.10.1 Baseline emissions from deforestation

Area of land deforested in baseline

The RWE+REDD activity encompasses landscapes that have been drained by legacy canals and which will be rewetted by a program of canal blocking. The areas area of land planned for deforestation and conversion to plantations is 78,395.9 hectares.

Land Cover Strata	Areas converted to plantations by land cover and year ($A_{planned,i}$)							
	Planting Year							
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Peat dome	0.0	0.0	0.0	18.8	903.9	0.0	0.0	922.6
Dense swamp forest	2,681.9	2,430.9	3,241.3	4,273.5	2,429.4	8.9	70.0	15,136.0
Medium swamp forest	10,094.6	7,590.8	9,058.9	9,047.6	7,273.1	480.6	826.8	44,372.4
Sparse swamp forest	2,292.8	4,211.6	3,525.7	2,762.5	4,126.3	733.6	312.6	17,964.9
Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	15,069.3	14,233.3	15,825.9	16,102.3	14,732.7	1,223.0	1,209.4	78,395.9

Table 126- Areas converted to plantations by land cover and year in baseline

The annual areas of land planned for deforestation and conversion to plantations under RWE+REDD were calculated by concession license are shown in the table below:

Concession	Land Cover Strata	Areas converted to plantations by concession, land cover and year ($A_{planned,i}$)							
		Planting Year							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
PT GAN	Peat dome	0.0	0.0	0.0	18.8	0.0	0.0	0.0	18.8
	Dense swamp forest	0.0	0.0	414.3	440.0	0.3	8.9	70.0	933.5
	Medium swamp forest	0.0	0.0	533.6	1,024.9	289.0	480.6	826.8	3,154.8
	Sparse swamp forest	0.0	0.0	551.5	44.4	730.5	733.6	312.6	2,372.5
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT GCN	Dense swamp forest	1,135.6	1,140.4	1,993.5	2,497.7	2,031.5	0.0	0.0	8,798.6
	Medium swamp forest	1,659.7	1,271.6	1,155.6	1,094.3	1,324.1	0.0	0.0	6,505.2
	Sparse swamp forest	778.0	892.1	351.1	33.7	157.7	0.0	0.0	2,212.6
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT SMN	Dense swamp forest	1,050.3	1,214.7	336.7	1,042.0	248.1	0.0	0.0	3,891.7
	Medium swamp forest	3,058.8	2,969.1	3,476.7	3,230.8	2,320.6	0.0	0.0	15,056.0
	Sparse swamp forest	255.7	276.7	461.4	114.8	1,177.6	0.0	0.0	2,286.2
	Non-forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PT TBOT	Peat dome	0.0	0.0	0.0	0.0	903.9	0.0	0.0	903.9
	Dense swamp forest	496.0	75.9	496.8	293.9	149.5	0.0	0.0	1,512.1
	Medium swamp forest	5,376.1	3,350.1	3,893.0	3,697.6	3,339.5	0.0	0.0	19,656.3

	Sparse swamp forest	1,259.1	3,042.8	2,161.8	2,569.7	2,060.4	0.0	0.0	11,093.7
	Non Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Body	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		15,069.3	14,233.3	15,825.9	16,102.3	14,732.7	1,223.0	1,209.4	78,395.9

Table 127- Areas converted to plantations by concession, land cover and year in baseline

Changes in terrestrial above ground tree carbon pools in the baseline

The carbon stock changes in above ground biomass are calculated according to the methods described in §4.1.3.2 of the PD and summarized in the table below.

Above ground tree carbon stock in the baseline ($C_{AB\_tree\_bsl,i}$)							
Year	Above ground tree biomass in baseline ($C_{AB\_tree\_bsl,i}$)				Baseline carbon stock change in above ground biomass		
	Peat dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	AGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{AB\_tree\_bsl,i}$)
Pre-2016	183,881	2,274,934	5,000,764	1,408,452			
2016	183,881	1,871,837	3,863,108	1,228,695	1,720,510	808,640	2,965,282
2017	183,881	1,506,470	3,007,624	898,508	1,551,039	728,988	2,673,199
2018	183,881	1,019,305	1,986,682	622,097	1,784,517	838,723	3,075,597
2019	180,142	376,996	967,018	405,519	1,882,290	884,676	3,244,108
2020	0	11,860	147,338	82,018	1,688,459	793,576	2,910,043
2021	0	10,520	93,179	24,508	113,009	53,114	194,771
2022	0	0	0	0	128,207	60,257	220,963
Total					8,868,031	4,167,974	15,283,962

Table 128- Changes in Above ground tree carbon stock in the baseline

Changes in terrestrial below ground tree carbon pools in the baseline

The carbon stock changes in below ground biomass are calculated according to the methods described in §4.1.3.2 and summarized in the table below.

Below ground tree carbon stock in the baseline ($C_{BB\_tree\_bsl,i}$)							
Year	Below ground tree biomass in baseline ($C_{BB\_tree\_bsl,i}$)				Baseline carbon stock change in below ground biomass		
	Peat dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	BGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB\_tree\_bsl,i}$)
Pre-2016	56,158	694,770	1,411,980	397,681			
2016	56,158	571,664	1,090,760	346,926	495,082	232,689	853,269
2017	56,158	460,080	849,211	253,696	446,362	209,790	769,300
2018	56,158	311,298	560,946	175,651	515,092	242,093	887,757
2019	55,016	115,136	273,040	114,500	546,361	256,790	941,648
2020	0	3,622	41,601	23,158	489,310	229,976	843,321
2021	0	3,213	26,309	6,920	31,939	15,012	55,047
2022	0	0	0	0	36,442	17,128	62,807
Total					2,560,589	1,203,477	4,413,149

Table 129- Changes in Below ground tree carbon stock in the baseline

Below ground tree carbon stock in the baseline ($C_{BB\_tree\_bsl,i}$)													
Year	Annual below ground biomass by depletion year ()										Baseline carbon stock change in below ground biomass		
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	AGB (t)	CO2-C (t)	CO2-E (t) ($\Delta C_{BB\_tree\_bsl,i}$)
2016	49,508										49,508	23,269	85,327
2017	44,636	49,508									94,144	44,248	162,257
2018	51,509	44,636	49,508								145,654	68,457	251,033
2019	54,636	51,509	44,636	49,508							200,290	94,136	345,197
2020	48,931	54,636	51,509	44,636	49,508						249,221	117,134	429,529
2021	3,194	48,931	54,636	51,509	44,636	49,508					252,415	118,635	435,034
2022	3,644	3,194	48,931	54,636	51,509	44,636	49,508				256,059	120,348	441,315
2023		3,644	3,194	48,931	54,636	51,509	44,636	49,508			256,059	120,348	441,315
2024			3,644	3,194	48,931	54,636	51,509	44,636	49,508		256,059	120,348	441,315
2025				3,644	3,194	48,931	54,636	51,509	44,636	49,508	256,059	120,348	441,315
2026					3,644	3,194	48,931	54,636	51,509	44,636	206,551	97,079	355,988
2027						3,644	3,194	48,931	54,636	51,509	161,914	76,100	279,058
2028							3,644	3,194	48,931	54,636	110,405	51,890	190,282
2029								3,644	3,194	48,931	55,769	26,211	96,118
2030									3,644	3,194	6,838	3,214	11,785
2031										3,644	3,644	1,713	6,281
2032 - 2072													
Total	256,059	256,059	256,059	256,059	256,059	256,059	256,059	256,059	256,059	256,059	2,560,589	1,203,477	4,413,149

Table 130- Below ground tree carbon stock in the baseline

Greenhouse Gas Emissions from deforestation in the baseline

The Project has followed the requirements of VM0007 v1.6 § 5.4.2 and included N20 as a carbon pool because of the potential for Nitrogen fertilizer application in the baseline scenario. However, because no nitrogen fertilizer application occurs in the project scenario, it has been excluded from the GHG emission reduction accounting as suggested in table 7, § 5.4.2 of VM0007 v1.6.

4.1.10.2 Baseline emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

The RWE+REDD activity encompasses landscapes that have been drained by legacy canals and which will rewetted by a program of canal blocking.

Under the baseline, the legacy canals will be replaced by a plantation drainage canals (in contrast to blocking under the project scenario) resulting in continued peat soil GHG emissions from peatland degradation and GHG emissions from drains.

The total of land planned for deforestation and conversion to plantations is 71,768.0 hectares.

Year	Area drained ($A_{peatsoil-BSL,i,t}$)							
	Total	Legacy canals			Plantation canals			
		Total	RWE	RWE+ REDD	Total	RWE+ REDD	CIW	CIW+ REDD
2006	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2007	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2008	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2009	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2010	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2011	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2012	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2013	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2014	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2015	9,106.4	9,106.4	2,478.6	6,627.8	0.0	0.0	0.0	0.0
2016	23,053.6	7,984.0	2,478.6	5,505.4	15,069.6	1,122.4	0.3	13,946.9
2017	35,942.8	6,638.6	2,478.6	4,160.0	29,304.3	2,467.9	1.6	26,834.8
2018	50,236.1	5,104.4	2,478.6	2,625.8	45,131.7	4,002.0	3.3	41,126.4
2019	65,384.1	4,150.0	2,478.6	1,671.4	61,234.1	4,956.4	3.3	56,274.4
2020	78,558.3	2,589.7	2,478.6	111.2	75,968.6	6,516.7	5.1	69,446.8
2021	79,670.2	2,478.6	2,478.6	0.0	77,191.6	6,627.8	5.1	70,558.7
2022	80,879.6	2,478.6	2,478.6	0.0	78,401.0	6,627.8	5.1	71,768.0
2023	80,879.6	2,478.6	2,478.6	0.0	78,401.0	6,627.8	5.1	71,768.0
2024	80,879.6	2,478.6	2,478.6	0.0	78,401.0	6,627.8	5.1	71,768.0
2025 - 2072	80,879.6	2,478.6	2,478.6	0.0	78,401.0	6,627.8	5.1	71,768.0

Table 131- Areas of drained land and surface areas of drains in the baseline

The surface area of the canals in the project area is as follows:

Year	Surface area of drainage canals							
	Total	Legacy canals			Plantation canals			
		Total	RWE	RWE+REDD	Total	RWE+REDD	CIW	CIW+REDD
2006	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2007	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2008	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2009	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2010	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2011	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2012	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2013	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2014	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2015	29.2	29.2	7.5	21.7	0.0	0.0	0.00	0.0
2016	60.3	29.2	7.5	21.7	31.1	2.3	0.00	28.8
2017	86.1	25.5	7.5	18.0	60.6	5.1	0.00	55.5
2018	114.4	21.1	7.5	13.6	93.3	8.3	0.01	85.0
2019	142.7	16.1	7.5	8.6	126.6	10.2	0.01	116.3
2020	170.0	13.0	7.5	5.5	157.0	13.5	0.01	143.5
2021	167.4	7.9	7.5	0.4	159.5	13.7	0.01	145.8
2022	169.6	7.5	7.5	0.0	162.0	13.7	0.01	148.3
2023	169.6	7.5	7.5	0.0	162.0	13.7	0.01	148.3
2024	169.6	7.5	7.5	0.0	162.0	13.7	0.01	148.3
2025 - 2072	169.6	7.5	7.5	0.0	162.0	13.7	0.01	148.3

Table 132- Canal surface area statistics

Baseline emissions from peat soil

Baseline GHG emissions from peat soils ($GH_{proxy\text{-}BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{proxy\text{-}BSLi,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy\text{-}CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy\text{-}CH4,i,t}$)
2006	668,553	667,865	688
2007	668,553	667,865	688
2008	668,553	667,865	688
2009	668,553	667,865	688
2010	668,553	667,865	688
2011	668,553	667,865	688
2012	668,553	667,865	688
2013	668,553	667,865	688
2014	668,553	667,865	688
2015	668,553	667,865	688
2016	1,692,493	1,690,750	1,743
2017	2,638,763	2,636,046	2,717
2018	3,688,113	3,684,316	3,798
2019	4,800,213	4,795,270	4,943
2020	5,767,407	5,761,468	5,939
2021	5,849,036	5,843,013	6,023
2022	5,937,823	5,931,708	6,114
2023	5,937,823	5,931,708	6,114
2024	5,937,823	5,931,708	6,114
2025 - 2072	5,937,823	5,931,708	6,114

Table 133- Baseline GHG emissions from peat soils

Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline GHG emissions from ditches and other open water bodies in peatlands ($GH_{peatditch-BSL,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	1,935	88	1,847
2007	1,935	88	1,847
2008	1,935	88	1,847
2009	1,935	88	1,847
2010	1,935	88	1,847
2011	1,935	88	1,847
2012	1,935	88	1,847
2013	1,935	88	1,847
2014	1,935	88	1,847
2015	1,935	88	1,847
2016	3,999	181	3,817
2017	5,705	259	5,446
2018	7,580	344	7,236
2019	9,453	429	9,024
2020	11,264	511	10,753
2021	11,093	503	10,590
2022	11,235	510	10,725
2023	11,235	510	10,725
2024	11,235	510	10,725
2025 - 2072	11,235	510	10,725

Table 134- Baseline GHG emissions from ditches and other open water bodies in peatlands

Baseline Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment as there is no significant history or threat of peat or biomass burning in the baseline period. VM0007 ver 1.6 at table 9 in section 5.4.4 also indicates that “it is conservative to exclude”.

4.1.11 Significant Sources of Baseline Emissions

Most exclusions were implemented on the basis of conservatism which is permitted under VM0007. The Project has included all mandatory carbon pools, and all other required sources of GHG emissions have either been included or conservatively excluded.

Two sources of GHG emissions have been excluded for reasons of insignificance. These are the burning of woody biomass and peat combustion. These emission sources are excluded because of the complete absence of fire, or the drivers of fire which are occupation and deforestation, in the project area over the period of the baseline measurement period from 2006 to 2020. Because of the absence of fires, emissions from burning of woody biomass and peat combustion in the project are assumed to be zero and are conservatively omitted. The relative contribution (RE%) from woody biomass and peat combustion based on measured fires events is estimated as zero and less than the 5% threshold of their respective pools as specified in T-SIG. Note that fire events will be monitored and included in the project if they occur in the future.

Mineral soil carbon pool was excluded because this carbon pool does not exist within the project boundary. Because mineral soil carbon is estimated to be zero, the relative contribution (RE%) is estimated as zero and less than the 5% threshold of the total terrestrial carbon pool as specified in T-SIG, and can be excluded.

All sources of GHG emissions have been included or conservatively excluded and mandatory pools included. The net emissions from the baseline scenario between 17 June 2016 and 23 July 2072 is 347,584,166 t.CO_2-e. This is the equivalent to average annual baseline emissions of 6,195,947 t CO_2-e yr^{-1}.

4.2 Project Emissions

4.2.1 General Procedures and Assumptions

In the future, emissions from the Project Area (including any changes in those emissions) will be in part determined from specific site data. When no specific site data is available, necessary calculations can rely on IPCC default emissions factors, proxy analysis, and any national GHG allometrics based on published scientific research data.

Project scenario emissions accounted for were based on:

1. Water bodies,
2. Above ground stock changes in biomass due to REDD, and
3. Microbial peat decompositions.

Planned Project Activities in relation to climate were:

1. Drained peatland rewetting,
2. Existing undrained peatland conservation,
3. Revegetation,
4. Deforestation and forest degradation avoidance, and
5. Fire control and prevention for nil burning.

Revegetation, fire control, and prevention in the Project are being operationally implemented. However, it is noted that these activities are not included in emissions reduction estimates. This is also conservative.

It is assumed that uncontrolled burning will not occur in the Project Area during the Project Period since rewetting and fire prevention are conducted - therefore no GHG emissions are expected. Notwithstanding this, any emissions resulting from fires that do occur will be accounted for (using VMD0013 (E-BPB) ver. 1.2) under the established fire monitoring plan within the broader fire management activities. The Project assumes that zero non-human induced rewetting will form part of the Project Scenario.

N_2O emissions in the project are not accounted for because there will be no fertilizer applications. Furthermore, rewetting of organic soils decreases N_2O emissions rapidly and falls to virtually zero by the raising of the water table depth, in the event this depth is below the surface by <20cm. CH_4 emissions may be higher before stabilising to levels seen in undrained or never-drained areas during the transient period immediately after rewetting activities. Emissions of CH_4 from rewetting activities in the relevant strata sites commencing from the Project Start Date will be monitored directly. Once sufficient data has been collected from those sites, emissions of CH_4 will be assessed again and any variability accounted for in quantifications of GHG emissions based on specific site data.

4.2.1.1 Project area

Emission Characteristics in Project Scenario

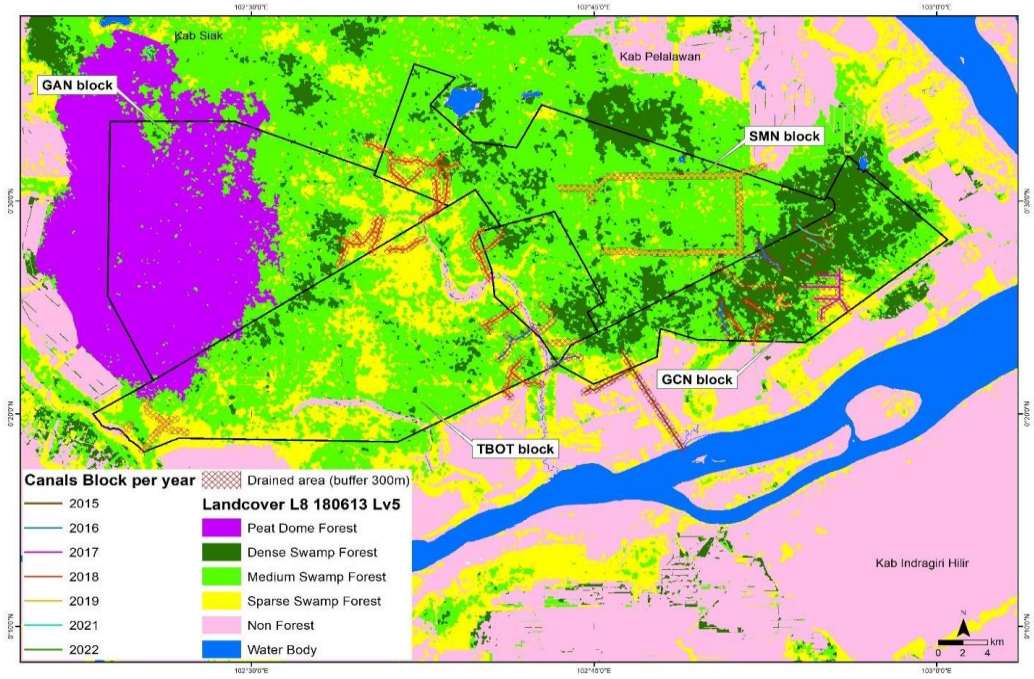
The Project Area under the Project Scenario has been stratified according to four classification categories:

- **Land cover** - including Peat Dome Forest, Dense Swamp Forest. Medium Swamp Forest, Sparse Swamp Forest, Non-Forest;
- **Soil and soil depth** – Peat by 50cm peat depth classes;
- **Drainage status** - including drained, undrained; and,
- **Water body** - Water body and land.

The Project Scenario Map (see Map 42) development process involved the following delineations as at Project Start Date:

- Existing water bodies such as rivers and lakes,
- Forest and non-forest areas, with further stratification into land cover types,
- Drained areas in proximity to drainage canals and other undrained areas. It was assumed that fully drained areas extend to 300m from the sides of canals. Based on this assumption, the presence of drainage canals consistently results in the lowering of water tables perpendicular to canals at differential levels, and

- An overlay of the above delineations resulted in the Project Scenario Maps in relation to each relevant activity as described below.



Map 42- Master project scenario map

4.2.1.2 Emission Characteristic Stratification for WRC Under Project Scenario

Emission Characteristic Stratification for REDD Under Project Scenario

During the Project Period, there is no deforestation or forest degradation anticipated under the Project Scenario in any area where there is planned deforestation.

Uncontrolled burning is assumed to be zero after project initiation, given the fire prevention programmes. There is no history of unplanned deforestation and forest degradation from illegal land clearing and there is assumed to be no unplanned deforestation and forest degradation.

Carbon enhancement is likely to take place based on the Project Scenario as a result of forest regrowth expected in all forested areas following Project commencement. Measurements of biomass accumulation will be taken as part of periodic monitoring activities.

Emission Characteristic Stratification for ARR Under Project Scenario

The main ARR activities under the Project Scenario will be enrichment and reforestation planting aimed at restoring the natural forest to a primary forest condition. All emissions reductions from these activities are excluded from the project emissions calculation and ARR is not a GHG activity under the Project.

Emission Characteristic Stratification for WRC Under Project Scenario

The locations of WRC activities under the Project Scenario are mapped by taking into account:

(1) Initial land use, cover, and drainage status,

(2) Historical timing of land-use changes and drainage status based on planned rewetting under the Project Scenario, and

(3) Peatland coverage:

a. Land cover – forest and non-forest
b. Location canals.
c. The timings of drainage canal blocking (rewetting) and the impacted canals and surrounding drained areas.

Because the Project Area is entirely covered in deep peat, no specific consideration is required for stratification by peat depth within the rewetted area.

Description of Strata	Area		Activity class
	(ha)	%	
Forested peatland, undrained and avoiding deforestation and avoiding peatland degradation, from plantation development: Peatland with forest cover present at Project Start Date, no drainage impact from human-made legacy canals, planned for forest clearing, drainage, and conversion to plantation.	71,768.1	55%	CIW+ REDD
Forested peatland, drained, avoiding deforestation from plantation development, and peatland restoration by canal rewetting: Peatland with forest cover present at Project Start Date and drainage impact from human-made legacy canals. This covers a 300m belt alongside canals within the plantation development zone. This area was planned for conversion to plantation.	6,627.8	5%	RWE+ REDD
Non-forested peatland and drained and peatland restoration by canal rewetting + Forested peatland and drained and peatland restoration by canal rewetting (but no avoided deforestation): Peatland which will be rewetted but is ineligible under REDD.	2,478.6	2%	RWE
Non-forested peatland, undrained and avoiding peatland degradation, from plantation development: Peatland without forest cover at Project Start Date due to prior logging and burning, with drainage impact from human-made legacy canals. This covers a 300m belt alongside canals.	5.1	0	CIW
Undrained peatland with no planned plantation development: Peatland which has been planned for conservation and excluded from plantation development under the baseline.	49,210.4	38%	Not eligible for RWE or REDD
Total	130,0909 0.0	100%	

Table 135- Activity class of each stratum

Under the project, the PP plans to replant selected non-forest areas, restore deselected degraded forest areas and block the legacy canals to rewet the drained landscape. The ARR activities are not included in the project emissions estimates and are not described in detail here.

The strata that are distinguished in the Project Scenario based on this analysis are:

- Drained peatland,
- Undrained peatland.

The quantum of GHG emissions resulting from microbial peat decomposition and loss of DOC via peatlands water bodies has been measured using an explicit temporal and spatial methodology.

4.2.2 Project Emissions Modelling Approach

Separate project emissions calculations have been prepared for 4 separate project activities:

1. RWE – Restoration of drained peatland with no avoiding planned deforestation.
2. RWE+REDD - Restoration of drained peatland with avoiding planned deforestation.
3. CIW – Avoiding wetland degradation with no avoiding planned deforestation.
4. CIW+REDD - Avoiding wetland degradation with avoiding planned deforestation.

All the areas developed into plantations under the baseline are protected under the respective project activity. Existing legacy canals will be blocked over a period of 8 years under the project and the drained areas rewetted.

For each stratum in the Project Scenario has been subdivided into the smallest parcel units of land or water body and have relatively uniform spatial variables as shown in Table 136 Temporal variability for Project emissions is accounted for by organising calculations into discrete timing 1-year units. Table 136 outlines each of the following:

- Variables that determine strata change sequences,
- Temporal variability of parameters for GHG emissions, and
- Temporal restrictions to GHG emissions.

This schematization provides the assurance that GHG emission parameters at the correct spatial location and the correct time have been appropriately used.

Variables	Description
(A) Spatial Variables	
(A1) Type of soil	Distinction between peat and non-peat. This is used to exclude all non-peat parcels from GHG calculation. All the Project Area is deep peat and there is no non-peat.
(A2) Initial peat thickness available for microbial decomposition	Derived from DEM and Peat Thickness Map. This is used as the initial condition for subsequent calculations of the remaining available peat for microbial decompositions
(A3) Initial stratum within the peat area	Stratum of the corresponding parcel at project start date before conversion into other (rewetted) stratum takes effect. All the Project Area is deep peat.
(B) Temporal Variables	
(B1) Year of rewetting	Employed to determine the onset of conversion from initial to rewetted stratum, which sets all relevant parameters and variables related to drainage accordingly. e.g. emission factors for the corresponding land parcels.
(B2) Remaining peat thickness available for microbial decompositions and burnings	Employed for determining whether Project Scenario PDT has been reached for the corresponding land parcel in the corresponding year. The entire Project Area is deep peat with no stratum ever depleting to a thickness of 20cm and set to zero.

Table 136- Variables adopted for the systematic organisation of measurements for GHG emissions arising from microbial peat decomposition and dissolving organic carbon from peatlands under the Project Scenario.

4.2.3 Emissions calculations for REDD

4.2.3.1 Total Project Emissions from REDD

For the project area of REDD project activities, the net GHG emissions in the project case is equal to the sum of stock changes due to deforestation and forest degradation plus the total GHG emissions minus any eligible forest carbon stock enhancement from VCS Module VMD0015 - M-PEAT equation 1:

$$\Delta C_{WPS-REDD} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t} \right)$$

Where:

$\Delta C_{WPS-REDD}$	Net GHG emissions in the REDD project scenario up to year *t**; t CO_2-e
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* in year *t*; t CO_2-e
$\Delta C_{P,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* in year *t*; t CO_2-e
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* in year *t*; t CO_2-e
$GHG_{P-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*; t CO_2-e
$\Delta C_{P,Enh,i,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline[2] in stratum *i* in year *t*; t CO_2-e
i	1, 2, 3, …*M* strata
t	1, 2, 3, … *t** years elapsed since the start of the project activity

Note under the project, it is assumed that all deforestation and forest degradation will be avoided and that no net carbon stock changes will occur as a result natural disturbance. Therefore, the only contributor to net GHG emissions from REDD will be reductions in emissions from forest carbon stock enhancement. The net GHG emissions from REDD are calculated using this equation and reported separately for CIW-REDD and RWE-REDD.

4.2.3.2 Project Emissions from Deforestation and Forest Degradation

During the Project Period:

1. There will be no deforestation anticipated under the project scenario and no associated emissions,
2. There will be no forest degradation anticipated under the project scenario and no associated emissions, and
3. There will be no emissions from uncontrolled biomass burning.

Because the project assumes no fire and no uncontrolled burning, then the estimation of GHG emissions from biomass and peat burning as described in VCS Module VMD0013 – E-BPB do not apply for this project.

4.2.3.3 Carbon Enhancement from Forest Growth

After Project Start Date, forested areas that would otherwise have been converted to plantations or faced degradation are expected to benefit from regrowth and the associated biomass accumulation and CO_2 removal. Under VMD0015 M-REDD Version 2.2, changes to net ex-ante carbon stock resulting from enhancement of forest carbon stock is multiplied by the areas where carbon stock is accumulating and the difference in carbon stock (between baseline and project case). Project equation 27 is from equation 25 of VMD0015 M-REDD.

$$\Delta C_{P,Enh,i,t} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\left(C_{P,i,t} - C_{BSL,i} \right) * A_{Enh,UP,i,t} \right) \quad (27)$$

Where:

$\Delta C_{P,Enh,i,t}$	Net carbon stock changes as a result of forest carbon stock enhancement in stratum *i* in year *t*; t CO_2-e
$C_{P,i,t}$	Carbon stock in all pools in the project case in stratum *i* in year *t*; t CO_2-e
$C_{BSL,i}$	Carbon stock in all carbon pools in stratum *i*; t CO_2-e ha^{-1}
$A_{Enh,UP,i,t}$	Project area in stratum *i* in which carbon stocks are accumulating but that would have undergone unplanned deforestation in the baseline scenario in year *t*; ha
i	1, 2, 3, …*M* strata
t	1, 2, 3, … *t** years elapsed since the projected start of the project activity

The process for calculating forest growth in the avoided deforested areas is as follows:

1. The forests are classified by forest type:
    a. Peat Dome Forest,
    b. Dense Swamp Forest,
    c. Medium Swamp Forest, and
    d. Sparse Swamp Forest.

    Each of these forest types has an average tree biomass estimate.
2. The forests are further classified into the year of baseline land clearing.
3. The above ground biomass growth rates of each forest type are based on the following IPCC allometrics:
    a. It is assumed that the remaining forest will accumulate biomass until an average ABG of 348 t/ha is attained. This is estimated as the average AGB for naturally regenerated tropical forests in Insular Asia[103].
    b. For Dense and Medium Swamp Forest, 3.4 t ha^{-1} of biomass until an average biomass of 348 t/ha is attained.

c. For Sparse Swamp Forest, 13.0 t ha^{-1} of biomass for 20 years. After 20 years, 3.4 t ha^{-1} of biomass until an average biomass of 348 t/ha is attained.

d. Peat Dome Forest is assumed to be unlogged primary forest and no net forest increment.

The eligible area is determined from the area due to be deforested each year in the baseline. Project equation 28 is from equation 26 of VMD0015 M-REDD:

$$A_{Enh,PL,i,t} = D\%_{planned,i,t} * A_{planned,i,t} \quad (28)$$

Where:

$A_{Enh,PL,i,t}$	Project area in stratum *i* in which carbon stocks are accumulating but that would have undergone planned deforestation in the baseline scenario in year *t*; ha
$D\%_{planned,i,t}$	Projected annual proportion of land that will be deforested in stratum *i* in year *t*; %
$A_{planned,i}$	Total area of planned deforestation over the entire project lifetime for stratum *i*; ha
i	1, 2, 3, …*M* strata
t	1, 2, 3, … *t** years elapsed since the projected start of the project activity

The planned areas of deforestation for CIW+REDD activities are:

Eligible area for deforestation ($A_{plannedEnh,PL,i,t}$)					
Year	Area of LUC by land cover types (ha)				
	Peat Dome	Dense swamp forest	Medium swamp forest	Sparse swamp forest	Total area of planned deforestation
2016	0%	19%	23%	12%	19%
2017	0%	16%	17%	25%	18%
2018	0%	22%	20%	19%	20%
2019	2%	26%	21%	18%	21%
2020	98%	17%	17%	20%	18%
2021	0%	0%	1%	4%	2%
2022	0%	0%	2%	2%	2%
Total %	100%	100%	100%	100%	100%
Total Area ($A_{planned,i,t}$)	920.9	14,033.7	41,707.6	15,105.8	71,768.0

Table 137- Eligible area for deforestation for CIW+REDD activities

The source for these allometrics is the IPCC Good Practice Guidance for LULUCF 2003, table 3A.1.5 and 3A.1.2. Under this full restoration of ABG to primary forest levels will be attained within 58.1, 69.2, and 79.3 years respectively for the dense, medium, and sparse forest, respectively. Carbon stock in the baseline stratum is equal to the C stock of forest at project initiation year. Carbon stock enhancement will be monitored according to the VCS methodology VMD0015 module M-REDD and will be reported at each monitoring event.

4.2.3.4 Project Emissions from Greenhouse Gases

The calculation of project GHG emissions using project equation 29, derived from equation 30 of VMD0015 M-REDD:

$$GHG_{P,E,i,t} = E_{FC,i,t} + E_{BiomassBurn,i,t} + N_2O_{direct\text{-}N,i,t} \quad (29)$$

Where:

$GHG_{P,E,i,t}$	Greenhouse gas emissions as a result of deforestation activities within the project area in the project case in stratum *i* in year *t*; t CO_2-e
$E_{FC,i,t}$	Emission from fossil fuel combustion in stratum *i* within the project area in year *t*; t CO_2-e
$E_{BiomassBurn,i,t}$	Non-CO_2 emissions due to biomass burning in stratum *i* in year *t*; t CO_2-e
$N_2O_{direct\text{-}N,i,t}$	Direct N_2O emission as a result of nitrogen application on the alternative land use in stratum *i* within the project area in year *t*; t CO_2-e
i	1, 2, 3, …*M* strata
t	1, 2, 3, …*t** years elapsed since the start of the REDD VCS project activity

No GHG emissions are included in the project. Note:

- There is no expectation of deforestation or forest degradation.
- There is no expectation of planned or unplanned forest fires.
- Fossil fuel combustion is not included.
- The project does not include any land use that uses fertilizers.

4.2.4 Emissions calculations for RWE and CIW

4.2.4.1 Total Project Emissions from Peatlands

The Project has followed §5.1 of M-Peat to determine the net CO_2-equivalent emissions resulting from microbial peat decompositions and water bodies for each land parcel within the Project Area (taking into consideration the temporal and spatial variability). They were estimated using project equation 30 which was obtained from equation 1 of VMD0046 M-PEAT, as shown below:

$$GHG_{WPS-PEAT} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(A_{peatsoil-WPS,i,t} \times GHG_{peatsoil-WPS,i,t} + A_{ditch-WPS,i,t} \times GHG_{peatditch-WPS,i,t} + A_{peastburn-WPS,i,t} \times GHG_{peatburn-WPS,i,t} \right) \quad (30)$$

Where:

$GHG_{WPS-PEAT}$	Net GHG emissions in the WRC project scenario on peatland up to year t^* (t CO_2e)
$GHG_{peatsoil-WPS,i,t}$	GHG emissions from microbial decomposition of the peat soil within the project boundary in the project scenario in stratum i in year t (t CO_2e ha^{-1} yr^{-1})
$GHG_{peatditch-WPS,i,t}$	GHG emissions from water bodies within the project boundary in the project scenario in stratum i in year t (t CO_2e ha^{-1} yr^{-1})
$GHG_{peatburn-WPS,i,t}$	GHG emissions from burning of peat within the project boundary in the project scenario in stratum i in year t (t CO_2e ha^{-1} yr^{-1})
$A_{peatsoil-WPS,i,t}$	Area of peatland (not open water, not burnt) in stratum i in year t in the project scenario (ha)
$A_{ditch-WPS,i,t}$	Area of ditch and other open water in stratum i in year t in the project scenario (ha)
$A_{peatburn-WPS,i,t}$	Area of peat burnt in stratum i in year t in the project scenario (ha)
i	1, 2, 3 …M_{WPS} strata in the project scenario (unitless)
t	1, 2, 3, … t^* time elapsed since the project start (years)

Note under the project, it is assumed that no fires will occur. The area of peat burnt and the GHG emissions emitted from peat soil fires will be assumed to equal zero. Therefore, the only contributor to net GHG emissions from RWE / CIW will be GHG emissions from:

- Microbial decomposition of peat soil
- Water bodies

The net GHG emissions from WRC are calculated using this equation and reported separately for CIW-REDD and RWE-REDD.

4.2.4.2 Project Emissions from Peat Soil Degradation

The Project assessed GHG emissions from soil pursuant to §5.2 of M-Peat using Equation 2 of VMD0046 M-PEAT:

$GHG_{peatsoil\text{-}WPS,i,t} = GHG_{proxy\text{-}WPS,I,t}$

Where:

$GHG_{peatsoil\text{-}WPS,i,t}$	Greenhouse gas emissions from microbial decomposition of the peat soil within the project boundary in the project scenario in stratum *i* in year *t* (t CO_2e ha^{-1} yr^{-1})
$GHG_{proxy\text{-}WPS,i,t}$	GHG emissions as per the chosen proxy in the project scenario in stratum *i* in year *t* (t CO_2e ha^{-1} yr^{-1})
i	1, 2, 3 …M_{WPS} strata in the project scenario (unitless)
t	1, 2, 3, … *t** time elapsed since the project start (years)

Peat soil GHG emissions consist of CO_2 and CH_4, calculated employing equation 3 of VMD0046 M-PEAT as shown below:

$GHG_{proxy\text{-}WPS,i,t} = GHG_{proxy\text{-}CO2,i,t} + GHG_{proxy\text{-}CH4,i,t}$ (31)

Where:

$GHG_{proxy\text{-}WPS,i,t}$	GHG emissions as per the chosen proxy in the project scenario in stratum *i* in year *t* (t CO_2e $ha^{-1}yr^{-1}$)
$GHG_{proxy\text{-}CO2,i,t}$	Emission of CO_2 as per the chosen proxy in stratum *i* in year *t* (t CO_2e $ha^{-1}yr^{-1}$)
$GHG_{proxy\text{-}CH4,i,t}$	Emission of CH_4 as per the chosen proxy in stratum *i* in year *t* (t CO_2e $ha^{-1}yr^{-1}$)
i	1, 2, 3 …M_{WPS} strata[5] in the project scenario (unitless)
t	1, 2, 3, … *t** time elapsed since the project start (years)

Processes for quantifying carbon stock dynamics and peat losses are similar to those applied to the baseline scenario (see §3.4). The only differences include 1) stratification, 2) strata sequence, and 3) the absence of burning in the Project Scenario that has been assumed.

4.2.4.3 Subsidence in relation to Peat Microbial Decomposition

For consistency between remaining peat carbon stock and yearly net CO_2-e emissions, yearly loss rates for peat and carbon stock under the Project Scenario were calculated on an annual basis applying the following:

- the rate of emissions stemming from peat microbial decompositions (CO_2 and CH_4),
- bulk peat density above the water table, and
- a conservative carbon content value of 52.08 kg.kg-1 dry mass[104].

Project equation 32 below was used for these calculations, it was acquired from equation 13 of VMD0016 X-STR:

$$Rate_{peatloss,i,t} = \frac{\sum_{i-1}^{M}(GHG_{peatsoil,i,t}+GHG_{peatburn,i,t})}{A_{i,t}\times C_{vol\_lower,i,t}} \times 10 \times \frac{12}{44} \quad (32)$$

Where:

$Rate_{peatloss,i,t}$	Rate of peat loss due to subsidence and fire in stratum *i* in year *t* (m yr^{-1})
$GHG_{peatsoil,CO2,i,t}$	CO_2 emissions from the peat soil in stratum *i* in year *t* (t CO_2e yr^{-1})
$GHG_{peatburn,CO2,i,t}$	CO_2 emissions from burning of peat in stratum *i* in year *t* (t CO_2e yr^{-1})
$A_{i,t}$	Area of stratum *i* in year *t* in baseline or project scenario ($A_{WPS,i,t}$ or $A_{BSL,i,t}$) (ha)
$C_{vol\_lower,i,t}$	Volumetric carbon content of the peat below the water table in stratum *i* in year *t* (kg C m^{-3})
12/44	Factor to change from t CO_2e yr^{-1} to t C yr^{-1}
10	Conversion from kg m^{-2} to t ha^{-1}

A yearly assessment for the duration of the Project's total lifetime was conducted for remaining peat thickness, based on the peat loss rate resulting from peat microbial decomposition. Project equation 33 below was used for these calculations, it was acquired from equation 9 of VMD0016 X-STR:

$$Depth_{peat-WPS,i,t100} = Depth_{peat-WPS,1,t0} - \sum_{t=1}^{t=100} Rate_{peatloss-WPS,i,t} \quad (33)$$

Where:

$Depth_{peat-WPS,i,t100}$	Average peat depth in the project scenario in stratum *i* at *t* = 100 (m)
$Depth_{peat-WPS,i,t0}$	Average peat depth in the project scenario in stratum *i* at project start (m)
$Rate_{peatloss-WPS,i,t}$	Rate of peat loss due to subsidence and fire in the project scenario in stratum *i* in year *t*; alternatively, a conservative (high) value may be applied that remains constant over time (m yr^{-1})

Assurance was provided that there are no GHG emissions that have been accounted for in all parcels of stratum by tracking yearly peat carbon stock and thickness in the baseline scenario, once any available peat carbon stock has been depleted. On a conservative basis, it is assumed that peat is depleted when peat thickness available for decomposition has been reduced to 20cm.

The below tables provide detail on the Project emission factors and stratification related to WRC:

Description	IPCC default emission factor for CO_2	IPCC default emission factor for CH_4	IPCC default emission factor for N_2O	IPCC default emission factor for DOC
	($t.CO_2$-C ha^{-1} yr^{-1})	($kg.CH_4$ ha^{-1} yr^{-1})	($kg.N_2O$ ha^{-1} yr^{-1})	($t.CO_2$-E ha^{-1} yr^{-1})
Undrained deforested peatland	0	0	0	N/A
Drained deforested peatland	20	2.7	1.2	N/A
Undrained peatland forest	0	0	0	N/A
Drained peatland forest	20	2.7	5.3	N/A
Water bodies (rivers and canals) on peatland present at project start date	N/A	N/A	N/A	0.82

Table 138- Stratification employed for calculation of GHG emissions, the area (ha), and the CO_2 and CH_4 default factors used in each stratum for the specific land use

4.2.4.4 Project GHG emissions from ditches and other open water bodies in peatlands

The Project assesses GHG emissions from ditches and other open water bodies pursuant to §5.4 of PL-PEAT. The emissions in the baseline are derived on the basis of ditched area and area of open water combined with an emission factor as per project equation 34, obtained from equation 7 of VMD0042 BL-PEAT:

$$GHG_{peatditch\text{-}WPS,i,t} = GHG_{peatditch\text{-}CO2,i,t} + GHG_{peatditch\text{-}CH4,i,t} \quad (34)$$

Where:

$GHG_{peatditch\text{-}WPS,i,t}$	GHG emissions from ditch and other open water stratum *i* in year *t* in the project scenario (t CO_2e $ha^{-1}yr^{-1}$)
$GHG_{peatditch\text{-}CO2,i,t}$	Emission of CO_2 from ditch and open water stratum *i* in year *t* in the project scenario (t CO_2e $ha^{-1}yr^{-1}$)
$GHG_{peatditch\text{-}CH4,i,,t}$	Emission of CH_4 from ditch and open water stratum *i* in year *t* in the project scenario (t CO_2e $ha^{-1}yr^{-1}$)
i	1, 2, 3 …M_{WPS} strata[6] in the project scenario (unitless)
t	1, 2, 3, … *t** time elapsed since the project start (years)

The annual emissions of dissolved organic carbon (DOC) and CH_4 from ditches and other open water bodies are estimated using IPCC allometrics.

Land Use	GHG	Emission factor		
Surface area of canals	Degradation	CH_4	2,259	kg CH_4 ha^{-1} yr^{-1}
	Dissolved Organic Carbon	DOC	0.82	tonnes C ha^{-1} yr^{-1}
Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].				

Table 139- Emission factors of surface area of canals

DOC is then converted to CO2E by multiplication using the CO_2 to molecular C conversion factor of 3.667[105].

4.2.4.5 Emissions from Uncontrolled Peat Burning

Uncontrolled burning is assumed not to be present under the Project Scenario, since rewetting of peatland and best-practice fire management (such as fire control and prevention, zero burning policies, and others as determined by the relevant authorities) are implemented as Project Activities.

Since Project Start Date, APRIL has incorporated the project area within their comprehensive fire monitoring and fire-fighting program, they have implemented a comprehensive community-based program to mitigate fire risks from adjacent communities. Should uncontrolled burning occur during the Project lifetime, any area of fire scare and burn scar depth should be mapped within 3 months of the fire event. Historical hotspot tracking and direct observation data will determine the repetition of burning events in the Project Area, with maps generated of burning areas during the Project lifetime. Deductions from emissions reductions will be undertaken for equivalent and quantified GHG emissions from uncontrolled burning.

GHG emissions from peat burning will be calculated taking into account:

- dry mass loss on the basis of burn scar,
- burn depths,
- combustion factors,
- peat bulk density, and
- GHG potential of specific GHG species.

GHG emissions from the loss of biomass as a result of burning are quantified based on:

- type of land cover,
- combustion factors, and
- GHG potential of specific GHG species.

Scar depths for repeated burnings in the first, second and third (plus) instances of burning will be assumed as 18, 11, and 4cm in depth.

Procedures for the quantifying of peat burning GHG emissions are undertaken in line with the VCS methodology VM0007 and Module VMD0013 E-BPB.

4.2.4.6 Emissions reductions from peat combustion, using fire reduction premium

Uncontrolled burning is assumed not to be present under the Project Scenario (or the Baseline Scenario for that matter), since rewetting of peatland and best-practice fire management (such as fire control and prevention, zero burning policies, and others as determined by the relevant

authorities) are implemented as Project Activities. The emissions from this source from peat combustion are assumed to be zero.

4.2.5 Future approaches for calculating project emissions

A) Current projections for project emissions

At the commencement of the Project, GHG emission factors provided in Table 140 were used as a conservative and scientifically robust approach (IPCC default emission factors), where adequate site-specific and long-term measurements of emissions related to peat were not yet available for estimating overall emissions. Procedures used are in accordance with the VCS methodology VM0007 modules BL-PEAT and M-PEAT. Similar procedures are followed for GHG emissions estimations for rewetted (WRE) or undrained or partially drained peat (CIW). GHG emissions projections for microbial decompositions of peat are shown in Table 140 below.

Year	GHG Emissions Estimates			Legacy canal drained area (ha)
	CO_2-e (t CO_2-e)	CO_2-C (t CO_2-e)	CH_4 (t CO_2-e)	
2016	270,853	270,574	279	8,015
2017	543,918	543,358	560	7,409
2018	346,354	345,997	357	4,718
2019	141,658	141,512	146	1,930
2020	59,428	59,367	61	809
2021	37,575	37,537	39	512
2022	37,575	37,537	39	512
2023	37,575	37,537	39	512
2024	0	0	0	0
2052 - 2072	0	0	0	0

Table 140- GHG emissions from microbial decompositions of peat in the project scenario in t.CO_2-e y^{-1}.

B) Future approaches for calculating project emissions

For determining GHG and carbon fluxes resulting from microbial decomposition of peat under the Project Scenario, different approaches will be used in the future. Within the Project lifetime, site-specific measurement approaches (IPCC TIER 2 and TIER 3) will be conducted, and data collected to minimise uncertainties in estimated emissions in relation to water table temporal and spatial variations. This will enable the gathering of site-specific data sets for quantifying Project emissions for all non-forest strata and strata with the most dynamic water table. For stratum that remains unaffected by deforestation and drainage, the IPCC factors approach will be applied throughout the Project lifetime since water table depths are less dynamic unless substantial changes in emission characteristics are observed.

In the future, estimates of Project emissions will be calculated using two TIER 3 methods. As these methods are complementary, they can be used effectively for minimising uncertainty and allow cross-checking.

- Method 1: Monitoring soil subsidence - over the long-term, soil subsidence provides a reliable proxy for estimation of peat soil carbon losses.

- Method 2: Measuring direct CO_2 emissions (CH_4 to follow) - data will be used to establish empirical models specific to site and strata by combining proxies such as soil temperature, soil moisture, and water table depth.

Water table depths and soil subsidence have been monitored in the Project Area since 2016 and will continue through the Project lifetime over the next 60 years.

4.2.6 Project Emissions – RWE

4.2.6.1 Project emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

The legacy canal blocking program and the resultant change in canal length, surface area, and drained area under RWE activity are shown in the table below:

Year	Length of Legacy Canals (km)	Surface Area of Legacy Canals (ha)	Area Drained by Legacy Canals (ha)
2014	37.6	7.5	2,478.6
2015	37.6	7.5	2,470.6
2016	36.5	7.3	2,202.7
2017	32.2	6.4	2,188.0
2018	31.4	6.3	1,313.9
2019	18.5	3.7	590.4
2020	7.0	1.4	312.6
2021	3.9	0.8	93.3
2022	1.3	0.3	93.3
2023	0.0	0.0	93.3
2024	0.0	0.0	0.0
2025 – 2072	0.0	0.0	0.0

Table 141- Areas of drained land and surface areas of drains in the baseline

The RWE activity encompasses landscapes that have been drained by legacy canals and which will be rewetted by a program of canal blocking. There is no planned deforestation under this activity because the areas are either in non-forest or are forested without any planned deforestation.

Under the project, the canals will be blocked over an eight-year period resulting in complete rewetting of the peat soils in the project area. The starting area of drained peatland in the RWE activity is 2,478.6 hectares in 2016 and all canals are blocked by 2024.

Year	Drained area estimates ($A_{peatsoil-WPS,i,t}$)
	Area drained by legacy canals
2006	2,478.6
2007	2,470.6
2008	2,202.7
2009	2,188.0
2010	1,313.9
2011	590.4

2012	312.6
2013	93.3
2014	93.3
2015	93.3
2016	0.0

Table 142- Drained area estimates of legacy canals

The surface area of the canals in RWE activity is as follows:

Year	Surface area of drained canals (ha) ($A_{ditch-BSL,i,t}$)
2014	7.5
2015	7.5
2016	7.3
2017	6.4
2018	6.3
2019	3.7
2020	1.4
2021	0.8
2022	0.3
2023	0.0
2024	0.0
2052 - 2072	0.0

Table 143- Canal surface area statistics

Project GHG emissions from Peat Soils ($GH_{peatsoil-WPS,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatsoil-WPS,i,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	181,966	181,779	187
2007	181,966	181,779	187
2008	181,966	181,779	187
2009	181,966	181,779	187
2010	181,966	181,779	187
2011	181,966	181,779	187
2012	181,966	181,779	187
2013	181,966	181,779	187
2014	181,966	181,779	187
2015	181,378	181,191	187
2016	161,710	161,544	167
2017	160,633	160,468	165
2018	96,457	96,358	99
2019	43,342	43,297	45
2020	22,948	22,924	24
2021	6,850	6,843	7
2022	6,850	6,843	7
2023	6,850	6,843	7
2024	0	0	0
2025 - 2072	0	0	0

Table 144- Project GHG emissions from Peat Soils

Project GHG emissions from ditches and other open water bodies in peatlands

Project GHG emissions from ditches and other open water bodies in peatlands ($GHG_{peatditch-WPS,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	498	23	475
2007	498	23	475
2008	498	23	475
2009	498	23	475
2010	498	23	475
2011	498	23	475
2012	498	23	475
2013	498	23	475
2014	498	23	475
2015	498	23	475
2016	484	22	462
2017	427	19	408
2018	416	19	397
2019	245	11	234
2020	93	4	89
2021	51	2	49
2022	17	1	17
2023	0	0	0
2024	0	0	0
2025 - 2072	0	0	0

Table 145- Project GHG emissions from ditches and other open water bodies in peatlands

Project Emissions from Peat Burning

Emissions from peat burning are excluded from the project.

4.2.7 Project Emissions - RWE+REDD

Project Emissions from REDD

Area of land deforested in baseline

The planned areas of deforestation for RWE+REDD activities are:

Eligible area for deforestation ($A_{plannedEnh,PL,i,t}$)					
Year	Area of LUC by land cover types (ha)				
	Peat Dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	Total area of planned deforestation
2016	0%	5%	23%	16%	17%
2017	0%	21%	26%	15%	20%
2018	0%	15%	26%	24%	23%
2019	0%	52%	13%	1%	14%
2020	100%	7%	12%	41%	24%
2021	0%	0%	0%	3%	2%
Total %	100%	100%	100%	100%	100%
Total Area ($A_{planned,i,t}$)	1.8	1,102.2	2,664.7	2,859.1	6,627.8

Table 146- Eligible area for deforestation in the baseline

This is the extent of the "avoiding deforestation" area.

Growth of Avoided Deforestation Areas

The carbon stock changes in above ground biomass are calculated according to the methods described in §4.2.3.2 and summarized in the table below.

Growth of Avoided Deforestation Areas							
Year	Areas of avoided deforestation (ha)				Growth of avoided deforested forests		
	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest	AGB (t)	BGB (t)	CO_2E (t)
2016	0.0	49.7	626.2	446.5	3,816	1,112	8,495
2017	0.0	279.2	1,308.2	880.5	8,391	2,438	18,663
2018	0.0	449.6	1,992.4	1,560.0	13,607	3,964	30,284
2019	0.0	1,024.2	2,332.5	1,599.7	16,852	4,883	37,460
2020	1.8	1,102.2	2,651.8	2,760.9	22,151	6,473	49,332
2021	1.8	1,102.2	2,664.7	2,859.1	22,529	6,587	50,180
2022	1.8	1,102.2	2,664.7	2,859.1	22,529	6,587	50,180
2023	1.8	1,102.2	2,664.7	2,859.1	22,529	6,587	50,180
2024	1.8	1,102.2	2,664.7	2,859.1	22,529	6,587	50,180
2025 - 2072	1.8	1,102.2	2,664.7	2,859.1	22,529	6,587	50,180

Table 147- Ex-ante net carbon stock changes as a result of forest carbon stock enhancement in the Project Area

4.2.7.1 Project emissions reductions from RWE+REDD

Areas of drained land and surface areas of drains

The legacy canal blocking program and the resultant change in canal length, surface area, and drained area under RWE+REDD activity are shown in the table below:

Year	Length of Legacy Canals (km)	Surface Area of Legacy Canals (ha)	Area Drained by Legacy Canals (ha)
2014	108.4	21.7	6,627.8
2015	106.7	21.3	6,532.0
2016	105.9	21.2	5,812.3
2017	94.4	18.9	5,220.7
2018	84.8	17.0	3,403.9
2019	54.6	10.9	1,339.2
2020	20.6	4.1	496.9
2021	7.2	1.4	418.5
2022	6.4	1.3	418.5
2023	6.4	1.3	418.5
2024	0.0	0.0	0.0
2052 - 2072	0.0	0.0	0.0

Table 148- Areas of drained land and surface areas of drains

The RWE+REDD activity encompasses landscapes that have been drained by legacy canals and which will be rewetted by a program of canal blocking.

Under the project, the canals will be blocked over an eight-year period resulting in complete rewetting of the peat soils in the project area. The starting area of drained peatland in the RWE activity is 6,627.8 hectares in 2016 and all canals are blocked by 2024.

Year	Drained area estimates ($A_{peatsoil-WPS,i,t}$)
	Area drained by legacy canals
2006	6,627.8
2007	6,532.0
2008	5,812.3
2009	5,220.7
2010	3,403.9
2011	1,339.2
2012	496.9
2013	418.5
2014	418.5
2015	418.5
2016	0.0

Table 149- Drained area estimates of legacy canals

The surface area of the canals in RWE+REDD activity is as follows:

Year	Surface area of drained canals (ha) ($A_{ditch-BSL,i,t}$)
2014	21.7
2015	21.3
2016	21.2
2017	18.9
2018	17.0
2019	10.9
2020	4.1
2021	1.4
2022	1.3
2023	1.3
2024	0.0
2025 - 2072	0.0

Table 150- Canal surface area statistics

C. **Project Emissions from Peat Soil**

Project GHG emissions from peat soils ($GH_{peatsoil-WPS,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatsoil-WPS,i,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	486,587	486,086	501
2007	486,587	486,086	501
2008	486,587	486,086	501
2009	486,587	486,086	501
2010	486,587	486,086	501
2011	486,587	486,086	501
2012	486,587	486,086	501
2013	486,587	486,086	501
2014	486,587	486,086	501
2015	479,552	479,058	494

2016	426,717	426,277	439
2017	383,284	382,890	395
2018	249,896	249,639	257
2019	98,316	98,215	101
2020	36,480	36,443	38
2021	30,726	30,694	32
2022	30,726	30,694	32
2023	30,726	30,694	32
2024	0	0	0
2025 - 2072	0	0	0

Table 151- Project GHG emissions from peat soils

D. **Project GHG emissions from ditches and other open water bodies in peatlands**

Project GHG emissions from ditches and other open water bodies in peatlands ($GHG_{peatditch-WPS,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	1,437	65	1,372
2007	1,437	65	1,372
2008	1,437	65	1,372
2009	1,437	65	1,372
2010	1,437	65	1,372
2011	1,437	65	1,372
2012	1,437	65	1,372
2013	1,437	65	1,372
2014	1,437	65	1,372
2015	1,437	65	1,372
2016	1,591	72	1,518
2017	1,532	70	1,462
2018	1,450	66	1,384
2019	1,248	57	1,191
2020	1,255	57	1,198
2021	932	42	889
2022	908	41	866
2023	908	41	866
2024	908	41	866
2025 - 2072	908	41	866

Table 152- Project GHG emissions from ditches and other open water bodies in peatlands

E. **Project Emissions from Peat Burning**

Emissions from peat burning are excluded from the baseline assessment.

4.2.8 Project Emissions – CIW

4.2.8.1 Project emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

There are no legacy canals in CIW project activity area and all the landscape is fully wetted.

Project Emissions from Peat Soil

Because the landscape is fully wetted, there are no peat soil emissions in the CIW project activity area.

Project GHG emissions from ditches and other open water bodies in peatlands

Because there are no legacy canals in CIW project activity area, there are GHG emissions from ditches in the CIW project activity area.

Project Emissions from Peat Burning

Emissions from peat burning are excluded from the project.

4.2.9 Project Emissions - CIW+REDD

4.2.9.1 Project emissions reductions from REDD

Area of land deforested in baseline

The planned areas of deforestation for CIW+REDD activities are:

Eligible area for deforestation ($A_{plannedEnh,PL,i,t}$)					
Year	Area of LUC by land cover types (ha)				
	Peat Dome	Dense swamp forest	Medium swamp forest	Sparse swamp forest	Total area of planned deforestation
2016	0%	19%	23%	12%	19%
2017	0%	16%	17%	25%	18%
2018	0%	22%	20%	19%	20%
2019	2%	26%	21%	18%	21%
2020	98%	17%	17%	20%	18%
2021	0%	0%	1%	4%	2%
2022	0%	0%	2%	2%	2%
Total %	100%	100%	100%	100%	100%
Total Area ($A_{planned,i,t}$)	920.9	14,033.7	41,707.6	15,105.8	71,768.0

Table 153- Eligible area for deforestation for CIW+REDD activities

Growth of Avoided Deforestation Areas

The carbon stock changes in above ground biomass are calculated according to the methods described in §4.2.3.2 and summarized in the table below.

Growth of Avoided Deforestation Areas							
Year	Areas of avoided deforestation (ha)				Growth of avoided deforested forests		
	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest	AGB (t)	BGB (t)	CO_2E (t)
2016	2,632.2	9,468.4	1,846.3	13,946.9	47,420	13,534	105,052
2017	4,833.7	16,377.2	5,623.9	26,834.8	91,238	26,202	202,407

2018	7,904.5	24,751.9	8,470.0	41,126.4	139,830	40,145	310,185
2019	11,603.5	33,459.4	11,192.8	56,274.4	191,269	54,902	424,274
2020	13,954.8	40,413.2	14,157.9	69,446.8	232,988	67,851	518,493
2021	13,963.7	40,880.8	14,793.2	70,558.7	236,769	68,968	526,934
2022	14,033.7	41,707.6	15,105.8	71,768.0	240,880	70,153	536,064
2023	14,033.7	41,707.6	15,105.8	71,768.0	240,880	70,153	536,064
2024	14,033.7	41,707.6	15,105.8	71,768.0	240,880	70,153	536,064
2025 - 2072	14,033.7	41,707.6	15,105.8	71,768.0	240,880	70,153	536,064

Table 154- Ex-ante net carbon stock changes as a result of forest carbon stock enhancement in the Project Area

4.2.9.2 Project emissions from peat soils

Areas of drained land and surface areas of drains in the baseline

There are no legacy canals in CIW+REDD project activity area and all the landscape is fully wetted.

Project Emissions from Peat Soil

Because the landscape is fully wetted, there are no peat soil emissions in the CIW+REDD project activity area.

Project GHG emissions from ditches and other open water bodies in peatlands

Because there are no legacy canals in CIW+REDD project activity area, there are GHG emissions from ditches in the CIW+REDD project activity area.

Project Emissions from Peat Burning

Emissions from peat burning are excluded from the project.

4.2.10 Project Emissions – All Activities

4.2.10.1 Project Emissions from REDD

Area of land deforested in baseline

The planned areas of deforestation for the project area are:

Eligible area for deforestation ($A_{plannedEnh,PL,i,t}$)					
Year	Area of LUC by land cover types (ha)				
	Peat Dome forest	Dense swamp forest	Medium swamp forest	Sparse swamp forest	Total area of planned deforestation
2016	0%	18%	23%	13%	19%
2017	0%	16%	17%	23%	18%
2018	0%	21%	20%	20%	20%
2019	2%	28%	20%	15%	21%
2020	98%	16%	16%	23%	19%
2021	0%	0%	1%	4%	2%
2022	0%	0%	2%	2%	2%
Total %	100%	100%	100%	100%	100%
Total Area ($A_{planned,i,t}$)	922.6	15,135.95	44,372.35	17,964.95	78,395.89

Table 155- Eligible area for deforestation for REDD activities

This is the extent of the "avoiding deforestation" area.

Growth of Avoided Deforestation Areas

The carbon stock changes in above ground biomass are calculated according to the methods described in §4.2.3.2 and summarized in the table below.

Growth of Avoided Deforestation Areas							
Year	Areas of avoided deforestation (ha)				Growth of avoided deforested forests		
	Peat Dome Forest	Dense Swamp Forest	Medium Swamp Forest	Sparse Swamp Forest	AGB (t)	BGB (t)	CO_2E (t)
2016	0	2,682	10,095	2,293	88,304	25,243	113,547
2017	0	5,113	17,685	6,504	171,709	49,361	221,071
2018	0	8,354	26,744	10,030	264,447	76,022	340,469
2019	19	12,628	35,792	12,793	358,694	103,040	461,734
2020	923	15,057	43,065	16,919	439,729	128,095	567,825
2021	923	15,066	43,546	17,652	446,896	130,218	577,114
2022	923	15,136	44,372	17,965	453,983	132,261	586,244
2023	923	15,136	44,372	17,965	453,983	132,261	586,244
2024	923	15,136	44,372	17,965	453,983	132,261	586,244
2025 - 2072	923	15,136	44,372	17,965	453,983	132,261	586,244

Table 156- Ex-ante net carbon stock changes as a result of forest carbon stock enhancement in the Project Area

4.2.10.2 Project emissions reductions from RWE

Areas of drained land and surface areas of drains

Under the project, the canals will be blocked over an eight-year period resulting in complete rewetting of the peat soils in the project area. The starting area of drained peatland in the project area is 9,106.4 hectares in 2016 and all canals are blocked by 2024.

Year	Area drained ($A_{peatsoil-WPS,i,t}$)		
	Legacy canals		
	Total	RWE	RWE+REDD
2006	9,106.4	2,478.6	6,627.8
2007	9,106.4	2,478.6	6,627.8
2008	9,106.4	2,478.6	6,627.8
2009	9,106.4	2,478.6	6,627.8
2010	9,106.4	2,478.6	6,627.8
2011	9,106.4	2,478.6	6,627.8
2012	9,106.4	2,478.6	6,627.8
2013	9,106.4	2,478.6	6,627.8
2014	9,106.4	2,478.6	6,627.8
2015	9,002.6	2,470.6	6,532.0
2016	8,015.0	2,202.7	5,812.3
2017	7,408.7	2,188.0	5,220.7
2018	4,717.7	1,313.9	3,403.9
2019	1,929.5	590.4	1,339.2
2020	809.5	312.6	496.9
2021	511.8	93.3	418.5
2022	511.8	93.3	418.5
2023	511.8	93.3	418.5

2024	0.0	0.0	0.0
2025 - 2072	0.0	0.0	0.0

Table 157- Area drained by legacy canals

The surface area of the canals in RWE+REDD activity is as follows:

Year	Surface area of drainage canals		
	Legacy canals		
	Total	RWE	RWE+REDD
2006	29.2	7.5	21.7
2007	29.2	7.5	21.7
2008	29.2	7.5	21.7
2009	29.2	7.5	21.7
2010	29.2	7.5	21.7
2011	29.2	7.5	21.7
2012	29.2	7.5	21.7
2013	29.2	7.5	21.7
2014	29.2	7.5	21.7
2015	28.9	7.5	21.3
2016	28.5	7.3	21.2
2017	25.3	6.4	18.9
2018	23.2	6.3	17.0
2019	14.6	3.7	10.9
2020	5.5	1.4	4.1
2021	2.2	0.8	1.4
2022	1.5	0.3	1.3
2023	1.3	0.0	1.3
2024	0.0	0.0	0.0
2025 - 2072	0.0	0.0	0.0

Table 158- Canal surface area statistics

Project Emissions from Peat Soil

Project GHG emissions from peat soils ($GH_{peatsoil-WPS,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatsoil-WPS,i,t}$)	CO_2-C (t CO_2-E) ($GHG_{proxy-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{proxy-CH4,i,t}$)
2006	668,553	667,865	688
2007	668,553	667,865	688
2008	668,553	667,865	688
2009	668,553	667,865	688
2010	668,553	667,865	688
2011	668,553	667,865	688
2012	668,553	667,865	688
2013	668,553	667,865	688
2014	668,553	667,865	688
2015	660,930	660,249	681
2016	588,427	587,821	606
2017	543,918	543,358	560
2018	346,354	345,997	357
2019	141,658	141,512	146
2020	59,428	59,367	61
2021	37,575	37,537	39
2022	37,575	37,537	39

2023	37,575	37,537	39
2024	0	0	0
2025 - 2072	0	0	0

Table 159- Project GHG emissions from peat soils

Project GHG emissions from ditches and other open water bodies in peatlands

Project GHG emissions from ditches and other open water bodies in peatlands ($GH_{peatditch-WPS,i,t}$)			
Year	Total GHG (t CO_2-E) ($GHG_{peatditch-BSLi,t}$)	DOC (t CO_2-E) ($GHG_{peatditch-CO2,i,t}$)	CH_4 (t CO_2-E) ($GHG_{peatditch-CH4,i,t}$)
2006	1,935	88	1,847
2007	1,935	88	1,847
2008	1,935	88	1,847
2009	1,935	88	1,847
2010	1,935	88	1,847
2011	1,935	88	1,847
2012	1,935	88	1,847
2013	1,935	88	1,847
2014	1,935	88	1,847
2015	1,912	87	1,825
2016	1,887	86	1,801
2017	1,678	76	1,602
2018	1,539	70	1,469
2019	968	44	924
2020	366	17	350
2021	147	7	140
2022	102	5	98
2023	85	4	81
2024	0	0	0
2025 - 2072	908	41	866

Table 160- Project GHG emissions from ditches and other open water bodies in peatlands

Project Emissions from Peat Burning

Emissions from peat burning are excluded from the baseline assessment; as a result, the total Project Emissions from peat burning are “0.”

4.3 Leakage

4.3.1 Applicability of Leakage Modules

According to VM0007, leakage shall be considered for all project activities using the following leakage modules, including:

- Planned deforestation / degradation: module LK-ASP
- Unplanned deforestation / degradation: module LK-ASU
- Fuelwood/charcoal collection: module LK-DFW
- Pre-project agricultural activities: module LK-ARR
- Ecological leakage: module LK-ECO

Module LK-ASU is not relevant because there is no avoided unplanned deforestation in the project. Module LK-ME is not relevant because the project does not consider the impacts of reduction of wood supply on local markets. Modules BL-DFW and LK-DFW are not relevant because there was no pre-project history of unsustainable fuelwood collection.

The baseline activity is defined as (i) planned deforestation and (2) peatland drainage from conversion to *Acacia* fibre plantations. The Project is therefore categorized as Avoiding Planned Deforestation (APD) in combination with Conservation of Undrained and Partially drained Peatland (CUPP) and Rewetting of Drained Peatland (RDP) activities.

Potential sources of leakage emissions include:

- The displacement of planned and unplanned deforestation activities;
- The displacement of pre-project agricultural activities on non-forest land, and;
- The displacement of fuelwood collection activities, and;
- Ecological leakage due to possible alterations of mean annual water table depth in adjacent areas.

The applicability of the above-referenced leakage modules to the project activities is described in Table 161 below:

Module	Applicability
Estimation of emissions from activity shifting for avoiding planned deforestation/ degradation (LK-ASP)	Applicable. The Project may cause activity shifting of avoided planned deforestation.
Estimation of emissions from activity shifting for avoiding unplanned deforestation/ degradation: module LK-ASU	Not Applicable. The Project is not categorized as avoiding planned deforestation.
Estimation of emissions from the displacement of fuelwood extraction (LK-DFW)	Not Applicable. The Project is not categorized as avoiding fuelwood extraction.
Estimation of emissions from the displacement of pre-project agricultural activities (LK-ARR)	Not Applicable. The Project is not categorized as avoiding afforestation, revegetation, and revegetation and is not categorized as pre-project agricultural activities.

Estimation of emissions from ecological leakage (LK-ECO)	Applicable. The Project is categorized as WRC and may cause ecological leakage.

Table 161- Applicability of leakage modules

4.3.2 Where the Specific Deforestation Agent has been Identified

RER Estimation of Leakage Emissions from Activity Shifting for Avoiding Planned Deforestation and Planned Degradation (LK-ASP)

As discussed previously, the most likely class of deforestation agent in the baseline has been identified as specific industrial *Acacia* plantation operators.

Module LK-ASP is the applicable methodology for estimating the leakage emissions due to activity shifting from forest lands that are legally authorized and documented to be converted to non-forest land, including activity shifting to forested peatland that is drained as a consequence of project implementation. Under these situations, displacement of baseline activities can be controlled and measured directly by monitoring the baseline deforestation agents or class of agents. This tool must be used for projects in areas where planned deforestation happens on forested peatlands, regardless of the absence of peatland within the project boundaries.

Step 1 – Determination of the Baseline Rate of Forest Clearance by the Deforestation Agent

Option 1.1: Historical Deforestation Trend

§ 5.1.1 of Module LK-ASP provides three options for estimating the baseline rate of forest clearance by the deforestation agent. We select Option 1.1 – Historical Deforestation Trend for this analysis.

Annual baseline deforestation is estimated by extrapolation the historical annual trend using linear regression as per project equation 35, obtained from equation 2 of VMD0009 LK-ASP:

$$WoPR_{i,t} = a + b \times t \quad (35)$$

Where:

$WoPR_{i,t}$	Deforestation by the baseline agent of the planned deforestation in the absence of the project in stratum i in year t^3 (ha)
a	Estimated intercept of the regression line (ha)
b	Slope of the linear regression (ha yr^{-1})
t	1, 2, 3, … t^* time elapsed since the projected start of the project activity (years)

Data for this analysis was obtained from Kementerian Lingkungan Hidup dan Kehutanan (KLHK - Ministry of Environment and Forestry of The Republic of Indonesia) describing forest plantation concessions issued between 1995 and 2019.

Year SK	HTI concessions licensed	Cumulative number of HTI licensed	Licensed Area (ha)	Cumulative licensed area (ha)

1995	2	2	18,845	18,845
1996	13	15	1,288,475	1,307,320
1997	21	36	459,980	1,767,300
1998	18	54	547,946	2,315,246
1999	2	56	52,830	2,368,076
2000	2	58	104,812	2,472,888
2001	4	62	85,729	2,558,618
2002	3	65	33,605	2,592,223
2003	9	74	124,734	2,716,957
2004	5	79	267,631	2,984,588
2005	3	82	44,659	3,029,247
2006	13	95	236,474	3,265,721
2007	25	120	693,320	3,959,040
2008	3	123	73,238	4,032,278
2009	38	161	1,449,173	5,481,451
2010	11	172	414,084	5,895,535
2011	17	189	585,938	6,481,473
2012	12	201	269,259	6,750,732
2013	14	215	963,231	7,713,964
2014	24	239	910,951	8,624,914
2015	5	244	203,057	8,827,972
2016	11	255	212,793	9,040,765
2017	12	267	527,017	9,567,782
2018	19	286	1,287,618	10,855,401
2019	12	298	432,975	11,288,375

Table 162- Official data on historic HTI concession licenses granted

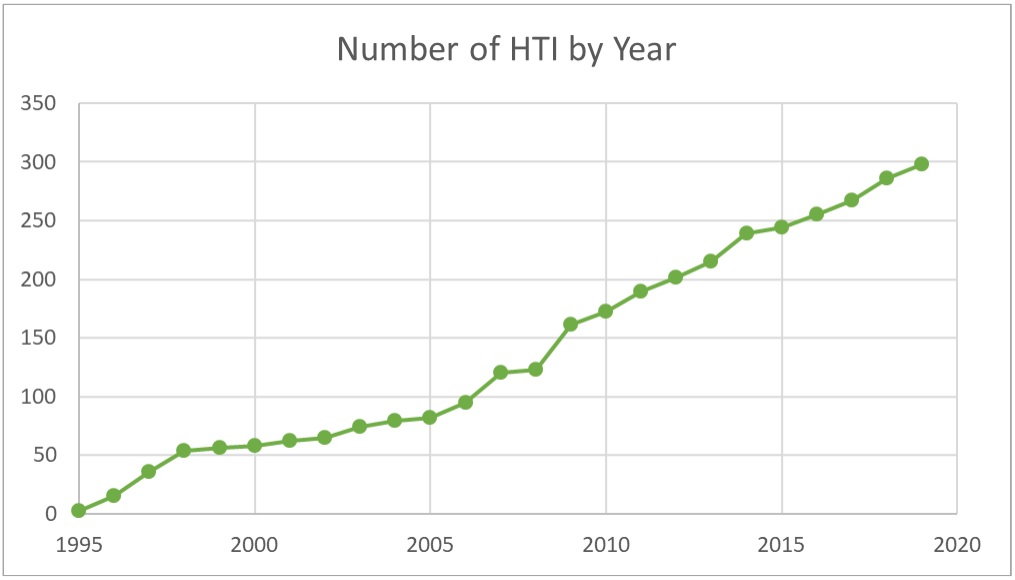


Figure 26- Number of HTI 1995-2020

A regression analysis was conducted to estimate the historical trend in the cumulative area licensed for conversion to HTI plantations between 2005 and 2015 (Figure 26). The following project equation 36 was generated from the regression line of Figure 26.

$$Area\ of\ HTI = -123099541 + 619382.6919 * Year \quad (36)$$

Where:

Area of HTI = Total license area of HTI plantation concessions

YEAR = The year of HTI issuance.

The ANOVA indicates that the regression model and the regression parameter estimates were significant at a 95% confidence level.

Multiple R	0.992
R Square	0.984
Adjusted R Square	0.982
Standard Error	278,573
Observations	11

Table 163- Historical Trends Regression statistics

ANOVA						
Source	SS	df	MS	F	Significant Diff	R^2
Model	4.22E+13	1	4.22E+13	543.8	Yes	98.4%
Error	6.98E+11	9	7.76E+10			
Total	4.29E+13	10				

Table 164- Historical Trends Regression ANOVA

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1239099541	53387430	-23.2096	2.43E-09	-1.4E+09	-1.1E+09	-1.4E+09	-1.1E+09
X Variable 1	619382.6919	26560.88	23.31936	2.33E-09	559297.8	679467.6	559297.8	679467.6

Table 165- Historical Trends Regression Parameter Estimates

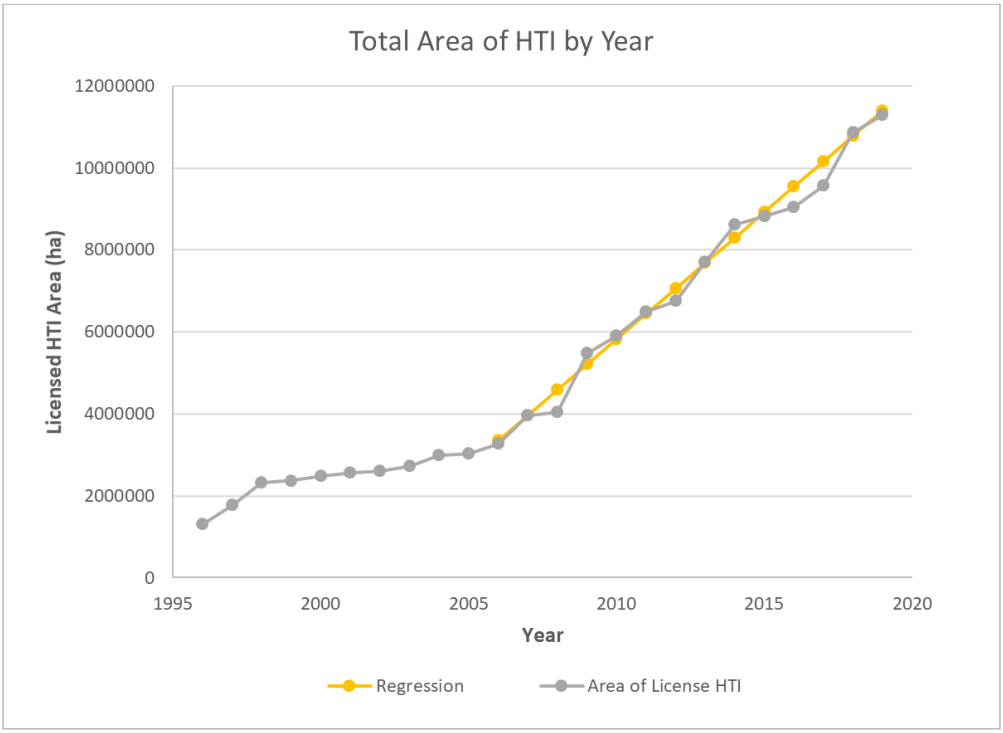


Figure 27- Results of the regression analysis to test the significance of the historical trend in the cumulative area licensed for conversion to HTI plantations between 2005 and 2015.

The regression analysis has been used to estimate the annual area licensed in Table 166. The total projected area of HTI as of 2072 is projected to be 44,225,575 hectares. Applicable laws and common practices suggest that 10% of the total licensed concession area would be reserved for conservation while the remaining 90% would be converted. Then by applying the 7.97% baseline deforestation rate as mandated by the LK-ASP, we produce the following deforestation estimates in Table 166 below. We note that from 2031, the area of plantation development is limited to the area remaining after 10% of the area is conserved. We have used KLHK land cover charts to estimate the total plantation area as 1.6 million hectares as of 2015. The future areas are calculated by summing the previous year's planting to the current year's plantation conversion area. In 2072, the estimated plantation area is calculated as 39,245,573 hectares.

Year	Estimated HTI area	Increase in HTI area	Area Plantation	Area deforestation and conversion to plantation (WOPR, t)
	(ha)			
2016	9,540,144	619,383	1,621,027	684,315
2017	10,159,527	619,383	2,305,342	728,743
2018	10,778,910	619,383	3,034,085	773,171
2019	11,398,292	619,383	3,807,256	817,600
2020	12,017,675	619,383	4,624,855	862,028
2021	12,637,058	619,383	5,486,883	906,456
2022	13,256,440	619,383	6,393,339	950,884
2023	13,875,823	619,383	7,344,224	995,313
2024	14,495,206	619,383	8,339,537	1,039,741
2025	15,114,588	619,383	9,379,278	1,084,169
2026	15,733,971	619,383	10,463,447	1,128,598
2027	16,353,354	619,383	11,592,045	1,173,026
2028	16,972,737	619,383	12,765,071	1,217,454
2029	17,592,119	619,383	13,982,525	1,261,883
2030	18,211,502	619,383	15,244,408	1,145,944
2031	18,830,885	619,383	16,390,352	557,444
2032	19,450,267	619,383	16,947,796	557,444
2033	20,069,650	619,383	17,505,241	557,444
2034	20,689,033	619,383	18,062,685	557,444
2035	21,308,415	619,383	18,620,129	557,444
2036	21,927,798	619,383	19,177,574	557,444
2037	22,547,181	619,383	19,735,018	557,444
2038	23,166,563	619,383	20,292,463	557,444
2039	23,785,946	619,383	20,849,907	557,444
2040	24,405,329	619,383	21,407,352	557,444
2041	25,024,712	619,383	21,964,796	557,444
2042	25,644,094	619,383	22,522,240	557,444
2043	26,263,477	619,383	23,079,685	557,444
2044	26,882,860	619,383	23,637,129	557,444
2045	27,502,242	619,383	24,194,574	557,444
2046	28,121,625	619,383	24,752,018	557,444
2047	28,741,008	619,383	25,309,462	557,444
2048	29,360,390	619,383	25,866,907	557,444
2049	29,979,773	619,383	26,424,351	557,444
2050	30,599,156	619,383	26,981,796	557,444

2051	31,218,538	619,383	27,539,240	557,444
2052	31,837,921	619,383	28,096,685	557,444
2053	32,457,304	619,383	28,654,129	557,444
2054	33,076,687	619,383	29,211,573	557,444
2055	33,696,069	619,383	29,769,018	557,444
2056	34,315,452	619,383	30,326,462	557,444
2057	34,934,835	619,383	30,883,907	557,444
2058	35,554,217	619,383	31,441,351	557,444
2059	36,173,600	619,383	31,998,796	557,444
2060	36,792,983	619,383	32,556,240	557,444
2061	37,412,365	619,383	33,113,684	557,444
2062	38,031,748	619,383	33,671,129	557,444
2063	38,651,131	619,383	34,228,573	557,444
2064	39,270,513	619,383	34,786,018	557,444
2065	39,889,896	619,383	35,343,462	557,444
2066	40,509,279	619,383	35,900,907	557,444
2067	41,128,662	619,383	36,458,351	557,444
2068	41,748,044	619,383	37,015,795	557,444
2069	42,367,427	619,383	37,573,240	557,444
2070	42,986,810	619,383	38,130,684	557,444
2071	43,606,192	619,383	38,688,129	557,444
2072	44,225,575	619,383	39,245,573	557,444

Table 166- Deforestation Estimates

Step 2 – Estimate New Projection of Forest Clearance by the Baseline Agent of Deforestation with Project Implementation if No Leakage is Occurring

The new area of annual deforestation by the baseline class of deforestation agents was calculated by subtracting the annual area of clearance by the class of agents in the absence of the Project by the total annual area of planned baseline deforestation as per project equation 37, derived from equation 5 of VMD0009 LK-ASP:

$$NewR_{i,t} = WoPR_{i,t} - \left(D\%_{planned,i,t} \times A_{planned,i}\right) \quad (37)$$

Where:

$NewR_{i,t}$	New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)
$WoPR_{i,t}$	Deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t* in the absence of the project (ha)
$D\%_{planned,i,t}$	Projected annual proportion of land that will be deforested in project stratum *i* in year *t* (percent)
$A_{planned,i,}$	Total area of planned deforestation over the baseline period for project stratum *i* (ha)
i	1, 2, 3, … *M* strata (unitless)
t	1, 2, 3, … t^* time elapsed since the projected start of the project activity (years)

Year	Unadjusted forest clearance estimate $WoPR_{i,t}$	New forest clearance estimate $NewR_{i,t}$
2015	639,886	624,808
2016	684,315	670,079
2017	728,743	712,902

2018	773,171	757,068
2019	817,600	802,865
2020	862,028	860,805
2021	906,456	905,247
2022	950,884	950,884
2023	995,313	995,313
2024	1,039,741	1,039,741
2025	1,084,169	1,084,169
2026	1,128,598	1,128,598
2027	1,173,026	1,173,026
2028	1,217,454	1,217,454
2029	1,261,883	1,261,883
2030	1,145,944	1,145,944
2031 - 2072	557,444	557,444

Table 167- New area of annual deforestation by the baseline class of deforestation agents in which no leakage occurs.

Step 3 – Monitor All Areas Deforested by Baseline Agent of Deforestation Through the Years in Which Planned Deforestation was Forecast To Occur

For each monitoring period, we will estimate all areas deforested by the class of agents in the country by monitoring the total area licensed for conversion to HTI concessions and the actual deforestation. The KLHK is now publishing annual land cover maps showing concession boundaries, natural forest, plantation, and non-plantation land uses, and data is available for 1990, 1996, 2000, 2003, 2006, 2009, 2011, 2012, 2013, 2015, and 2019. Land cover maps will be prepared annually from 2020. It is also anticipated that more historic annual land cover maps are likely to become available in the future.

Actual leakage will be calculated using the following equation as per project equation 38, derived from equation 6 of VMD0009 LK-ASP:

$$LKA_{planned\,j,t} = A_{defLK,j,t} - NewR_{i,t} \quad (38)$$

Where:

$LKA_{planned,i,t}$	The area of activity shifting leakage in stratum *i* in year *t* (ha)
$NewR_{i,t}$	New calculated forest clearance by the baseline agent of the planned deforestation in stratum *i* in year *t* where no leakage is occurring (ha)
$A_{defLK,i,t}$	The total area of monitored deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t* (ha)
i	1, 2, 3, … *M* strata (unitless)
t	1, 2, 3, … t^* time elapsed since the start of the project activity (years)

For this Project, we assume no leakage will occur. Monitoring will verify if leakage occurs in the future.

Step 4 – Monitoring of GHG Emissions Outside the Project Boundary by Baseline Agent of Deforestation

This can only be monitored and quantified when a specific deforestation agent is identified and is not considered by this Project.

4.3.3 Peatlands and Tidal Wetlands

The project is located on peatlands and the planned deforestation baseline land use requires the drainage of the peatland. Therefore, the GHG emissions from drainage and degradation of the peatlands must be accounted for. The net GHG emissions due to wetland degradation from planned deforestation displaced from the project area are estimated as per project equation 39, derived from equation 10 of VMD0009 LK-ASP.

$$GHG_{LK\text{-}WRC\text{-}AS,planned} = \Delta C_{LK\text{-}ASP\text{-}PEAT} + \Delta C_{LK\text{-}ASP\text{-}TW} \quad (39)$$

Where:

$GHG_{LK\text{-}WRC\text{-}AS,planned}$	Net GHG emissions due to wetland degradation from planned deforestation displaced from the project area up to year t^* (t CO_2e)
$\Delta C_{LK\text{-}ASP\text{-}PEAT}$	Net GHG emissions due to peatland drainage from planned deforestation displaced from the project area up to year t^* (t CO_2e)
$\Delta C_{LK\text{-}ASP\text{-}TW}$	Net GHG emissions due to tidal wetland degradation from planned deforestation displaced from the project area up to year t^* (t CO_2e)

Note that this project only includes peatlands and does not include tidal wetlands.

Step 1 – Estimate Soil Organic Carbon Loss in All of Agent's Concessions

PDT in the undrained peatland of alternative areas was used to determine the emission factors for activity shifting leakage within peatlands. We estimate the cumulative carbon lost at t_{PDT} as per project equation 40, acquired from equation 11 of VMD0009 LK-ASP.

$$C_{loss\text{-}PDT} = (C_{t0\text{-}} - C_{PDT}) \times 44/12 \quad (40)$$

Where:

$C_{loss\text{-}PDT}$	Cumulative peat loss at t_{PDT} (t CO_2e ha^{-1})
C_{t0}	Soil organic carbon stock at t_0 (t C ha^{-1})
C_{PDT}	Soil organic carbon stock at t_{PDT} (t C ha^{-1})
t_{PDT}	Peat Depletion Time (years)

By using the land-use designation of the Indonesian Production Forest, the Project was able to consider areas that could potentially generate peat emissions as a result of potential shifting

leakage. Licensed plantation concessions (HTI) and other unlicensed Production Forest were identified for this analysis using the KLHK land cover and soil map information.

At any point that there is deforestation in the peatlands, the Project assumed that there is simultaneous drainage. To be conservative, the Project assumed that drained peatland is equal to deforested peatland area. This assumption is made because as a general rule, industrial-level conversion and deforestation on large areas of peatlands result in canal development that leads to oxidation. By making this assumption, i.e. deforested areas were drained, the Project conservatively ensured the inclusion of the most likely scenario that licensed HTI or unlicensed HP areas would eventually be drained.

From the analysis:

- Approximately 1,369,621 ha (54%) of the licensed HTI in HP area was estimated to have been deforested at the project start date.
- Approximately 914,479 ha (29.3%) of the unlicensed HP area was estimated to have been deforested at the project start date.

We assumed conservatively that all peatlands in the unlicensed area are forested and undrained. This assumption considered a higher AGB carbon stock in peatlands despite the actual vegetation composition, hence a more conservative approach for accounting growth rate and emission factors.

Land cover type	Peatland		Non-Peatland		Peatland + Non-Peatland	
	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)
HTI						
Natural forest	1,125,346	45%	4,348,386	50%	5,473,732	49%
Plantation	734,302	29%	1,369,469	16%	2,103,770	19%
Non-forest	635,319	25%	2,993,059	34%	3,628,379	32%
Total HTI plantation	2,494,968	100%	8,710,914	100%	11,205,881	100%
Unlicensed HP areas						
Natural forest	2,204,101	71%	37,254,172	84%	39,458,273	83%
Plantation	408,379	13%	2,118,498	5%	2,526,878	5%
Non-forest	506,050	16%	5,058,125	11%	5,564,175	12%
Total unlicensed HP areas	3,118,530	100%	44,430,795	100%	47,549,325	100%
Total HTI + Unlicensed HP areas						
Natural forest	3,329,447	59%	41,602,558	78%	44,932,005	76%
Plantation	1,142,681	20%	3,487,967	7%	4,630,648	8%
Non-forest	1,141,369	20%	8,051,184	15%	9,192,554	16%
Total HTI + unlicensed HP areas	5,613,497	100%	53,141,709	100%	58,755,206	100%

Table 168- Deforested and forested area in HTI and unlicensed HP areas right before the project start.

We summarized the total peatland area and carbon stock loss at t_{PDT} in licensed HTI *Acacia* plantations and unlicensed HP areas in the table below. The amount of carbon loss at t_{PDT} was based on peat thickness loss at t_{PDT} and an average bulk density in Riau of 69.8 Kg C / m^3:

Peat Depth Class			HTI			Unlicensed HP		
Range (m)	Avg peat depth (m)	%	Area (ha)	Avg $C_{peatloss}$ (t.C.ha^{-1})	Total Peat Loss (t.C.yr^{-1})	Area (ha)	Avg $C_{peatloss}$ (t.C.ha^{-1})	Total Peat Loss (t.C.yr^{-1})
<1	0.75	1%	13,666	524	7,154,312	17,082	524	8,942,374
1-2	1.5	4%	93,262	1,047	97,645,564	116,571	1,047	122,049,907
2-3	2.5	10%	245,719	1,745	428,780,352	307,132	1,745	535,944,494
3-4	3.5	17%	418,613	2,443	1,022,672,085	523,236	2,443	1,278,266,298
4-5	4.5	13%	327,603	3,141	1,028,999,977	409,480	3,141	1,286,175,706
5-6	5.5	28%	701,941	3,839	2,694,750,913	877,375	3,839	3,368,244,155
6-7	6.5	25%	631,725	4,537	2,866,136,869	789,611	4,537	3,582,464,231
>7	7	3%	62,438	4,886	305,071,741	78,043	4,886	381,317,659
Total		100%	2,494,968		8,451,211,813	3,118,530		10,563,404,824
Carbon density for Riau peatlands = 69.8 Kg C m-3								

Table 169- Summary of Peat Thickness and average carbon loss tPDT in all HTI and Unlicensed HP Concessions

The total soil organic carbon (t C) is estimated to be 8,451,211,813 and 10,563,404,824 for HTI and Unlicensed HP. This equates to an average soil organic carbon loss (C_{t0}-C_{PDT}) of 3,387 t C ha^{-1}.

This converts to cumulative peat loss at t_{PDT} ($C_{loss\text{-}PDT}$) of 12,420 t CO_2e ha^{-1}.

Step 2 – Estimate CO_2 Emission Factor for Leakage to Peatland Per Hectare

We estimate the CO_2 emissions factor from leakage to undrained peatlands at **12,420** t CO_2e ha^{-1} as per project equation 41, acquired from equation 13 of VMD0009 LK-ASP.

$$LK_{EF\text{-}PEAT} = C_{loss\text{-}PDT} \quad (41)$$

Where:

$LK_{EF\text{-}PEAT}$ CO_2 emission factor from leakage to undrained peatlands (t CO_2e ha^{-1})

$C_{loss\text{-}PDT}$ Cumulative peat loss at t_{PDT} (t CO_2e ha^{-1})

In its analysis, the Project used the proportion of deforested area (54.8%) in the HP area licensed for HTI concessions, to estimate the proportion of deforested and drained peatland before the beginning of the Project start date.

RER assumed the projected undrained peatland that would be drained in the baseline in HP areas licensed for HTI to be equal to the forested peatland without the area designated for conservation (10% of the peatland). It was further estimated the projected undrained peatland that would be drained in the unlicensed HP areas is equal to 61% of the peatland area.

Category	HTI		Unlicensed HP	
	Area (ha)	Area (%)	Area (ha)	Area (%)
Peatland	2,494,968	100%	3,118,530	100%
Deforested / drained peatland	1,369,621	55%	914,429	29%
Forested peatland	1,125,346	45%	2,204,101	71%
Conservation area	249,497	10%	311,853	10%
Projection of undrained peatland in the baseline scenario	875,850	35%	1,892,248	61%

Table 170- Projection of undrained peatland in HP areas as alternative areas for leakage to peatland.

RER notes that the emission factor for leakage to peatlands is the average loss of carbon from peat soils per ha in all of the class of agents' concessions at PDT, expressed as tonnes of CO_2e.

The total amount of $C_{peatloss,tPDT}$ was factored by the percentage of drained peatland. It is estimated as LK_{EF} for licensed and unlicensed HP areas and is summarized below.

Parameters	HTI plantations in HP	Unlicensed HP area
$C_{peatloss,tPDT}$(t C)	3,811,889,626	7,465,956,368
Total undrained area of peatlands in alternative areas	875,850	1,892,248
LK_{EF} (t.CO_2-E ha^{-1})	15,958	14,467

Table 171- Estimated emission factors of leakage to peatland.

Step 3 – Estimate Net GHG Emissions Due to Leakage to Undrained Peatland as a Result of Implementation of a Planned Deforestation Project

The Project was able to calculate the proportion of undrained peatlands in alternative areas based on licensed HTI, unlicensed HP area, and undrained peatland areas. The results are set forth below.

Category	HTI plantations in HP area	Unlicensed HP area
	(ha)	
Alternative area (HP area)	11,205,881	47,549,324.9
Undrained peatlands	875,850	11,408,775.87
$PROP_{PEAT-AGENT}$	0.0782	0.2399

Table 172- The proportion of undrained peatland areas in the alternative area.

RER will calculate emissions due to leakage to undrained peatlands during project monitoring as per project equation 42, obtained from equation 15 of VMD0009 LK-ASP.

$$\Delta C_{LK\text{-}ASP\text{-}PEAT} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} LKA_{planned,i,t} \times PROP_{PEAT\text{-}AGENT} \times LK_{EF\text{-}PEAT} \quad (15)$$

Where:

$\Delta C_{LK\text{-}ASP\text{-}PEAT}$	Net GHG emissions due to peatland drainage from planned deforestation displaced from the project area up to year t^* (t CO_2e)
$LKA_{planned,i,t}$	The area of activity shifting leakage in stratum i in year t (ha)
$PROP_{PEAT\text{-}AGENT}$	Proportion of undrained peatland areas in the agent´s concessions with respect to the total area of such concessions (unitless)
$LK_{EF\text{-}PEAT}$	CO_2 emission factor from leakage to undrained peatlands (t CO_2e ha^{-1})
i	1, 2, 3, … M strata
t	1, 2, 3, … t^* years elapsed since the start of the project activity

4.3.3.1 Total Emissions from Activity Shifting for Avoiding Planned Deforestation

At each monitoring event, RER is able to calculate the total emissions from activity shifting leakage for APD This calculation will be based on the parameters described in Steps above as per project equation 43, obtained from equation 17 of VMD0009 LK-ASP.

$$\Delta C_{LK-ASP-PEAT} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(D\%_{planned,i,t} \times A_{planned,i} \times LK_{CP-ME,c,i} \times LK_{MAF} \times PROP_{PEAT-ALT} \times LK_{EF-PEAT} \right) \quad (43)$$

Where:

$\Delta C_{LK\text{-}ASP\text{-}PEAT}$	Net GHG emissions due to peatland drainage from planned deforestation displaced from the project area up to year t^* (t CO_2e)
$D\%_{planned,i,t}$	Projected annual proportion of land that will be deforested in stratum i in year t (percent)
$A_{planned,i,}$	Total area of planned deforestation over the baseline period for stratum i (ha)
$LK_{CP\text{-}ME,c,i}$	Leakage factor for displacement of class of planned deforestation agents (unitless)
LK_{MAF}	Leakage management adjustment factor (unitless)
$PROP_{PEAT\text{-}ALT}$	Proportion of undrained peatland areas in the alternative areas with respect to the total alternative areas (unitless)
$LK_{EF\text{-}PEAT}$	CO_2 emission factor from leakage to undrained peatlands (t CO_2e ha^{-1})
i	1, 2, 3, … M strata
t	1, 2, 3, … t^* years elapsed since the start of the project activity

The RER Project assumes that no leakage will occur. There are leakage mitigation activities in place for the RER Project and there will be monitoring and reporting of any leakage that occurs will during the t crediting period. Any leakage will be reported at the verification events.

4.3.4 Estimation of Emissions from Ecological Leakage (LK-ECO)

VMD0044 Module LK-ECO requires that ecological leakage affecting the soil (peat) carbon pool does not occur, by ensuring that the effect of hydrological connectivity with adjacent areas is insignificant. This can be achieved by demonstrating an appropriate design (e.g. by establishing an impermeable dam, by rewetting peatland that is surrounded by undrained peatland or by rivers), or by a buffer zone within the project boundary.

The Project Area consists entirely of an intact peat swamp forest which requires relatively small but significant intervention in terms of rewetting. As such, the risk of ecological leakage is by definition limited to comparatively small areas along the legacy canals that existed at the commencement of the Project.

Since the commencement of the Project in 2016, 126 km out of 146 km of the original legacy canals have been successfully blocked and only 18.6 km of canals remain to be blocked within the Project Area. The risk of ecological leakage is minimal as demonstrated by conditions in this area and its surrounding peatlands at project start:

- In the Project Area where rewetting is being undertaken (9,148 ha), or about 7% of the total Project Area, the canal blocking is taking place in a cascade design manner such that each canal has a blockage, not at a single location, but at locations determined by the gradient of the slope the canal. This stepwise approach to canal blocking will also result in limiting water flow in the event of a breach or failure of any of the dams.

- It should be noted that the size of the canals that are being blocked are as part of the rewetting effort are not sizable. They are generally between 2-3 meters wide and about 1 to 1.5 meters deep. These relatively small dimensions also limit the amount of downstream water discharge, which in turn severely limits the risk of ecological leakage. Even were a dam to lose structural integrity and fail, the potential for ecological leakage remains minimal as demonstrated by conditions in this area and its surrounding peatlands prior to and at the Project Start Date.
- The conditions of the Project Area, that is, the geography and hydrological layout of the Project Area and the additional peatlands that surround the area is such that flooding does, in fact, occur regularly. However, the reason for the flooding is from substantial rainfall that regularly occurs in the region and is not likely to be linked to the interventions of the WRC Project activities.
- Lastly, none of the blocked canals are situated in a way that would allow discharge to leak into the neighbouring landscape. All of the canals drain into natural waterways (the Serkap, Sangar, and Turip Rivers) which in turn drains into the Kampar river that itself discharges directly into the sea. These Rivers would easily be able to take on the additional water discharged from a dam breach and would further act to mitigate any leakage.

No ecological leakage is anticipated to take place in the project scenario. Through the Project's ongoing monitoring activities, using subsidence poles, dipwells, and automatic level-loggers that have been installed, and will continue to be installed near the blocked canals where they discharge into a River or have some other type of main outlet. Monitoring will take place regularly, both during the wet and dry seasons, and is outlined in more detail in Chapter 5. The automatic level-loggers that will be installed in these areas will provide regular data on a daily basis. And if a dam loses integrity, it will be promptly repaired, in-line with the requirements of § 6.3 of VMD0044 (LK-ECO).

Further, the quantity of water that could potentially be leaked beyond the boundaries of the concession is limited and would not increase GHG emissions because:

a) Even where some or all dams rupture, the in situ natural waterways (i.e. rivers) and, to a much lesser extent, man-made waterways have adequate capacity, would be easily able to absorb the extra discharge, and would not lead to additional GHG emissions.

b) All of the land surrounding the project area is currently wetlands as well, and there are no dryland areas that could be accidentally converted to wetlands (i.e. causing increased CH4 emissions).

c) Further, even if there was some leakage into the adjacent areas, not captured by the in-situ waterways because all of the surrounding areas are already in wetland forest, there would be no vegetive die-off as all of the surrounding areas already well adapted to the regular seasonal natural flooding conditions.

d) There is no situation, in the event of the breach of a dam in the Project area that would create a situation where an area outside of the Project boundary would suffer lowering of the water table that would lead to increased N_2O emissions.

In conclusion, the total emissions for the Project from Leakage is "0".

4.4 Net GHG Emission Reductions and Removals

4.4.1 General

Net GHG emission reductions from REDD, ARR, and WRC prescribed in VM0007 REDD+ MF.

Note that the project does not include ARR activities and ARR emissions are not calculated.

4.4.2 Total Net GHG Emission Reductions for REDD Project Activity

The total net GHG reductions of the REDD project activity are calculated as per project equation 44, obtained from equation 2 of VM0007 REDD+ MF.

$$NER_{REDD} = \Delta C_{BSL\text{-}REDD} - \Delta C_{WPS\text{-}REDD} - \Delta C_{LK\text{-}REDD} \quad (44)$$

Where:

NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year t^* ($t CO_2e$)
$\Delta C_{BSL\text{-}REDD}$	Net GHG emissions in the REDD baseline scenario up to year t^* ($t CO_2e$)
$\Delta C_{WPS\text{-}REDD}$	Net GHG emissions in the REDD project scenario up to year t^* – from Module *M-REDD* ($t CO_2e$)
$\Delta C_{LK\text{-}REDD}$	Net GHG emissions due to leakage from the REDD project activity up to year t^* ($t CO_2e$)

Note that the RER Project assumes that no leakage will occur and net emissions from leakage are assumed to be zero.

The net GHG emissions in the REDD baseline scenario ($\Delta C_{BSL\text{-}REDD}$) are calculated as per project equation 45, obtained from equation 3 of VM0007 REDD+ MF.

$$\Delta C_{BSL,REDD} = \Delta C_{BSL,planned} + \Delta C_{BSL,unplanned} + \Delta C_{BSL,degrad-FW/C} \quad (45)$$

Where:

$\Delta C_{BSL\text{-}REDD}$	Net GHG emissions in the REDD baseline scenario up to year t^* ($t CO_2e$)
$\Delta C_{BSL,planned}$	Net GHG emissions in the baseline scenario from planned deforestation up to year t^* – from Module *BL-PL* ($t CO_2e$)
$\Delta C_{BSL,unplanned}$	Net GHG emissions in the baseline scenario from unplanned deforestation up to year t^* – from Module *BL-UP* ($t CO_2e$)
$\Delta C_{BSL,degrad-FW/C}$	Net GHG emissions in the baseline scenario from degradation caused by fuelwood collection and charcoal making up to year t^* – from Module *BL-DFW* ($t CO_2e$)

Note that the RER Project excludes emissions from unplanned deforestation and degradation from fuelwood/charcoal production and net emissions from these are assumed to be zero.

The total net GHG reductions of the REDD project activity are presented in the table below.

After exclusions and zero-rated emissions sources are accounted for, total net GHG reductions of the REDD project activity ($\Delta C_{BSL-REDD}$) are equivalent to the total net GHG emissions in the baseline scenario from planned deforestation ($\Delta C_{BSL-planned}$).

Year	Net GHG reductions in the REDD project activity (NER_{REDD})	Net GHG emissions in the REDD baseline scenario ($C_{BSL-REDD}$)	Net GHG emissions in the REDD project scenario ($C_{WPS-REDD}$)	Net GHG emissions due to leakage from the REDD project activity
	(t CO_2e)	(t CO_2e)	(t CO_2e)	($C_{LK-REDD}$) (t CO_2e)
2016	1,707,777	1,646,493	-61,284	0
2017	3,056,527	2,835,456	-221,071	0
2018	3,667,098	3,326,630	-340,469	0
2019	4,051,040	3,589,305	-461,734	0
2020	3,907,397	3,339,572	-567,825	0
2021	1,206,919	629,805	-577,114	0
2022	1,248,522	662,278	-586,244	0
2023	1,027,559	441,315	-586,244	0
2024	1,027,559	441,315	-586,244	0
2025	1,027,559	441,315	-586,244	0
2026	942,232	355,988	-586,244	0
2027	865,302	279,058	-586,244	0
2028	776,526	190,282	-586,244	0
2029	682,361	96,118	-586,244	0
2030	598,029	11,785	-586,244	0
2031	592,525	6,281	-586,244	0
2032	586,244	0	-586,244	0
2033	586,244	0	-586,244	0
2034	586,244	0	-586,244	0
2035	586,244	0	-586,244	0
2036	586,244	0	-586,244	0
2037	586,244	0	-586,244	0
2038	586,244	0	-586,244	0
2039	586,244	0	-586,244	0
2040	586,244	0	-586,244	0
2041	586,244	0	-586,244	0
2042	586,244	0	-586,244	0
2043	586,244	0	-586,244	0
2044	586,244	0	-586,244	0
2045	586,244	0	-586,244	0
2046	586,244	0	-586,244	0
2047	586,244	0	-586,244	0
2048	586,244	0	-586,244	0
2049	586,244	0	-586,244	0
2050	586,244	0	-586,244	0
2051	586,244	0	-586,244	0
2052	586,244	0	-586,244	0

2053	586,244	0	-586,244	0
2054	586,244	0	-586,244	0
2055	586,244	0	-586,244	0
2056	586,244	0	-586,244	0
2057	586,244	0	-586,244	0
2058	586,244	0	-586,244	0
2059	586,244	0	-586,244	0
2060	586,244	0	-586,244	0
2061	586,244	0	-586,244	0
2062	586,244	0	-586,244	0
2063	586,244	0	-586,244	0
2064	586,244	0	-586,244	0
2065	586,244	0	-586,244	0
2066	586,244	0	-586,244	0
2067	586,244	0	-586,244	0
2068	586,244	0	-586,244	0
2069	586,244	0	-586,244	0
2070	586,244	0	-586,244	0
2071	586,244	0	-586,244	0
2072	327,654	0	-327,654	0
Totals	50,162,342	18,292,996	-31,869,346	0

Table 173 – Total net GHG Emission Reductions from REDD Activity

4.4.3 Total Net GHG Emission Reductions for ARR Project Activity

GHG removals from ARR activities are not included in the RER project.

4.4.4 Total Net GHG Emission Reductions for WRC Project Activity

4.4.4.1 Net GHG emissions in the WRC project activity

The total net GHG emissions of the WRC project activity are calculated as per project equation 46, obtained from equation 6 of VM0007 REDD+ MF.

$$NER_{WRC} = GHG_{BSL\text{-}WRC} - GHG_{WPS\text{-}WRC} - GHG_{LK\text{-}WRC} \quad (46)$$

Where:

NER_{WRC}	Total net GHG emission reductions in the WRC project up to year t^* (t CO_2e)
$GHG_{BSL\text{-}WRC}$	Net GHG emissions in the WRC baseline scenario up to year t^* (t CO_2e)
$GHG_{WPS\text{-}WRC}$	Net GHG emissions in the WRC project scenario up to year t^* (t CO_2e)
$GHG_{LK\text{-}WRC}$	Net GHG emissions due to leakage from the WRC project activity up to year t^* (t CO_2e)

Note that the RER Project assumes that no leakage will occur and net emissions from leakage ($GHG_{LK\text{-}WRC}$) are assumed to be zero.

4.4.4.2 Net GHG emissions in the WRC baseline scenario

For CIW-REDD, RWE-REDD, and CIW project activities in the baseline, net GHG emissions in the WRC baseline scenario are calculated as per project equation 47, obtained from equation 7 of VM0007 REDD+ MF.

$$GHG_{BSL\text{-}WRC} = GHG_{BSL\text{-}PEAT} + GHG_{BSL\text{-}TW} \quad (47)$$

Where:

$GHG_{BSL\text{-}WRC}$	Net GHG emissions in the WRC baseline scenario up to year t^* (t CO_2e)
$GHG_{BSL\text{-}PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}TW}$	Net GHG emissions in the WRC baseline scenario on tidal wetland up to year t^* (t CO_2e)

Note that the RER Project is located entirely on peatland and there are no tidal wetlands within the project area. It is assumed net emissions from tidal wetlands ($GHG_{BSL\text{-}TW}$) are zero.

For CIW-REDD, RWE-REDD, and CIW project activities in the baseline, net GHG emissions in the WRC baseline scenario on peatland are calculated as per project equation 48, obtained from equation 8 of VM0007 REDD+ MF.

$$GHG_{BSL\text{-}PEAT} = GHG_{BSL\text{-}PEAT,planned} + GHG_{BLS\text{-}PEAT,unplanned} \quad (48)$$

Where:

$GHG_{BSL\text{-}PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}PEAT,planned}$	Net GHG emissions in the baseline scenario from planned peatland degradation up to year t^* – from Module *BL-PL* (t CO_2e)
$GHG_{BLS\text{-}PEAT,unplanned}$	Net GHG emissions in the baseline scenario from unplanned peatland degradation up to year t^* – from Module *BL-UP* (t CO_2e)

Note that the RER Project excludes emissions from unplanned peatland degradation and net emissions from this $GHG_{BLS\text{-}PEAT,unplanned}$ is assumed to be zero.

For RWE project activities in the baseline, baseline fossil fuel is excluded from GHG emissions estimation.

For RWE project activities in the baseline, net GHG emissions in the WRC baseline scenario on peatland are calculated as per project equation 49, derived from equation 10 of VM0007 REDD+ MF.

$$GHG_{BSL\text{-}WRC} = GHG_{BSL\text{-}PEAT} + GHG_{BSL\text{-}TW} + GHG_{BSL\text{-}fuel} \quad (49)$$

Where:

$GHG_{BSL\text{-}WRC}$	Net GHG emissions in the WRC baseline scenario up to year t^* (t CO_2e)
$GHG_{BSL\text{-}PEAT}$	Net GHG emissions in the WRC baseline scenario on peatland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}TW}$	Net GHG emissions in the WRC baseline scenario on tidal wetland up to year t^* (t CO_2e)
$GHG_{BSL\text{-}fuel}$	Net CO_2e emissions from fossil fuel use in the baseline scenario up to year t^* (from Module *BL-TW*) (t CO_2e)
i	1, 2, 3, … M strata
t	1, 2, 3, …t^* years elapsed since the projected start of the WRC project activity

Note that the RER Project is located entirely on peatland and there are no tidal wetlands within the project area. It is assumed net emissions from tidal wetlands ($GHG_{BSL\text{-}TW}$) are zero.

Note also that the RER Project excludes emissions from fossil fuel use ($GHG_{BSL\text{-}FUEL}$) and these are assumed to be zero.

After exclusions and zero-rated emissions sources are accounted for, total net GHG reductions of the REDD project activity ($\Delta C_{BSL\text{-}WRC}$) is equivalent to the total net GHG emissions in the baseline scenario from on peatland ($\Delta C_{BSL\text{-}PEAT}$), which in turn is equivalent to the total net GHG emissions in the baseline scenario from planned deforestation ($\Delta C_{BSL\text{-}planned}$).

4.4.4.3 Net GHG emissions in the WRC project scenario

The net GHG emissions in the WRC project scenario are calculated as per project equation 50, derived from equation 11 of VM0007 REDD+ MF.

$$GHG_{WPS\text{-}WRC} = GHG_{WPS\text{-}PEAT} + GHG_{WPS\text{-}TW} \quad (50)$$

Where:

$GHG_{WPS\text{-}WRC}$	Net GHG emissions in the WRC project scenario up to year t^* (t CO_2e)
$GHG_{WPS\text{-}PEAT}$	Net GHG emissions in the WRC project scenario on peatland up to year t^* (t CO_2e)
$GHG_{WPS\text{-}TW}$	Net GHG emissions in the WRC project scenario on tidal wetland up to year t^* (t CO_2e)

Note that the RER Project is located entirely on peatland and there are no tidal wetlands within the project area. It is assumed net emissions from tidal wetlands ($GHG_{WPS\text{-}TW}$) are zero.

Note also that the RER Project is located entirely on peatland and there are no tidal wetlands within the project area. It is assumed net emissions from tidal wetlands ($GHG_{WPS\text{-}TW}$) are zero.

Note that the RER Project assumes that no leakage will occur and net emissions from leakage are assumed to be zero.

4.4.4.4 Total Net GHG Emission Reductions for WRC Project Activity

After exclusions and zero-rated emissions sources are accounted for, total net GHG emissions in the WPS project scenario ($GHG_{WPS-WRC}$) is equivalent to the total net GHG emissions in the WRC project scenario on peatland ($GHG_{WPS-PEAT}$).

Year	Net GHG reductions in the WRC project activity (NER_{WRC}) (t CO_2e)	Net GHG emissions in the WRC baseline scenario ($C_{BSL-WRC}$) (t CO_2e)	Net GHG emissions in the WRC project scenario ($C_{WPS-WRC}$) (t CO_2e)	Net GHG emissions due to leakage from the WRC project activity (C_{LK-WRC}) (t CO_2e)
2016	597,033	915,641	318,608	0
2017	2,098,872	2,644,468	545,596	0
2018	3,347,801	3,695,694	347,893	0
2019	4,667,040	4,809,666	142,626	0
2020	5,718,876	5,778,671	59,794	0
2021	5,822,407	5,860,129	37,722	0
2022	5,911,380	5,949,058	37,678	0
2023	5,911,397	5,949,058	37,660	0
2024	5,949,058	5,949,058	0	0
2025	5,949,058	5,949,058	0	0
2026	5,949,058	5,949,058	0	0
2027	5,949,058	5,949,058	0	0
2028	5,949,058	5,949,058	0	0
2029	5,949,058	5,949,058	0	0
2030	5,949,058	5,949,058	0	0
2031	5,949,058	5,949,058	0	0
2032	5,949,058	5,949,058	0	0
2033	5,949,058	5,949,058	0	0
2034	5,949,058	5,949,058	0	0
2035	5,949,058	5,949,058	0	0
2036	5,949,058	5,949,058	0	0
2037	5,949,058	5,949,058	0	0
2038	5,949,058	5,949,058	0	0
2039	5,949,058	5,949,058	0	0
2040	5,949,058	5,949,058	0	0
2041	5,949,058	5,949,058	0	0
2042	5,949,058	5,949,058	0	0
2043	5,949,058	5,949,058	0	0
2044	5,949,058	5,949,058	0	0
2045	5,949,058	5,949,058	0	0
2046	5,949,058	5,949,058	0	0
2047	5,949,058	5,949,058	0	0
2048	5,949,058	5,949,058	0	0
2049	5,949,058	5,949,058	0	0
2050	5,949,058	5,949,058	0	0
2051	5,949,058	5,949,058	0	0
2052	5,949,058	5,949,058	0	0
2053	5,949,058	5,949,058	0	0
2054	5,949,058	5,949,058	0	0
2055	5,949,058	5,949,058	0	0
2056	5,949,058	5,949,058	0	0
2057	5,949,058	5,949,058	0	0
2058	5,949,058	5,949,058	0	0
2059	5,949,058	5,949,058	0	0
2060	5,949,058	5,949,058	0	0
2061	5,949,058	5,949,058	0	0
2062	5,949,058	5,949,058	0	0
2063	5,949,058	5,949,058	0	0
2064	5,949,058	5,949,058	0	0
2065	5,949,058	5,949,058	0	0
2066	5,949,058	5,949,058	0	0
2067	5,949,058	5,949,058	0	0
2068	5,949,058	5,949,058	0	0
2069	5,949,058	5,949,058	0	0
2070	5,949,058	5,949,058	0	0
2071	5,949,058	5,949,058	0	0
2072	3,324,953	3,324,953	0	0
Total	322,954,522	324,482,098	1,527,576	0

Table 174 - Net GHG Emissions from WRC Activity

4.4.5 Summary of GHG Emission Reductions and Removals

4.4.5.1 GHG Emission Reductions and Removals by Emissions Class

Net GHG emission reductions from REDD, ARR and WRC activities are calculated as per project equation 51, acquired from equation 1 of VM0007 REDD+ MF.

$$NER_{REDD+} = NER_{REDD} + NGR_{ARR} + NER_{WRC} \quad (51)$$

Where:

NER_{REDD+}	Total net GHG emission reductions of the REDD+ project activity up to year t^* (t CO_2e)
NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year t^* (t CO_2e)
NGR_{ARR}	Total net GHG removals of the ARR project activity up to year t^* (t CO_2e)
NER_{WRC}	Total net GHG emission reductions of the WRC project activity up to year t^* (t CO_2e)

The project does not include ARR activities and ARR emissions are estimated to be zero.

Years	Total net GHG emission reductions of REDD+ project activities	Total net GHG emission reductions of REDD project activities	Total net GHG emission reductions of WRC project activities
	(NER_{REDD+})	(NER_{REDD})	(NER_{WRC})
	(t CO_2e)	(t CO_2e)	(t CO_2e)
2016	2,304,810	1,707,777	597,033
2017	5,155,399	3,056,527	2,098,872
2018	7,014,900	3,667,098	3,347,801
2019	8,718,080	4,051,040	4,667,040
2020	9,626,273	3,907,397	5,718,876
2021	7,029,326	1,206,919	5,822,407
2022	7,159,902	1,248,522	5,911,380
2023	6,938,956	1,027,559	5,911,397
2024	6,976,616	1,027,559	5,949,058
2025	6,976,616	1,027,559	5,949,058
2026	6,891,289	942,232	5,949,058
2027	6,814,359	865,302	5,949,058
2028	6,725,584	776,526	5,949,058
2029	6,631,419	682,361	5,949,058
2030	6,547,087	598,029	5,949,058
2031	6,541,582	592,525	5,949,058
2032	6,535,301	586,244	5,949,058
2033	6,535,301	586,244	5,949,058

2034	6,535,301	586,244	5,949,058
2035	6,535,301	586,244	5,949,058
2036	6,535,301	586,244	5,949,058
2037	6,535,301	586,244	5,949,058
2038	6,535,301	586,244	5,949,058
2039	6,535,301	586,244	5,949,058
2040	6,535,301	586,244	5,949,058
2041	6,535,301	586,244	5,949,058
2042	6,535,301	586,244	5,949,058
2043	6,535,301	586,244	5,949,058
2044	6,535,301	586,244	5,949,058
2045	6,535,301	586,244	5,949,058
2046	6,535,301	586,244	5,949,058
2047	6,535,301	586,244	5,949,058
2048	6,535,301	586,244	5,949,058
2049	6,535,301	586,244	5,949,058
2050	6,535,301	586,244	5,949,058
2051	6,535,301	586,244	5,949,058
2052	6,535,301	586,244	5,949,058
2053	6,535,301	586,244	5,949,058
2054	6,535,301	586,244	5,949,058
2055	6,535,301	586,244	5,949,058
2056	6,535,301	586,244	5,949,058
2057	6,535,301	586,244	5,949,058
2058	6,535,301	586,244	5,949,058
2059	6,535,301	586,244	5,949,058
2060	6,535,301	586,244	5,949,058
2061	6,535,301	586,244	5,949,058
2062	6,535,301	586,244	5,949,058
2063	6,535,301	586,244	5,949,058
2064	6,535,301	586,244	5,949,058
2065	6,535,301	586,244	5,949,058
2066	6,535,301	586,244	5,949,058
2067	6,535,301	586,244	5,949,058
2068	6,535,301	586,244	5,949,058
2069	6,535,301	586,244	5,949,058
2070	6,535,301	586,244	5,949,058
2071	6,535,301	586,244	5,949,058
2072	3,652,607	327,654	3,324,953
Total	**373,116,864**	**50,162,342**	**322,954,522**

Table 175- GHG Emission Reductions and Removals by Emissions Class

4.4.5.2 GHG Emission Reductions and Removals by Baseline and Project Case

Years	Estimated baseline emissions and removals	Estimated project emissions and removals	Estimated leakage emissions	Estimated net GHG emissions reductions and removals
	(tCO_2e)	(tCO_2e)	(tCO_2e)	(tCO_2e)
2016	2,562,134	257,324	0	2,304,810
2017	5,479,924	324,525	0	5,155,399
2018	7,022,323	7,424	0	7,014,900
2019	8,398,971	-319,109	0	8,718,080
2020	9,118,243	-508,030	0	9,626,273
2021	6,489,934	-539,392	0	7,029,326
2022	6,611,335	-548,566	0	7,159,902
2023	6,390,372	-548,584	0	6,938,956
2024	6,390,372	-586,244	0	6,976,616
2025	6,390,372	-586,244	0	6,976,616
2026	6,305,046	-586,244	0	6,891,289
2027	6,228,116	-586,244	0	6,814,359
2028	6,139,340	-586,244	0	6,725,584
2029	6,045,175	-586,244	0	6,631,419
2030	5,960,843	-586,244	0	6,547,087
2031	5,955,338	-586,244	0	6,541,582
2032	5,949,058	-586,244	0	6,535,301
2033	5,949,058	-586,244	0	6,535,301
2034	5,949,058	-586,244	0	6,535,301
2035	5,949,058	-586,244	0	6,535,301
2036	5,949,058	-586,244	0	6,535,301
2037	5,949,058	-586,244	0	6,535,301
2038	5,949,058	-586,244	0	6,535,301
2039	5,949,058	-586,244	0	6,535,301
2040	5,949,058	-586,244	0	6,535,301
2041	5,949,058	-586,244	0	6,535,301
2042	5,949,058	-586,244	0	6,535,301
2043	5,949,058	-586,244	0	6,535,301
2044	5,949,058	-586,244	0	6,535,301
2045	5,949,058	-586,244	0	6,535,301
2046	5,949,058	-586,244	0	6,535,301
2047	5,949,058	-586,244	0	6,535,301

2048	5,949,058	-586,244	0	6,535,301
2049	5,949,058	-586,244	0	6,535,301
2050	5,949,058	-586,244	0	6,535,301
2051	5,949,058	-586,244	0	6,535,301
2052	5,949,058	-586,244	0	6,535,301
2053	5,949,058	-586,244	0	6,535,301
2054	5,949,058	-586,244	0	6,535,301
2055	5,949,058	-586,244	0	6,535,301
2056	5,949,058	-586,244	0	6,535,301
2057	5,949,058	-586,244	0	6,535,301
2058	5,949,058	-586,244	0	6,535,301
2059	5,949,058	-586,244	0	6,535,301
2060	5,949,058	-586,244	0	6,535,301
2061	5,949,058	-586,244	0	6,535,301
2062	5,949,058	-586,244	0	6,535,301
2063	5,949,058	-586,244	0	6,535,301
2064	5,949,058	-586,244	0	6,535,301
2065	5,949,058	-586,244	0	6,535,301
2066	5,949,058	-586,244	0	6,535,301
2067	5,949,058	-586,244	0	6,535,301
2068	5,949,058	-586,244	0	6,535,301
2069	5,949,058	-586,244	0	6,535,301
2070	5,949,058	-586,244	0	6,535,301
2071	5,949,058	-586,244	0	6,535,301
2072	3,324,953	-327,654	0	3,652,607
Total	**342,775,094**	**-30,341,770**	**0**	**373,116,864**

Table 176- Estimated net GHG emissions reductions (tCO2e)

4.4.6 Uncertainty Analysis

Per VMD0017 (X-UNC), uncertainties were calculated for the project's REDD and WRC components in both the Project and baseline scenarios.

4.4.6.1 Uncertainty in REDD baseline estimates

Step 1: Assess Uncertainty in Projection of Baseline Rate of Deforestation

It is here assumed that there is zero uncertainty in baseline rate of deforestation are based on actual deforestation plans. Furthermore, there is assumed to be no unplanned deforestation in the baseline. In this case:

$$Uncertainty_{BSL,RATE} = 0$$

The uncertainty in the baseline rate of deforestation as zero is supported since:

- An unquestionably conservative deforestation rate was used.
- An actual deforestation plan was prepared according to existing regulations and using common practices as verified against proxy areas all located in the immediately adjacent to the Project Area.
- Furthermore, as mentioned in § 4.4.1.1, the total uncertainty in the combined carbons stocks and greenhouse gas sources in the REDD baseline was determined to be 8.6%. Therefore, the cumulative uncertainty in the REDD baseline scenario is 8.6%. The Ex-Post uncertainty in the REDD Project Scenario was set to zero, since no ex-post (re-) measurements of carbon pools or GHG sources have been made. Uncertainties will be reassessed when carbon pools are re-measured.

Step 2: Assess Uncertainty of Emissions and Removals in Project Area in Baseline

The parameters and modules used in this analysis are shown in the table below:

Parameters	Modules	Comment
C_{AB}-tree	CP-AB	AGB has been directly measured in the AGB inventory. Uncertainty calculations have been included for this parameter.
C_{BB}-tree	CP-AB	BGB is estimated using proxy values from tier 2 allometrics for natural forest in Indonesia. Uncertainty calculations have not been included for this parameter.
C_{DW}	CP-D	Deadwood carbon pool is not included in this project. Uncertainty for this parameter is assumed to be zero and calculations have not been included.
C_{LI}	CP-L	Litter carbon pool is not included in this project. Uncertainty for this parameter is assumed to be zero and calculations have not been included.

C_{SOC}	CP-S	Soil organic carbon pool is included in the WRC uncertainty calculations. Uncertainty for this parameter is assumed to be zero and calculations have not been included.
$C_{WP\ frp,}$	CP-W	The long-term wood products pool is not included in this project. Uncertainty for this parameter is assumed to be zero and calculations have not been included.
$E_{biomassburn}$	E-BPB	Biomass burning is not included in this project. Uncertainty for this parameter is assumed to be zero and calculations have not been included.
E_{FC}	E-FFC	Emissions from fossil fuel combustion are not included in this project. Uncertainty for this parameter is assumed to be zero and calculations have not been included.
$N_2O_{direct-N}$	E-NA	Nitrate emissions are not included in the baseline. Nitrate emissions from project activities are assumed to be zero. Uncertainty for this parameter is assumed to be zero and calculations have not been included.

Table 177 - Uncertainty Parameters and Modules

The uncertainty is calculated for AGB stratum using the following equation:

$$U_{REDD-BSL,SS,i} = \frac{\sqrt{\sum_1^n (U_{REDD-BSL,SS,i,pool\#} \times E_{REDD-BSL,SS,i,pool\#})^2}}{\sum_1^n E_{REDD-BSL,SS,i,pool\#}} \quad (4)$$

Where:

$U_{REDD\_BSL,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline scenario in stratum *i* (%)
$U_{REDD\_BSL,SS,i,pool\#}$	Percentage uncertainty for carbon stocks and greenhouse gas sources in the REDD baseline scenario in stratum *i* (%)
$E_{REDD\_BSL,SS,i,pool\#}$	Carbon stock or GHG sources in the REDD baseline scenario (t CO_2e)
i	1, 2, 3 …*M* strata (unitless)

From the AGB inventory, the uncertainty is estimated as 8.65% as follows.

LC Class	Area	Avg BM	Stdev	No. plots	t stat	CI 95%	Uncertainty
Dense swamp forest	19,287	150.3	43.7	50	2.010	12.4	8.3%
Medium swamp forest	63,328	112.7	31.3	92	1.986	6.5	5.7%
Sparse swamp forest	22,439	78.4	38.4	17	2.120	19.7	25.2%
Peat Dome Forest	23,748	199.3	55.9	10	2.262	40.0	20.1%
$U_{REDD-BSL,SS,i}$							8.65%

Table 178- AGB Uncertainty Estimates

Step 3: Estimate Total Uncertainty in REDD Baseline Scenario

Rate uncertainty is incorporated as follows:

$$Uncertainty_{REDD-BSL,t*} = \sqrt{Uncertainty_{BSL,RATE,t*}{}^2 + Uncertainty_{REDD-BSL,SS}{}^2}$$

Where:

$Uncertainty_{REDD-BSL,t*}$	Cumulative uncertainty in REDD baseline scenario up to year *t** (%)
$Uncertainty_{REDD-BSL,RATE,t*}$	Cumulative uncertainty in the baseline rate of deforestation up to year *t* (%)
$Uncertainty_{REDD-BSL,SS}$	Total uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline scenario (%)
t	1, 2, 3, …*t** time elapsed since the start of the project activity (years)

Given that the baseline rate uncertainty equals zero and the REDD uncertainty equals 8.65%, then the total uncertainty equals 8.65%.

4.4.6.2 WRC Uncertainty

Using the standard error data for the peat emission factors provided by the IPCC (IPCC Wetlands Supplement 2013) the uncertainties of CO_2 and CH_4 emissions from microbial decompositions of peat and Dissolved Organic Carbon from water bodies were calculated in both the baseline and project scenarios. The uncertainty of GHG emissions from uncontrolled peat burning in the project scenario was also set to zero as it was assumed all fires in the baseline and Project will be prevented. Based on these assumptions the WRC uncertainty in the baseline and Project Scenarios were calculated to be 0.82% and 2.93% respectively.

The total error in the REDD+ project activity was calculated as 0.87%. Considering the 15% uncertainty threshold, no VCU deductions were made due to uncertainty. Further detail on all calculations is provided in Annex 17.

4.4.7 Calculation of AFOLU Pooled Buffer Account Contribution

Pursuant to §8.4.5 of VM0007, the number of credits to be held in the AFOLU pooled buffer account is determined as a percentage for the total carbon stock benefits. For REDD project activities, this is equal to the net emissions in the baseline minus the net emissions from in the project case. For WRC project activities, the proxy net change in carbon stocks applied in the REDD-MF methodology is NER_{WRC}

The Project has used the following equations number 13, 14 and 18 respectively from VM0007 to estimate the buffer withholding:

$$Buffer_{Total} = Buffer_{Planned} + Buffer_{Unplanned} + Buffer_{Degrad-FW/C} + Buffer_{WRC} + Buffer_{ARR}$$

$$Buffer_{Planned} = \left(\left(\Delta C_{BSL,Planned} - \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right)_{BSL\ Planned} - \left(\Delta C_{P,Planned} - \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(E_{FC,i,t} + N_2O_{direct,i,t} \right) \right)_{P\ Planned} \right) \times Buffer\%$$

$$Buffer_{WRC} = NER_{WRC} \times Buffer\%$$

Where:

BufferTotal	Total permanence risk buffer withholding (t CO_2e)
BufferPlanned	Buffer withholding for avoiding planned deforestation project activities (t CO_2e)
BufferWRC	Buffer withholding for WRC activities (t CO_2e)
$\Delta C_{BSL,Planned}$	Net GHG emissions in the baseline from planned deforestation (t CO_2e)
ΔC_P	Net GHG emission in the project area in the project scenario (t CO_2e)
$E_{FC,i,t}$	Emission from fossil fuel combustion in stratum *i* in year *t* (t CO_2e)
$N_2O_{direct-N,i,t}$	Direct N2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum *i* in year *t* (t CO_2e)

Any variable in the above equation that is not used by the Project is calculated a zero.

The Non-Permanence Risk Buffer Assessment Report (See Appendix 28) determined that the combined non-permanence risk rating for the project is 10%. As set forth in VM0007, the annual buffer withholding amounts are determined as a percentage of the total carbon stock benefit, excluding leakage emissions. N_2O emissions, fossil fuel combustion emissions, and biomass burning emissions were omitted from the calculations as the Project does not account for them.

Years	REDD net GHG emissions reductions (tCO_2e)	WRC net GHG emissions reductions (tCO_2e)	Non-Permanence risk buffer (10%) ($Buffer_{Total}$) (tCO_2e)
2016	1,707,777	597,033	230,481
2017	3,056,527	2,098,872	515,540
2018	3,667,098	3,347,801	701,490
2019	4,051,040	4,667,040	871,808
2020	3,907,397	5,718,876	962,627
2021	1,206,919	5,822,407	702,933
2022	1,248,522	5,911,380	715,990
2023	1,027,559	5,911,397	693,896
2024	1,027,559	5,949,058	697,662
2025	1,027,559	5,949,058	697,662
2026	942,232	5,949,058	689,129
2027	865,302	5,949,058	681,436
2028	776,526	5,949,058	672,558
2029	682,361	5,949,058	663,142
2030	598,029	5,949,058	654,709
2031	592,525	5,949,058	654,158
2032	586,244	5,949,058	653,530
2033	586,244	5,949,058	653,530
2034	586,244	5,949,058	653,530
2035	586,244	5,949,058	653,530
2036	586,244	5,949,058	653,530
2037	586,244	5,949,058	653,530
2038	586,244	5,949,058	653,530
2039	586,244	5,949,058	653,530
2040	586,244	5,949,058	653,530
2041	586,244	5,949,058	653,530
2042	586,244	5,949,058	653,530
2043	586,244	5,949,058	653,530
2044	586,244	5,949,058	653,530
2045	586,244	5,949,058	653,530
2046	586,244	5,949,058	653,530
2047	586,244	5,949,058	653,530
2048	586,244	5,949,058	653,530
2049	586,244	5,949,058	653,530
2050	586,244	5,949,058	653,530
2051	586,244	5,949,058	653,530
2052	586,244	5,949,058	653,530
2053	586,244	5,949,058	653,530
2054	586,244	5,949,058	653,530
2055	586,244	5,949,058	653,530
2056	586,244	5,949,058	653,530
2057	586,244	5,949,058	653,530
2058	586,244	5,949,058	653,530
2059	586,244	5,949,058	653,530
2060	586,244	5,949,058	653,530
2061	586,244	5,949,058	653,530
2062	586,244	5,949,058	653,530
2063	586,244	5,949,058	653,530
2064	586,244	5,949,058	653,530
2065	586,244	5,949,058	653,530
2066	586,244	5,949,058	653,530
2067	586,244	5,949,058	653,530
2068	586,244	5,949,058	653,530
2069	586,244	5,949,058	653,530
2070	586,244	5,949,058	653,530
2071	586,244	5,949,058	653,530
2072	327,654	3,324,953	365,261
Total	50,162,342	322,954,522	37,311,686

Table 179 - Non-Permanence Risk Buffer Withholding

4.4.8 Calculation of Verified Carbon Units

The Verified Carbon Units (VCU) are calculated as per project equation 52, acquired from equation 19 of VM0007 REDD+ MF.

$$VCU_t = \left(Adjusted\_NER_{REDD+,t_2} - Adjusted\_NER_{REDD+,t_1}\right) - Buffer_{Total} \quad (52)$$

Where:

VCU_t	Number of Verified Carbon Units at year $t = t_2 - t_1$ (VCU)
$Adjusted\_NER_{REDD+,t2}$	Total net GHG emission reductions of the REDD+ project activity up to year t_2 and adjusted to account for uncertainty (t CO_2e)
$Adjusted\_NER_{REDD+,t1}$	Total net GHG emission reductions of the REDD+ project activity up to year t_1 and adjusted to account for uncertainty (t CO_2e)
$Buffer_{Total}$	Total permanence risk buffer withholding (t CO_2e)
NER_{WRC}	Total net GHG emission reductions of the WRC project activity up to year t^* (t CO_2e)

The baseline and project scenarios are calculated on a calendar year starting from 1 January to 31 December. But the VCU's are calculated from the project start date (17/6/2016) to the project end date (23 July 2072). Therefore, only a percentage of carbon emissions in the start and end year are eligible for VCUs. The following adjustment factors have been calculated to estimate the percentage of emissions reductions that are eligible as VCUs in the start and end year:

Period	Date	Start / end year eligibility factor
Start	17/06/2016	0.5397
End	23/07/2072	0.5589

Table 180- Net emissions adjustment factors at project start and end years

The methodology requires adjustment of estimated NER to account for uncertainty. As explained previously, the project level uncertainty falls below the 15% uncertainty threshold, so no VCU deductions were made due to uncertainty are due.

The annual estimated VCU's originated by the Project are calculated by subtracting the VCS Non-Permanence risk buffer withholding amounts from the uncertainty adjusted net emission reductions for each separate Project Activity are set forth in Table 181 below.

Years	Estimated VCUs (VCU_t)	$NER_{REDD+,t2}$	$NER_{REDD+,t1}$	Non-Permanence risk buffer (10%)	Start/End date eligibility factor
	($t CO_2e$)	($t CO_2e$)	($t CO_2e$)	($t CO_2e$)	
2016	2,074,329	4,270,333	0	427,033	54%
2017	4,639,859	9,425,732	4,270,333	515,540	100%
2018	6,313,410	16,440,632	9,425,732	701,490	100%
2019	7,846,272	25,158,712	16,440,632	871,808	100%
2020	8,663,646	34,784,985	25,158,712	962,627	100%
2021	6,326,393	41,814,311	34,784,985	702,933	100%
2022	6,443,912	48,974,212	41,814,311	715,990	100%
2023	6,245,061	55,913,169	48,974,212	693,896	100%
2024	6,278,955	62,889,785	55,913,169	697,662	100%
2025	6,278,955	69,866,401	62,889,785	697,662	100%
2026	6,202,161	76,757,691	69,866,401	689,129	100%
2027	6,132,924	83,572,050	76,757,691	681,436	100%
2028	6,053,025	90,297,634	83,572,050	672,558	100%
2029	5,968,277	96,929,053	90,297,634	663,142	100%
2030	5,892,378	103,476,140	96,929,053	654,709	100%
2031	5,887,424	110,017,722	103,476,140	654,158	100%
2032	5,881,771	116,553,024	110,017,722	653,530	100%
2033	5,881,771	123,088,325	116,553,024	653,530	100%
2034	5,881,771	129,623,627	123,088,325	653,530	100%
2035	5,881,771	136,158,928	129,623,627	653,530	100%
2036	5,881,771	142,694,230	136,158,928	653,530	100%
2037	5,881,771	149,229,531	142,694,230	653,530	100%
2038	5,881,771	155,764,832	149,229,531	653,530	100%
2039	5,881,771	162,300,134	155,764,832	653,530	100%
2040	5,881,771	168,835,435	162,300,134	653,530	100%
2041	5,881,771	175,370,737	168,835,435	653,530	100%
2042	5,881,771	181,906,038	175,370,737	653,530	100%
2043	5,881,771	188,441,340	181,906,038	653,530	100%
2044	5,881,771	194,976,641	188,441,340	653,530	100%
2045	5,881,771	201,511,943	194,976,641	653,530	100%
2046	5,881,771	208,047,244	201,511,943	653,530	100%
2047	5,881,771	214,582,546	208,047,244	653,530	100%
2048	5,881,771	221,117,847	214,582,546	653,530	100%
2049	5,881,771	227,653,149	221,117,847	653,530	100%
2050	5,881,771	234,188,450	227,653,149	653,530	100%
2051	5,881,771	240,723,751	234,188,450	653,530	100%
2052	5,881,771	247,259,053	240,723,751	653,530	100%
2053	5,881,771	253,794,354	247,259,053	653,530	100%
2054	5,881,771	260,329,656	253,794,354	653,530	100%
2055	5,881,771	266,864,957	260,329,656	653,530	100%
2056	5,881,771	273,400,259	266,864,957	653,530	100%
2057	5,881,771	279,935,560	273,400,259	653,530	100%
2058	5,881,771	286,470,862	279,935,560	653,530	100%
2059	5,881,771	293,006,163	286,470,862	653,530	100%
2060	5,881,771	299,541,465	293,006,163	653,530	100%
2061	5,881,771	306,076,766	299,541,465	653,530	100%
2062	5,881,771	312,612,067	306,076,766	653,530	100%
2063	5,881,771	319,147,369	312,612,067	653,530	100%
2064	5,881,771	325,682,670	319,147,369	653,530	100%

2065	5,881,771	332,217,972	325,682,670	653,530	100%
2066	5,881,771	338,753,273	332,217,972	653,530	100%
2067	5,881,771	345,288,575	338,753,273	653,530	100%
2068	5,881,771	351,823,876	345,288,575	653,530	100%
2069	5,881,771	358,359,178	351,823,876	653,530	100%
2070	5,881,771	364,894,479	358,359,178	653,530	100%
2071	5,881,771	371,429,781	364,894,479	653,530	100%
2072	1,837,311	211,246,238	207,593,631	365,261	56%
Total	**334,355,143**	**10,901,490,888**	**10,526,408,501**	**37,508,239**	

Table 181 - Annual VCUs, NERs and Buffer Credits with Totals

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$\Delta C_{BSL,planned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions in the baseline from planned deforestation
Source of data	*Module BL-PL*
Value applied	51,877,310 (CAB_tree + CBG_tree)
Justification of choice of data or description of measurement methods and procedures applied (Justification)	Derived and justified in §4.1 of the PD in which the baseline is set and calculated as required by BL-PL.
Purpose of Data	*Calculation of baseline emissions*
Comments	Parameter is from REDD-MF

Data / Parameter	$GHG_{BSL-WRC}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions in the WRC baseline scenario up to year t*
Source of data	*Module BL-PL*
Value applied	327,887,054
Justification	See Module BL-PL.
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is from REDD-MF

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	Dimensionless
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data	Remote sensing in combination with GPS data collected during ground truthing
Value applied	0
Justification	The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy. Frequency: Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Purpose of Data	Calculation of forest cover
Comments	Where forest land contains more than one forest class, the map must be stratified into forest classes using module X-STR. Parameter is from M-REDD

Data / Parameter	CF
Data unit	t C t d.m.$^{-1}$
Description	Carbon fraction of dry matter in t C t^{-1} d.m.
Source of data	Values from the literature (e.g. IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3) shall be used if available, otherwise default value of 0.47 t C t^{-1} d.m. can be used
Value applied	0.47
Justification	Globally accepted default value derived from IPCC 2006GL
Purpose of Data	Calculation of carbon stock
Comments	Parameter is found in modules M-REDD and CB-AB

Data / Parameter	CF_j
Data unit	t C t d.m.$^{-1}$
Description	Carbon fraction of biomass for tree species j
Source of data	Values from the literature (e.g. IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3) shall be used if available, otherwise default value of 0.47 t C t^{-1} d.m. can be used
Value applied	0.47 or species specific value.
Justification	IPCC 2006GL
Purpose of Data	Calculation of carbon stock
Comments	Where new species are encountered in the course of monitoring, new carbon fraction values must be sourced from the literature or otherwise use the default value. Parameter is from M-REDD

Data / Parameter	D_j
Data unit	t d.m. m $^{-3}$
Description	Density of wood by species from World Wood Database
Source of data	See wood density allometrics attached
Value applied	The species density assumptions are recorded in the appendices.
Justification	Derived from World Wood Database. See also Module CP-AB
Purpose of Data	Calculation of wood density
Comments	Parameter is from M-REDD

Data / Parameter	D_{MN}
Data unit	t d.m. m $^{-3}$
Description	Mean wood density of commercially harvested species.
Source of data	See wood density allometrics attached
Value applied	The species density assumptions are recorded in the appendices.
Justification	Derived from World Wood Database. See also Module CP-AB
Purpose of Data	Calculation of wood density of commercially harvested species.
Comments	Parameter is from M-REDD

Data / Parameter	fj(X,Y)
Data unit	t d.m. tree^{-1}
Description	Allometric equation for species *j* linking measured tree variable(s) to aboveground biomass of living trees, expressed as t d.m. tree^{-1}
Source of data	Chave, J., C. Andalo, S. Brown, M. A. Cairns, J. Q. Chambers, D. Eamus, H. Folster, F. Fromard, N. Higuchi, T. Kira, J.-P. Lescure, B. W. Nelson, H. Ogawa, H. Puig, B. Riera, T. Yamakura. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145: 87-99. The formula is: AGB = 0.0776*(WOOD DENSITY)*(DBH)*(DBH)*(Estimated Height)^0.94

	Diameter at breast height (DBH) and Estimated Height are generated from forest inventory. Wood density uses the World Wood Database
Value applied	Module CP-AB – see also the reference
Justification	Derived from Chave, J., C. Andalo, S. Brown, M. A. Cairns, J. Q. Chambers, D. Eamus, H. Folster, F. Fromard, N. Higuchi, T. Kira, J.-P. Lescure, B. W. Nelson, H. Ogawa, H. Puig, B. Riera, T. Yamakura. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145: 87-99.
Purpose of Data	Calculation of aboveground biomass
Comments	It is necessary to validate the applicability of equations used. Source data from which equation was derived should be reviewed and confirmed to be representative of the forest type/species and conditions in the project and covering the range of potential independent variable values. Parameter is found in modules M-REDD and CB-AB

Data / Parameter	$A_{planned,i}$
Data unit	ha
Description	Total area of planned deforestation over the fixed baseline period for stratum i
Source of data	GPS coordinates and/or Remote Sensing data and/or legal parcel records
Value applied	See table 90 of the RER-CP VCS-PD ver11
Justification	Derived and justified in §4.1 of the PD in which the baseline is set and calculated as required by BL-PL.
Purpose of Data	Calculation of baseline planned deforestation
Comments	Parameter from module M-REDD

Data / Parameter	$C_{BSL,i,t100}$
Data unit	t C ha-1
Description	Peat carbon stock in the baseline scenario in peat depth stratum i at t=100
Source of data	Module X-STR
Value applied	413,465,913.14
Justification	Derived and justified in §4.1 of the PD in which the project emissions are described.
Purpose of Data	Calculation of peat carbon stock
Comments	Parameter from module M-REDD

Data / Parameter	$C_{AB\_tree,peatdome}$
Data unit	t CO_2e ha^{-1}
Description	Mean aboveground tree biomass carbon stock of trees in peat dome forest.
Source of data	*Module CP-AB*
Value applied	343.47
Justification	Derived from and justified in §3.3 of the PD.
Purpose of Data	Calculation of carbon stock
Comments	Parameter from module M-REDD

Data / Parameter	$C_{AB\_tree,dense\ swamp\ forest}$
Data unit	t CO_2e ha^{-1}
Description	Mean aboveground tree biomass carbon stock of trees in dense swamp forest
Source of data	*Module CP-AB*
Value applied	258.96

Justification	Derived from and justified in §3.3 of the PD.
Purpose of Data	Calculation of carbon stock
Comments	Parameter from module M-REDD

Data / Parameter	$C_{AB\_tree,medium\ swamp\ forest}$
Data unit	t CO_2e ha^{-1}
Description	Mean aboveground tree biomass carbon stock of trees in medium swamp forest
Source of data	*Module CP-AB*
Value applied	194.22
Justification	Derived from and justified in §3.3 of the PD.
Purpose of Data	Calculation of carbon stock
Comments	Parameter from module M-REDD and BL-PL

Data / Parameter	$C_{AB\_tree,sparse\ swamp\ forest}$
Data unit	t CO_2e ha^{-1}
Description	Mean aboveground tree biomass carbon stock of trees in sparse swamp forest
Source of data	*Module CP-AB*
Value applied	135.07
Justification	Derived from and justified in §3.3 of the PD.
Purpose of Data	Calculation of carbon stock
Comments	Parameter from module M-REDD and BL-PL

Data / Parameter	$D\%_{planned,i,t}$
Data unit	% $year^{-1}$
Description	Projected annual proportion of land that will be deforested in stratum *i* at year *t*
Source of data	Module BL-PL
Value applied	8.61%
Justification	This is the rate estimated from the baseline plantation development plan. It is almost identical to deforestation rate from analysis of Remote Sensing data and/or legal records for a number of proxy areas (8.46%). It justified in §4.1 of the PD in which the baseline is set and calculated as required by BL-PL.
Purpose of Data	Calculation of projected deforestation
Comments	Must be revisited at the time of baseline revision Parameter from module M-REDD and BL-PL

Data / Parameter	$N_2O_{direct\text{-}N,i,t}$
Data unit	t CO_2e
Description	Direct N_2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum i in year t
Source of data	Module E-NA
Value applied	N/A
Justification	Justified in § 4.2 of the PD. See also Module E-NA
Purpose of Data	Calculation of N_2O emissions on the alternative land use
Comments	Parameter from module M-REDD

Data / Parameter	R
Data unit	t root d.m. t $^{-1}$ shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area:above ground biomass per unit area (not on a per stem basis)
Source of data	

Emissions factors for calculation of biomass for non-tree pools in natural forest and scrub

Forest type	$AGB_{DBH \geq 5cm}$	$AGB_{DBH < 5cm}$	$AGB_{understorey}$	BGB (root)	Litter	Woody debris
		Ratio to (2)	*Ratio to (2+3)*	*Ratio to (2+3+4)*	*Ratio to (2+3)*	*Ratio to (2+3)*
-1	-2	-3	-4	-5	-6	-7
Dense swamp forest	From carbon stock estimate report	16.83%	3.30%	30.54%	2.22%	25.91%
Medium swamp forest		15.00%	4.94%	28.24%	3.01%	31.02%
Sparse swamp forest		15.00%	4.94%	28.24%	3.01%	31.02%
Peat dome forest		16.83%	3.30%	30.54%	2.22%	25.91%

Source: Krisnawati et al. (2015). Standard Methods for Estimating Greenhouse Gas Emissions from Forests and Peatlands in Indonesia (Version 2). Table 2-3. Indonesian National Carbon Accounting System.

Value applied	30.54% peat dome and dense swamp forest 28.24 for medium and sparse swamp forest
Justification	Derived from Table 2-3 of the Indonesian National Carbon Accounting System, Krisnasati, *et al*. 2015. *Standard methods for estimating greenhouse gas emissions from forests and peatlands in Indonesia* (version2). See also Module CP-AB
Purpose of Data	Calculation of carbon stock
Comments	See Module CP-AB Parameter is found in modules M-REDD and CB-AB

Data / Parameter	$A_{BSL,i,t}$ or $A_{i,t}$
Data unit	ha
Description	Area of baseline stratum i in year t
Source of data	Own assessment
Value applied	See table 50 of the RER_CP VCS-PD ver 11
Justification	Delineation of strata is preferably done using a Geographical Information System (GIS), which allows for integrating data from different sources (including GPS coordinates and remote sensing data). Applied techniques must follow international standards of application or local standards as laid out in pertinent scientific literature or handbooks. The area of peat burnt (Apeatburn-WPS,i,t for the project scenario from Module M-PEAT and Apeatburn-BSL,i,t for the baseline scenario from Module BL-PEAT) and area of peatland (not open water, not burnt) (Apeatsoil-WPS,i,t for the project scenario from Module M-PEAT and Apeatsoil-BSL,i,t for the baseline scenario from Module BL-PEAT) determine the difference between the remaining carbon stock in the project scenario and baseline scenarios after 100 years. In the procedures in Section 5.4 these areas are together referred to as AWPS,i,t and ABSL,i,t.
Purpose of Data	Calculation of peat carbon stock
Comments	Parameter from module X-STR

Data / Parameter	$Depth_{peat\text{-}BSL,i,t0}$
Data unit	m
Description	Average peat depth in the baseline scenario and the project scenario in stratum *i* at project start
Source of data	Existing peat depth maps and/or field assessment and/or in combination with remote sensing data.
Value applied	See table 46
Justification	Procedures for monitoring peat depth are given in Module *M-PEAT* and in this module. Peat depths can be derived from • Existing peat depth maps • Literature datasets involving the project or similar areas. • Field measurements, e.g., using a peat corer Remote sensing to derive height of the peat surface above datum. For the purpose of determining the PDT, where relevant, peat depth may be determined as the depth of the peat layer down to a level where no further oxidation or other losses occur (e.g., the average water table depth).
Purpose of Data	Calculation of baseline emissions
Comments	In the absence of peer-reviewed data sources, the project proponent must justify that the data used are representative and that standard methods have been used. Parameter from module X-STR

Data / Parameter	$Depth_{peat\text{-}WPS,i,t0}$
Data unit	m
Description	Average peat depth in the baseline scenario and the project scenario in stratum *i* at project start
Source of data	Existing peat depth maps and/or field assessment and/or in combination with remote sensing data.
Value applied	See table 46 of the RER-CP VCS-PD ver10
Justification	Procedures for monitoring peat depth are given in Module *M-PEAT* and in this module. Peat depths can be derived from • Existing peat depth maps • Literature datasets involving the project or similar areas. • Field measurements, e.g., using a peat corer Remote sensing to derive height of the peat surface above datum. For the purpose of determining the PDT, where relevant, peat depth may be determined as the depth of the peat layer down to a level where no further oxidation or other losses occur (e.g., the average water table depth).
Purpose of Data	Calculation of baseline emissions
Comments	In the absence of peer-reviewed data sources, the project proponent must justify that the data used are representative and that standard methods have been used. Parameter from module X-STR

Data / Parameter	$Sub_{initial\text{-}BSL,i}$
Data unit	m yr^{-1}
Description	Subsidence in the initial years after drainage in stratum i
Source of data	Default factor from scientific literature or field assessments in peatland areas in the same region that underwent equal land use development as projected for the baseline scenario.
Value applied	0.04
Justification	Deemed 0 for RDP projects. Procedures for measuring soil subsidence are described in Module M-PEAT

Purpose of Data	Calculation of baseline GHG emissions
Comments	Parameter from module X-STR

Data / Parameter	$Rate_{peatloss-BSL,i,t}$; $Rate_{peatloss-BSL,i}$
Data unit	m yr^{-1}
Description	Rate of peat loss due to subsidence and fire in the baseline scenario in stratum i in year t; a conservative (low) value may be applied that remains constant over time; Subsidence in the initial years after drainage is not included in this rate; Rate of peat loss due to subsidence and fire in the baseline scenario in stratum i; a conservative (high) value must be applied that remains constant over the time from t = 0 to PDT
Source of data	Default factor from scientific literature or field assessments in peatland areas that are similar to the project area (proxy area)
Value applied	0
Justification	See VMD0016 X-STR Section 5.4. Subsidence in the initial years after drainage is not included in this rate. Also there is no fire modelled in the baseline and the losses are estimated as 0.
Purpose of Data	Calculation of baseline emissions
Comments	Parameter from module X-STR

Data / Parameter	$C_{vol\_lower,BSL,l,t}$; $C_{vol\_lower,WPS,i,t}$
Data unit	kg C m^{-3}
Description	Volumetric carbon content of the peat below the water table in the project scenario in stratum *i* in year *t*
Source of data	Module M-PEAT
Value applied	52 kg C m-3 based on bulk density (0.093 g cm-3), carbon content 56% (Anshari et al., 2010; Page et al., 2011; Hooijer et al., 2012).
Justification	Anshari et al., 2010, Drainage and land use impacts on changes in selected peat properties and peat degradation in West Kalimantan Province, Indonesia, Biogeosciences, 7, 3403-3419; Page et al., 2011. Global and regional importance of the tropical peatland carbon pool, Global change Biology. 17:2, 798-818; Hooijer et al., 2012. Subsidence and carbon loss in drained tropical peatlands. Biogeosciences 9, 1053-1071. See also Module M-PEAT
Purpose of Data	Calculation of project emissions
Comments	See Module M-PEAT Parameter from module X-STR

Data / Parameter	$GHG_{peatsoil,CO2,i,t}$
Data unit	t CO_2e yr^{-1}
Description	CO_2 emissions from microbial decomposition of the peat soil in stratum *i* in year *t*
Source of data	Module BL-PEAT
Value applied	323,866,833
Justification	Justified in §4.1 of the PD. See also module BL-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Parameter from module X-STR

Data / Parameter	VC
Data unit	kg C m^{-3}
Description	Volumetric organic carbon content
Source of data	Direct measurements and/or literature involving the project area or similar areas
Value applied	52 kg C m-3 based on bulk density (0.093 g cm-3), carbon content 56% (Anshari et al., 2010; Page et al., 2011; Hooijer et al., 2012).

Justification	Anshari *et al*., 2010, *Drainage and land use impacts on changes in selected peat properties and peat degradation in West Kalimantan Province*, Indonesia, Biogeosciences, 7, 3403-3419; Page *et al*., 2011. *Global and regional importance of the tropical peatland carbon pool*, Global change Biology. 17:2, 798-818; Hooijer *et al*., 2012. *Subsidence and carbon loss in drained tropical peatlands*. Biogeosciences 9, 1053-1071. See also Module M-PEAT & Module E-NA. Justified in § 4.1 of the PD.
Purpose of Data	Calculation of baseline emissions Calculation of the maximum quantity of GHG emission reductions that may be claimed by the project
Comments	Parameter from module X-STR

Data / Parameter	$E_{REDD\_BSL,SS,I,Pool\#}$
Data unit	t CO_2e
Description	Carbon stock or GHG sources (eg, trees, down dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the REDD baseline scenario
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions used in calculating net emission reductions from the following relevant modules: CP-AB, E-NA.
Value applied	540.6
Justification	See relevant modules noted above in Source of Data.
Purpose of Data	Calculation of uncertainty
Comments	The ex-ante estimation must be derived directly from the estimations originating in the relevant modules: CP-AB, E-NA. Parameter from module X-UNC

Data / Parameter	$U_{REDD\_BSL,SS,i,pool\#}$
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the REDD baseline scenario (1, 2...n represent different carbon pools and/or GHG sources)
Source of data	Calculations arising from field measurement data
Value applied	0.09
Justification	Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence level. For wood products the uncertainty should be the confidence interval around the volume of timber extracted from the forest. For emission sources conservative parameters should be used sufficient to allow the uncertainty to be set as zero.
Purpose of Data	Calculation of uncertainty
Comments	Baseline stocks and sources are estimated ex ante for each baseline period Parameter from module X-UNC

Data / Parameter	$U_{*,i,t}$
Data unit	t CO_2e ha^{-1} yr^{-1}
Description	Uncertainty in parameter * in stratum i in year t * = parameters Eproxy-CO2,t, Eproxy-CH4,t, Epeatditch-CO2,t, Epeatditch-CH4,t and Epeatburn-BSL,
Source of data	Module X-UNC
Value applied	0.09

Justification	Where regression models are used to estimate emissions from oxidation of peat from proxy parameters, uncertainty is calculated by referencing the 95% confidence limits of the regression model, calculated using standard regression analysis techniques. For the value of the referenced proxy in year t, the half-width of the 95% confidence interval for the dependent variable (emissions) is calculated to produce parameters U*t. Where emissions are estimated applying a discrete default factor, uncertainty, U*t, is simply calculated by referencing the 95% confidence limit of the default factor estimate, or assigned as zero if an indisputably conservative factor is used.
Purpose of Data	Calculation of uncertainty
Comments	Parameter from module X-UNC

Data / Parameter	$D\%_{pn}$
Data unit	%
Description	Percent of deforestation in land parcel pn etc of a proxy area as a result of planned deforestation as defined in this module
Source of data	Module X-UNC & Module BL-PL
Value applied	42.26%
Justification	Justified in §4.1 of the PD. See also Module BL-PL
Purpose of Data	Calculation of uncertainty
Comments	Parameter from module X-UNC

Data / Parameter	Yrs_{pn}
Data unit	years
Description	Number of years over which deforestation occurred in land parcel pn in proxy area
Source of data	Module BL-PL
Value applied	N/A
Justification	Justified in §4.1 of the PD. See also Module BL-PL
Purpose of Data	Calculation of uncertainty
Comments	Parameter from module X-UNC

Data / Parameter	$C_{vol\_upper,i,t}$ and $C_{vol\_lower,i,t}$
Data unit	g C cm^{-3}
Description	Average volumetric carbon content of the peat above and below the water table in stratum i at year t
Source of data	Own measurements
Value applied	0.05
Justification	Justified in §4.2 of the PD. Estimated conservatively from literature or determined from field sampling using standard laboratory techniques
Purpose of Data	Calculation of project emissions.
Comments	M-PEAT Section 5.6.5 - if subsidence is chosen as proxy Parameter from module M-PEAT

Data / Parameter	$D_{peatburn,i,t}$
Data unit	m yr^{-1}
Description	The peat fire depth, or fire scar depth per year
Source of data	Data sources or own measurements
Value applied	0
Justification	Field measurements or remote sensing, expert judgment, literature (e.g., Ballhorn *et al.* 2009; Couwenberg *et al*. 2010; Van der Werf *et al.* 2010; IPCC) and/or datasets of historic burn depths involving the project or similar areas
Purpose of Data	Calculation of project emissions.
Comments	See M-PEAT Section 5.6.8

	Parameter from module M-PEAT

Data / Parameter	CC
Data unit	%
Description	Carbon concentration of the peat
Source of data	Anshari et al., 2010; Page et al., 2011; Hooijer et al., 2012
Value applied	Default factor (if employed): 0.56
Justification	Sampling using national default factors
Purpose of Data	Calculation of project emissions
Comments	See M-PEAT Section 5.6.5 - if subsidence is chosen as proxy Parameter from module M-PEAT

Data / Parameter	A_p
Data unit	ha
Description	Total area of peat in the project area (in case of rewetting projects) or proxy area (in case of conservation projects)
Source of data	Module X-STR
Value applied	130,090.00
Justification	Justified in §4.2 of the PD. See also Module X-STR
Purpose of Data	Calculation of project emissions
Comments	Parameter from module M-PEAT

Data / Parameter	$A_{peatburn-BSL,i,t}$
Data unit	ha
Description	Area of peat burnt in stratum i in year t in the project scenario
Source of data	Module X-STR
Value applied	N/A
Justification	Justified in §4.1 of the PD. See also Module X-STR. Also the area of peat burnt can be assessed using field observations and/or remote sensing using best-practice methods (see e.g., Congalton 1991; Congalton et al., 2008). Remote sensing-based data on burnt peat areas must be validated by field observations or other, higher resolution remote sensing data. When using remote sensing, data must be georeferenced into a common geodetic system, for example using the UTM system using best-practice methods in remote sensing (see e.g., Congalton 1991; Congalton et al., 2008). Semi-automated image classification approaches may be applied. Strata must be validated by reference data collected in the field, other official documentation or from recent independent higher resolution remote sensing imagery. See Module X-STR for procedures to delineate all peat strata
Purpose of Data	Calculation of baseline emissions
Comments	Parameter from module M-PEAT & BL-PEAT

Data / Parameter	$GHG_{peatsoil,BSL,i,t}$
Data unit	t CO_2e y^{-1}
Description	CO_2 emissions from microbial decomposition of the peat soil within the project boundary in the baseline scenario in stratum *i* in year *t*
Source of data	Module BL-PEAT
Value applied	323,866,833
Justification	See Module BL-PEAT
Purpose of data	Calculation of baseline emissions
Comments	Parameter from module M-PEAT

Data / Parameter	$L\text{-}D_i$
Data unit	%
Description	Likelihood of deforestation in stratum i
Source of data	Module BL-PL
Value applied	1
Justification	For all areas not both under Government control and zoned for deforestation, *L-Di* must be equal to 1 For areas under Government control and zoned for deforestation *L-Di* must be calculated as the summed proxy areas in the appropriate stratum divided by the areas within these proxy areas that has been deforested within the previous five years.
Purpose of Data	Calculation of projected deforestation
Comments	Alternatively, BCEF, where not directly available, can be calculated as wood density (t dry mass m-3 green volume) * BEF (Biomass Expansion Factor = ratio of aboveground biomass to biomass of the commercial volume). If using BCEFs developed outside the project country (cases (c) and (d) above under Source of data), it is necessary to validate the applicability of BCEFs used. Parameter is found in BL-PL

Data / Parameter	$GHG_{BSL\text{-}PEAT}$
Data unit	t CO_2e
Description	Net GHG emissions in the WRC baseline scenario up to year t*
Source of data	Module BL-PEAT
Value applied	327,887,054
Justification	Derived and justified in §4.1 of the PD in which the baseline is set and calculated as required by BL-PEAT
Purpose of Data	*Calculation of baseline emissions*
Comments	Parameter is found in module BL-PL A

Data / Parameter	$GHG_{peatburn\text{-}BSL,i,t}$
Data unit	t CO_2e ha^{-1} y^{-1}
Description	GHG emissions from burning of peat in the baseline scenario in stratum i at year t
Source of data	(IPCC) default factors, literature values or direct measurements
Value applied	N/A
Justification	Justified in §4.1 of the PD. Procedures for assessing GHG emissions from burning of biomass and peat are provided in Module E-BPB.
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{proxy\text{-}CO2,i,t}$
Data unit	t CO_2e ha^{-1} y^{-1}
Description	Emission of CO_2 in relation to the chosen proxy in stratum i at year t
Source of data	(IPCC) default factors, literature values or direct measurements IPCC (2013) Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Value applied	73.34
Justification	Justified in §4.1 of the PD. See also Module M-PEAT
Purpose of Data	Calculation of baseline emissions

Comments	Proxies must comply with VCS requirements on proxies. It must be demonstrated that the proxy used is strongly correlated with CO2 emissions by referring to IPCC, literature or own data. When referring to own data, comparison with literature values must be made. Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{proxy\text{-}CH4,i,t}$
Data unit	t CH_4 ha^{-1} y^{-1}
Description	Emission of CH_4 in relation to the chosen proxy in stratum i at year t
Source of data	IPCC (2013) Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Value applied	0.0756
Justification	Justified in §4.1 of the PD. See also Module M-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Proxies must comply with VCS requirements on proxies. It must be demonstrated that the proxy used is strongly correlated with CO2 emissions by referring to IPCC, literature or own data. When referring to own data, comparison with literature values must be made. Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{peatditch\text{-}CO2,i,t}$
Data unit	t CO_2e ha^{-1} y^{-1}
Description	Emission of CO_2 from ditch and open water stratum i at year t
Source of data	Project-specific values; appropriate literature sources
Value applied	3.01
Justification	Justified in §4.1 of the PD. See also Module M-PEAT
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	$GHG_{peatditch\text{-}CH4,i,t}$
Data unit	t CO_2e ha^{-1} y^{-1}
Description	Emission of CH_4 from ditch and open water stratum i at year t
Source of data	Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Value applied	63.25
Justification	Justified in §4.1 of the PD. See also Module M-PEAT and IPCC 2013GL.
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	$A_{peatsoil\text{-}BSL,i,t}$
Data unit	ha
Description	Area of peatland (not open water, not burnt) in stratum i in year t in the project scenario
Source of data	Module X-STR
Value applied	130,090.00
Justification	Justified in §4.1 of the PD. See also Module X-STR
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	$A_{ditch-BSL,i,t}$
Data unit	ha
Description	Total area of ditch and other open water stratum i in year t in the baseline scenario
Source of data	Module X-STR
Value applied	158.54
Justification	Justified in §4.1 of the PD. See also Module X-STR
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT

Data / Parameter	$t_{PDT-BSL,i}$
Data unit	yr
Description	Peat depletion time (PDT) in the baseline scenario in stratum i in years elapsed since the project start
Source of data	Module X-STR
Value applied	>100 years
Justification	Justified in §4.1 of the PD. See also Module X-STR
Purpose of Data	Calculation of baseline emissions
Comments	Parameter is found in module BL-PEAT and in LK-ASP

Data / Parameter	$Hist_{Hai}$
Data unit	ha
Description	Average annual area of deforestation by the baseline agent of deforestation in stratum i for the 5 years prior to project implementation
Source of data	Data sources or own measurements
Value applied	0
Justification	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation.
Purpose of Data	Calculation of annual deforestation by the baseline agent
Comments	Must be re-evaluated whenever the baseline is revised Parameter is found in module LK-ASP

Data / Parameter	GHG_{LK-ECO}
Data unit	t CO_2e
Description	Net GHG emissions due to ecological leakage from the WRC project activity up to year t
Source of data	On the ground observations, remotely sensed data and GIS.
Value applied	0
Justification	Under the applicability conditions of this methodology, ecological leakage affecting the soil (peat) carbon pool does not occur, by ensuring that the effect of hydrological connectivity with adjacent areas is insignificant, as outlined in §5 of LK-ASP.
Purpose of Data	Calculation of Leakage
Comments	All of the Projects areas where blocking canals occurs are a significant distance from any adjacent area, thus the risk of ecological is insignificant.

5.2 Data and Parameters Monitored

Data / Parameter	$\Delta C_{WPS-REDD}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions within the project area under the project scenario;
Source of data	M-REDD
Description of MM&P	See Module M-REDD
Frequency	Upon each verification event. See also Module M-REDD
Value applied	-1,466,626 t CO_2e
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	Calculation of project emissions
Calculation method	See Module M-REDD
Comments	Parameter is found in REDD-MF

Data / Parameter	$\Delta C_{LK-AS,planned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation
Source of data	Public records of Indonesian HTI concessions from MoEF. See also Module LK-ASP
Description of MM&P	See Module LK-ASP
Frequency	Upon each verification event. See also Module LK-ASP
Value applied	0
Monitoring equipment	GIS and remote sensed images. See also Module LK-ASP
QA/QC	See Module LK-ASP
Purpose of data	Calculation of leakage
Calculation method	See Module LK-ASP
Comments	Parameter is found in REDD-MF

Data / Parameter	$GHG_{WPS-WRC}$
Data unit	t CO_2e
Description	Net GHG emissions in the WRC project scenario up to year t*
Source of data	Module M-PEAT
Description of MM&P	See Module M-PEAT
Frequency	Upon each verification event. See also Module M-PEAT
Value applied	1,799,282
Monitoring equipment	See Module M-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of project emissions
Calculation method	See Module M-PEAT
Comments	Parameter is found in REDD-MF

Data / Parameter	GHG_{LK-ECO}
Data unit	t CO_2e
Description	Net GHG emissions due to ecological leakage from the WRC project activity up to year t
Source of data	Module LK-ECO
Description of MM&P	See Module LK-ECO
Frequency	See Module LK-ECO
Value applied	0
Monitoring equipment	See Module LK-ECO
QA/QC	See Module LK-ECO
Purpose of data	Calculation of leakage
Calculation method	See Module LK-ECO
Comments	Parameter is found in REDD-MF

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	Dimensionless

Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data	Remote sensing in combination with GPS data collected during ground truthing
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Maps provided for 2016 to 2020. No evidence or indication of deforestation or forest degradation.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	The minimum map accuracy must be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy. Frequency: Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Calculation method	See Module M-REDD
Comments	Where forest land contains more than one forest class, the map must be stratified into forest classes using module X-STR. Parameter is from module M-REDD

Data / Parameter	$A_{DefPA,i,u,t}$
Data unit	Ha
Description	Area of recorded deforestation in the project area in stratum i converted to land use u at time t
Source of data	Remote sensing imagery
Description of MM&P	See Module M-REDD
Frequency	Frequency: Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	0 ha. There is no deforestation or forest degradation detected during the monitoring period.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	Calculation of deforestation
Calculation method	See Module M-REDD
Comments	Ex-ante, an estimation shall be made of deforestation in the with-project case. If the belief is that zero deforestation will occur within the project boundaries then this parameter may be set to zero if clear infrastructure, hiring and policies are in place to prevent deforestation. Parameter is from module M-REDD

Data / Parameter	F_{LU}
Data unit	Dimensionless
Description	Land use factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Factor = 1. No FLU because there is no skid trail creation detected during the monitoring period.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	"Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock. The management factor after conversion can be conservative
Calculation method	See Module M-REDD
Comments	Parameter is from module M-REDD

Data / Parameter	F_{MG}
Data unit	Dimensionless
Description	Management factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Factor = 1. No FMG because there is no skid trail creation detected during the monitoring period.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	"Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock.
Calculation method	See Module M-REDD
Comments	Parameter is from module M-REDD

Data / Parameter	F_I
Data unit	Dimensionless
Description	Input factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Description of MM&P	See Module M-REDD
Frequency	See Module M-REDD
Value applied	Factor = 1.
Monitoring equipment	See Module M-REDD
QA/QC	See Module M-REDD
Purpose of data	"Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock.
Calculation method	The land use factor after conversion can be conservatively assumed to equate 1, the default value for meduim input.
Comments	Parameter is from module M-REDD

Data / Parameter	$A_{planned,i}$
Data unit	Ha
Description	Total area of planned deforestation over the entire project lifetime for stratum i
Source of data	Data sources or own measurements
Description of MM&P	GPS coordinates and/or remote sensing data and/or legal parcel records. Ex ante, Aplanned,i must be determined as described in Module BL-PL
Frequency	Must be examined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	78,395.8 ha of planned deforestation
Monitoring equipment	See Module BL-PL
QA/QC	See section 9.3 of REDD+ MF or other VCS methodology that uses this module.
Purpose of data	Calculation of baseline deforestation
Calculation method	See Module BL-PL
Comments	See Module BL-PL Parameter is from modules M-REDD, BL-PL & LK-ASP

Data / Parameter	$\Delta C_{BSL,i}$
Data unit	t CO_2e ha^{-1}
Description	Net carbon stock changes from planned deforestation in all pools in the baseline stratum i
Source of data	Module BL-PL
Description of MM&P	See Module BL-PL
Frequency	See Module BL-PL
Value applied	19,697,112
Monitoring equipment	See Module BL-PL
QA/QC	See Module BL-PL
Purpose of data	Calculation of leakage emissions, analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation.
Calculation method	See Module BL-PL
Comments	Must be re-evaluated whenever the baseline is revised Parameter is found in modules M-REDD & LK-ASP

Data / Parameter	$C_{AB\_tree,Dense\ swamp\ forest}$
Data unit	t CO_2e /ha
Description	Carbon stock in aboveground biomass of trees in plot sp in stratum i
Source of data	APRIL forest inventories, 2015 and 2020
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	150.3 t CO_2e /ha
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	Parameter is from module M-REDD

Data / Parameter	$C_{AB\_tree,Medium\ swamp\ forest}$
Data unit	t CO_2e /ha
Description	Carbon stock in aboveground biomass of trees in plot sp in stratum i
Source of data	APRIL forest inventories, 2015 and 2020
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	112.7 t CO_2e /ha
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	Parameter is from module M-REDD

Data / Parameter	$C_{AB\_tree,Sparse\ swamp\ forest}$
Data unit	t CO_2e /ha
Description	Carbon stock in aboveground biomass of trees in plot sp in stratum i
Source of data	See Module CP-AB
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	78.4 t CO_2e /ha
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	Parameter is from module M-REDD

Data / Parameter	$C_{AB\_tree,peat\ dome\ forest}$
Data unit	t C
Description	Carbon stock in aboveground biomass of trees in plot sp in stratum i
Source of data	See Module CP-AB
Description of MM&P	See Module CP-AB
Frequency	See Module CP-AB
Value applied	199.3 t CO_2e /ha
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	Calculation of aboveground biomass
Calculation method	See Module CP-AB
Comments	See Module CP-AB Parameter is from module M-REDD

Data / Parameter	*AWPS,i,t* or *Ai,t*
Data unit	Ha
Description	Area of project stratum *i* in year *t*
Source of data	Own assessment
Description of MM&P	GIS coverages, ground survey data and/or remote imagery (satellite or aerial photographs), as outlined in Section 5. The area of peat burnt (*Apeatburn-WPS,i,t* for the project scenario from Module *M-PEAT* and *Apeatburn-BSL,i,t* for the baseline scenario from Module *BL-PEAT*) and area of peatland (not open water, not burnt) (*Apeatsoil-WPS,i,t* for the project scenario from Module *M-PEAT* and *Apeatsoil-BSL,i,t* for the baseline scenario from Module *BL-PEAT*) determine the difference between the remaining carbon stock in the project scenario and baseline scenarios after 100 years. In the procedures in Section 5.4 these areas are together referred to as *AWPS,i,t* and *ABSL,i,t*.
Frequency	At each monitoring event
Value applied	130,090 ha
Monitoring equipment	See Module M-PEAT
QA/QC	See Section 9.3 of *REDD+ MF* or other VCS methodology that uses this module.
Purpose of data	Calculation of project emissions
Calculation method	See Module M-PEAT
Comments	the area for *AWPS,i,t100* must be used Parameter is from module X-STR

Data / Parameter	$Rate_{peatloss\text{-}WPS,i,t}$
Data unit	m yr^{-1}
Description	Rate of peat loss due to subsidence and fire in the project scenario in stratum *i* in year *t*
Source of data	Module M-PEAT
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	The rate of peat loss due to subsidence and fire due in the project scenario is approximately 2.26 cm/year over the monitoring period.
Monitoring equipment	See Module M-PEAT
QA/QC	Calculation of baseline emissions
Purpose of data	See Module X-STR
Calculation method	See Module X-STR
Comments	Parameter is from module X-STR

Data / Parameter	$GHG_{peatsoil,CO2,i,t}$
Data unit	t CO_2e yr^{-1}
Description	GHG emissions from microbial decomposition of the peat soil in stratum *i* in year *t*
Source of data	Module M-PEAT
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	GHG emissions from microbial decomposition of the peat soil within the project boundary in the baseline scenario during the monitoring period (17 June 2016 to 31 July 2020) is 15,390,409 t CO_2e.
Monitoring equipment	See Module BL-PEAT
QA/QC	See Module BL-PEAT
Purpose of data	Calculation of project emissions. See module M-PEAT
Calculation method	See Module M-PEAT
Comments	Parameter is from module X-STR

Data / Parameter	$E_{REDD,WPS,SS,i,\ Pool\#}$
Data unit	t CO_2e
Description	Percentage of uncertainty of Carbon stock or GHG sources (eg, trees, down dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the project scenario
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions used in calculating net emission reductions from the following relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA.
Description of MM&P	See Module X-UNC
Frequency	See Module X-UNC
Value applied	8.65%
Monitoring equipment	See Module X-UNC
QA/QC	See Module X-UNC
Purpose of data	Calculation of uncertainty
Calculation method	See Module X-UNC
Comments	The ex ante estimation shall be derived directly from the estimations originating in the relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA. Parameter stems from module X-UNC

Data / Parameter	$U_{REDD,WPS,SS,i,pool\#}$
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the project case (1, 2...n represent different carbon pools and/or GHG sources)
Source of data	Calculations arising from field measurement data
Description of MM&P	See Module X-UNC
Frequency	See Module X-UNC
Value applied	The calculated uncertainty in the AGB carbon stock inventory was 8.65%.
Monitoring equipment	See Module X-UNC
QA/QC	See Module X-UNC
Purpose of data	"Calculation of uncertainty. Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence level.
Calculation method	For wood products the uncertainty should be the confidence interval around the volume of timber extracted from the forest. For emission sources conservative parameters should be used sufficient to allow the uncertainty to be set as zero."
Comments	The ex ante estimation shall be derived directly from the estimations originating in the relevant modules: CP-AB, CP-D, CP-L, CP-S, CP-W, E-BB, E-FFC, E-NA. Parameter stems from module X-UNC

Data / Parameter	$GHG_{peatburn-WPS,i,t}$
Data unit	t CO_2e ha^{-1} y^{-1}
Description	CO2 emissions from burning of peat within the project boundary in the project scenario in stratum *i* in year *t*
Source of data	IPCC default factors, literature or direct measurements
Description of MM&P	See Module M-PEAT
Frequency	At each monitoring period
Value applied	0 t CO_2e ha^{-1} y^{-1}. No fire or burning of peat detected during the monitoring period.
Monitoring equipment	GIS and remote sensed images; see also Module M-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of project emissions
Calculation method	See Module M-PEAT
Comments	Parameter is found in M-PEAT

Data / Parameter	$GHG_{proxy-CO2,i,t}$
Data unit	t CO_2e ha^{-1} y^{-1}
Description	Soil emission of CO_2 as per the chosen proxy in stratum *i* at year *t*
Source of data	(IPCC) default factors, literature values or direct measurements
Description of MM&P	The estimation of GHG emissions in rewetted (for RPD projects) or undrained or partially drained (for CUPP projects) peat follows similar procedures as described in Module *BL-PEAT*.
Frequency	At each monitoring period
Value applied	Soil emission of CO_2 in rewetted peat was estimated to be 0 t CO_2e ha^{-1} y^{-1}.
Monitoring equipment	See Module BL-PEAT
QA/QC	See Section 9.3 of *REDD+ MF* or other VCS methodology that uses this module
Purpose of data	Calculation of baseline emissions.
Calculation method	See Module BL-PEAT
Comments	Proxies must comply with VCS requirements on proxies.[11] It must be demonstrated that the proxy used is strongly correlated with CO_2 emissions by referring to IPCC, literature or own data. When referring to own data, comparison with literature values must be made. Parameter is found in M-PEAT

Data / Parameter	$GHG_{proxy-CH4,i,t}$
Data unit	t CH_4 ha^{-1} y^{-1}
Description	Soil emission of CH_4 as per the chosen proxy in stratum *i* at year *t*
Source of data	(IPCC) default factors, literature values or direct measurements
Description of MM&P	The estimation of GHG emissions in rewetted (for RPD projects) or undrained or partially drained (for CUPP projects) peat follows similar procedures as described in Module *BL-PEAT*.
Frequency	At each monitoring period
Value applied	Soil emission of CH_4 in rewetted peat was estimated to be 0 t CH_4 ha^{-1} y^{-1}.
Monitoring equipment	See Module BL-PEAT
QA/QC	See Section 9.3 of *REDD+ MF* or other VCS methodology that uses this module
Purpose of data	Calculation of project emissions
Calculation method	See Module BL-PEAT
Comments	Proxies must comply with VCS requirements on proxies.[12] It must be demonstrated that the proxy used is strongly correlated with CO_2 emissions by referring to IPCC, literature or own data. When referring to own data, comparison with literature values must be made. Parameter is found in M-PEAT

Data / Parameter	$A_{peatsoil-WPS,i,t}$
Data unit	ha
Description	Area of peatland (not open water, not burnt) in stratum i in year t in the project scenario
Source of data	Module X-STR
Description of MM&P	See Module X-STR
Frequency	See Module X-STR
Value applied	139,090 ha
Monitoring equipment	See Module M-PEAT

QA/QC	See Section 9.3 of *REDD+ MF* or other VCS methodology that uses this module
Purpose of data	Calculation of baseline emissions. Module X-STR
Calculation method	See Module X-STR
Comments	Parameter is found in M-PEAT

Data / Parameter	$A_{ditch\text{-}WPS,i,t}$
Data unit	ha
Description	Total area of ditch and other open water stratum i in year t in the baseline scenario
Source of data	Module X-STR
Description of MM&P	See Module X-STR
Frequency	See Module X-STR
Value applied	9.3 ha at the end of the monitoring period.
Monitoring equipment	See Module X-STR
QA/QC	See Section 9.3 of *REDD+ MF* or other VCS methodology that uses this module
Purpose of data	Calculation of project emissions. Module X-STR
Calculation method	See Module X-STR
Comments	Parameter is found in M-PEAT

Data / Parameter	$A_{peatburn\text{-}WPS,i,t}$
Data unit	ha
Description	Area of peat burnt in stratum i in year t in the project scenario
Source of data	Module X-STR
Description of MM&P	The area of peat burnt can be assessed using field observations and/or remote sensing using best-practice methods (see e.g., Congalton 1991; Congalton *et al*., 2008). Remote sensing-based data on burnt peat areas must be validated by field observations or other, higher resolution remote sensing data. When using remote sensing, data must be georeferenced into a common geodetic system, for example using the UTM system using best-practice methods in remote sensing (see e.g., Congalton 1991; Congalton *et al*., 2008). Semi-automated image classification approaches may be applied. Strata must be validated by reference data collected in the field, other official documentation or from recent independent higher resolution remote sensing imagery.
Frequency	See Module X-STR
Value applied	Area = 0 hectares. No peat burning was detected during the monitoring period.
Monitoring equipment	See Module X-STR
QA/QC	See Section 9.3 of *REDD+ MF* or other VCS methodology that uses this module
Purpose of data	Calculation of project emissions.
Calculation method	See Module M-PEAT
Comments	Parameter is found in M-PEAT

Data / Parameter	$GHG_{peatditch\text{-}CO2,i,t}$
Data unit	$CO_2e\ ha^{-1}\ y^{-1}$
Description	Emission of CO_2 from ditch and open water stratum i at year t
Source of data	Project-specific values; appropriate literature sources
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	3.01 t $CO_2e\ ha^{-1}\ y^{-1}$. Source: Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Monitoring equipment	See Module M-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of baseline emissions. See Module M-PEAT
Calculation method	See Module M-PEAT
Comments	Parameter is found in M-PEAT

Data / Parameter	$GHG_{peatditch-CH4,i,t}$
Data unit	$CO_2e\ ha^{-1}\ y^{-1}$
Description	Emission of CH_4 from ditch and open water stratum i at year t
Source of data	Project-specific values; appropriate literature sources
Description of MM&P	See Module M-PEAT
Frequency	See Module M-PEAT
Value applied	2,259 kg CH_4 ha^{-1} yr^{-1} equivalent to 63.2 t CO_2e ha^{-1} y^{-1}. Source: Intergovernmental Panel on Climate Change. 2013. 2013 Supplement to the 2006 IPCC guidelines for national greenhouse gas inventories: Wetlands. Methodological guidance on lands with wet and drained soils and constructed wetlands for wastewater treatment. Gyldenkaerne, S. and Lin, E. (eds). Japan: Institute for Global Environmental Strategies [IGES].
Monitoring equipment	See Module BL-PEAT
QA/QC	See Module M-PEAT
Purpose of data	Calculation of baseline emissions. See Module X-STR
Calculation method	See Module M-PEAT
Comments	Parameter is found in M-PEAT

Data / Parameter	N
Data unit	Dimensionless
Description	Number of sample points
Source of data	Recording and archiving of number of sample points
Description of measurement methods and procedures to be applied (Description of MM&P)	See Module CP-AB
Frequency of monitoring/recording (Frequency)	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included monitoring shall occur at least every five years
Value applied	N/A
Monitoring equipment	See Module CP-AB
QA/QC procedures to be applied (QA/QC)	See Module CP-AB
Purpose of data	Monitoring
Calculation method	See Module CP-AB
Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known *ex-ante*. Where part of project monitoring, *ex-ante* the number of sample plots shall be estimated based on projected sample

Data / Parameter	DBH
Data unit	*cm*
Description	Diameter at breast height of a tree in cm
Source of data	Field measurements in sample plots
Description of MM&P	Typically measured 1.3m aboveground. Measure all trees above some minimum DBH in the sample plots. The minimum DBH varies depending on tree species and climate; for instance, the minimum DBH may be as small as 2.5 cm or as high as 20 cm, but for humid tropical forests 10 cm is commonly used. Minimum DBH employed in inventories is held constant for the duration of the project.
Frequency	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included monitoring shall occur at least every five years
Value applied	N/A
Monitoring equipment	See Module CP-AB
QA/QC	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended.
Purpose of data	Carbon stock in AGB
Calculation method	See Module CP-AB

Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known ex-ante. Where part of project monitoring, ex-ante DBH shall be estimated based on projections of growth.

Data / Parameter	H
Data unit	*m*
Description	Total height of tree
Source of data	Field measurements in sample plots
Description of MM&P	See Module CP-AB
Frequency	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included monitoring shall occur at least every five years
Value applied	N/A
Monitoring equipment	See Module CP-AB
QA/QC	See Module CP-AB
Purpose of data	See Module CP-AB
Calculation method	See Module CP-AB
Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known *ex-ante*. Where part of project monitoring, *ex-ante* height shall be estimated based on projections of growth.

Data / Parameter	Ecological leakage process as described in Table 5.1
Data unit	N/A
Description	N/A
Source of data	On the ground observations, remote sensed data and GIS
Description of MM&P	See Module LK-ECO
Frequency	At each monitoring
Value applied	0
Monitoring equipment	See Module LK-ECO
QA/QC	See Module LK-ECO and REDD+ MF
Purpose of data	Assessing avoidance of leakage emissions
Calculation method	See Module LK-ECO for process – not calculations
Comments	N/A

5.3 Monitoring Plan

5.3.1 Monitoring Methods

The RER Carbon Project is required to undertake periodic monitoring of the Project and leakage area.

The RER-CP Monitoring Reporting and Verification (MRV) system uses a dynamic system that seeks to identify, assess and create a mitigation plan for potential risks that might arise concerning the Project. The system is established to ensure a process for monitoring Project progress and documenting lessons learned or corrections that may be needed and incorporating them into Project decision-making for future monitoring periods. The Project adopts the systems that are already in place and implemented for APRIL.

The company (i.e. APRIL) activity in Riau Province being PEFC certified, has *in situ*, a set of procedures and systems in place (verified annually during the PEFC verification audits) that regulate the management of documents, the procedures for verification and validation, etc. These are systems that RER and APRIL management and staff are used to working with. The quality assurance and quality control (QA/QC) systems already in place will serve as a "backbone" for the Project QA/QC system, for example, to handle complaints or non-conformities, etc.

The MRV Plan is described in detail in Appendix 24 - RER-CP MRV Plan; it is based on 10 main activities:

1. Remote Sensed Monitoring – Natural Disturbances/Anthropogenic Disturbances
2. Field Monitoring
    a. Permanent Sample Plot (PSP) Inventory
    b. Illegal Activities and Fire
    c. Ground Water Table & Subsidence Monitoring
    d. Changes of Peat Carbon Stock (i.e. bulk density and carbon contents) & Peat Depth
    e. Dam & Canal Monitoring
    f. Weather Monitoring
    g. GHG Flux Measurements
3. Leakage Monitoring
4. Uncertainty Monitoring
5. Non-Permanence Risk Assessment
6. Quality Assurance/ Quality Control
7. Training
8. Big Data and Document Management
9. VCU Calculations
10. Stakeholder Access to Online Selected Documents

5.3.2 Policies for oversight and accountability of monitoring activities

5.3.2.1 General Approaches for Monitoring

The monitoring plan incorporates the latest scientific findings and new technologies as they become available to increase effectiveness of existing practices systematically.

The monitoring plan includes monitoring changes in land cover, peat thickness and water table level, as per the latest VCS VM0007 REDD+ Methodology Framework (REDD+ MF) requirements.

MRV Activities

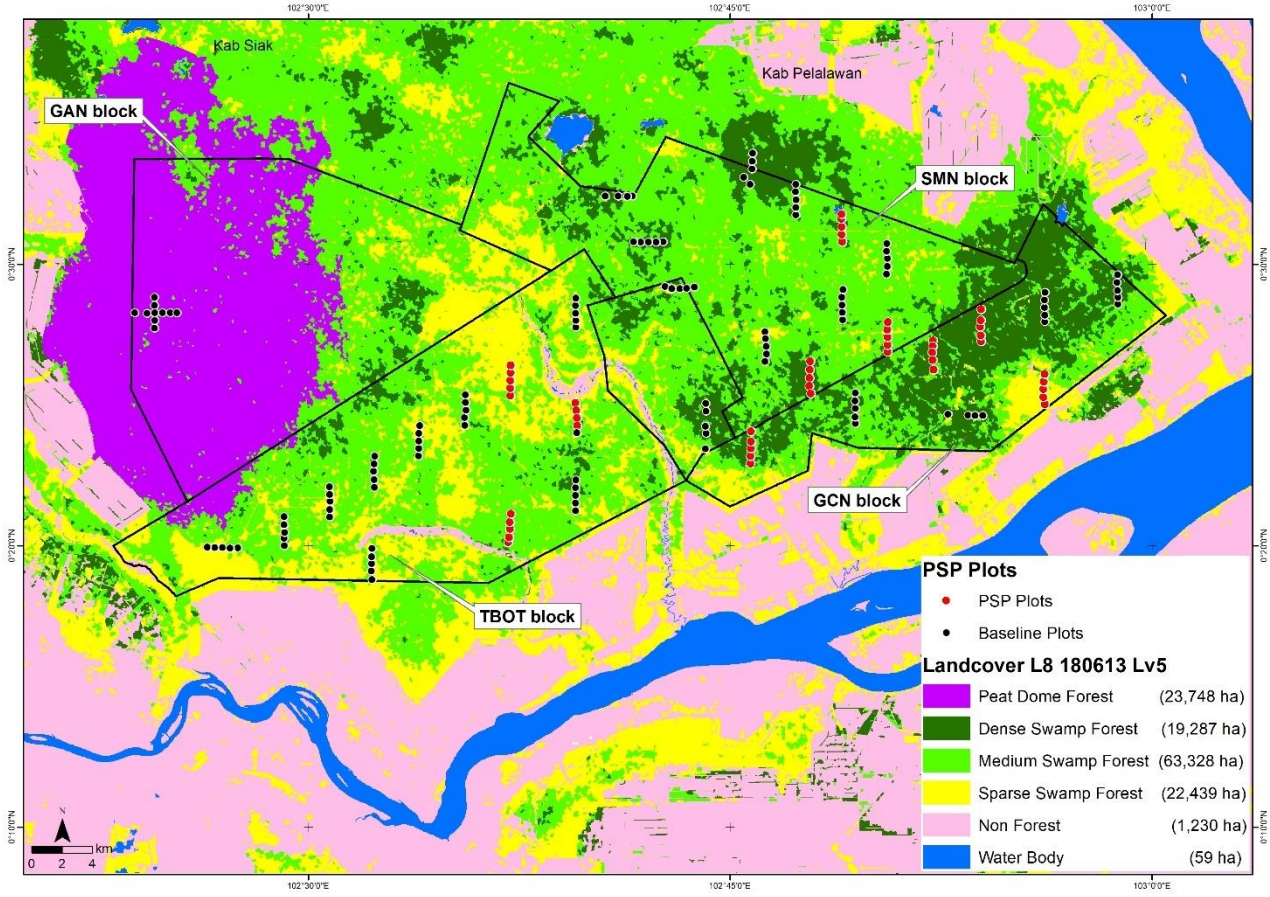
1. Remotely Sensed Monitoring

Prior to verification and at least every 5 years, satellite images will be acquired by the Project of the Project Area. Those images will be analysed to determine any evidence of forest loss or forest changes, either from natural disturbances or from human-induced changes.

2. Field Monitoring

a. Permanent Sample Plot Inventory

The Project has established a network of 40 Permanent Sample Plots that will be monitored upon verification but at least every 5 years. In practice, at least 50% of the plots will be measured at each monitoring event.



Map 43- Established Permanent Sample Plots (PSP) in red and AGB inventory plots.

Prior to plot measurement, the labels on each tree will be checked. In-growth (trees that have attained 5cm DBH since the last measurement) will be identified and labelled for measurement. Trees that have died since the last measurement will be identified – these should be measured in the current measurement event. Trees that were declared dead in the previous measurement event should be checked to confirm the "dead" status – these trees can be confirmed as dead and permanently removed from the live tree list for subsequent PSP measurements.

The parameters and forest dynamics will then be measured, analysed and compiled to estimate the carbon stock changes for above-ground biomass and regrowth of the forest.

b. Illegal Activities and Fire

Illegal logging is not considered a viable threat of the Project as there are no communities that reside directly in the Project Area. Furthermore, the closest communities have limited means to access the Project Area (i.e. by boat or on foot without roads). Nonetheless, on-the-ground conditions can change rapidly in the Province of Riau and Indonesia.

The Project will maintain guard posts at the Project's river access points along the Serkap, Turip and Sangar rivers. The guard posts will record and monitor all river access and use conducted by boats into the Project

Area (primarily local fisherman). Regular field patrols by boat and foot will occur in the project area both for unauthorised activity and for fire.

The Project, in conjunction with APRIL, monitors all fire hotspots on the Kampar Peninsula and the project area for fire hotspots via multiple remote sensing platforms.

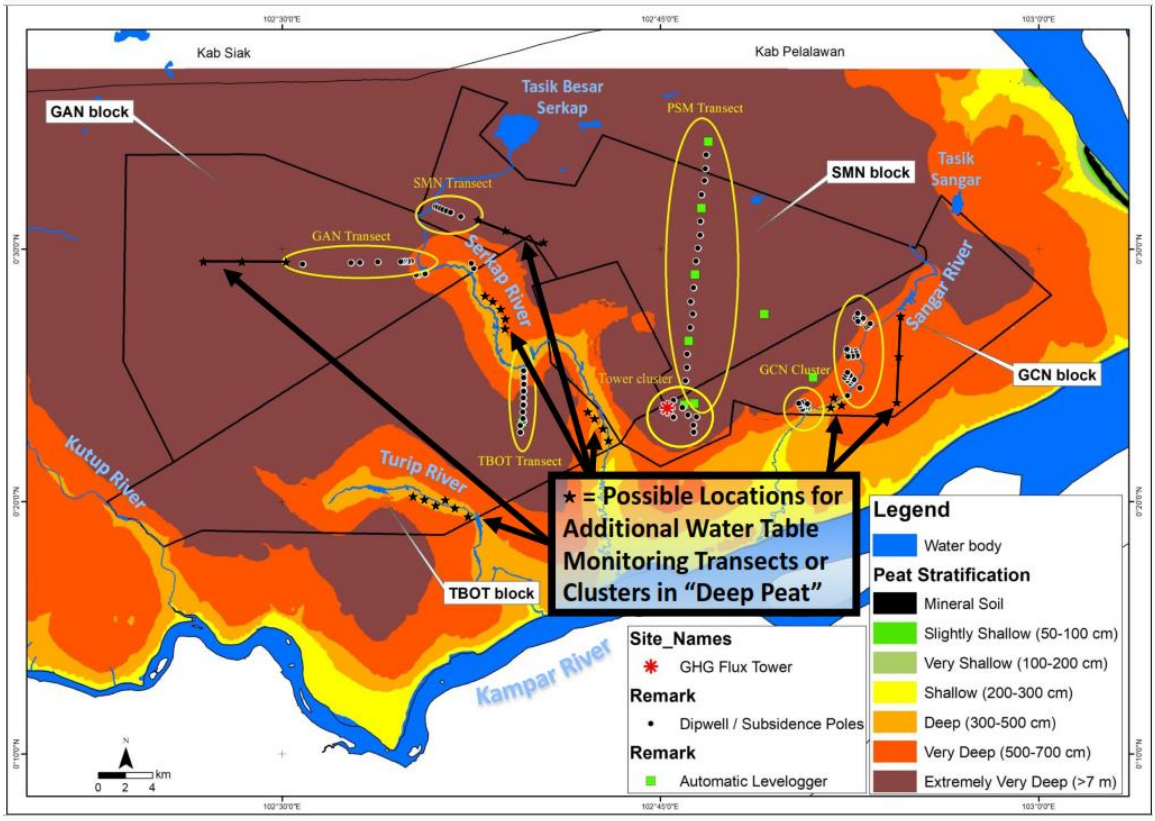
c. Ground Water Table & Subsidence Monitoring

Current Monitoring. The Project has a number of *in situ* automatic level-loggers, dipwells and subsidence poles to monitor the peat characteristics. At present, there are 81 subsidence poles, of which 44 are integrated with a manual dipwells in the Project Area. The Project also has 9 automatic level loggers, 5 of which run (every 5km) along a north-south transect known as the PSM transect, originating from the GHG Flux Tower. There are a further 4 automatic level loggers in the Project Area that pre-date the carbon project (two in TBOT, one in GCN and one in SMN). The distribution of these monitoring points is set forth in Map 44 below. Numerous automatic level-loggers are also currently *in situ* outside of the Project Area in the Project Zone and can be used to monitor for ecological leakage issues.

Medium Term Increases. In addition to the current monitoring stations, the Project intends to increase its monitoring capabilities so that there are at a minimum 10 automatic level-loggers and subsidence poles on dedicated transects that correspond to each of the three peat strata. These will be positioned, if feasible, to correspond to current PSP locations. This will be completed before the end of 2024 to coincide with the baseline readjustment.

Long term, the Project intends to increase the current monitoring such that there will be one monitoring point for 50% of every 300 ha in the Project Area classified as Deep Peat (300-500cm) and Very Deep Peat (500-700 cm). Further there will be one monitoring point for 33% of every 1000 ha in the Project Area classified as Extremely Very Deep Peat (700+ cm). Some or all of these monitoring points will be automatic level loggers.

The density of monitoring equipment, i.e. dipwells or level loggers and subsidence poles will then be adequate for long term scientific monitoring. Map 44 shows the possible locations for monitoring locations and transects.



Map 44- The Existing and Proposed New Monitoring transects or Clusters

d. Changes of Peat Carbon Stock & Peat Depth (i.e. Bulk Density, Nitrogen, Carbon Contents and Depth)

In line with water table levels, changes in carbon stocks must also be monitored. The monitoring will be done at least every 10 years but maybe also done once every 5 years. Peat depth will also be re-assessed at least every 10 years at the baseline review event. The sample size of the peat depth in line with the current methodological requirements unless a methodological deviation is agreed to with the VCS. It can be assumed that the sample size will be at least as intensive as past efforts, which resulted in 443 peat depth points (see above at § 3.3.4.2). However, it is more likely that the effort will be more intensive with peat depth sampling occurring according to the Indonesian National requirements as well as the Project's peat expert. As such, depth sampling would be conducted in 15% of the total are at a sampling rate of 1 depth measurement per 25 ha. This would result in 780 peat depth and carbon content samples. The Projects peat expert, Dr. Gusti Anshari[106] believes that this approach is sufficient. All resampling will be conducted in transects that cross the concessions in line with the current methodological requirements in order to ensure a new depth map can be generated. The Project will also work with the VCS to consider the appropriateness of the above in light of the updated requirements in VCS VMD046 (M-PEAT)[107].The change of carbon stocks in peats indicate the rate of peat accumulation if the change is positive. On the other hand, the negative change of carbon stock indicates peat as a source of carbon. The ratio of carbon and nitrogen indicates the potential peat decomposition.

e. Dam & Canal Monitoring

The Project has since 2016 been actively blocking the 146 km of canals on the project area with hand-built dams as a significant component of the WRC project activity. Foot patrols regularly monitor both the dams and canals. The dams are monitored to ensure that they remain in position and intact. If there is any degradation to their structure, this is noted, and they are scheduled for service. Monitoring and maintaining the dams is an integral part of ensuring that the Project's rewetting activity remains in place. Canals are also monitored to determine if they are filling in, collapsing or in some other way reverting to a more natural state. The Project will establish a standardised operating procedure (SOP) to undertake canal and dam monitoring.

f. Weather Monitoring

Currently, the Project has access to weather data from APRIL which operates nine (9) automated weather stations on the Kampar Peninsula and has up to date weather data. Rainfall, temperature, wind speed and humidity are essential variables for assessing the health of peatlands and will be monitored in an ongoing fashion. Weather monitoring is also important to assist with monitoring water balance, anticipate dry seasons and document when rain deficit occurs. The Project will use the weather monitoring capabilities of the GHG flux tower in GCN to provide automatic and sophisticated real-time weather monitoring for temperature, precipitation, humidity and wind.

g. GHG Flux Monitoring

In 2017 the Project began the monitoring local GHG emissions by directly monitoring proxy variables for GHG flux that are used when calculating GHG emissions. RER will continue to monitor forest and non-forest cover as well as water table levels. The *in situ* GHG flux tower utilises the Eddy Covariance Technique to monitor greenhouse gas emissions, ecosystem CO_2 exchange, groundwater level and subsidence rate. It measures the net balance of all vertical carbon dioxide (CO_2) source and removal pathways. It provides high-frequency measurements (every 60 min) with temporal variability and ecosystem-scale measurements, i.e. 200 ha around the tower.

3. Leakage Monitoring

Appropriate production and water table data from the Project Area and Project Zone will be collected, analysed and compiled upon each verification event to estimate activity shifting and ecological leakage.

4. Uncertainty Monitoring

Uncertainty linked to the parameters monitored will be automatically calculated using excel models.

5. Non-Permanence Risk Assessment

The non-permanence risk tool will be reviewed upon each verification event and updated with respect to any relevant data collected.

6. Procedures for internal auditing and Quality Assurance/Quality Control

The Project via APRIL, implements a rigorous QA/QC system to ensure the long-term accuracy of the data that is collected, to ensure a robust data storage system and to create a systematic data management structure. This QA/QC system is entirely integrated into the already existing APRIL QA/QC system that has been implemented for PEFC certification. This system is reviewed annually during PEFC Verification audits, so as to guarantee of the quality and dynamic nature of the QA/QC system.

7. Training

All new personal participating in PSPs inventory/control, water table monitoring, etc. will be trained following PSP Inventory/Control/Monitoring Procedures specifications and standard RER and APRIL practices, as much as is reasonably possible. Training will be provided to ensure consistent data collection of all monitoring equipment and techniques.

8. Data and Document Management

All data and documents are reviewed and controlled managed and stored in a manner that complies with standard APRIL practices, or as much as is reasonably possible. Data will be stored and managed following APRIL's ISO Data Management procedures and will be kept for at least 10 years.

9. VCU Calculation

For each verification event, VCU vintage is estimated and updated based on the parameters monitoring results.

10. Stakeholder Access to Online Selected Documents

The role of stakeholders is significant for contributing to the performance of RER project. Having access to selected monitoring documents would help stakeholders to participate in the monitoring platform. The Project will report to stakeholders at least annually, including the local community through annual reporting which will be available online. The RER Community teams will also provide reporting directly to the local communities.

5.3.3 Sampling Approach

The sampling approaches for the two Project Categories, REDD & WRC. In general terms though, the over arching goal of monitoring is to ensure the accurate scientific description of the changes to the landscape over time. The Project therefore aims to achieve a target precision level for its monitoring at a 95% confidence interval, +/- 10%; which is sufficient for the requirements of VCS and GHG project level monitoring. Should the monitoring not achieve the target precision requirements, then additional monitoring will be conducted until the targets are met.

5.3.3.1 REDD Project Category

For each monitoring period, the Project will acquire appropriate data from remote sensing platforms to determine if there are obvious changes in land cover, If there are obvious areas of disturbance, this will be investigated and sampled for AGB. Otherwise, AGB and regrowth of the project area where GHG crediting takes place will be conducted by remeasurement of PSPs. Any areas that might have been subject to fire disturbance will also be sampled for loss of AGB and loss of peat.

Remote Sensing Monitoring

RER collect remote sensing imagery on a continuous basis in conjunction with APRIL (plantation based) planning team. Images acquired are for the entirety of the RER area and from multiple satellite sources, primarily Landsat 8 (15m resolution) and Sentinel (resolution) and others as required. The APRIL team in Kerinci are continuously monitoring land use change in the protected areas within the entire APRIL estate and in RER and immediately notify RER if any suspicious activity occurs within the Project boundary or close to the project boundary. The remote sensed images are also accessed for changes to land cover are determined and reported.

Above ground biomass

Originally 159 AGB inventory plots were sampled, and then in 2020, a further 10 AGB inventory plots were measured in the PT GAN peat dome forest to support the AGB baseline assessment. It is assumed that these plots will be completely remeasured for the baseline reassessment sometime prior to 2026.

In 2020, RER selected 40 of the original plots (from the original 159) within the REDD area (where avoided deforestation would be assumed to occur as part of the baseline scenario, and also known as the “plantation development area”) for ongoing assessment of natural forest growth. These plots were established as Permanent Sample Plots (PSPs) and will be monitored during each verification period. Every monitoring period at least 20 PSPs will be monitored so that an appropriate representative sample of each land cover type is monitored. This means that all 40 PSPs will be re-measured every two monitoring periods. See Map 44 above.

Illegal Activities and Fire

RER monitors the potential for illegal activities and fire on a 24 hour, 7 days a week basis via remote sensing. Additionally, security rangers man guard-posts on the boundary of the Project area on all river access ways and roadways. All movements of people into the Project Area are recorded and reported, and suspicious activities are managed through their security SOP and protocols.

APRIL has a sophisticated hotspot fire monitoring program across all their estates and RER is also covered by this programme. RER receive daily reports on fire risks and fires on their boundaries and within RER. A procedure is in place to determine fire management activities in response to the daily fire risk assessment. Forest protection engages rangers to undertake fire patrols and to investigate reported hotspots.

5.3.3.2 WRC Project Category

For each monitoring period the Project will assess the effectiveness of the canal blocking program and its ability to maintain a natural water table level. This will be done by regular monitoring of all canals and dams as well as the regular monitoring of water table levels (via dip wells or level-loggers) and potential increase or decrease of the peat (via subsidence poles). The project will also monitor rainfall on a daily basis in order to correlate water table with natural precipitation.

Dam & Canal Monitoring

All dams are inspected visually at least once per year usually, during the dry season. The maintenance program is then prepared based on the observed condition of the dams in the canals.

Ground Water Table & Subsidence Monitoring

RER maintain an extensive network of ground water and subsidence monitoring stations, as of March 2021, which are described below.

- ***81 Subsidence poles***: Measure the rate of peat subsidence, and are monitored at least once per year;
- ***44 Dip wells***: Manually measure water depth, and are monitored at least every two months;
- ***9 Automatic level loggers***: Automatically measure water depth. The data is collected from the field approximately every 6 months.

Peat Carbon Stock

Peat Carbon stock will be resampled at each baseline event. Peat sampling is conducted for depth and carbon content pursuant to the respective SOPs. Ongoing sampling will be done to at least the same level of intensity that was originally undertaken for the Project. However, as the sampling requirements for peat have altered with the latest methodological updates in September of 2020, sampling will be conducted in transects crossing the Project Area at the sampling rate noted above in §5.3.2.1. It is assumed that these Peat Carbon stock and depth will be completely remeasured for the baseline reassessment sometime prior to 2026.

5.3.4 Procedures for handling non-conformances with the validated monitoring plan.

The RER-Carbon Project maintains a method to handle internal auditing and non-conformities that are addressed through APRIL's SOPs that incorporate multiple QA/QC measures. All QA/QC systems are based on ISO certified systems that are in place throughout all of APRIL's Riau concessions. All data is collected, recorded, stored, and reported. All data is subject to review and approval by team leaders or project managers concerning specific written SOPs, which cover different levels of operations and data management. A list of SOPs which have already been or will be developed is presented in the VCS PD Appendices. Copies of SOPs are available to validators on request.

5.3.5 Data Management Methods and Structure

Data that is generated by RER-CP is centrally managed in the Kerinci offices and as part of an online, user-restricted proprietary database. Hard copies of all paper-based data or data sheets are archived in field offices. Duplicate copies may be stored centrally in RER's headquarter in Riau or alternatively in APRIL headquarters. Field data is uploaded directly into the RER and APRIL database from the field or head office, allowing simultaneous multi-user input through a local server network. After the database server collates the data, it is available to the Project and may be adapted as necessary to fulfil all RER Project or APRIL monitoring and reporting needs. All data will be kept for at least 10 years.

To ensure the traceability and security of data entry and QA/QC procedures, all users are allocated unique user IDs and passwords in order to access any of APRIL or RER's database. Access to the databases is restricted based on an individual's role and responsibility per APRIL's standard data policies.

5.3.6 Organizational structure, responsibilities, and competencies of the personnel

Title	Name	Responsibilities	Competencies
Project Coordinator	Bradford M. Sanders (BMS)	1) Remote Sensed (RS) Monitoring - Forest Disturbances 2) Field Monitoring a) PSPs Monitoring b) Unauthorised Activities and Fire Monitoring c) Ground Water Table & Subsidence Monitoring d) Peat Carbon Stock Monitoring e) Dam & Canal Monitoring f) Weather Monitoring g) GHG Flux Measurements 3) Leakage Monitoring 4) Uncertainty Monitoring 5) Non-Permanence Risk Assessment 6) Quality Assurance / Quality Control 7) Training	Bradford M. Sanders is currently the Deputy Head of Conservation of Riau Ecosystem Restoration (RER). Bradford has tremendous experience in the forestry industry and has held multiple roles such as a fire protection specialist and fuels specialist since 1988. Bradford was the executive head of The Royal Society for the Protection of Birds / PT Restorasi Ekosistem Indonesia prior to his work in RER. Bradford provides operational management and leadership to 170 employees and staff to protect and restore 150,693 ha of Ecosystem Restoration Concessions in lowland peat tropical rainforest on the Kampar Peninsula and Padang Island, and coordinates environmental and social technical advice from collaborators. Bradford also promotes the RER program to customers, financiers, academics, and in public forums. Bradford has 21 publications on a wide range of topics regarding strategic forest management to integrated forest fire management. Education: M.S. Forestry, Clemson University, 1987 B.S. Forest Management, Clemson University, 1985

		8) Data & Documentation Management 9) VCU Calculation 10) Community & Stakeholder Reporting	
Field Work Supervisor	Nawari (NAW)	1) Remote Sensed (RS) Monitoring - Forest Disturbances 2) Field Monitoring a) PSPs Monitoring b) Unauthorised Activities and Fire Monitoring d) Peat Carbon Stock Monitoring 6) Quality Assurance / Quality Control 7) Training	Nawari has held multiple roles as a forest biometrician and strategy and remote sensing and mapping manager in APRIL since 2012. Nawari is currently the Strategy and Tactical Forest Planning Manager of APRIL and established the permanent sample plots for above ground biomass in the RER project area. Nawari played an essential role in land cover and land use change monitoring and provided forestry density data through field resistograph measurement and developed the mathematical prediction model. Nawari has 6 scientific publications regarding agroforestry regimes and mortality and production of *Acacia* plantations in Indonesia. Nawari's latest publication in January 2021 is about Suitability Analysis and Environmental Carrying Capacity for Ecotourism Development in Central Lombok. Education: PhD. Environmental Science, Riau University, 2020 - Present M.S. Environmental Science, Gadjah Mada University (UGM), 2020 M.S. Computer Science, Gadjah Mada University (UGM), 2011 B.S. Forest Resources Conservation, Gadjah Mada University (UGM), 2004
Field Work Analyst	Dr. Sofyan Kurnianto (SK)	2) Remote Sensed (RS) Monitoring - Forest Disturbances 3) Field Monitoring d) PSPs Monitoring e) Peat Carbon Stock Monitoring	Sofyan Kurnianto is currently the Manager - Biogenic Carbon Assessment and Sustainability Support, Peatland Science. Sofyan is a peatland ecologist with the research interest on the linking between biogeochemical processes with the peat hydraulic properties. He has experience on the quantifying carbon stocks and greenhouse gas emission in the tropical peatlands. He developed the framework of greenhouse gas inventory system at the

		6) Quality Assurance / Quality Control 8) Data & Documentation Management	corporate level to quantify the total emission along the value chain, including the land use change emission. Sofyan has developed the research on linking hydrological and biogecochemical cycle in tropical peatlands and quantified the total greenhouse gas emission from land use and land use change for all APRIL land bank. Education: PhD. Wetlands Hydrology, Oregon State University (OSU), 2017 M.S. Geochemical System Specialisation, University of New Hampshire, 2013 B.S. Meteorology and Geophysics, Bogor Agricultural Unveristy, 2004
Technical Partner	Ralph J. Strebel (RJS)	1) Remote Sensed (RS) Monitoring - Forest Disturbances 2) Field Monitoring a) PSPs Monitoring 3) Leakage Monitoring 4) Uncertainty Monitoring 5) Non-Permanence Risk Assessment 6) VCU Calculation	Ralph J. Strebel has worked in the climate change sector since 2007, almost exclusively with forest carbon projects. Ralph has substantial experience in all aspects of forest carbon projects, from assessments to project development. He successfully developed the world's first REDD+ Improved Forest Management project in Africa, worked assessing and developing numerous large-scale REDD+ projects in Indonesia, and was the lead author of the Republic of Congo's successful application to join the World Bank's Forest Carbon Partnership Facility, including establishing the National Reference Emission Levels for the country. Ralph holds degrees from the University of Colorado – Boulder (International Affairs / Political Science) and Lancaster University (Hons. Law). He is a licensed attorney in the States of Colorado and Arizona as well as being a qualified solicitor in England & Wales.
Sustainability Operations	Craig R. Tribolet (CRT)	10) Community & Stakeholder Reporting	Craig Tribolet has more than twenty years in environmental and forest management in Asia and Australia with experience in both the public, private, and academic sectors as a forester, consultant and ecologist and has demonstrated skills and experience in developing, managing, and delivering large scale, multi-stakeholder

			projects. Craig has a strong customer, contractor and community focus. Ability to listen to and integrate stakeholder needs and deliver results. Craig is currently the Sustainability Operations Manager and has held the position since 2014. Craig is responsible for all facets of forest protection including sustainability, certification, fire management and conservation forest management, as well as leading audits teams to meet domestic and international audits. Education: M.S. Business Administration, Corporate Finance and Accounting, Leadership and Project Management. Australian National University, 2006 B.S. Ecology, Australian National University, 1996 B.S. Forestry, Australian National University, 1995
Technical Monitoring	Chandra S. Deshmukh (CSD)	2) Field Monitoring f) Weather Monitoring g) GHG Flux Measurements	Chandra S. Deshmukh is experienced in the design and implementation of programs aimed at Greenhouse Gas (GHG) removals and emissions monitoring and reporting in hydroelectric and forestry sector. Chandra has an excellent scientific publication record to prove science background in GHG removals and emissions monitoring and reporting. Chandra has 38 scientific publications, and 28 of them being presented at international conferences. The latest being the presentation on significant carbon loss from a natural tropical peatland under current climate at the European Geosciences Union (EGU) General Assembly in May 2020. Education: PhD. Greenhouse Gas Emissions from Hydroelectric Reservior in Subtropical South Asia, Université Paul Sabatier (Toulouse III), 2013 MS. Water Resources Engineering, Indian Institute of Technology, 2008 B.S. Agricultural Engineering, CAE, Jabalpur (JNKVV), 2006

Data Coordinator	Kuswondo (Dodo) ST (KUS)	2) Field Monitoring a) PSPs Monitoring 6) Quality Assurance / Quality Control 8) Data & Documentation Management	Kuswondo (Dodo) ST has a wide experience with land survey equipment such as total station, Drone Phantom 4 Pro, Water Pass and GPS and with hydrography survey such as echosounder, side scan sonar, SVP (sound velocity profile) and Veripos (GPS). Kuswondo is responsible for analytical data monitoring such as hydrology, weather, vegetation, restoration and social monitoring since 2017. Kuswondo has undergone training courses throughout Southeast Asia from training for QINSy Software with SAFA Geoscience in Kuala Lumpur, Malaysia to Prevention and Management of Human and Wildlife Conflicts in Harimau Kita, Indonesia. Kuswondo has completed topographic surveys for a double track rail line, limestone quarry, sports facility, housing complexes, water pipeline, commercial development, sanitation, cement and digital satellite imagery mainly in Java but also in West Timur and East and Central Kalimantan. Education: BS. Geomatic Engineering, Sepuluh Nopember Institute of Technology, 2013
Field Operations	Dibyo Kuswiyono (DK)	2) Field Monitoring b) Unauthorised Activities and Fire Monitoring 6) Quality Assurance / Quality Control 9) Data & Documentation Management	Dibyo Kuswiyono is currently the Estate Manager in Restoration Kampar Peninsula and has held the position since 2020. Dibyo has held multiple positions in RAPP since 2003 as a forester and plantation quality assessor. During this time, Dibyo has developed his professional career and has grown to be an exceptional forest protection executive in Restoration Pulau Padang and a restoration executive in Restoration Kampar Peninsula. Dibyo has undergone numerous training courses to further develop his skills as an estate manager in RER such as ISO training in ISO 14001 & OHSAS 18001 in 2006 and water management in 2015 to leadership & people management in 2020 and restoration techniques in peat area in 2021. Education: M.S. Environmental Science, Riau University, 2020 B.S. Silviculture in Forestry, Gadjah Mada University, 2003

6 APPENDICES

Appendix 1. Proof of Legal Ownership

Appendix 1 - Lists the proof of legal ownership of each concession in the project area.

PT. GAN IUPHHK-RE

MENTERI KEHUTANAN
REPUBLIK INDONESIA

KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
Nomor : SK.230/Menhut-II/2014

TENTANG

PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. GLOBAL ALAM NUSANTARA ATAS AREAL HUTAN PRODUKSI SELUAS ± 36.850 (TIGA PULUH ENAM RIBU DELAPAN RATUS LIMA PULUH) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU

MENTERI KEHUTANAN REPUBLIK INDONESIA,

Menimbang : a. bahwa Direktur PT. Global Alam Nusantara dengan surat Nomor 08/Dir-GAN/IV/2013 tanggal 18 April 2013, mengajukan permohonan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) Dalam Hutan Alam di Wilayah Kabupaten Pelalawan, Provinsi Riau;

b. bahwa Menteri Kehutanan dengan surat Nomor S.501/Menhut-VI/2013 tanggal 29 Agustus 2013, telah menetapkan PT. Global Alam Nusantara sebagai calon pemegang IUPHHK-RE untuk areal seluas ± 33.900 (tiga puluh tiga ribu sembilan ratus) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau, dengan kewajiban melakukan Upaya Pengelolaan Lingkungan Hidup dan Upaya Pemantauan Lingkungan hidup (UKL-UPL) sesuai peraturan perundang-undangan;

c. bahwa sesuai surat Menteri Kehutanan Nomor S.679/Menhut-VI/2013 tanggal 27 November 2013, PT. Global Alam Nusantara menyelesaikan UKL dan UPL yang telah mendapat persetujuan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan, Provinsi Riau sesuai Keputusan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/BLH-AM/2013/26 tanggal 1 Oktober 2013 dan Izin Lingkungan sesuai Keputusan Bupati Pelalawan Nomor KPTS.660/BLH/2013/642 tanggal 1 Oktober 2013, kepada Direktur Jenderal Planologi Kehutanan untuk menerbitkan peta areal kerja (*Working Area*/WA) IUPHHK-RE PT. Global Alam Nusantara;

d. bahwa berdasarkan telaahan Direktorat Jenderal Planologi Kehutanan sesuai surat Direktur Jenderal Planologi Kehutanan Nomor S.1730/VII-WP3H/2013 tanggal 31 Desember 2013 areal yang dapat diberikan untuk IUPHHK-RE PT. Global Alam Nusantara seluas ± 36.850 (tiga puluh enam ribu delapan ratus lima puluh) hektar, di Kabupaten Pelalawan, Provinsi Riau;

e. bahwa berdasarkan hasil penilaian, PT. Global Alam Nusantara telah memenuhi persyaratan untuk diberikan IUPHHK-RE, sebagaimana Peraturan Menteri Kehutanan Nomor P.50/Menhut-II/2010 tentang Tata Cara Pemberian Dan Perluasan Areal Kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu (IUPHHK) Dalam Hutan Alam, IUPHHK Restorasi Ekosistem, Atau IUPHHK Hutan Tanaman Industri Pada Hutan Produksi sebagaimana telah diubah dengan Peraturan Menteri Kehutanan Nomor P.26/Menhut-II/2012;

f. bahwa ...

f. bahwa berdasarkan pertimbangan huruf a sampai dengan huruf e, kepada PT. Global Alam Nusantara dapat diberikan IUPHHK-RE atas areal hutan produksi seluas ± 36.850 (tiga puluh enam ribu delapan ratus lima puluh) hektar, di Kabupaten Pelalawan, Provinsi Riau dengan menetapkan Keputusan Menteri Kehutanan.

Mengingat : 1. Undang-Undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya;
2. Undang-Undang Nomor 41 Tahun 1999 tentang Kehutanan jo Undang-Undang Nomor 19 Tahun 2004;
3. Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah, jis Nomor 8 Tahun 2005 dan Nomor 12 Tahun 2008;
4. Undang-Undang Nomor 33 Tahun 2004 tentang Perimbangan Keuangan antara Pemerintah Pusat dan Daerah;
5. Undang-Undang Nomor 26 Tahun 2007 tentang Penataan Ruang;
6. Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup;
7. Undang-Undang Nomor 18 Tahun 2013 tentang Pencegahan dan Pemberantasan Perusakan Hutan;
8. Peraturan Pemerintah Nomor 22 Tahun 1997 tentang Jenis dan Penyetoran Penerimaan Negara Bukan Pajak jo Peraturan Pemerintah Nomor 52 Tahun 1998;
9. Peraturan Pemerintah Nomor 59 Tahun 1998 tentang Tarif Atas Jenis Penerimaan Negara Bukan Pajak Yang Berlaku Pada Departemen Kehutanan dan Perkebunan jo Peraturan Pemerintah Nomor 74 Tahun 1999;
10. Peraturan Pemerintah Nomor 35 Tahun 2002 tentang Dana Reboisasi jo Peraturan Pemerintah Nomor 58 Tahun 2007;
11. Peraturan Pemerintah Nomor 44 Tahun 2004 tentang Perencanaan Kehutanan;
12. Peraturan Pemerintah Nomor 45 Tahun 2004 tentang Perlindungan Hutan jo Peraturan Pemerintah Nomor 60 Tahun 2009;
13. Peraturan Pemerintah Nomor 6 Tahun 2007 tentang Tata Hutan dan Penyusunan Rencana Pengelolaan Hutan, Serta Pemanfaatan Hutan jo Peraturan Pemerintah Nomor 3 Tahun 2008;
14. Peraturan Pemerintah Nomor 38 Tahun 2007 tentang Pembagian Urusan Pemerintahan antara Pemerintah, Pemerintahan Daerah Provinsi dan Pemerintahan Daerah Kabupaten/Kota;
15. Peraturan Pemerintah Nomor 26 Tahun 2008 tentang Rencana Tata Ruang Wilayah Nasional;
16. Peraturan Presiden Nomor 47 Tahun 2009 tentang Pembentukan dan Organisasi Kementerian Negara sebagaimana telah diubah terakhir dengan Peraturan Presiden Nomor 55 Tahun 2013;
17. Keputusan Presiden Nomor 84/P Tahun 2009 tentang Pembentukan Kabinet Indonesia Bersatu II sebagaimana telah diubah terakhir dengan Keputusan Presiden Nomor 5/P Tahun 2013;
18. Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas dan Fungsi Kementerian Negara serta Susunan Organisasi, Tugas dan Fungsi Eselon I Kementerian Negara sebagaimana telah diubah terakhir dengan Keputusan Presiden Nomor 56 Tahun 2013;
19. Instruksi Presiden Nomor 6 Tahun 2013 tentang Penundaan Pemberian Izin Baru dan Penyempurnaan Tata Kelola Hutan Alam Primer dan Lahan Gambut;

/20. Peraturan ...

20. Peraturan Menteri Kehutanan Nomor P.55/Menhut-II/2006 tentang Penatausahaan Hasil Hutan yang Berasal dari Hutan Negara sebagaimana telah diubah terakhir dengan Peraturan Menteri Kehutanan Nomor P. 45/Menhut-II/2009;
21. Peraturan Menteri Kehutanan Nomor P.18/Menhut-II/2007 tentang Petunjuk Teknis Tata Cara Pengenaan, Pemungutan, dan Pembayaran Provisi Sumber Daya Hutan dan Dana Reboisasi;
22. Peraturan Menteri Kehutanan Nomor P.39/Menhut-II/2008 tentang Tata Cara Pengenaan Sanksi Administratif terhadap Pemegang Izin Pemanfaatan Hutan;
23. Peraturan Menteri Kehutanan Nomor P.58/Menhut-II/2008 tentang Kompetensi dan Sertifikasi Tenaga Teknis Pengelolaan Hutan Produksi Lestari;
24. Peraturan Menteri Kehutanan Nomor P.11/Menhut-II/2009 tentang Sistem Silvikultur dalam Areal Izin Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi;
25. Peraturan Menteri Kehutanan Nomor P.23/Menhut-II/2009 tentang Tata Cara Penyerahan Kembali Izin Usaha Pemanfaatan Hasil Hutan Kayu Sebelum Jangka Waktu Izin Berakhir;
26. Peraturan Menteri Kehutanan Nomor P.33/Menhut-II/2009 tentang Pedoman Inventarisasi Hutan Menyeluruh Berkala (IHMB) pada Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi jo Peraturan Menteri Kehutanan Nomor P.5/Menhut-II/2011;
27. Peraturan Menteri Kehutanan Nomor P.34/Menhut-II/2009 tentang Tata Cara dan Persyaratan Pemindahtanganan Izin Usaha Pemanfaatan Hasil Hutan Kayu;
28. Peraturan Menteri Kehutanan Nomor P.38/Menhut-II/2009 tentang Standard dan Pedoman Penilaian Kinerja Pengelolaan Hutan Produksi Lestari dan Verifikasi Legalitas Kayu Pada Pemegang Izin atau Pada Hutan Hak sebagaimana telah diubah terakhir dengan Peraturan Menteri Kehutanan Nomor P.42/Menhut-II/2013;
29. Peraturan Menteri Kehutanan Nomor P.53/Menhut-II/2009 tentang Pemasukan dan Penggunaan Alat untuk Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu atau Izin Pemanfaatan Kayu;
30. Peraturan Menteri Kehutanan Nomor P.56/Menhut-II/2009 tentang Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu Hutan Alam dan Restorasi Ekosistem jo Peraturan Menteri Kehutanan Nomor P.24/Menhut-II/2011;
31. Peraturan Menteri Kehutanan Nomor P.69/Menhut-II/2009 tentang Pedoman Pelaporan Keuangan Pemanfaatan Hutan Produksi dan Pengelolaan Hutan (DOLAPKEU – PHP2H);
32. Peraturan Menteri Kehutanan Nomor P.9/Menhut-II/2010 tentang Izin Pembuatan dan Penggunaan Koridor;
33. Peraturan Menteri Kehutanan Nomor P.12/Menhut-II/2010 tentang Tata Cara Pengenaan, Penagihan, dan Pembayaran Iuran Izin Usaha Pemanfaatan Hutan pada Hutan Produksi;
34. Peraturan Menteri Kehutanan Nomor P.40/Menhut-II/2010 tentang Organisasi dan Tata Kerja Kementerian Kehutanan jo Peraturan Menteri Kehutanan Nomor P.33/Menhut II/2012;
35. Peraturan Menteri Kehutanan Nomor P.50/Menhut-II/2010 tentang Tata Cara Pemberian Dan Perluasan Areal Kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu (IUPHHK) Dalam Hutan Alam, IUPHHK Restorasi Ekosistem, Atau IUPHHK Hutan Tanaman Industri Pada Hutan Produksi jo Peraturan Menteri Kehutanan Nomor P.26/Menhut-II/2012.

/36. Keputusan ...

-4-

36. Keputusan Direktur Jenderal Planologi Kehutanan atas nama Menteri Kehutanan Nomor SK 6018/Menhut-VII/IPSDH/2013 tentang Penetapan Peta Indikatif Penundaan Pemberian Izin Baru Pemanfaatan Hutan, Penggunaan Kawasan Hutan Dan Perubahan Peruntukan Kawasan Hutan dan Areal Penggunaan Lain (Revisi V).

Memperhatikan : 1. Akta Nomor 1 tanggal 1 Juni 2010 tentang Pendirian Perseroan Terbatas (PT) Global Alam Nusantara, dibuat Marijke Rooselien, S, SH, Notaris di Jakarta, pengesahan Menteri Hukum dan Hak Asasi Manusia sesuai Keputusan Nomor AHU-34681.01.01.Tahun 2010 tanggal 9 Juli 2010 yang telah diubah terakhir dengan Akta Nomor 02 tanggal 6 Maret 2013 dibuat oleh Hanita Sentono, SH. Notaris di Jakarta, pengesahan Menteri Hukum dan Hak Asasi Manusia Nomor AHU-AH.01.10-12649 tanggal 8 April 2013;
2. Surat Bupati Pelalawan Nomor 522/Dishut/2011/689 tanggal 22 Desember 2011 perihal Pertimbangan IUPHHK-RE A.n PT. Global Alam Nusantara;
3. Surat Kepala Badan Pelayanan Perizinan Terpadu Nomor 03/BP2T-IR/31 tanggal 7 Februari 2013 perihal Rekomendasi Analisis Fungsi Kawasan Hutan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) A.n PT. Global Alam Nusantara di Kabupaten Pelalawan;
4. Keputusan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/ BLH-AM/2013/26 tanggal 1 Oktober 2013 tentang Rekomendasi atas UKL-UPL Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) PT. Global Alam Nusantara;
5. Keputusan Bupati Pelalawan Nomor Kpts.660/BLH/2013/642 tanggal 1 Oktober 2013 tentang Izin Lingkungan Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) PT. Global Alam Nusantara, Di Kelompok Hutan Sungai Serkap, Kecamatan Teluk Meranti, Kabupaten Pelalawan.

MEMUTUSKAN :

Menetapkan : **KEPUTUSAN MENTERI KEHUTANAN TENTANG PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. GLOBAL ALAM NUSANTARA ATAS AREAL HUTAN PRODUKSI SELUAS ± 36.850 (TIGA PULUH ENAM RIBU DELAPAN RATUS LIMA PULUH) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU.**

KESATU : Memberikan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) dalam Hutan Alam kepada PT. Global Alam Nusantara atas areal Hutan Produksi seluas ± 36.850 (tiga puluh enam ribu delapan ratus lima puluh) hektar, yang keseluruhannya merupakan Hutan Produksi Tetap (HP), dengan penutupan lahan berdasarkan penafsiran citra landsat liputan tahun 2011 berupa hutan rawa sekunder seluas ± 36.765 (tiga puluh enam ribu tujuh ratus enam puluh lima) hektar, dan semak belukar rawa seluas ± 85 (delapan puluh lima) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau, sebagaimana terlukis pada Peta Lampiran Keputusan ini.

KEDUA : Luas dan letak definitif areal kerja IUPHHK-RE sebagaimana dimaksud pada Amar KESATU ditetapkan kembali oleh Kementerian Kehutanan setelah dilaksanakan pengukuran dan penataan batas areal kerja (temu gelang).

KETIGA ...

PT. GAN IUPHHK-RE

KETIGA : PT. Global Alam Nusantara berhak :

1. Melakukan kegiatan dan memperoleh manfaat dari hasil usahanya sesuai dengan izin yang diperolehnya.
2. Diberikan kewenangan dan tanggung jawab untuk melaksanakan Rencana Kerja Tahunan (RKT) tanpa pengesahan dari pejabat yang berwenang (*self approval*) dalam hal memenuhi kriteria dan indikator yang ditetapkan oleh Menteri.

KEEMPAT : PT. Global Alam Nusantara :

(1) Wajib :

a. Menyusun Rencana Kerja (RK) untuk seluruh areal kerja;
b. Melaksanakan kegiatan nyata di lapangan untuk paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE dalam Hutan Alam;
c. Melaksanakan penataan batas areal kerja paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE dalam Hutan Alam;
d. Melaksanakan perlindungan hutan di areal kerjanya;
e. Menatausahakan keuangan kegiatan usahanya sesuai standar akuntansi kehutanan yang berlaku bagi pemegang izin usaha pemanfaatan hutan;
f. Mempekerjakan tenaga profesional bidang kehutanan (GANISPHPL) dan tenaga lain yang memenuhi persyaratan sesuai kebutuhan dan ketentuan peraturan perundang-undangan;
g. Melaksanakan sistem silvikultur sesuai dengan kondisi setempat;
h. Menggunakan peralatan pemanfaatan hasil hutan yang sesuai dengan ketentuan peraturan perundang-undangan;
i. Membayar iuran atau dana sesuai ketentuan peraturan perundang-undangan;
j. Melakukan kerjasama dengan koperasi masyarakat setempat, paling lambat 1 (satu) tahun setelah diterimanya IUPHHK-RE;
k. Menyusun Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu (RKUPHHK) jangka panjang untuk seluruh areal kerja, paling lambat 1 (satu) tahun setelah IUPHHK-RE diberikan, dan diajukan kepada Menteri Kehutanan atau pejabat yang ditunjuk guna mendapatkan persetujuan;
l. Menyusun RKT berdasarkan RKUPHHK sebagaimana dimaksud huruf k untuk disahkan oleh Kepala Kesatuan Pemangkuan Hutan (KPH) atau pejabat yang ditunjuk oleh Menteri Kehutanan;
m. Mengajukan RKT paling lambat 2 (dua) bulan sebelum RKT berjalan;
n. Menyampaikan laporan kinerja pemegang izin secara periodik kepada Menteri Kehutanan;
o. Melaporkan kepada Pemerintah dan Pemerintah Daerah dana yang diterima dari pihak asing dan dipublikasikan di media massa setempat dan nasional untuk diaudit oleh Akuntan Publik yang terdaftar di Indonesia;
p. Memberantas perambahan hutan, pembalakan liar dan menanggulangi kebakaran hutan di areal izin dan apabila tidak mampu setelah melaporkan kepada Pemerintah Daerah atau Menteri Kehutanan, izin dicabut tanpa peringatan.
q. Membantu pengembangan Hutan Tanaman Rakyat (HTR), Hutan Kemasyarakatan (HKM) atau Hutan Desa (HD) yang ditetapkan oleh Menteri Kehutanan di sekitar areal kerja;
r. Mengalokasikan saham untuk Koperasi Karyawan Kementerian Kehutanan 1 % dan Koperasi Pensiunan Kehutanan 1 % secara *voluntary*, dan Koperasi masyarakat setempat 1 %.

s. Melapor ....

s. Melaporkan kepada pemerintah/Kementerian Kehutanan dan mempublikasikan kepada masyarakat setempat tentang pelaksanaan penjualan *carbon offset* kepada pihak asing di pasar karbon sukarela.
t. Mematuhi dan melaksanakan ketentuan-ketentuan yang tercantum dalam Lampiran Keputusan dan peraturan perundang-undangan.

(2)Dilarang :
a. Menebang pohon di dalam areal kerjanya tanpa izin, kecuali dalam rangka pembangunan sarana dan prasarana sesuai ketentuan peraturan perundang-undangan.
b. Meninggalkan areal kerja.
c. Memindahtangankan IUPHHK-RE kecuali dengan persetujuan tertulis dari Menteri Kehutanan.
d. Mengontrakkan atau menyerahkan sebagian atau seluruh kegiatan usahanya kepada pihak lain tanpa persetujuan tertulis dari Menteri Kehutanan.

KELIMA : 1. Dalam hal kegiatan restorasi ekosistem belum diperoleh keseimbangan hayati, kepada PT. Global Alam Nusantara dapat diberikan Izin Usaha Pemanfaatan Kawasan (IUPK), Izin Usaha Pemanfaatan Jasa Lingkungan (IUPJL), atau Izin Usaha Pemanfaatan Hasil Hutan Bukan Kayu (IUPHHBK) pada hutan produksi;
2. Dalam hal kegiatan restorasi ekosistem telah diperoleh keseimbangan hayati, kepada PT. Global Alam Nusantara dapat diberikan IUPHHK pada hutan produksi dengan menerapkan satu atau lebih sistem silvikultur.

KEENAM : 1. IUPHHK-RE tidak merupakan hak kepemilikan atas kawasan hutan.
2. Areal IUPHHK-RE tidak dapat dijadikan jaminan, agunan, atau dijaminkan kepada pihak lain.

KETUJUH : 1. Apabila di dalam areal IUPHHK-RE terdapat lahan yang telah menjadi tanah milik, perkampungan, tegalan, persawahan atau telah diduduki dan digarap oleh pihak ketiga secara sah berdasarkan peraturan perundang-undangan, maka lahan tersebut dikeluarkan dari areal kerja IUPHHK-RE, tanpa mengubah status dan fungsi kawasan hutan.
2. Apabila lahan tersebut pada angka 1 dikehendaki untuk dijadikan areal IUPHHK-RE, maka penyelesaiannya dilakukan oleh PT. Global Alam Nusantara dengan pihak-pihak yang bersangkutan sesuai dengan ketentuan peraturan perundang-undangan.

KEDELAPAN : 1. IUPHHK-RE dievaluasi setiap 5 (lima) tahun oleh Menteri Kehutanan sebagai dasar kelangsungan izin.
2. Pemegang IUPHHK-RE dikenakan sanksi apabila melanggar ketentuan dalam Keputusan dan peraturan perundang-undangan

KESEMBILAN : 1. PT. Global Alam Nusantara wajib membayar Iuran Izin Usaha Pemanfaatan Hutan (IIUPH) sesuai dengan ketentuan peraturan perundang-undangan.
2. Salinan asli Keputusan Menteri Kehutanan tentang Pemberian IUPHHK-RE dalam Hutan Alam pada Hutan Produksi diberikan oleh Direktur Jenderal Bina Usaha Kehutanan setelah kewajiban angka 1 (satu) dibayar lunas.

KESEPULUH ....

-7-

KESEPULUH : Dalam hal PT. Global Alam Nusantara sampai dengan batas waktu yang ditentukan tidak membayar IIUPH sebagaimana dimaksud dalam Amar KESEMBILAN, maka pemberian IUPHHK-RE batal dengan sendirinya

KESEBELAS : Keputusan beserta lampirannya merupakan satu kesatuan yang tidak terpisahkan.

KEDUABELAS : Keputusan ini mulai berlaku pada tanggal ditetapkan untuk jangka waktu 60 (enam puluh) tahun, kecuali apabila diserahkan kembali oleh pemegang izin atau dicabut oleh Menteri Kehutanan, apabila dalam jangka waktu 2 (dua) tahun sejak ditetapkan Keputusan tidak ada kegiatan nyata di lapangan, maka Keputusan batal dengan sendirinya.

Ditetapkan di : Jakarta
Pada tanggal : 14 Maret 2014

Salinan sesuai dengan aslinya,
KEPALA BIRO HUKUM DAN ORGANISASI,

KRISNA RYA

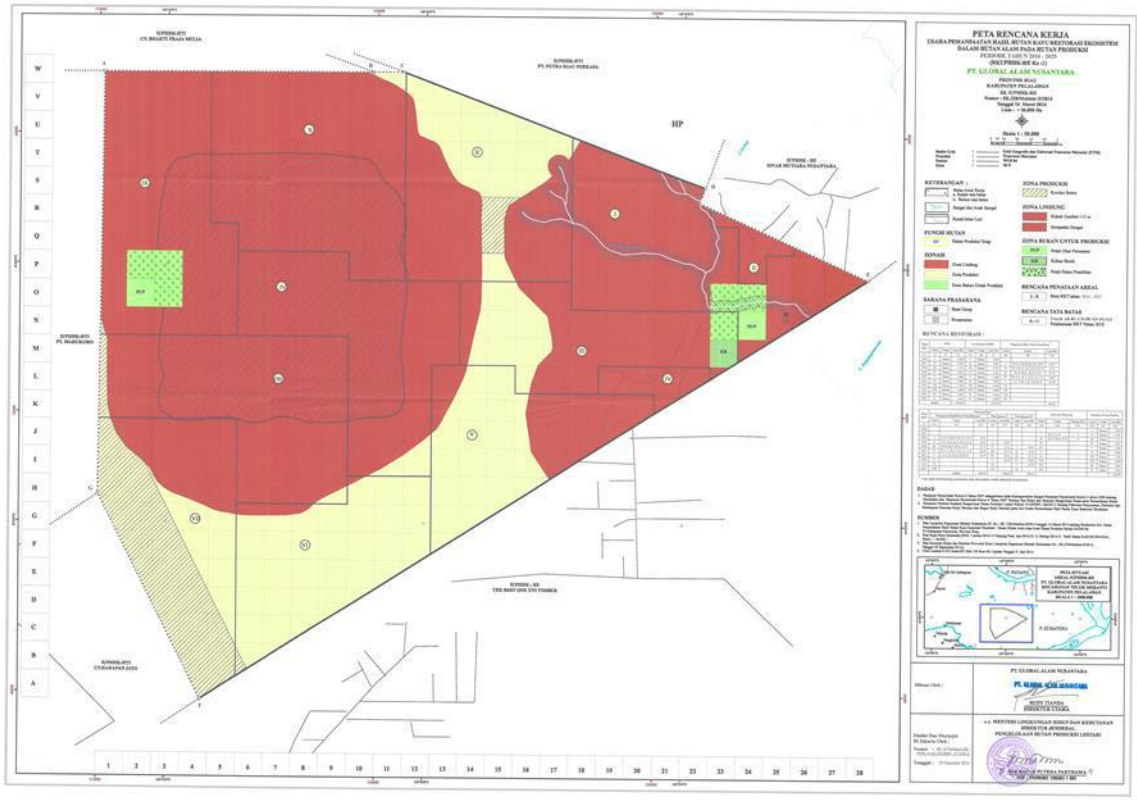
MENTERI KEHUTANAN
REPUBLIK INDONESIA,

Ttd.

ZULKIFLI HASAN

Salinan Keputusan ini disampaikan kepada yth.:
1. Menteri Koordinator Bidang Perekonomian.
2. Menteri Dalam Negeri.
3. Menteri Keuangan.
4. Menteri Energi dan Sumber Daya Mineral.
5. Menteri Perdagangan.
6. Menteri Perindustrian.
7. Menteri Tenaga Kerja dan Transmigrasi.
8. Menteri Lingkungan Hidup.
9. Kepala Badan Pertanahan Nasional.
10. Sekretaris Jenderal Kementerian Kehutanan.
11. Inspektur Jenderal Kementerian Kehutanan.
12. Direktur Jenderal Bina Usaha Kehutanan.
13. Direktur Jenderal Planologi Kehutanan.
14. Gubernur Riau.
15. Bupati Pelalawan.
16. Kepala Dinas Kehutanan Provinsi Riau.
17. Kepala Dinas Kehutanan Kabupaten Pelalawan.
18. Direktur PT. Global Alam Nusantara.

PT. GAN RKU


PETA RENCANA KERJA
PT. GLOBAL ALAM NUSANTARA
KETERANGAN :
ZONA PRODUKSI
ZONA LINDUNG
ZONA BUKAN UNTUK PRODUKSI
RENCANA PENATAAN AREAL
RENCANA TATA BATAS
SARANA PRASARANA
FUNGSI HUTAN
ZONASI
RENCANA RESTORASI :
DASAR :
SUMBER :
HP

PT. GAN MONEV-Certificate



KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN
DIREKTORAT JENDERAL PENGELOLAAN HUTAN PRODUKSI LESTARI
DIREKTORAT USAHA JASA LINGKUNGAN DAN HASIL HUTAN BUKAN KAYU HUTAN PRODUKSI

SURAT KETERANGAN

HASIL KEGIATAN MONITORING DAN EVALUASI IUPHHK-RE

Nomor : KT. 6/JASLING/PKU /HPL.2 /8/2019

Diberikan kepada :

PT. Global Alam Nusantara

(Keputusan Menteri Kehutanan Nomor : SK. 230/Menhut-II/2014)

Pada kegiatan Monitoring dan Evaluasi IUPHHK-RE Tahun 2019, memperoleh nilai dengan kategori :

"BAIK"

Jakarta, 28 Agustus 2019

Direktur Usaha Jasa Lingkungan dan Hasil Hutan Bukan Kayu Hutan Produksi,

Ir. Djoman Utama Perbatasari, M.M.

NIP. 19601230 198801 1 001

PT. GCN IUPHHK-RE

MENTERI KEHUTANAN
REPUBLIK INDONESIA

KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
NOMOR : SK. 395/Menhut-II/2012.

TENTANG

PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. GEMILANG CIPTA NUSANTARA, ATAS AREAL HUTAN PRODUKSI SELUAS ± 20.265 (DUA PULUH RIBU DUA RATUS ENAM PULUH LIMA) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU.

KEMENTERIAN KEHUTANAN

JAKARTA, 24 JULI 2012

PT. GCN IUPHHK-RE

MENTERI KEHUTANAN
REPUBLIK INDONESIA

KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
NOMOR : SK.395/Menhut-II/2012

TENTANG

PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. GEMILANG CIPTA NUSANTARA, ATAS AREAL HUTAN PRODUKSI SELUAS ± 20.265 (DUA PULUH RIBU DUA RATUS ENAM PULUH LIMA) HEKTAR, DI KABUPATEN PELALAWAN, PROVINSI RIAU

MENTERI KEHUTANAN REPUBLIK INDONESIA,

Menimbang : a. bahwa Direktur PT. Gemilang Cipta Nusantara dengan surat Nomor 02/GCN-Dir/III/2011 tanggal 25 Maret 2011, mengajukan permohonan IUPHHK-RE pada areal eks IUPHHK-HA PT. Agam Sampurna di Kabupaten Pelalawan, Provinsi Riau;

b. bahwa Menteri Kehutanan dengan Keputusan Nomor SK.07/Menhut-II/2011 jis Nomor SK.4234/MENHUT-II/BRPUK/2011, dan Nomor SK.6273/Menhut-VI/SET/2011, telah mencadangkan kawasan hutan produksi untuk areal Izin Usaha Pemanfatan Hasil Hutan Kayu Restorasi Ekosistem seluas ± 538.646 (lima ratus tiga puluh delapan ribu enam ratus empat puluh enam) hektar, di Provinsi Riau;

c. bahwa berdasarkan surat Direktur Jenderal Bina Usaha Kehutanan a.n. Menteri Kehutanan Nomor S.709/Menhut-VI/BRPUK/2011 tanggal 22 November 2011, PT. Gemilang Cipta Nusantara ditetapkan sebagai calon pemegang Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) di areal seluas ± 19.647 (sembilan belas ribu enam ratus empat puluh tujuh) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau dengan kewajiban untuk melakukan upaya kelola lingkungan hidup dan upaya pemantauan lingkungan hidup (UKL-UPL) sesuai peraturan perundang-undangan;

d. bahwa berdasarkan surat Direktur Jenderal Bina Usaha Kehutanan a.n. Menteri Kehutanan Nomor S.108/Menhut-VI/BRPUK/2012 tanggal 17 Februari 2012, PT. Gemilang Cipta Nusantara telah menyelesaikan UKL dan UPL yang telah mendapat persetujuan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan berdasarkan surat Nomor 660/BLH-AM/2012/030 tanggal 10 Januari 2012, dan diinstruksikan kepada Direktur Jenderal Planologi Kehutanan untuk menerbitkan peta areal kerja (*Working Area*/WA);

e. bahwa berdasarkan telaahan Direktorat Jenderal Planologi Kehutanan sesuai surat Direktur Jenderal Planologi Kehutanan Nomor S.425/VII-WP3H/2012 tanggal 19 April 2012 areal yang dapat diberikan untuk IUPHHK-RE PT. Gemilang Cipta Nusantara seluas ± 20.265 (dua puluh ribu dua ratus enam puluh lima) hektar, yang seluruhnya merupakan Hutan Produksi Tetap (HP);

f. bahwa ...

f. bahwa berdasarkan hasil penilaian, PT. Gemilang Cipta Nusantara telah memenuhi persyaratan untuk diberikan IUPHHK-RE, sebagaimana ketentuan Peraturan Menteri Kehutanan Nomor P.50/Menhut-II/2010;

g. bahwa berdasarkan pertimbangan tersebut di atas, kepada PT. Gemilang Cipta Nusantara dapat diberikan IUPHHK-RE atas areal hutan produksi seluas ± 20.265 (dua puluh ribu dua ratus enam puluh lima) hektar, di Kabupaten Pelalawan, Provinsi Riau dengan menetapkan Keputusan Menteri Kehutanan.

Mengingat : 1. Undang-Undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya;

2. Undang-Undang Nomor 41 Tahun 1999 tentang Kehutanan sebagaimana telah diubah dengan Undang-Undang Nomor 19 Tahun 2004;

3. Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah, sebagaimana telah beberapa kali diubah terakhir dengan Undang-Undang Nomor 12 Tahun 2008;

4. Undang-Undang Nomor 33 Tahun 2004 tentang Perimbangan Keuangan antara Pemerintah Pusat dan Daerah;

5. Undang-Undang Nomor 26 Tahun 2007 tentang Penataan Ruang;

6. Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup;

7. Peraturan Pemerintah Nomor 22 Tahun 1997 tentang Jenis dan Penyetoran Penerimaan Negara Bukan Pajak sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 52 Tahun 1998;

8. Peraturan Pemerintah Nomor 59 Tahun 1998 tentang Tarif Atas Jenis Penerimaan Negara Bukan Pajak Yang Berlaku Pada Departemen Kehutanan dan Perkebunan sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 74 Tahun 1999;

9. Peraturan Pemerintah Nomor 35 Tahun 2002 tentang Dana Reboisasi sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 58 Tahun 2007;

10. Peraturan Pemerintah Nomor 44 Tahun 2004 tentang Perencanaan Kehutanan;

11. Peraturan Pemerintah Nomor 45 Tahun 2004 tentang Perlindungan Hutan sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 60 Tahun 2009;

12. Peraturan Pemerintah Nomor 6 Tahun 2007 tentang Tata Hutan dan Penyusunan Rencana Pengelolaan Hutan, Serta Pemanfaatan Hutan sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 3 Tahun 2008;

13. Peraturan Pemerintah Nomor 38 Tahun 2007 tentang Pembagian Urusan Pemerintahan antara Pemerintah, Pemerintahan Daerah Provinsi dan Pemerintahan Daerah Kabupaten/Kota;

14. Peraturan Pemerintah Nomor 26 Tahun 2008 tentang Rencana Tata Ruang Wilayah Nasional;

15. Peraturan Presiden Nomor 47 Tahun 2009 tentang Pembentukan dan Organisasi Kementerian Negara sebagaimana telah diubah dengan Peraturan Presiden Nomor 91 Tahun 2011;

16. Keputusan ...

16. Keputusan Presiden Nomor 84/P Tahun 2009 tentang Pembentukan Kabinet Indonesia Bersatu II, sebagaimana telah diubah dengan Keputusan Presiden Nomor 59/P Tahun 2011;
17. Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas dan Fungsi Kementerian Negara serta Susunan Organisasi, Tugas dan Fungsi Eselon I Kementerian Negara;
18. Instruksi Presiden Nomor 10 Tahun 2011 tentang Penundaan Pemberian Izin Baru dan Penyempurnaan Tata Kelola Hutan Alam Primer dan Lahan Gambut;
19. Peraturan Menteri Kehutanan Nomor P.55/Menhut-II/2006 tentang Penatausahaan Hasil Hutan yang Berasal dari Hutan Negara sebagaimana telah beberapa kali diubah terakhir dengan Peraturan Menteri Kehutanan Nomor P. 45/Menhut-II/2009;
20. Peraturan Menteri Kehutanan Nomor P.18/Menhut-II/2007 tentang Petunjuk Teknis Tata Cara Pengenaan, Pemungutan, dan Pembayaran Provisi Sumber Daya Hutan dan Dana Reboisasi;
21. Peraturan Menteri Kehutanan Nomor P.39/Menhut-II/2008 tentang Tata Cara Pengenaan Sanksi Administratif terhadap Pemegang Izin Pemanfaatan Hutan;
22. Peraturan Menteri Kehutanan Nomor P.58/Menhut-II/2008 tentang Kompetensi dan Sertifikasi Tenaga Teknis Pengelolaan Hutan Produksi Lestari;
23. Peraturan Menteri Kehutanan Nomor P.11/Menhut-II/2009 tentang Sistem Silvikultur dalam Areal Izin Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi;
24. Peraturan Menteri Kehutanan Nomor P.23/Menhut-II/2009 tentang Tata Cara Penyerahan Kembali Izin Usaha Pemanfaatan Hasil Hutan Kayu Sebelum Jangka Waktu Izin Berakhir;
25. Peraturan Menteri Kehutanan Nomor P.33/Menhut-II/2009 tentang Pedoman Inventarisasi Hutan Menyeluruh Berkala (IHMB) pada Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi sebagaimana telah diubah dengan Peraturan Menteri Kehutanan Nomor P.5/Menhut-II/2011;
26. Peraturan Menteri Kehutanan Nomor P.34/Menhut-II/2009 tentang Tata Cara dan Persyaratan Pemindahtanganan Izin Usaha Pemanfaatan Hasil Hutan Kayu;
27. Peraturan Menteri Kehutanan Nomor P.38/Menhut-II/2009 tentang Standard dan Pedoman Penilaian Kinerja Pengelolaan Hutan Produksi Lestari dan Verifikasi Legalitas Kayu Pada Pemegang Izin atau Pada Hutan Hak sebagaimana telah diubah dengan Peraturan Menteri Kehutanan Nomor P.68/Menhut-II/2011;
28. Peraturan Menteri Kehutanan Nomor P.53/Menhut-II/2009 tentang Pemasukan dan Penggunaan Alat untuk Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu atau Ijin Pemanfaatan Kayu;
29. Peraturan Menteri Kehutanan Nomor P.56/Menhut-II/2009 tentang Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu Hutan Alam dan Restorasi Ekosistem sebagaimana telah diubah dengan Peraturan Menteri Kehutanan Nomor P.24/Menhut-II/2011;

30. Peraturan ...

30. Peraturan Menteri Kehutanan Nomor P.69/Menhut-II/2009 tentang Pedoman Pelaporan Keuangan Pemanfaatan Hutan Produksi dan Pengelolaan Hutan (DOLAPKEU – PHP2H);
31. Peraturan Menteri Kehutanan Nomor P.9/Menhut-II/2010 tentang Izin Pembuatan dan Penggunaan Koridor;
32. Peraturan Menteri Kehutanan Nomor P.12/Menhut-II/2010 tentang Tata Cara Pengenaan, Penagihan, dan Pembayaran Iuran Izin Usaha Pemanfaatan Hutan pada Hutan Produksi;
33. Peraturan Menteri Kehutanan Nomor P.40/Menhut-II/2010 tentang Organisasi dan Tata Kerja Kementerian Kehutanan;
34. Peraturan Menteri Kehutanan Nomor P.50/Menhut-II/2010 tentang Tata Cara Pemberian dan perluasan Areal kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu (IUPHHK) dalam Hutan Alam, IUPHHK Restorasi Ekosistem, atau IUPHHK Hutan Tanaman Industri pada Hutan Produksi.

Memperhatikan : 1. Akta Nomor 06 tanggal 15 Februari 2010 tentang Pendirian Perseroan Terbatas (PT) Gemilang Cipta Nusantara, yang dibuat dihadapan Indra Tjahja Rinanto, SH., Notaris di Jakarta, yang disahkan oleh Menteri Hukum dan Hak Asasi Manusia Republik Indonesia dengan Keputusan Nomor AHU-09955.AH.01.01. Tahun 2010 tanggal 24 Februari 2010 yang telah diubah beberapa kali terakhir dengan Akta Nomor 55 tanggal 15 Maret 2011 yang dibuat dihadapan Linda Herawati, SH., Notaris di Jakarta Pusat dan telah dicatat dalam database Sisminbakum Departeman Hukum dan Hak Asasi Manusia sesuai surat Menteri Hukum dan Hak Asasi Manusia Nomor AHU-AH.01.10-08970 tanggal 24 Maret 2011;

2. Surat Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/BLH-AM/2012/030 tanggal 10 Januari 2012 perihal Rekomendasi atas UKL-UPL kegiatan IUPHHK-RE PT. Gemilang Cipta Nusantara.

MEMUTUSKAN :

Menetapkan : **KEPUTUSAN MENTERI KEHUTANAN TENTANG PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. GEMILANG CIPTA NUSANTARA, ATAS AREAL HUTAN PRODUKSI SELUAS ± 20.265 (DUA PULUH RIBU DUA RATUS ENAM PULUH LIMA) HEKTAR, DI KABUPATEN PELALAWAN, PROVINSI RIAU.**

KESATU : Memberikan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) dalam Hutan Alam kepada PT. Gemilang Cipta Nusantara atas areal hutan produksi seluas ± 20.265 (dua puluh ribu dua ratus enam puluh lima) hektar, seluruhnya berada pada Hutan Produksi Tetap (HP), dengan penutupan lahan berdasarkan hasil penafsiran citra landsat Provinsi Riau liputan tahun 2011 terdiri dari Hutan Rawa Primer seluas ± 965 (sembilan ratus enam puluh lima) hektar, Hutan Rawa Sekunder seluas ± 18.275 (delapan belas ribu dua ratus tujuh puluh lima) hektar, Belukar Rawa seluas ± 1.007 (seribu tujuh) hektar, Air seluas ± 18 (delapan belas) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau, sebagaimana terlukis pada Peta Lampiran Keputusan ini.

KEDUA ...

KEDUA : Luas dan letak definitif areal kerja IUPHHK-RE sebagaimana dimaksud pada Amar KESATU ditetapkan kembali oleh Kementerian Kehutanan setelah dilaksanakan pengukuran dan penataan batas areal kerja (temu gelang).

KETIGA : PT. Gemilang Cipta Nusantara berhak :

1. Melakukan kegiatan dan memperoleh manfaat dari hasil usahanya sesuai dengan izin yang diperolehnya.
2. Diberikan kewenangan dan tanggung jawab untuk melaksanakan RKT tanpa pengesahan dari pejabat yang berwenang (*self approval*) dalam hal memenuhi kriteria dan indikator yang ditetapkan oleh Menteri.

KEEMPAT : PT. Gemilang Cipta Nusantara :

(1) Wajib :

a. Menyusun Rencana Kerja (RK) untuk seluruh areal kerja;

b. Melaksanakan kegiatan nyata di lapangan untuk paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE;

c. Melaksanakan penataan batas areal kerja paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE;

d. Melaksanakan perlindungan hutan di areal kerjanya;

e. Menatausahakan keuangan kegiatan usahanya sesuai standar akuntansi kehutanan yang berlaku bagi pemegang izin usaha pemanfaatan hutan;

f. Mempekerjakan tenaga profesional bidang kehutanan (GANISPHPL) dan tenaga lain yang memenuhi persyaratan sesuai kebutuhan dan ketentuan peraturan perundang-undangan;

g. Melaksanakan sistem silvikultur sesuai dengan kondisi setempat;

h. Menggunakan peralatan pemanfaatan hasil hutan yang sesuai dengan ketentuan peraturan perundang-undangan;

i. Membayar iuran atau dana sesuai ketentuan peraturan perundang-undangan;

j. Melakukan kerjasama dengan koperasi masyarakat setempat, paling lambat 1 (satu) tahun setelah diterimanya IUPHHK-RE;

k. Menyusun Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu (RKUPHHK) jangka panjang untuk seluruh areal kerja, paling lambat 1 (satu) tahun setelah IUPHHK-RE diberikan, dan diajukan kepada Menteri Kehutanan atau pejabat yang ditunjuk guna mendapatkan persetujuan;

l. Menyusun Rencana Kerja Tahunan (RKT) berdasarkan RKUPHHK sebagaimana dimaksud huruf k untuk disahkan oleh Kepala KPH atau pejabat yang ditunjuk oleh Menteri Kehutanan;

m. Mengajukan RKT paling lambat 2 (dua) bulan sebelum RKT berjalan;

n. Menyampaikan laporan kinerja pemegang izin secara periodik kepada Menteri Kehutanan;

o. Mematuhi ...

o. Mematuhi dan melaksanakan ketentuan-ketentuan yang tercantum dalam Lampiran Keputusan ini dan peraturan perundang-undangan;

p. Membantu pengembangan HTR, HKM atau HD yang ditetapkan oleh Menteri Kehutanan di sekitar areal kerja;

q. Mengalokasikan saham untuk Koperasi Karyawan Kementerian Kehutanan 1 % dan Koperasi Pensiunan Kehutanan 1 % secara voluntary.

(2) Dilarang :

a. Menebang pohon di dalam areal kerjanya tanpa izin, kecuali dalam rangka pembangunan sarana dan prasarana sesuai ketentuan peraturan perundang-undangan.

b. Meninggalkan areal kerja.

c. Memindahtangankan IUPHHK-RE kecuali dengan persetujuan tertulis dari pemberi izin.

d. Mengontrakkan atau menyerahkan sebagian atau seluruh kegiatan usahanya kepada pihak lain tanpa persetujuan tertulis dari Menteri Kehutanan.

KELIMA : 1. Dalam hal kegiatan restorasi ekosistem belum diperoleh keseimbangan hayati, kepada PT. Gemilang Cipta Nusantara dapat diberikan IUPK, IUPJL, atau IUPHHBK pada hutan produksi.

2. Dalam hal kegiatan restorasi ekosistem telah diperoleh keseimbangan hayati, kepada PT. Gemilang Cipta Nusantara dapat diberikan IUPHHK pada hutan produksi dengan menerapkan satu atau lebih sistem silvikultur.

3. IUPK, IUPJL, IUPHHBK, dan IUPHHK dimaksud pada angka 1 dan angka 2 diberikan dengan izin tersendiri.

KEENAM : 1. IUPHHK-RE tidak merupakan hak kepemilikan atas kawasan hutan.

2. Areal IUPHHK-RE ini tidak dapat dijadikan jaminan, agunan, atau dijaminkan kepada pihak lain.

KETUJUH : 1. Apabila di dalam areal IUPHHK-RE terdapat lahan yang telah menjadi tanah milik, perkampungan, tegalan, persawahan atau telah diduduki dan digarap oleh pihak ketiga secara sah berdasarkan peraturan perundang-undangan, maka lahan tersebut dikeluarkan dari areal kerja IUPHHK-RE dalam Hutan Alam, tanpa mengubah status dan fungsi kawasan hutan.

2. Apabila lahan tersebut pada angka 1 dikehendaki untuk dijadikan areal IUPHHK-RE, maka penyelesaiannya dilakukan oleh PT. Gemilang Cipta Nusantara dengan pihak-pihak yang bersangkutan sesuai dengan ketentuan peraturan perundang-undangan.

KEDELAPAN : 1. IUPHHK-RE ini dievaluasi setiap 5 (lima) tahun oleh Menteri Kehutanan sebagai dasar kelangsungan izin.

2. Pemegang IUPHHK-RE ini akan dikenakan sanksi apabila melanggar ketentuan dan peraturan perundang-undangan.

KESEMBILAN ...

- 7 -

KESEMBILAN : Sebelum salinan asli Keputusan Menteri Kehutanan tentang Pemberian IUPHHK-RE dalam Hutan Alam ini dikirimkan oleh Direktur Jenderal Bina Usaha Kehutanan, PT. Gemilang Cipta Nusantara wajib membayar Iuran Izin Usaha Pemanfaatan Hutan (IIUPH) yang terhutang sesuai dengan ketentuan peraturan perundang-undangan.

KESEPULUH : Dalam hal PT. Gemilang Cipta Nusantara sampai dengan batas waktu yang ditentukan tidak dapat membayar IIUPH sebagaimana dimaksud dalam Amar KESEMBILAN, maka pemberian IUPHHK-RE ini dibatalkan.

KESEBELAS : Keputusan ini beserta lampirannya merupakan satu kesatuan yang tidak terpisahkan.

KEDUABELAS : Keputusan ini mulai berlaku pada tanggal ditetapkan untuk jangka waktu 60 (enam puluh) tahun, kecuali apabila diserahkan kembali oleh pemegang izin atau dicabut oleh Menteri Kehutanan, apabila dalam jangka waktu 2 (dua) tahun sejak ditetapkan Keputusan ini tidak ada kegiatan nyata di lapangan, maka Keputusan ini batal dengan sendirinya.

Ditetapkan di Jakarta
pada tanggal 24 Juli 2012

MENTERI KEHUTANAN
REPUBLIK INDONESIA,

Ttd.

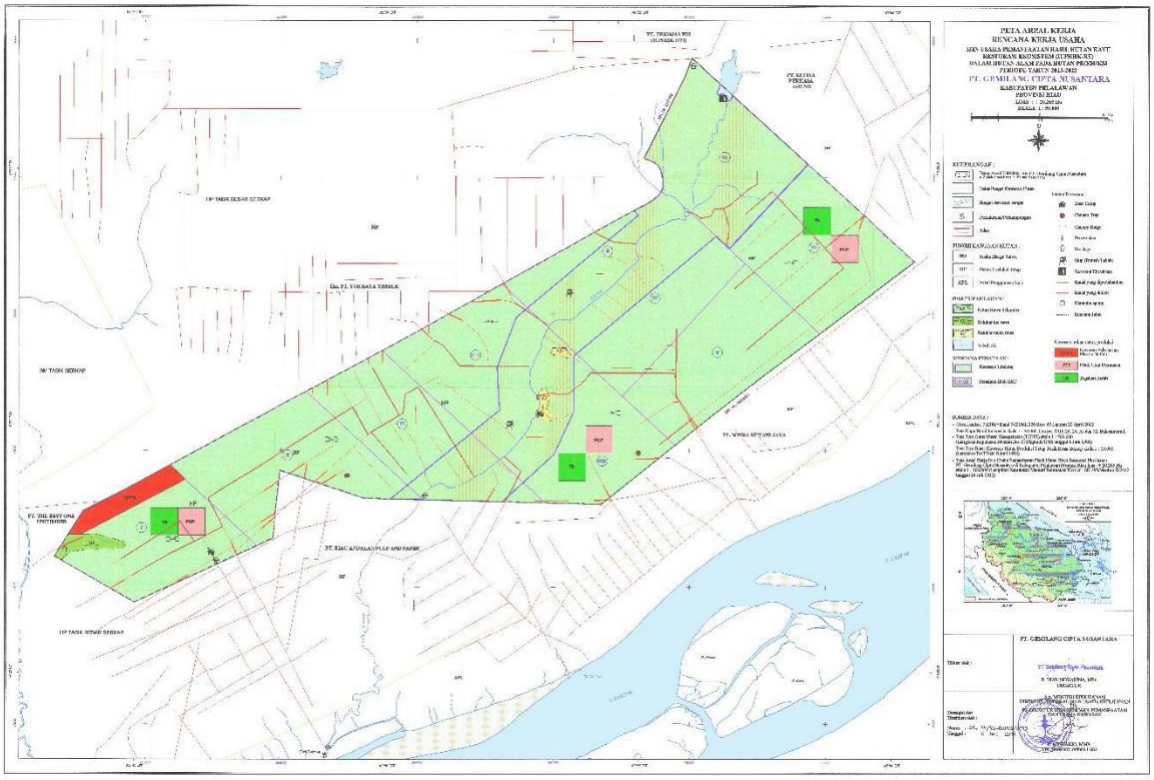
ZULKIFLI HASAN

Salinan sesuai dengan aslinya
KEPALA BIRO HUKUM DAN ORGANISASI,

KRISNA RYA

Salinan Keputusan ini disampaikan kepada yth. :
1. Menteri Koordinator Bidang Perekonomian.
2. Menteri Dalam Negeri.
3. Menteri Keuangan.
4. Menteri Energi dan Sumber Daya Mineral.
5. Menteri Perdagangan.
6. Menteri Perindustrian.
7. Menteri Tenaga Kerja dan Transmigrasi.
8. Menteri Lingkungan Hidup.
9. Kepala Badan Pertanahan Nasional.
10. Sekretaris Jenderal Kementerian Kehutanan.
11. Inspektur Jenderal Kementerian Kehutanan.
12. Direktur Jenderal Bina Usaha Kehutanan.
13. Direktur Jenderal Planologi Kehutanan.
14. Gubernur Riau.
15. Bupati Pelalawan.
16. Kepala Dinas Kehutanan Provinsi Riau.
17. Kepala Pusat Pengendalian Pembangunan Kehutanan Regional I.
18. Kepala Dinas Kehutanan Kabupaten Pelalawan.
19. Direktur Utama PT. Gemilang Cipta Nusantara.

PT. GCN RKU


PETA AREAL KERJA
RENCANA KERJA USAHA
PT. GEMILANG CIPTA NUSANTARA
KABUPATEN PELALAWAN
PROVINSI RIAU

PT. GCN MONEV-Certificate



KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN
DIREKTORAT JENDERAL PENGELOLAAN HUTAN PRODUKSI LESTARI
DIREKTORAT USAHA JASA LINGKUNGAN DAN HASIL HUTAN BUKAN KAYU HUTAN PRODUKSI

SURAT KETERANGAN

HASIL KEGIATAN MONITORING DAN EVALUASI IUPHHK-RE

Nomor : KT. 4/JASLING/PKU/HPL.2/8/2019

Diberikan kepada :

PT. Gemilang Cipta Nusantara

(Keputusan Menteri Kehutanan Nomor : SK. 395/Menhut-II/2012)

Pada kegiatan Monitoring dan Evaluasi IUPHHK-RE Tahun 2019, memperoleh nilai dengan kategori :

"BAIK"

Jakarta, 28 Agustus 2019

Direktur Usaha Jasa Lingkungan dan Hasil Hutan Bukan Kayu Hutan Produksi,

Ir. Djohan Utama Perbatasari, M.M.

NIP. 19601230 198801 1 001

MENTERI KEHUTANAN
REPUBLIK INDONESIA

KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
Nomor : SK.162/Menhut-II/2014

TENTANG

PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. SINAR MUTIARA NUSANTARA ATAS AREAL HUTAN PRODUKSI SELUAS ± 32.830 (TIGA PULUH DUA RIBU DELAPAN RATUS TIGA PULUH) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU

MENTERI KEHUTANAN REPUBLIK INDONESIA,

Menimbang : a. bahwa Direktur PT. Sinar Mutiara Nusantara dengan surat Nomor 005/SMN/II/2012 tanggal 16 Februari 2012, mengajukan permohonan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) Dalam Hutan Alam di Wilayah Kabupaten Pelalawan, Provinsi Riau;

b. bahwa Menteri Kehutanan dengan surat Nomor S.500/Menhut-VI/2013 tanggal 29 Agustus 2013, telah menetapkan PT. Sinar Mutiara Nusantara sebagai calon pemegang IUPHHK-RE untuk areal seluas ± 30.600 (tiga puluh ribu enam ratus) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau, dengan kewajiban melakukan Upaya Pengelolaan Lingkungan Hidup dan Upaya Pemantauan Lingkungan hidup (UKL-UPL) sesuai peraturan perundang-undangan;

c. bahwa sesuai surat Menteri Kehutanan Nomor S.648/Menhut-VI/2013 tanggal 12 November 2013, PT. Sinar Mutiara Nusantara menyelesaikan UKL dan UPL yang telah mendapat persetujuan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan, Provinsi Riau sesuai Keputusan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/BLH-AM/2013/25 tanggal 1 Oktober 2013 dan Izin Lingkungan sesuai Keputusan Bupati Pelalawan Nomor KPTS.660/BLH/2013/641 tanggal 1 Oktober 2013, kepada Direktur Jenderal Planologi Kehutanan untuk menerbitkan peta areal kerja (*Working Area*/WA) IUPHHK-RE PT. Sinar Mutiara Nusantara;

d. bahwa berdasarkan telaahan Direktorat Jenderal Planologi Kehutanan sesuai surat Direktur Jenderal Planologi Kehutanan Nomor S.1708/VII-WP3H/2013 tanggal 30 Desember 2013 areal yang dapat diberikan untuk IUPHHK-RE PT. Sinar Mutiara Nusantara seluas ± 32.830 (tiga puluh dua ribu delapan ratus tiga puluh) hektar, di Kabupaten Pelalawan, Provinsi Riau;

e. bahwa berdasarkan hasil penilaian, PT. Sinar Mutiara Nusantara telah memenuhi persyaratan untuk diberikan IUPHHK-RE, sebagaimana Peraturan Menteri Kehutanan Nomor P.50/Menhut-II/2010 tentang Tata Cara Pemberian Dan Perluasan Areal Kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu (IUPHHK) Dalam Hutan Alam, IUPHHK Restorasi Ekosistem, Atau IUPHHK Hutan Tanaman Industri Pada Hutan Produksi sebagaimana telah diubah dengan Peraturan Menteri Kehutanan Nomor P.26/Menhut-II/2012;

f. bahwa ...

f. bahwa berdasarkan pertimbangan huruf a sampai dengan huruf e, kepada PT. Sinar Mutiara Nusantara dapat diberikan IUPHHK-RE atas areal hutan produksi seluas ± 32.830 (tiga puluh dua ribu delapan ratus tiga puluh) hektar, di Kabupaten Pelalawan, Provinsi Riau dengan menetapkan Keputusan Menteri Kehutanan.

Mengingat : 1. Undang-Undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya;

2. Undang-Undang Nomor 41 Tahun 1999 tentang Kehutanan jo Undang-Undang Nomor 19 Tahun 2004;
3. Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah, jis Nomor 8 Tahun 2005 dan Nomor 12 Tahun 2008;
4. Undang-Undang Nomor 33 Tahun 2004 tentang Perimbangan Keuangan antara Pemerintah Pusat dan Daerah;
5. Undang-Undang Nomor 26 Tahun 2007 tentang Penataan Ruang;
6. Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup;
7. Undang-undang Nomor 18. Tahun 2013 tentang Pencegahan dan Pemberantasan Perusakan Hutan;
8. Peraturan Pemerintah Nomor 22 Tahun 1997 tentang Jenis dan Penyetoran Penerimaan Negara Bukan Pajak jo Peraturan Pemerintah Nomor 52 Tahun 1998;
9. Peraturan Pemerintah Nomor 59 Tahun 1998 tentang Tarif Atas Jenis Penerimaan Negara Bukan Pajak Yang Berlaku Pada Departemen Kehutanan dan Perkebunan jo Peraturan Pemerintah Nomor 74 Tahun 1999;
10. Peraturan Pemerintah Nomor 35 Tahun 2002 tentang Dana Reboisasi jo Peraturan Pemerintah Nomor 58 Tahun 2007;
11. Peraturan Pemerintah Nomor 44 Tahun 2004 tentang Perencanaan Kehutanan;
12. Peraturan Pemerintah Nomor 45 Tahun 2004 tentang Perlindungan Hutan jo Peraturan Pemerintah Nomor 60 Tahun 2009;
13. Peraturan Pemerintah Nomor 6 Tahun 2007 tentang Tata Hutan dan Penyusunan Rencana Pengelolaan Hutan, Serta Pemanfaatan Hutan jo Peraturan Pemerintah Nomor 3 Tahun 2008;
14. Peraturan Pemerintah Nomor 38 Tahun 2007 tentang Pembagian Urusan Pemerintahan antara Pemerintah, Pemerintahan Daerah Provinsi dan Pemerintahan Daerah Kabupaten/Kota;
15. Peraturan Pemerintah Nomor 26 Tahun 2008 tentang Rencana Tata Ruang Wilayah Nasional;
16. Peraturan Presiden Nomor 47 Tahun 2009 tentang Pembentukan dan Organisasi Kementerian Negara sebagaimana telah diubah terakhir dengan Peraturan Presiden Nomor 55 Tahun 2013;
17. Keputusan Presiden Nomor 84/P Tahun 2009 tentang Pembentukan Kabinet Indonesia Bersatu II sebagaimana telah diubah terakhir dengan Keputusan Presiden Nomor 5/P Tahun 2013;
18. Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas dan Fungsi Kementerian Negara serta Susunan Organisasi, Tugas dan Fungsi Eselon I Kementerian Negara sebagaimana telah diubah terakhir dengan Keputusan Presiden Nomor 56 Tahun 2013;
19. Instruksi Presiden Nomor 6 Tahun 2013 tentang Penundaan Pemberian Izin Baru dan Penyempurnaan Tata Kelola Hutan Alam Primer dan Lahan Gambut;

/20. Peraturan...

20. Peraturan Menteri Kehutanan Nomor P.55/Menhut-II/2006 tentang Penatausahaan Hasil Hutan yang Berasal dari Hutan Negara sebagaimana telah diubah terakhir dengan Peraturan Menteri Kehutanan Nomor P. 45/Menhut-II/2009;
21. Peraturan Menteri Kehutanan Nomor P.18/Menhut-II/2007 tentang Petunjuk Teknis Tata Cara Pengenaan, Pemungutan, dan Pembayaran Provisi Sumber Daya Hutan dan Dana Reboisasi;
22. Peraturan Menteri Kehutanan Nomor P.39/Menhut-II/2008 tentang Tata Cara Pengenaan Sanksi Administratif terhadap Pemegang Izin Pemanfaatan Hutan;
23. Peraturan Menteri Kehutanan Nomor P.58/Menhut-II/2008 tentang Kompetensi dan Sertifikasi Tenaga Teknis Pengelolaan Hutan Produksi Lestari;
24. Peraturan Menteri Kehutanan Nomor P.11/Menhut-II/2009 tentang Sistem Silvikultur dalam Areal Izin Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi;
25. Peraturan Menteri Kehutanan Nomor P.23/Menhut-II/2009 tentang Tata Cara Penyerahan Kembali Izin Usaha Pemanfaatan Hasil Hutan Kayu Sebelum Jangka Waktu Izin Berakhir;
26. Peraturan Menteri Kehutanan Nomor P.33/Menhut-II/2009 tentang Pedoman Inventarisasi Hutan Menyeluruh Berkala (IHMB) pada Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi jo Peraturan Menteri Kehutanan Nomor P.5/Menhut-II/2011;
27. Peraturan Menteri Kehutanan Nomor P.34/Menhut-II/2009 tentang Tata Cara dan Persyaratan Pemindahtanganan Izin Usaha Pemanfaatan Hasil Hutan Kayu;
28. Peraturan Menteri Kehutanan Nomor P.38/Menhut-II/2009 tentang Standard dan Pedoman Penilaian Kinerja Pengelolaan Hutan Produksi Lestari dan Verifikasi Legalitas Kayu Pada Pemegang Izin atau Pada Hutan Hak sebagaimana telah diubah terakhir dengan Peraturan Menteri Kehutanan Nomor P.42/Menhut-II/2013;
29. Peraturan Menteri Kehutanan Nomor P.53/Menhut-II/2009 tentang Pemasukan dan Penggunaan Alat untuk Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu atau Ijin Pemanfaatan Kayu;
30. Peraturan Menteri Kehutanan Nomor P.56/Menhut-II/2009 tentang Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu Hutan Alam dan Restorasi Ekosistem jo Peraturan Menteri Kehutanan Nomor P.24/Menhut-II/2011;
31. Peraturan Menteri Kehutanan Nomor P.69/Menhut-II/2009 tentang Pedoman Pelaporan Keuangan Pemanfaatan Hutan Produksi dan Pengelolaan Hutan (DOLAPKEU – PHP2H);
32. Peraturan Menteri Kehutanan Nomor P.9/Menhut-II/2010 tentang Izin Pembuatan dan Penggunaan Koridor;
33. Peraturan Menteri Kehutanan Nomor P.12/Menhut-II/2010 tentang Tata Cara Pengenaan, Penagihan, dan Pembayaran Iuran Izin Usaha Pemanfaatan Hutan pada Hutan Produksi;
34. Peraturan Menteri Kehutanan Nomor P.40/Menhut-II/2010 tentang Organisasi dan Tata Kerja Kementerian Kehutanan jo Peraturan Menteri Kehutanan Nomor P.33/Menhut II/2012;
35. Peraturan Menteri Kehutanan Nomor P.50/Menhut-II/2010 tentang Tata Cara Pemberian Dan Perluasan Areal Kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu (IUPHHK) Dalam Hutan Alam, IUPHHK Restorasi Ekosistem, Atau IUPHHK Hutan Tanaman Industri Pada Hutan Produksi jo Peraturan Menteri Kehutanan Nomor P.26/Menhut-II/2012.

/36. Keputusan...

-4-

36. Keputusan Direktur Jenderal Planologi Kehutanan atas nama Menteri Kehutanan Nomor SK 6018/Menhut-VII/IPSDH/2013 tentang Penetapan Peta Indikatif Penundaan Pemberian Izin Baru Pemanfaatan Hutan, Penggunaan Kawasan Hutan Dan Perubahan Peruntukan Kawasan Hutan dan Areal Penggunaan Lain (Revisi V).

Memperhatikan : 1. Akta Nomor 07 tanggal 7 Januari 2005 tentang Pendirian Perseroan Terbatas (PT) Sinar Mutiara Nusantara, dibuat oleh Untung Raharjo, SH. Notaris di Bekasi, pengesahan Menteri Hukum dan Hak Asasi Manusia Republik Indonesia sesuai Keputusan Nomor C-16213 HT.01.01.TH.2005 tanggal 13 Juni 2005 yang telah diubah terakhir dengan Akta Nomor 06 tanggal 7 Maret 2012 dibuat oleh Rita Komala Dewi, SH., MH., M.Kn. Notaris di Tanggerang, pengesahan Menteri Hukum dan Hak Asasi Manusia Republik Indonesia Nomor AHU-33559.AH.01.02.TH.2012 tanggal 19 Juni 2012;

2. Surat Bupati Pelalawan Nomor 522/DISHUT/2011/680 tanggal 22 Desember 2011 perihal Pertimbangan IUPHHK-RE An. PT. Sinar Mutiara Nusantara;
3. Surat Kepala Badan Pelayanan Perizinan Terpadu Provinsi Riau Nomor 503/BP2T-IR/32 tanggal 7 Februari 2012 perihal Rekomendasi Analisis Fungsi Kawasan Hutan Kayu pada Restorasi Ekosistem (IUPHHK-RE) a.n. PT. Sinar Mutiara Nusantara.
4. Surat Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/BLH-AM/2013/25 perihal Rekomendasi atas UKL-UPL Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) PT. Sinar Mutiara Nusantara.
5. Keputusan Bupati Pelalawan Nomor KPTS.660/BLH/2013/641 tanggal 1 Oktober 2013 perihal Izin Lingkungan Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) PT. Sinar Mutiara Nusantara di Kelompok Hutan Sungai Serkap, Kecamatan Teluk Meranti, Kabupaten Pelalawan

MEMUTUSKAN :

Menetapkan : **KEPUTUSAN MENTERI KEHUTANAN TENTANG PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. SINAR MUTIARA NUSANTARA ATAS AREAL HUTAN PRODUKSI SELUAS ± 32.830 (TIGA PULUH DUA RIBU DELAPAN RATUS TIGA PULUH) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU.**

KESATU : Memberikan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) dalam Hutan Alam kepada PT. Sinar Mutiara Nusantara atas areal Hutan Produksi seluas ± 32.830 (tiga puluh dua ribu delapan ratus tiga puluh) hektar, yang keseluruhannya merupakan Hutan Produksi Tetap (HP), dengan penutupan lahan berdasarkan penafsiran citra landsat liputan tahun 2011 berupa Hutan Rawa Primer seluas ± 16.050 (enam belas ribu lima puluh) hektar, Hutan Rawa Sekunder seluas ± 16.750 (enam belas ribu tujuh ratus lima puluh) hektar, dan tubuh air seluas 30 (tiga puluh) hektar yang terletak di Kabupaten Pelalawan, Provinsi Riau, sebagaimana terlukis pada Peta Lampiran Keputusan ini.

KEDUA : Luas dan letak definitif areal kerja IUPHHK-RE sebagaimana dimaksud pada Amar KESATU ditetapkan kembali oleh Kementerian Kehutanan setelah dilaksanakan pengukuran dan penataan batas areal kerja (temu gelang).

KETIGA...

-5-

KETIGA : PT. Sinar Mutiara Nusantara berhak :

1. Melakukan kegiatan dan memperoleh manfaat dari hasil usahanya sesuai dengan izin yang diperolehnya.
2. Diberikan kewenangan dan tanggung jawab untuk melaksanakan Rencana Kerja Tahunan (RKT) tanpa pengesahan dari pejabat yang berwenang (*self approval*) dalam hal memenuhi kriteria dan indikator yang ditetapkan oleh Menteri.

KEEMPAT : PT. Sinar Mutiara Nusantara:

(1) Wajib :

a. Menyusun Rencana Kerja (RK) untuk seluruh areal kerja;
b. Melaksanakan kegiatan nyata di lapangan untuk paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE dalam Hutan Alam;
c. Melaksanakan penataan batas areal kerja paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE dalam Hutan Alam;
d. Melaksanakan perlindungan hutan di areal kerjanya;
e. Menatausahakan keuangan kegiatan usahanya sesuai standar akuntansi kehutanan yang berlaku bagi pemegang izin usaha pemanfaatan hutan;
f. Mempekerjakan tenaga profesional bidang kehutanan (GANISPHPL) dan tenaga lain yang memenuhi persyaratan sesuai kebutuhan dan ketentuan peraturan perundang-undangan;
g. Melaksanakan sistem silvikultur sesuai dengan kondisi setempat;
h. Menggunakan peralatan pemanfaatan hasil hutan yang sesuai dengan ketentuan peraturan perundang-undangan;
i. Membayar iuran atau dana sesuai ketentuan peraturan perundang-undangan;
j. Melakukan kerjasama dengan koperasi masyarakat setempat, paling lambat 1 (satu) tahun setelah diterimanya IUPHHK-RE;
k. Menyusun Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu (RKUPHHK) jangka panjang untuk seluruh areal kerja, paling lambat 1 (satu) tahun setelah IUPHHK-RE diberikan, dan diajukan kepada Menteri Kehutanan atau pejabat yang ditunjuk guna mendapatkan persetujuan;
l. Menyusun RKT berdasarkan RKUPHHK sebagaimana dimaksud huruf k untuk disahkan oleh Kepala Kesatuan Pemangkuan Hutan (KPH) atau pejabat yang ditunjuk oleh Menteri Kehutanan;
m. Mengajukan RKT paling lambat 2 (dua) bulan sebelum RKT berjalan;
n. Menyampaikan laporan kinerja pemegang izin secara periodik kepada Menteri Kehutanan;
o. Melaporkan kepada Pemerintah dan Pemerintah Daerah dana yang diterima dari pihak asing dan dipublikasikan di media massa setempat dan nasional untuk diaudit oleh Akuntan Publik yang terdaftar di Indonesia;
p. Memberantas perambahan hutan, pembalakan liar dan menanggulangi kebakaran hutan di areal izin dan apabila tidak mampu setelah melaporkan kepada Pemerintah Daerah atau Menteri Kehutanan, izin dicabut tanpa peringatan.
q. Membantu pengembangan Hutan Tanaman Rakyat (HTR), Hutan Kemasyarakatan (HKM) atau Hutan Desa (HD) yang ditetapkan oleh Menteri Kehutanan di sekitar areal kerja;
r. Mengalokasikan saham untuk Koperasi Karyawan Kementerian Kehutanan 1 % dan Koperasi Pensiunan Kehutanan 1 % secara *voluntary*, dan Koperasi masyarakat setempat 1 %.

/s. Melaporkan...

s. Melaporkan kepada pemerintah/Kementerian Kehutanan dan mempublikasikan kepada masyarakat setempat tentang pelaksanaan penjualan *carbon offset* kepada pihak asing di pasar karbon sukarela.

t. Mematuhi dan melaksanakan ketentuan-ketentuan yang tercantum dalam Lampiran Keputusan dan peraturan perundang-undangan.

(2)Dilarang :

a. Menebang pohon di dalam areal kerjanya tanpa izin, kecuali dalam rangka pembangunan sarana dan prasarana sesuai ketentuan peraturan perundang-undangan.

b. Meninggalkan areal kerja.

c. Memindahtangankan IUPHHK-RE kecuali dengan persetujuan tertulis dari Menteri Kehutanan.

d. Mengontrakkan atau menyerahkan sebagian atau seluruh kegiatan usahanya kepada pihak lain tanpa persetujuan tertulis dari Menteri Kehutanan.

KELIMA :

1. Dalam hal kegiatan restorasi ekosistem belum diperoleh keseimbangan hayati, kepada PT. Sinar Mutiara Nusantara dapat diberikan Izin Usaha Pemanfaatan Kawasan (IUPK), Izin Usaha Pemanfaatan Jasa Lingkungan (IUPJL), atau Izin Usaha Pemanfaatan Hasil Hutan Bukan Kayu (IUPHHBK) pada hutan produksi;
2. Dalam hal kegiatan restorasi ekosistem telah diperoleh keseimbangan hayati, kepada PT. Sinar Mutiara Nusantara dapat diberikan IUPHHK pada hutan produksi dengan menerapkan satu atau lebih sistem silvikultur.

KEENAM :

1. IUPHHK-RE tidak merupakan hak kepemilikan atas kawasan hutan.
2. Areal IUPHHK-RE tidak dapat dijadikan jaminan, agunan, atau dijaminkan kepada pihak lain.

KETUJUH :

1. Apabila di dalam areal IUPHHK-RE terdapat lahan yang telah menjadi tanah milik, perkampungan, tegalan, persawahan atau telah diduduki dan digarap oleh pihak ketiga secara sah berdasarkan peraturan perundang-undangan, maka lahan tersebut dikeluarkan dari areal kerja IUPHHK-RE, tanpa mengubah status dan fungsi kawasan hutan.
2. Apabila lahan tersebut pada angka 1 dikehendaki untuk dijadikan areal IUPHHK-RE, maka penyelesaiannya dilakukan oleh PT. Sinar Mutiara Nusantara dengan pihak-pihak yang bersangkutan sesuai dengan ketentuan peraturan perundang-undangan.

KEDELAPAN :

1. IUPHHK-RE dievaluasi setiap 5 (lima) tahun oleh Menteri Kehutanan sebagai dasar kelangsungan izin.
2. Pemegang IUPHHK-RE dikenakan sanksi apabila melanggar ketentuan dalam Keputusan dan peraturan perundang-undangan

KESEMBILAN :

1. PT. Sinar Mutiara Nusantara wajib membayar Iuran Izin Usaha Pemanfaatan Hutan (IIUPH) sesuai dengan ketentuan peraturan perundang-undangan.
2. Salinan asli Keputusan Menteri Kehutanan tentang Pemberian IUPHHK-RE dalam Hutan Alam pada Hutan Produksi diberikan oleh Direktur Jenderal Bina Usaha Kehutanan setelah kewajiban angka 1 (satu) dibayar lunas.

KESEPULUH : Dalam hal PT. Sinar Mutiara Nusantara sampai dengan batas waktu yang ditentukan tidak membayar IIUPH sebagaimana dimaksud dalam Amar KESEMBILAN, maka pemberian IUPHHK-RE batal dengan sendirinya

KESEBELAS...

-7-

KESEBELAS : Keputusan beserta lampirannya merupakan satu kesatuan yang tidak terpisahkan.

KEDUABELAS : Keputusan ini mulai berlaku pada tanggal ditetapkan untuk jangka waktu 60 (enam puluh) tahun, kecuali apabila diserahkan kembali oleh pemegang izin atau dicabut oleh Menteri Kehutanan, apabila dalam jangka waktu 2 (dua) tahun sejak ditetapkan Keputusan tidak ada kegiatan nyata di lapangan, maka Keputusan batal dengan sendirinya.

Ditetapkan di : Jakarta
Pada tanggal : 18 Februari 2014

Salinan sesuai dengan aslinya,
KEPALA BIRO HUKUM DAN ORGANISASI,

KRISNA RYA

MENTERI KEHUTANAN
REPUBLIK INDONESIA,

Ttd.

ZULKIFLI HASAN

Salinan Keputusan ini disampaikan kepada yth.:
1. Menteri Koordinator Bidang Perekonomian.
2. Menteri Dalam Negeri.
3. Menteri Keuangan.
4. Menteri Energi dan Sumber Daya Mineral.
5. Menteri Perdagangan.
6. Menteri Perindustrian.
7. Menteri Tenaga Kerja dan Transmigrasi.
8. Menteri Lingkungan Hidup.
9. Kepala Badan Pertanahan Nasional.
10. Sekretaris Jenderal Kementerian Kehutanan.
11. Inspektur Jenderal Kementerian Kehutanan.
12. Direktur Jenderal Bina Usaha Kehutanan.
13. Direktur Jenderal Planologi Kehutanan.
14. Gubernur Riau.
15. Bupati Pelalawan.
16. Kepala Dinas Kehutanan Provinsi Riau.
17. Kepala Dinas Kehutanan Kabupaten Pelalawan.
18. Direktur PT. Sinar Mutiara Nusantara.

SK.IUPHHK-RE/PT. SINAR MUTIARA NUSANTARA

LAMPIRAN KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
NOMOR : SK.162/Menhut-II/2014
TANGGAL : 18 Februari 2014

KETENTUAN MENGENAI PELAKSANAAN USAHA PEMANFAATAN HASIL HUTAN KAYU (UPHHK) RESTORASI EKOSISTEM DALAM HUTAN ALAM PADA HUTAN PRODUKSI PT. SINAR MUTIARA NUSANTARA

Ketentuan I. TUJUAN UPHHK RESTORASI EKOSISTEM

Mendapatkan keuntungan finansial dari kegiatan pemulihan (restorasi) fungsi ekosistem hutan produksi dalam areal kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) dalam Hutan Alam pada Hutan Produksi berdasarkan prinsip pengelolaan hutan produksi lestari dan memajukan kesejahteraan masyarakat setempat.

Ketentuan II. TUJUAN UPHHK RESTORASI EKOSISTEM

Pemegang IUPHHK-RE dalam Hutan Alam pada Hutan Produksi di dalam arealnya melaksanakan kegiatan perencanaan hutan, pemanfaatan hasil hutan, permudaan dan pemeliharaan hutan, pemberdayaan masyarakat sekitar hutan, perlindungan dan pengamanan hutan, tenaga kerja, penelitian dan pengembangan.

Ketentuan III. TUJUAN UPHHK RESTORASI EKOSISTEM

1. PERENCANAAN HUTAN
   - 1.1. Penyusunan Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (RKUPHHK-RE) dalam Hutan Alam, yang dinilai dan disahkan oleh Menteri Kehutanan atau pejabat yang ditunjuk sebagai dasar penyusunan Rencana Kerja Tahunan Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (RKTUPHHK-RE) sesuai ketentuan.
   - 1.2. Penataan Hutan dalam rangka membentuk Kesatuan Pemangkuan Hutan Produksi (KPHP), atau bagian KPHP di areal kerjanya seluas ± 32.830 (tiga puluh dua ribu delapan ratus tiga puluh) hektar.
   - 1.3. Risalah Hutan dengan intensitas 1 (satu) persen setiap 10 tahunan sebagai dasar penyusunan RKUPHHK-RE serta RKTUPHHK-RE, dan penilaian kinerja perusahaan.
   - 1.4. RKUPHHK-RE disusun dalam 2 (dua) tahapan, yaitu sebelum tercapai keseimbangan ekosistem dan tahap sesudah tercapai keseimbangan ekosistem.

2. PEMANFAATAN HASIL HUTAN
   - 2.1. Pemanfaatan hasil hutan kayu diizinkan setelah mencapai keseimbangan ekosistem bila pada tingkat tapak, kelompok hutan atau pada seluruh areal kerjanya menerapkan sistem silvikultur yang tepat di bawah supervise pakar kehutanan di bidang silvikultur dan ekologi hutan.
   - 2.2. Memberi kemudahan pemungutan hasil hutan non kayu bagi penduduk setempat atau dalam hal ada izin pemungutan hasil hutan bukan kayu yang diterbitkan oleh pejabat yang berwenang sesuai peraturan perundang-undangan atau hak adat setempat tetap berlaku dan wajib diindahkan oleh pemegang izin.
   - 2.3. Jaringan Jalan :
     - 2.3.1. Menggunakan dan memelihara jaringan jalan yang sudah ada di dalam areal kerjanya sesuai peraturan perundang-undangan dan dituangkan dalam RKUPHHK-RE.
     - 2.3.2. Membongkar jembatan yang mengakibatkan masuknya perambah hutan atau penebang liar.

3. PERMUDAAN ...

-2-

3. PERMUDAAN DAN PEMELIHARAAN HUTAN
   3.1. Melaksanakan upaya-upaya untuk melakukan pemulihan ekosistem hutan, melalui pemeliharaan, perlindungan, penanaman, dan pengayaan dengan jenis-jenis asli setempat sesuai dengan ketentuan yang ditetapkan dan sesuai dengan IUPHHK-RE yang telah disetujui.
   3.2. Membuat plot permanen untuk mengukur pertumbuhan/riap tegakan hutan minimal 100 hektar per 5 (lima) tahun dan mengukur debit air serta mutu air sungai akibat dampak erosi.
   3.3. Membuat kebun bibit seluas 100 hektar per 5 (lima) tahun dengan jenis-jenis setempat disesuaikan dengan tanaman unggulan/andalan setempat serta mengadakan kebun pangkas.
   3.4. Membuat kebun bibit seluas 100 hektar per 5 (lima) tahun dengan jenis-jenis setempat disesuaikan dengan tanaman unggulan/andalan setempat serta perlu mengadakan kebun pangkas.
   3.5. Menyediakan areal seluas 300 hektar yang digunakan untuk menjaga dan melindungi plasma nutfah.

4. PEMBERDAYAAN MASYARAKAT SEKITAR HUTAN
   4.1. Melaksanakan kemitraan dalam usaha produktif di areal kerja dan penguatan kapasitas masyarakat setempat.
   4.2. Menyediakan fasilitas sosial bagi masyarakat di dalam areal kerja seperti tempat-tempat ibadah, pendidikan, dan kesehatan, minimal 1 (satu) desa yang ada di dalam/sekitar areal kerja.

5. PERLINDUNGAN DAN PENGAMANAN HUTAN
   5.1. Pencegahan/Kebakaran Hutan melalui :
      5.1.1. Menyediakan sarana dan prasarana (peralatan, pengawas, ilaran api) pencegahan dan pemadaman kebakaran hutan dalam jumlah yang memadai sesuai dengan luas dan keadaan areal kerjanya.
      5.1.2. Mempekerjakan tenaga mandor pengawas hutan berkualifikasi Tenaga Teknis (GANISPHPL) per seratus hektar dan membentuk satuan pengamanan hutan setiap 5.000 (lima ribu) hektar.
      5.1.3. Menyediakan dana yang cukup dan dilaporkan dalam audit yang dibuat oleh akuntan publik.
      5.1.4. Segera melapor pada instansi kehutanan atau instansi terkait setiap terjadi kebakaran di areal kerjanya.

   5.2. Pencegahan Perambahan Hutan
      5.2.1. Wajib mengatasi perambahan hutan dan atau penebangan liar oleh pihak ke 3 (tiga).
      5.2.2. Mencegah, melapor dan berkoordinasi dengan Pemerintah Daerah setempat.

   5.3. Perlindungan terhadap Tumbuh-tumbuhan
      5.3.1. Dilarang melakukan penebangan dengan radius atau jarak sampai dengan 500 m dari tepi waduk atau danau; 200 m dari tepi mata air dan kiri kanan sungai di daerah rawa; 100 m dari kiri kanan tepi sungai; 50 m kiri kanan tepi anak sungai; 2 kali kedalaman jurang dari tepi jurang; 130 kali selisih pasang tertinggi dan pasang terendah dari tepi pantai dengan membuat papan-papan larangan setiap 500 hektar, kecuali atas izin Menteri Kehutanan atau pejabat yang ditunjuk dengan memperhatikan kepentingan masyarakat.

5.3.2. Aktif ....

-2-

3. PERMUDAAN DAN PEMELIHARAAN HUTAN
   3.1. Melaksanakan upaya-upaya untuk melakukan pemulihan ekosistem hutan, melalui pemeliharaan, perlindungan, penanaman, dan pengayaan dengan jenis-jenis asli setempat sesuai dengan ketentuan yang ditetapkan dan sesuai dengan IUPHHK-RE yang telah disetujui.
   3.2. Membuat plot permanen untuk mengukur pertumbuhan/riap tegakan hutan minimal 100 hektar per 5 (lima) tahun dan mengukur debit air serta mutu air sungai akibat dampak erosi.
   3.3. Membuat kebun bibit seluas 100 hektar per 5 (lima) tahun dengan jenis-jenis setempat disesuaikan dengan tanaman unggulan/andalan setempat serta mengadakan kebun pangkas.
   3.4. Membuat kebun bibit seluas 100 hektar per 5 (lima) tahun dengan jenis-jenis setempat disesuaikan dengan tanaman unggulan/andalan setempat serta perlu mengadakan kebun pangkas.
   3.5. Menyediakan areal seluas 300 hektar yang digunakan untuk menjaga dan melindungi plasma nutfah.

4. PEMBERDAYAAN MASYARAKAT SEKITAR HUTAN
   4.1. Melaksanakan kemitraan dalam usaha produktif di areal kerja dan penguatan kapasitas masyarakat setempat.
   4.2. Menyediakan fasilitas sosial bagi masyarakat di dalam areal kerja seperti tempat-tempat ibadah, pendidikan, dan kesehatan, minimal 1 (satu) desa yang ada di dalam/sekitar areal kerja.

5. PERLINDUNGAN DAN PENGAMANAN HUTAN
   5.1. Pencegahan/Kebakaran Hutan melalui :
      5.1.1. Menyediakan sarana dan prasarana (peralatan, pengawas, ilaran api) pencegahan dan pemadaman kebakaran hutan dalam jumlah yang memadai sesuai dengan luas dan keadaan areal kerjanya.
      5.1.2. Mempekerjakan tenaga mandor pengawas hutan berkualifikasi Tenaga Teknis (GANISPHPL) per seratus hektar dan membentuk satuan pengamanan hutan setiap 5.000 (lima ribu) hektar.
      5.1.3. Menyediakan dana yang cukup dan dilaporkan dalam audit yang dibuat oleh akuntan publik.
      5.1.4. Segera melapor pada instansi kehutanan atau instansi terkait setiap terjadi kebakaran di areal kerjanya.

   5.2. Pencegahan Perambahan Hutan
      5.2.1. Wajib mengatasi perambahan hutan dan atau penebangan liar oleh pihak ke 3 (tiga).
      5.2.2. Mencegah, melapor dan berkoordinasi dengan Pemerintah Daerah setempat.

   5.3. Perlindungan terhadap Tumbuh-tumbuhan
      5.3.1. Dilarang melakukan penebangan dengan radius atau jarak sampai dengan 500 m dari tepi waduk atau danau; 200 m dari tepi mata air dan kiri kanan sungai di daerah rawa; 100 m dari kiri kanan tepi sungai; 50 m kiri kanan tepi anak sungai; 2 kali kedalaman jurang dari tepi jurang; 130 kali selisih pasang tertinggi dan pasang terendah dari tepi pantai dengan membuat papan-papan larangan setiap 500 hektar, kecuali atas izin Menteri Kehutanan atau pejabat yang ditunjuk dengan memperhatikan kepentingan masyarakat.

5.3.2. Aktif ....

5.3.2. Aktif dalam pengembangan dan perlindungan sumber daya alam, dan melaksanakan Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan (UKL/UPL).
5.3.3. Mencegah kerusakan dan gangguan hama penyakit terhadap hutan dan hasil hutan di areal kerjanya.
5.3.4. Mencegah kerusakan dan gangguan hama penyakit terhadap hutan dan hasil hutan di areal kerjanya.

6. TENAGA KERJA
Merekrut tenaga kerja dari masyarakat setempat dan mengikutsertakan pendidikan dan latihan bagi sebanyak-banyaknya tenaga kerja perusahaan dan masyarakat setempat.

7. PENELITIAN DAN PENGEMBANGAN
7.1. Menyediakan dana yang cukup untuk kegiatan penelitian dan pengembangan dengan titik berat pada tumbuhan asli setempat.
7.2. Mempekerjakan tenaga Sarjana Kehutanan untuk kegiatan penelitian dan pengembangan.
7.3. Bekerjasama dengan Lembaga Penelitian Kehutanan.

Ketentuan IV. LAIN-LAIN
Melindungi obyek-obyek bernilai sejarah dan atau ilmiah dari kerusakan-kerusakan dan harus segera melaporkan adanya kerusakan dan adanya penemuan baru kepada Pemerintah.

Ketentuan V. PENGAWASAN DAN PEMBINAAN PEMERINTAH
Pemerintah melakukan pengawasan dan pembinaan terhadap pelaksanaan Keputusan sebagaimana tercantum dalam Amar Keputusan dan Lampiran Keputusan.

Ketentuan VI. PELANGGARAN DAN SANKSI
Pelanggaran kewajiban dan Ketentuan sebagaimana dicantumkan dalam AMAR Keputusan dan Lampiran Keputusan dikenakan sanksi sesuai peraturan perundang-undangan.

Ketentuan VII. HAK DAN KEWAJIBAN ATAS BERAKHIRNYA IZIN (DISERAHKAN, DICABUT, BERAKHIR).
1. Hak Pemegang Izin
Dalam hal IUPHHK-RE, dibatalkan atau dicabut, pemegang izin tetap dibebankan kewajiban-kewajiban yang tercantum dalam pasal 82 Peraturan Pemerintah Nomor 6 Tahun 2007 yang telah diubah dengan Peraturan Pemerintah Nomor 3 Tahun 2008, dan:
1.1. Barang-barang persediaan yang berada di dalam gudang dan benda-benda bergerak yang dipergunakan pemegang izin, tetap menjadi milik pemegang izin dan dikeluarkan dalam izin paling lama 30 (tiga puluh) hari kerja sejak izin dicabut.
1.2. Segala hak yang dimiliki pemegang IUPHHK-RE berakhir.

2. Kewajiban ...

-4-

2. Kewajiban

2.1. Menyerahkan dalam keadaan baik semua benda tidak bergerak seperti *base camp*, gedung, jalan, jembatan, gudang, pelabuhan udara, pelabuhan/sungai dan laut, dok dan lain-lain yang telah dibangun oleh pemegang izin kepada Pemerintah tanpa ada ganti rugi dari Pemerintah.

2.2. Areal hutan yang dibebani IUPHHK-RE kembali sepenuhnya dikuasai Negara.

2.3. Menyerahkan semua klise serta peta, gambar-gambar ukuran tanah dan sebagainya kepada Kementerian Kehutanan dengan tidak menerima ganti rugi.

2.4. Wajib menyelesaikan semua kewajiban-kewajiban yang tercantum dalam Keputusan.

3. Dalam hal pemegang izin akan menyerahkan kembali IUPHHK-RE sebelum habis masa berlakunya, maka pemegang izin wajib menyelesaikan dan memenuhi semua kewajiban teknis dan finansial sebagaimana tercantum dalam Keputusan dan Lampiran Keputusan ini sebelum diserahkan kembali kepada pemerintah.

Salinan sesuai dengan aslinya
KEPALA BIRO HUKUM DAN ORGANISASI,

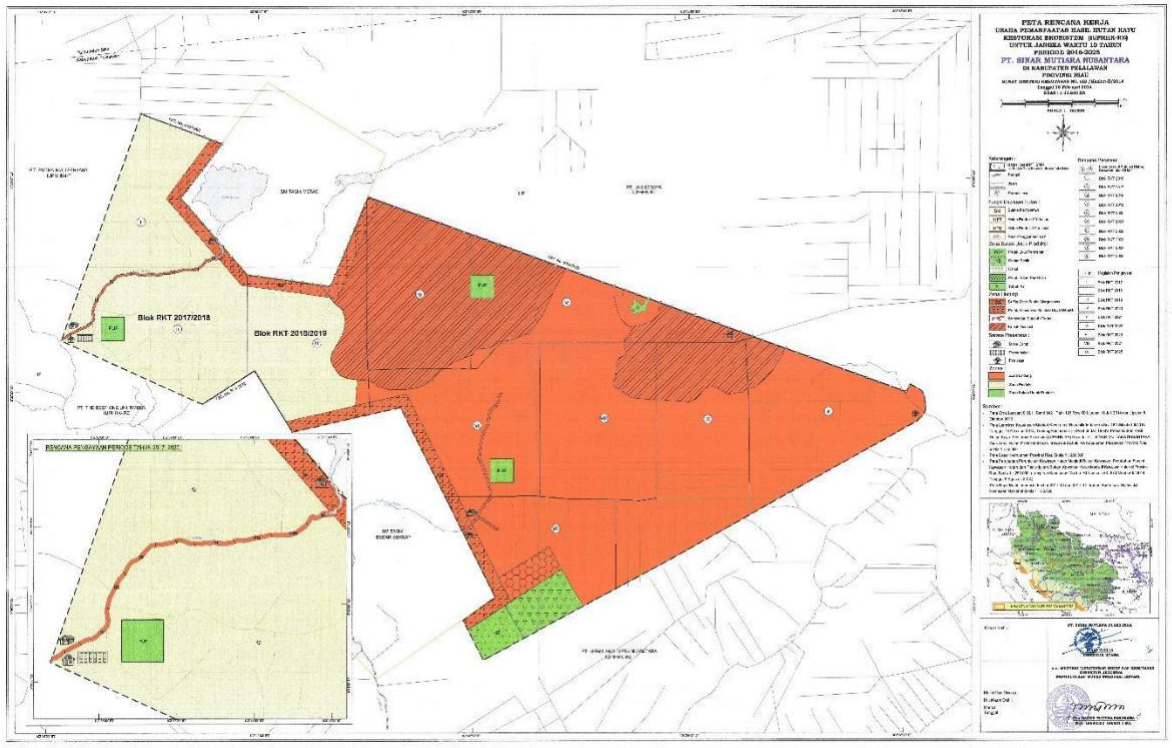
KRISNA RYA

MENTERI KEHUTANAN
REPUBLIK INDONESIA,

Ttd.

ZULKIFLI HASAN

PT. SMN RKU


PETA RENCANA KERJA
USAHA PEMANFAATAN HASIL HUTAN KAYU
KESTORASI EKOSISTEM (RESTORE-HTI)
UNTUK JANGKA WAKTU 10 TAHUN
PERIODE 2016-2025
PT. SINAR MUTIARA NUSANTARA
DI KABUPATEN PELALAWAN
PROVINSI RIAU
Blok RKT 2017/2018
Blok RKT 2018/2019

PT. SMN MONEV-Certificate



KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN
DIREKTORAT JENDERAL PENGELOLAAN HUTAN PRODUKSI LESTARI
DIREKTORAT USAHA JASA LINGKUNGAN DAN HASIL HUTAN BUKAN KAYU HUTAN PRODUKSI

SURAT KETERANGAN

HASIL KEGIATAN MONITORING DAN EVALUASI IUPHHK-RE

Nomor : KT. II/JASLING/PKU/HPL.2/8/2019

Diberikan kepada :

PT. Sinar Mutiara Nusantara

(Keputusan Menteri Kehutanan Nomor : SK. 162/Menhut-II/2014)

Pada kegiatan Monitoring dan Evaluasi IUPHHK-RE Tahun 2018, memperoleh nilai dengan kategori :

"SEDANG"

Jakarta, 26 Agustus 2019

Direktur Usaha Jasa Lingkungan dan Hasil Hutan Bukan Kayu Hutan Produksi,

Ir. Djohan Utama Perbatasari, M.M.
NIP. 19601230 198801 1 001

PT. TBOT IUPHHK-RE

MENTERI KEHUTANAN
REPUBLIK INDONESIA

KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
Nomor : SK.747/Menhut-II/2014

TENTANG

PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. THE BEST ONE UNITIMBER ATAS AREAL HUTAN PRODUKSI SELUAS ± 39.412 (TIGA PULUH SEMBILAN RIBU EMPAT RATUS DUA BELAS) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU

MENTERI KEHUTANAN REPUBLIK INDONESIA,

Menimbang : a. bahwa Direktur PT. The Best One Unitimber dengan surat Nomor 02/TBOT-DIR/X/2013 tanggal 22 Oktober 2013, mengajukan permohonan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) Dalam Hutan Alam di Wilayah Kabupaten Pelalawan, Provinsi Riau;

b. bahwa Menteri Kehutanan dengan surat Nomor S.703/Menhut-VI/2013 tanggal 13 Desember 2013, telah menetapkan PT. The Best One Unitimber sebagai calon pemegang IUPHHK-RE untuk areal seluas ± 39.412 (tiga puluh sembilan ribu empat ratus dua belas) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau, dengan kewajiban melakukan Upaya Kelola Lingkungan Hidup dan Upaya Pemantauan Lingkungan hidup (UKL-UPL) sesuai peraturan perundang-undangan;

c. bahwa sesuai surat Menteri Kehutanan Nomor S.227/Menhut-VI/2014 tanggal 16 Mei 2014, PT. The Best One Unitimber menyelesaikan UKL dan UPL yang telah mendapat persetujuan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan, Provinsi Riau sesuai Keputusan Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/BLH-AM/2014/01 tanggal 10 Maret 2014 dan Izin Lingkungan sesuai Keputusan Bupati Pelalawan Nomor 332 Tahun 2014 tanggal 10 Maret 2014, kepada Direktur Jenderal Planologi Kehutanan untuk menerbitkan peta areal kerja (*Working Area*/WA) IUPHHK-RE PT. The Best One Unitimber;

d. bahwa berdasarkan telaahan Direktorat Jenderal Planologi Kehutanan sesuai surat Direktur Jenderal Planologi Kehutanan Nomor S.652/VII-WP3H/2014 tanggal 1 Juli 2014 areal yang dapat diberikan untuk IUPHHK-RE PT. The Best One Unitimber seluas ± 39.412 (tiga puluh sembilan ribu empat ratus dua belas) hektar, di Kabupaten Pelalawan, Provinsi Riau;

e. bahwa berdasarkan pertimbangan huruf a sampai dengan huruf d, kepada PT. The Best One Unitimber dapat diberikan IUPHHK-RE atas areal hutan produksi seluas ± 39.412 (tiga puluh sembilan ribu empat ratus dua belas) hektar, di Kabupaten Pelalawan, Provinsi Riau dengan menetapkan Keputusan Menteri Kehutanan.

Mengingat ...

-2-

Mengingat : 1. Undang-undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya;
2. Undang-undang Nomor 41 Tahun 1999 tentang Kehutanan sebagaimana telah diubah dengan Undang-undang Nomor 19 Tahun 2004;
3. Undang-undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah sebagaimana telah diubah terakhir dengan Undang-undang Nomor 12 Tahun 2008;
4. Undang-undang Nomor 33 Tahun 2004 tentang Perimbangan Keuangan antara Pemerintah Pusat dan Pemerintahan Daerah;
5. Undang-undang Nomor 26 Tahun 2007 tentang Penataan Ruang;
6. Undang-undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup;
7. Undang-undang Nomor 18 Tahun 2013 tentang Pencegahan dan Pemberantasan Perusakan Hutan.
8. Peraturan Pemerintah Nomor 22 Tahun 1997 tentang Jenis dan Penyetoran Penerimaan Negara Bukan Pajak sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 52 Tahun 1998;
9. Peraturan Pemerintah Nomor 35 Tahun 2002 tentang Dana Reboisasi sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 58 Tahun 2007;
10. Peraturan Pemerintah Nomor 44 Tahun 2005 tentang Perencanaan Kehutanan;
11. Peraturan Pemerintah Nomor 45 Tahun 2005 tentang Perlindungan Hutan sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 60 Tahun 2009;
12. Peraturan Pemerintah Nomor 6 Tahun 2007 tentang Tata Hutan dan Penyusunan Rencana Pengelolaan Hutan, serta Pemanfaatan Hutan sebagaimana telah diubah dengan Peraturan Pemerintah Nomor 3 Tahun 2008;
13. Peraturan Pemerintah Nomor 38 Tahun 2007 tentang Pembagian Urusan Pemerintahan antara Pemerintah, Pemerintahan Daerah Provinsi, dan Pemerintahan Daerah Kabupaten/Kota;
14. Peraturan Pemerintah Nomor 27 Tahun 2012 tentang Izin Lingkungan;
15. Peraturan Pemerintah Nomor 12 Tahun 2014 tentang Jenis dan Tarif Atas Jenis Penerimaan Negara Bukan Pajak Yang Berlaku Pada Kementerian Kehutanan;
16. Keputusan Presiden Nomor 84/P Tahun 2009 tentang Pembentukan Kabinet Indonesia Bersatu II sebagaimana telah diubah terakhir dengan Keputusan Presiden Nomor 50/P Tahun 2014;
17. Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas dan Fungsi Kementerian Negara serta Susunan Organisasi, Tugas, dan Fungsi Eselon I Kementerian Negara sebagaimana telah diubah terakhir dengan Peraturan Presiden nomor 56 Tahun 2013;
18. Instruksi Presiden Nomor 6 Tahun 2013 tentang Penundaan Pemberian Izin Baru dan Penyempurnaan Tata Kelola Hutan Alam Primer dan Lahan Gambut;
19. Peraturan Menteri Kehutanan Nomor P.55/Menhut-II/2006 tentang Penatausahaan Hasil Hutan yang Berasal dari Hutan Negara sebagaimana telah diubah terakhir dengan Peraturan Menteri Nomor P.45/Menhut-II/2009;

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20. Peraturan Menteri Kehutanan Nomor P.39/Menhut-II/2008 tentang Tata Cara Pengenaan Sanksi Administratif Terhadap Pemegang Izin Pemanfaatan Hutan;
21. Peraturan Menteri Kehutanan Nomor P.58/Menhut-II/2008 tentang Kompetensi dan Sertifikasi Tenaga Teknis Pengelolaan Hutan Produksi Lestari;
22. Peraturan Menteri Kehutanan Nomor P.11/Menhut-II/2009 tentang Sistem Silvikultur dalam Areal Izin Usaha Pemanfaatan Hasil Hutan Kayu pada Hutan Produksi;
23. Peraturan Menteri Kehutanan Nomor P.23/Menhut-II/2009 tentang Tata Cara Penyerahan Kembali Izin Usaha Pemanfaatan Hasil Hutan Kayu Sebelum Jangka Waktu Izin Berakhir;
24. Peraturan Menteri Kehutanan Nomor P.34/Menhut-II/2009 tentang Tata Cara dan Persyaratan Pemindahtanganan Izin Usaha Pemanfaatan Hasil Hutan Kayu;
25. Peraturan Menteri Kehutanan Nomor P.38/Menhut-II/2009 tentang Standard dan pedoman Penilaian Kinerja Pengelolaan Hutan Produksi Lestari dan Verifikasi Legalitas Kayu Pada Pemegang Izin atau Pada Hutan Hak sebagaimana telah diubah terakhir dengan Peraturan Menteri Kehutanan Nomor P.42/Menhut-II/2013;
26. Peraturan Menteri Kehutanan Nomor P.53/Menhut-II/2009 tentang Pemasukan dan Penggunaan Alat Untuk Kegiatan Izin Usaha Pemanfaatan Hutan atau Izin Pemanfaatan Kayu;
27. Peraturan Menteri Kehutanan Nomor P.69/Menhut-II/2009 tentang Pedoman Pelaporan Keuangan Pemanfaatan Hutan Produksi dan Pengelolaan Hutan (DOLAPKEU-PHP2H);
28. Peraturan Menteri Kehutanan Nomor P.12/Menhut-II/2010 tentang Tata Cara Pengenaan, Penagihan dan Pembayaran Iuran Izin Usaha Pemanfaatan Hutan Pada Hutan Produksi;
29. Peraturan Menteri Kehutanan Nomor P.40/Menhut-II/2010 tentang Organisasi dan Tata Kerja Kementerian Kehutanan sebagaimana telah diubah dengan Peraturan Menteri Kehutanan Nomor P.33/Menhut-II/2012;
30. Peraturan Menteri Kehutanan Nomor P.31/Menhut-II/2014 tentang Tata Cara Pemberian Dan Perluasan Areal Kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu Dalam Hutan Alam, Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem, Atau Izin Usaha Pemanfaatan Hasil Hutan Kayu Hutan Tanaman Industri Pada Hutan Produksi;
31. Peraturan Menteri Kehutanan Nomor P.33/Menhut-II/2014 tentang Inventarisasi Hutan Menyeluruh Berkala dan Rencana Kerja Pada Usaha Pemanfaatan Hasil Hutan Kayu Dalam Hutan Alam;
32. Peraturan Menteri Kehutanan Nomor P.52/Menhut-II/2014 tentang Tata Cara Pengenaan, Pemungutan, dan Penyetoran Provisi Sumber Daya Hutan dan Dana Reboisasi, Penggantian Nilai Tegakan dan Ganti Rugi Tegakan.
33. Keputusan Direktur Jenderal Planologi Kehutanan Atas Nama Menteri Kehutanan Nomor SK.3706/Menhut-VII/IPSDH/2014 tentang Penetapan Peta Indikatif Penundaan Izin Baru Pemanfaatan Hutan, Penggunaan Kawasan Hutan dan Perubahan Peruntukan Kawasan Hutan dan Areal Penggunaan Lain (Revisi VI).

Memperhatikan ...

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Memperhatikan :

1. Akta Nomor 24 tanggal 26 Juli 1974 tentang Pendirian Perseroan Terbatas (PT) The Best One Unitimber, dibuat oleh Sri Rahayu, SH. Notaris di Jakarta, yang telah diubah terakhir dengan Akta Nomor 66 tanggal 30 Juli 2013 dibuat oleh Linda Herawati, SH. Notaris di Jakarta, pengesahan Menteri Hukum dan Hak Asasi Manusia Nomor AHU-AH.01.10-33634 tanggal 19 Agustus 2013;
2. Surat Kepala Badan Pelayanan Perizinan Terpadu Provinsi Riau Nomor 503/BP2T-IR/XI/2012/784 tanggal 28 Nopember 2012 tentang Rekomendasi Izin Usaha Pemanfaatan Hasil Hutan Kayu Pada Restorasi Ekositem (IUPHHK-RE) a.n PT. The Best One Unitimber;
3. Surat Kepala Badan Lingkungan Hidup Kabupaten Pelalawan Nomor 660/BLH-AM/2014/01 tanggal 10 Maret 2014 tentang Rekomendasi Upaya Kelola Lingkungan Hidup dan Upaya Pemantauan Lingkungan Hidup (UKL-UPL) Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) PT. The Best One Unitimber;
5. Keputusan Bupati Pelalawan Nomor 332 Tahun 2014 tanggal 10 Maret 2014 tentang Izin Lingkungan Kegiatan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) PT. The Best One Unitimber di Kelompok Hutan Tasik Besar Serkap, Kecamatan Teluk Meranti, Kabupaten Pelalawan.

MEMUTUSKAN :

Menetapkan : **KEPUTUSAN MENTERI KEHUTANAN TENTANG PEMBERIAN IZIN USAHA PEMANFAATAN HASIL HUTAN KAYU RESTORASI EKOSISTEM DALAM HUTAN ALAM KEPADA PT. THE BEST ONE UNITIMBER ATAS AREAL HUTAN PRODUKSI SELUAS ± 39.412 (TIGA PULUH SEMBILAN RIBU EMPAT RATUS DUA BELAS) HEKTAR DI KABUPATEN PELALAWAN, PROVINSI RIAU.**

KESATU : Memberikan Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) dalam Hutan Alam kepada PT. The Best One Unitimber atas areal Hutan Produksi seluas ± 39.412 (tiga puluh sembilan ribu empat ratus dua belas) hektar, yang keseluruhannya merupakan Hutan Produksi Tetap (HP), dengan penutupan lahan berdasarkan penafsiran citra landsat liputan tahun 2012 berupa hutan rawa sekunder seluas ± 37.734 (tiga puluh tujuh ribu tujuh ratus tiga puluh empat) hektar, semak/belukar rawa seluas ± 1.548 (seribu lima ratus empat puluh delapan) hektar, dan rawa seluas ± 130 (seratus tiga puluh) hektar, yang terletak di Kabupaten Pelalawan, Provinsi Riau, sebagaimana terlukis pada Peta Lampiran Keputusan ini.

KEDUA : Luas dan letak definitif areal kerja IUPHHK-RE sebagaimana dimaksud pada Amar KESATU ditetapkan kembali oleh Kementerian Kehutanan setelah dilaksanakan pengukuran dan penataan batas areal kerja (temu gelang).

KETIGA : PT. The Best One Unitimber berhak :

1. Melakukan kegiatan dan memperoleh manfaat dari hasil usahanya sesuai dengan izin yang diperolehnya.

/2. Diberikan ...

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2. Diberikan kewenangan dan tanggung jawab untuk melaksanakan Rencana Kerja Tahunan (RKT) tanpa pengesahan dari pejabat yang berwenang (*self approval*) dalam hal memenuhi kriteria dan indikator yang ditetapkan oleh Menteri.

KEEMPAT : PT. The Best One Unitimber :

(1) Wajib :

a. Menyusun Rencana Kerja (RK) untuk seluruh areal kerja;
b. Melaksanakan kegiatan nyata di lapangan untuk paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE dalam Hutan Alam;
c. Melaksanakan penataan batas areal kerja paling lambat 1 (satu) tahun sejak diberikan IUPHHK-RE dalam Hutan Alam;
d. Melaksanakan perlindungan hutan di areal kerjanya;
e. Menatausahakan keuangan kegiatan usahanya sesuai standar akuntansi kehutanan yang berlaku bagi pemegang izin usaha pemanfaatan hutan;
f. Mempekerjakan tenaga profesional bidang kehutanan (GANISPHPL) dan tenaga lain yang memenuhi persyaratan sesuai kebutuhan dan ketentuan peraturan perundang-undangan;
g. Melaksanakan sistem silvikultur sesuai dengan kondisi setempat;
h. Menggunakan peralatan pemanfaatan hasil hutan yang sesuai dengan ketentuan peraturan perundang-undangan;
i. Membayar iuran atau dana sesuai ketentuan peraturan perundang-undangan;
j. Melakukan kerjasama dengan koperasi masyarakat setempat, paling lambat 1 (satu) tahun setelah diterimanya IUPHHK-RE;
k. Menyusun Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu (RKUPHHK) jangka panjang untuk seluruh areal kerja, paling lambat 1 (satu) tahun setelah IUPHHK-RE diberikan, dan diajukan kepada Menteri Kehutanan atau pejabat yang ditunjuk guna mendapatkan persetujuan;
l. Menyusun RKT berdasarkan RKUPHHK sebagaimana dimaksud huruf k untuk disahkan oleh Kepala Kesatuan Pemangkuan Hutan (KPH) atau pejabat yang ditunjuk oleh Menteri Kehutanan;
m. Mengajukan RKT paling lambat 2 (dua) bulan sebelum RKT berjalan;
n. Menyampaikan laporan kinerja pemegang izin secara periodik kepada Menteri Kehutanan;
o. Melaporkan kepada Pemerintah dan Pemerintah Daerah dana yang diterima dari pihak asing dan dipublikasikan di media massa setempat dan nasional untuk diaudit oleh Akuntan Publik yang terdaftar di Indonesia;
p. Memberantas perambahan hutan, pembalakan liar dan menanggulangi kebakaran hutan di areal izin dan apabila tidak mampu setelah melaporkan kepada Pemerintah Daerah atau Menteri Kehutanan, izin dicabut tanpa peringatan.
q. Membantu pengembangan Hutan Tanaman Rakyat (HTR), Hutan Kemasyarakatan (HKM) atau Hutan Desa (HD) yang ditetapkan oleh Menteri Kehutanan di sekitar areal kerja;
r. Mengalokasikan saham untuk Koperasi Karyawan Kementerian Kehutanan 1 % dan Koperasi Pensiunan Kehutanan 1 % secara *voluntary*, dan Koperasi masyarakat setempat 1 %.

s. Melapor ....

s. Melaporkan kepada pemerintah/Kementerian Kehutanan dan mempublikasikan kepada masyarakat setempat tentang pelaksanaan penjualan *carbon offset* kepada pihak asing di pasar karbon sukarela.
t. Mematuhi dan melaksanakan ketentuan-ketentuan yang tercantum dalam Lampiran Keputusan dan peraturan perundang-undangan.

(2) Dilarang :
a. Menebang pohon di dalam areal kerjanya tanpa izin, kecuali dalam rangka pembangunan sarana dan prasarana sesuai ketentuan peraturan perundang-undangan.
b. Meninggalkan areal kerja.
c. Memindahtangankan IUPHHK-RE kecuali dengan persetujuan tertulis dari Menteri Kehutanan.
d. Mengontrakkan atau menyerahkan sebagian atau seluruh kegiatan usahanya kepada pihak lain tanpa persetujuan tertulis dari Menteri Kehutanan.

KELIMA :
1. Dalam hal kegiatan restorasi ekosistem belum diperoleh keseimbangan hayati, kepada PT. The Best One Unitimber dapat diberikan Izin Usaha Pemanfaatan Kawasan (IUPK), Izin Usaha Pemanfaatan Jasa Lingkungan (IUPJL), atau Izin Usaha Pemanfaatan Hasil Hutan Bukan Kayu (IUPHHBK) pada hutan produksi;
2. Dalam hal kegiatan restorasi ekosistem telah diperoleh keseimbangan hayati, kepada PT. The Best One Unitimber dapat diberikan IUPHHK pada hutan produksi dengan menerapkan satu atau lebih sistem silvikultur.

KEENAM :
1. IUPHHK-RE tidak merupakan hak kepemilikan atas kawasan hutan.
2. Areal IUPHHK-RE tidak dapat dijadikan jaminan, agunan, atau dijaminkan kepada pihak lain.

KETUJUH :
1. Apabila di dalam areal IUPHHK-RE terdapat lahan yang telah menjadi tanah milik, perkampungan, tegalan, persawahan atau telah diduduki dan digarap oleh pihak ketiga secara sah berdasarkan peraturan perundang-undangan, maka lahan tersebut dikeluarkan dari areal kerja IUPHHK-RE, tanpa mengubah status dan fungsi kawasan hutan.
2. Apabila lahan tersebut pada angka 1 dikehendaki untuk dijadikan areal IUPHHK-RE, maka penyelesaiannya dilakukan oleh PT. The Best One Unitimber dengan pihak-pihak yang bersangkutan sesuai dengan ketentuan peraturan perundang-undangan.

KEDELAPAN :
1. IUPHHK-RE dievaluasi setiap 5 (lima) tahun oleh Menteri Kehutanan sebagai dasar kelangsungan izin.
2. Pemegang IUPHHK-RE dikenakan sanksi apabila melanggar ketentuan dalam Keputusan dan peraturan perundang-undangan

KESEMBILAN :
1. PT. The Best One Unitimber wajib membayar Iuran Izin Usaha Pemanfaatan Hutan (IIUPH) sesuai dengan ketentuan peraturan perundang-undangan.
2. Salinan asli Keputusan Menteri Kehutanan tentang Pemberian IUPHHK-RE dalam Hutan Alam pada Hutan Produksi diberikan oleh Direktur Jenderal Bina Usaha Kehutanan setelah kewajiban angka 1 (satu) dibayar lunas.

KESEPULUH ....

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KESEPULUH : Dalam hal PT. The Best One Unitimber sampai dengan batas waktu yang ditentukan tidak membayar IIUPH sebagaimana dimaksud dalam Amar KESEMBILAN, maka pemberian IUPHHK-RE batal dengan sendirinya

KESEBELAS : Keputusan beserta lampirannya merupakan satu kesatuan yang tidak terpisahkan.

KEDUABELAS : Keputusan ini mulai berlaku pada tanggal ditetapkan untuk jangka waktu 60 (enam puluh) tahun, kecuali apabila diserahkan kembali oleh pemegang izin atau dicabut oleh Menteri Kehutanan, apabila dalam jangka waktu 2 (dua) tahun sejak ditetapkan Keputusan tidak ada kegiatan nyata di lapangan, maka Keputusan batal dengan sendirinya.

Ditetapkan di : Jakarta
Pada tanggal : 15 September 2014

Salinan sesuai dengan aslinya,
KEPALA BIRO HUKUM DAN ORGANISASI,

KRISNA RYA

MENTERI KEHUTANAN
REPUBLIK INDONESIA,

Ttd.

ZULKIFLI HASAN

Salinan Keputusan ini disampaikan kepada yth.:
1. Menteri Koordinator Bidang Perekonomian.
2. Menteri Dalam Negeri.
3. Menteri Keuangan.
4. Menteri Energi dan Sumber Daya Mineral.
5. Menteri Perdagangan.
6. Menteri Perindustrian.
7. Menteri Tenaga Kerja dan Transmigrasi.
8. Menteri Lingkungan Hidup.
9. Kepala Badan Pertanahan Nasional.
10. Sekretaris Jenderal Kementerian Kehutanan.
11. Inspektur Jenderal Kementerian Kehutanan.
12. Direktur Jenderal Bina Usaha Kehutanan.
13. Direktur Jenderal Planologi Kehutanan.
14. Gubernur Riau.
15. Bupati Pelalawan.
16. Kepala Dinas Kehutanan Provinsi Riau.
17. Kepala Dinas Kehutanan Kabupaten Pelalawan.
18. Direktur PT. The Best One Unitimber.

SK.IUPHHK-RE.PT. The Best One Unitimber

PT. TBOT IUPHHK-RE

LAMPIRAN KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA
NOMOR : SK.744/Menhut-II/2014
TANGGAL : 15 September 2014

KETENTUAN MENGENAI PELAKSANAAN USAHA PEMANFAATAN HASIL HUTAN KAYU (UPHHK) RESTORASI EKOSISTEM DALAM HUTAN ALAM PADA HUTAN PRODUKSI PT. THE BEST ONE UNITIMBER

Ketentuan I. TUJUAN UPHHK RESTORASI EKOSISTEM

Mendapatkan keuntungan finansial dari kegiatan pemulihan (restorasi) fungsi ekosistem hutan produksi dalam areal kerja Izin Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (IUPHHK-RE) dalam Hutan Alam pada Hutan Produksi berdasarkan prinsip pengelolaan hutan produksi lestari dan memajukan kesejahteraan masyarakat setempat.

Ketentuan II. TUJUAN UPHHK RESTORASI EKOSISTEM

Pemegang IUPHHK-RE dalam Hutan Alam pada Hutan Produksi di dalam arealnya melaksanakan kegiatan perencanaan hutan, pemanfaatan hasil hutan, permudaan dan pemeliharaan hutan, pemberdayaan masyarakat sekitar hutan, perlindungan dan pengamanan hutan, tenaga kerja, penelitian dan pengembangan.

Ketentuan III. TUJUAN UPHHK RESTORASI EKOSISTEM

1. PERENCANAAN HUTAN
   - 1.1. Penyusunan Rencana Kerja Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (RKUPHHK-RE) dalam Hutan Alam, yang dinilai dan disahkan oleh Menteri Kehutanan atau pejabat yang ditunjuk sebagai dasar penyusunan Rencana Kerja Tahunan Usaha Pemanfaatan Hasil Hutan Kayu Restorasi Ekosistem (RKTUPHHK-RE) sesuai ketentuan.
   - 1.2. Penataan Hutan dalam rangka membentuk Kesatuan Pemangkuan Hutan Produksi (KPHP), atau bagian KPHP di areal kerjanya seluas ± 39.412 (tiga puluh sembilan ribu empat ratus dua belas) hektar.
   - 1.3. Risalah Hutan dengan intensitas 1 (satu) persen setiap 10 tahunan sebagai dasar penyusunan RKUPHHK-RE serta RKTUPHHK-RE, dan penilaian kinerja perusahaan.
   - 1.4. RKUPHHK-RE disusun dalam 2 (dua) tahapan, yaitu sebelum tercapai keseimbangan ekosistem dan tahap sesudah tercapai keseimbangan ekosistem.

2. PEMANFAATAN HASIL HUTAN
   - 2.1. Pemanfaatan hasil hutan kayu diizinkan setelah mencapai keseimbangan ekosistem bila pada tingkat tapak, kelompok hutan atau pada seluruh areal kerjanya menerapkan system silvikultur yang tepat di bawah supervisi pakar kehutanan di bidang silvikultur dan ekologi hutan.
   - 2.2. Memberi kemudahan pemungutan hasil hutan non kayu bagi penduduk setempat atau dalam hal ada izin pemungutan hasil hutan bukan kayu yang diterbitkan oleh pejabat yang berwenang sesuai peraturan perundang-undangan atau hak adat setempat tetap berlaku dan wajib diindahkan oleh pemegang izin.
   - 2.3. Jaringan Jalan :
     - 2.3.1. Menggunakan dan memelihara jaringan jalan yang sudah ada di dalam areal kerjanya sesuai peraturan perundang-undangan dan dituangkan dalam RKUPHHK-RE.
     - 2.3.2. Membongkar jembatan yang mengakibatkan masuknya perambah hutan atau penebang liar.

3. PERMUDAAN ...

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3. PERMUDAAN DAN PEMELIHARAAN HUTAN
   3.1. Melaksanakan upaya-upaya untuk melakukan pemulihan ekosistem hutan, melalui pemeliharaan, perlindungan, penanaman, dan pengayaan dengan jenis-jenis asli setempat sesuai dengan ketentuan yang ditetapkan dan sesuai dengan IUPHHK-RE yang telah disetujui.
   3.2. Membuat plot permanen untuk mengukur pertumbuhan/riap tegakan hutan minimal 100 hektar per 5 (lima) tahun dan mengukur debit air serta mutu air sungai akibat dampak erosi.
   3.3. Membuat kebun bibit seluas 100 hektar per 5 (lima) tahun dengan jenis-jenis setempat disesuaikan dengan tanaman unggulan/andalan setempat serta mengadakan kebun pangkas.
   3.4. Membuat kebun bibit seluas 100 hektar per 5 (lima) tahun dengan jenis-jenis setempat disesuaikan dengan tanaman unggulan/andalan setempat serta perlu mengadakan kebun pangkas.
   3.5. Menyediakan areal seluas 300 hektar yang digunakan untuk menjaga dan melindungi plasma nutfah.

4. PEMBERDAYAAN MASYARAKAT SEKITAR HUTAN
   4.1. Melaksanakan kemitraan dalam usaha produktif di areal kerja dan penguatan kapasitas masyarakat setempat.
   4.2. Menyediakan fasilitas sosial bagi masyarakat di dalam areal kerja seperti tempat-tempat ibadah, pendidikan, dan kesehatan, minimal 1 (satu) desa yang ada di dalam/sekitar areal kerja.

5. PERLINDUNGAN DAN PENGAMANAN HUTAN
   5.1. Pencegahan/Kebakaran Hutan melalui :
      5.1.1. Menyediakan sarana dan prasarana (peralatan, pengawas, ilaran api) pencegahan dan pemadaman kebakaran hutan dalam jumlah yang memadai sesuai dengan luas dan keadaan areal kerjanya.
      5.1.2. Mempekerjakan tenaga mandor pengawas hutan berkualifikasi Tenaga Teknis (GANISPHPL) per seratus hektar dan membentuk satuan pengamanan hutan setiap 5.000 (lima ribu) hektar.
      5.1.3. Menyediakan dana yang cukup dan dilaporkan dalam audit yang dibuat oleh akuntan publik.
      5.1.4. Segera melapor pada instansi kehutanan atau instansi terkait setiap terjadi kebakaran di areal kerjanya.

   5.2. Pencegahan Perambahan Hutan
      5.2.1. Wajib mengatasi perambahan hutan dan atau penebangan liar oleh pihak ke 3 (tiga).
      5.2.2. Mencegah, melapor dan berkoordinasi dengan Pemerintah Daerah setempat.

   5.3. Perlindungan terhadap Tumbuh-tumbuhan
      5.3.1. Dilarang melakukan penebangan dengan radius atau jarak sampai dengan 500 m dari tepi waduk atau danau; 200 m dari tepi mata air dan kiri kanan sungai di daerah rawa; 100 m dari kiri kanan tepi sungai; 50 m kiri kanan tepi anak sungai; 2 kali kedalaman jurang dari tepi jurang; 130 kali selisih pasang tertinggi dan pasang terendah dari tepi pantai dengan membuat papan-papan larangan setiap 500 hektar, kecuali atas izin Menteri Kehutanan atau pejabat yang ditunjuk dengan memperhatikan kepentingan masyarakat.

5.3.2. Aktif ....

5.3.2. Aktif dalam pengembangan dan perlindungan sumber daya alam, dan melaksanakan Upaya Pengelolaan Lingkungan dan Upaya Pemantauan Lingkungan (UKL/UPL).
5.3.3. Mencegah kerusakan dan gangguan hama penyakit terhadap hutan dan hasil hutan di areal kerjanya.
5.3.4. Mencegah kerusakan dan gangguan hama penyakit terhadap hutan dan hasil hutan di areal kerjanya.

6. TENAGA KERJA
Merekrut tenaga kerja dari masyarakat setempat dan mengikutsertakan pendidikan dan latihan bagi sebanyak-banyaknya tenaga kerja perusahaan dan masyarakat setempat.

7. PENELITIAN DAN PENGEMBANGAN
7.1. Menyediakan dana yang cukup untuk kegiatan penelitian dan pengembangan dengan titik berat pada tumbuhan asli setempat.
7.2. Mempekerjakan tenaga Sarjana Kehutanan untuk kegiatan penelitian dan pengembangan.
7.3. Bekerjasama dengan Lembaga Penelitian Kehutanan.

Ketentuan IV. LAIN-LAIN
Melindungi obyek-obyek bernilai sejarah dan atau ilmiah dari kerusakan-kerusakan dan harus segera melaporkan adanya kerusakan dan adanya penemuan baru kepada Pemerintah.

Ketentuan V. PENGAWASAN DAN PEMBINAAN PEMERINTAH
Pemerintah melakukan pengawasan dan pembinaan terhadap pelaksanaan Keputusan sebagaimana tercantum dalam Amar Keputusan dan Lampiran Keputusan.

Ketentuan VI. PELANGGARAN DAN SANKSI
Pelanggaran kewajiban dan Ketentuan sebagaimana dicantumkan dalam AMAR Keputusan dan Lampiran Keputusan dikenakan sanksi sesuai peraturan perundang-undangan.

Ketentuan VII. HAK DAN KEWAJIBAN ATAS BERAKHIRNYA IZIN (DISERAHKAN, DICABUT, BERAKHIR).
1. Hak Pemegang Izin
Dalam hal IUPHHK-RE, dibatalkan atau dicabut, pemegang izin tetap dibebankan kewajiban-kewajiban yang tercantum dalam pasal 82 Peraturan Pemerintah Nomor 6 Tahun 2007 yang telah diubah dengan Peraturan Pemerintah Nomor 3 Tahun 2008, dan:
1.1. Barang-barang persediaan yang berada di dalam gudang dan benda-benda bergerak yang dipergunakan pemegang izin, tetap menjadi milik pemegang izin dan dikeluarkan dalam izin paling lama 30 (tiga puluh) hari kerja sejak izin dicabut.
1.2. Segala hak yang dimiliki pemegang IUPHHK-RE berakhir.

2. Kewajiban ...

-4-

2. Kewajiban

2.1. Menyerahkan dalam keadaan baik semua benda tidak bergerak seperti *base camp*, gedung, jalan, jembatan, gudang, pelabuhan udara, pelabuhan/sungai dan laut, dok dan lain-lain yang telah dibangun oleh pemegang izin kepada Pemerintah tanpa ada ganti rugi dari Pemerintah.

2.2. Areal hutan yang dibebani IUPHHK-RE kembali sepenuhnya dikuasai Negara.

2.3. Menyerahkan semua klise serta peta, gambar-gambar ukuran tanah dan sebagainya kepada Kementerian Kehutanan dengan tidak menerima ganti rugi.

2.4. Wajib menyelesaikan semua kewajiban-kewajiban yang tercantum dalam Keputusan.

3. Dalam hal pemegang izin akan menyerahkan kembali IUPHHK-RE sebelum habis masa berlakunya, maka pemegang izin wajib menyelesaikan dan memenuhi semua kewajiban teknis dan finansial sebagaimana tercantum dalam Keputusan dan Lampiran Keputusan ini sebelum diserahkan kembali kepada pemerintah.

Salinan sesuai dengan aslinya
KEPALA BIRO HUKUM DAN ORGANISASI,

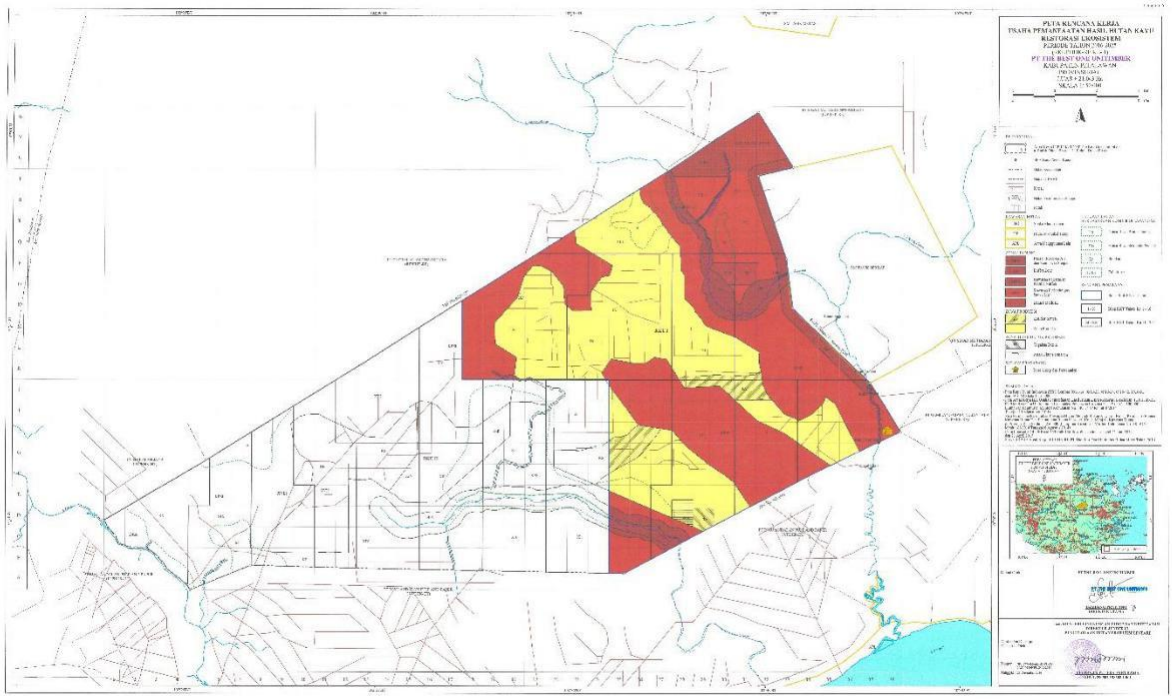
KRISNA RYA

MENTERI KEHUTANAN
REPUBLIK INDONESIA,

Ttd.

ZULKIFLI HASAN

PT. TBOT RKU



PT. TBOT MONEV-Certificate



KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN
DIREKTORAT JENDERAL PENGELOLAAN HUTAN PRODUKSI LESTARI
DIREKTORAT USAHA JASA LINGKUNGAN DAN HASIL HUTAN BUKAN KAYU HUTAN PRODUKSI

SURAT KETERANGAN

HASIL KEGIATAN MONITORING DAN EVALUASI IUPHHK-RE

Nomor : KT. 5/JASLING/PKU/HPL.2/8/2019

Diberikan kepada :

PT. The Best One Unitimber

(Keputusan Menteri Kehutanan Nomor : SK. 747/Menhut-II/2014)

Pada kegiatan Monitoring dan Evaluasi IUPHHK-RE Tahun 2019, memperoleh nilai dengan kategori :

"BAIK"

Jakarta, 28 Agustus 2019

Direktur Usaha Jasa Lingkungan dan Hasil Hutan Bukan Kayu Hutan Produksi,

Ir. Djohan Utama Perbatasari, M.M.

NIP. 19601230 198801 1 001

Appendix 2. Recorded Flora and Fauna

Appendix 2 lists all the flora and fauna species recording in the Project Area.

Mammals

No.	Family	Scientific Name	English name	Record	IUCN	GoI (P.106)	CITES	Last Updated
1	Tupaiidae	*Tupaia glis*	Common Treeshrew	2016/12	LC		II	06/10/2019
2	Tupaiidae	*Tupaia minor*	Lesser Treeshrew	2016/12	LC		II	06/10/2019
3	Tupaiidae	*Tupaia tana*	Large Treeshrew	2016/12	LC		II	06/10/2019
4	Cynocephalidae	*Galeopterus variegatus*	Sunda Flying Lemur	2016/12	LC			06/10/2019
5	Lorisidae	*Nycticebus coucang*	Sunda Slow Loris	2016/12	EN	√	I	06/10/2019
6	Cercopithecidae	*Presbytis femoralis* ssp. *percura*	East Sumatran Banded Langur	2016/12	VU		II	06/10/2019
7	Cercopithecidae	*Trachypithecus cristatus*	Silvered Langur	2016/12	VU	√	II	06/10/2019
8	Cercopithecidae	*Macaca fascicularis*	Long-tailed Macaque	2016/12	LC		II	06/10/2019
9	Cercopithecidae	*Macaca nemestrina*	Pig-tailed Macaque	2016/12	EN		II	06/10/2019
10	Hylobatidae	*Hylobates agilis*	Agile Gibbon	2016/12	EN	√	I	06/10/2019
11	Sciuridae	*Petaurista petaurista*	Red Giant Flying Squirrel	2016/12	LC			06/10/2019
12	Sciuridae	*Petaurista elegans*	Grey-headed Flying Squirrel	2016/12	LC			06/10/2019
13	Sciuridae	*Iomys horsfieldii*	Javanese Flying Squirrel	2016/12	LC	√		06/10/2019
14	Sciuridae	*Ratufa affinis*	Pale Giant Squirrel	2016/12	NT		II	06/10/2019
15	Sciuridae	*Ratufa bicolor*	Black Giant Squirrel	2016/12	NT		II	06/10/2019
16	Sciuridae	*Exilisciurus exilis*	Least Pygmy Squirrel	2016/12	DD			06/10/2019
17	Sciuridae	*Nannosciurus melanotis*	Black-eared Squirrel	2016/12	LC			06/10/2019
18	Sciuridae	*Sundasciurus hippurus*	Horse-tailed Squirrel	2016/12	NT			06/10/2019
19	Sciuridae	*Sundasciurus lowii*	Low's Squirrel	2016/12	LC			06/10/2019
20	Sciuridae	*Sundasciurus tenuis*	Slender Squirrel	2016/12	LC			06/10/2019
21	Sciuridae	*Lariscus insignis*	Three-striped Gound Squirrel	2016/12	LC			06/10/2019
22	Sciuridae	*Rhinosciurus laticaudatus*	Shrew-faced Squirrel	2017/04	NT			06/10/2019
23	Sciuridae	*Callosciurus notatus*	Plantain Squirrel	2016/12	LC			06/10/2019
24	Sciuridae	*Callosciurus prevostii*	Prevost's Squirrel	2016/12	LC			06/10/2019
25	Muriidae	*Rattus tanezumi*	Oriental House Rat	2016/12	LC			06/10/2019
26	Muriidae	*Rattus tiomanicus*	Malaysian Field Rat	2016/12	LC			06/10/2019
27	Muriidae	*Rattus argentiventer*	Ricefield Rat	2016/12	LC			06/10/2019
28	Muriidae	*Rattus exulans*	Polynesian Rat	2016/12	LC			06/10/2019
29	Muriidae	*Sundamys muelleri*	Muller's Giant Rat	2016/12	LC			06/10/2019
30	Muriidae	*Niviventer cremoriventer*	Dark-tailed Tree Rat	2016/12	LC			06/10/2019
31	Muriidae	*Maxomys rajah*	Rajah Spiny Rat	2016/12	VU			06/10/2019
32	Muriidae	*Maxomys whiteheadi*	Whitehead's Spiny Rat	2016/12	VU			06/10/2019

33	Muriidae	*Chiropodomys gliroides*	Indomalayan Pencil-tailed Tree Mouse	2016/12	LC			06/10/2019
34	Hystricidae	*Hystrix brachyura*	Malayan Porcupine	2016/12	LC			06/10/2019
35	Erinaceidae	*Echinosorex gymnura*	Moonrat	2016/12	LC			06/10/2019
36	Soricidae	*Chimarrogale himalayica*	Elegant Water Shrew	2016/12	LC			06/10/2019
37	Soricidae	*Crocidura fuliginosa*	Southeast Asian Shrew	2016/12	LC			06/10/2019
38	Pteropodidae	*Balionycteris maculata*	Spotted-winged Fruit Bat	2016/12	LC			06/10/2019
39	Pteropodidae	*Megaerops ecaudatus*	Temminck's Tailless Fruit Bat	2016/12	LC			06/10/2019
40	Pteropodidae	*Pteropus vampyrus*	Large Flying Fox	2016/12	NT		II	06/10/2019
41	Rhinolophidae	*Rhinolophus borneensis*	Bornean Horseshoe Bat	2016/12	LC			06/10/2019
42	Rhinolophidae	*Rhinolophus sedulus*	Lesser Wooly Horseshoe Bat	2016/12	NT			06/10/2019
43	Rhinolophidae	*Rhinolophus trifoliatus*	Trefoil Horseshoe Bat	2016/12	NT			06/10/2019
44	Emballonuridae	*Emballonura monticola*	Lesser Sheath-tailed Bat	2016/12	LC			06/10/2019
45	Vespertilionidae	*Murina suilla*	Brown Tube-nosed Rat	2016/12	LC			06/10/2019
46	Vespertilionidae	*Kerivoula hardwickii*	Common Woolly Bat	2016/12	LC			06/10/2019
47	Vespertilionidae	*Kerivoula intermedia*	Small Woolly Bat	2016/12	NT			06/10/2019
48	Vespertilionidae	*Kerivoula minuta*	Least Woolly Bat	2016/12	NT			06/10/2019
49	Vespertilionidae	*Kerivoula papillosa*	Papillose Woolly Bat	2016/12	LC			06/10/2019
50	Vespertilionidae	*Kerivoula pellucida*	Clear-winged Wooly Bat	2016/12	NT			06/10/2019
51	Vespertilionidae	*Phoniscus atrox*	Groove Toothed Bat	2016/12	NT			06/10/2019
52	Manidae	*Manis javanica*	Sunda Pangolin	2016/12	CR	√	I	06/10/2019
53	Felidae	*Pardofelis marmorata*	Marbled Cat	2016/12	NT	√	I	06/10/2019
54	Felidae	*Prionailurus bengalensis*	Leopard Cat	2016/12	LC	√	II	06/10/2019
55	Felidae	*Prionailurus planiceps*	Flat-headed Cat	2016/12	EN	√	I	06/10/2019
56	Felidae	*Neofelis diardi*	Sunda Clouded Leopard	2016/12	VU	√	I	06/10/2019
57	Felidae	*Panthera tigris ssp. sumatrae*	Sumatran Tiger	2016/12	CR	√	I	06/10/2019
58	Herpestidae	*Herpestes brachyurus*	Short-tailed Mongoose	2016/12	NT			06/10/2019
59	Viveridae	*Arctictis binturong*	Binturong	2016/12	VU	√		06/10/2019
60	Viveridae	*Arctogalidia trivirgata*	Small-toothed Palm Civet	2016/12	LC			06/10/2019
61	Viveridae	*Paguma larvata*	Masked Palm Civet	2016/12	LC			06/10/2019
62	Viveridae	*Cynogale bennettii*	Otter Civet	2018/10	EN	√	II	06/10/2019
63	Viveridae	*Paradoxurus hermaphroditus*	Common Palm Civet	2016/12	LC			06/10/2019
64	Viveridae	*Hemigalus derbyanus*	Banded Civet	2016/12	NT		II	06/10/2019
65	Viveridae	*Viverra tangalunga*	Malay Civet	2016/12	LC			06/10/2019
66	Prionodontidae	*Prionodon linsang*	Banded Linsang	2016/12	LC	√	II	06/10/2019
67	Ursidae	*Helarctos malayanus*	Malayan Sun Bear	2016/12	VU	√	I	06/10/2019
68	Mustelidae	*Aonyx cinereus*	Asian Small-clawed Otter	2016/12	VU		I	06/10/2019
69	Mustelidae	*Lutrogale perspicillata*	Smooth-coated Otter	2016/12	VU	√	I	06/10/2019
70	Mustelidae	*Martes flavigula*	Yellow-throated Marten	2016/12	LC			06/10/2019
71	Mustelidae	*Mustela nudipes*	Malay weasel	2019/10	LC			20/10/2019
72	Suidae	*Sus scrofa*	Wild Boar	2016/12	LC			06/10/2019

73	Suidae	*Sus barbatus*	Bearded Pig	2016/12	VU			06/10/2019
74	Tragulidae	*Tragulus spp.*	Oriental Chevrotain	2016/12	LC	√		06/10/2019
75	Cervidae	*Rusa unicolor*	Sambar Deer	2016/12	VU	√		06/10/2019
76	Tapiridae	*Tapirus indicus*	Malay Tapir	2016/12	EN	√	I	06/10/2019

Herpeto Fauna

No	Group	Family	Scientific Name	Record	IUCN	GoI (P.106)	CITES	Last Updated
1	Amphibian	Bufonidae	*Duttaphrynus melanostictus*	2016/12	LC			17/06/2019
2	Amphibian	Bufonidae	*Ingerophrynus biporcatus*	2016/12	LC			17/06/2019
3	Amphibian	Bufonidae	*Ingerophrynus divergens*	2016/12	LC			17/06/2019
4	Amphibian	Bufonidae	*Ingerophrynus quadriporcatus*	2016/12	LC			17/06/2019
5	Amphibian	Bufonidae	*Phrynoidis asper*	2016/12	LC			17/06/2019
6	Amphibian	Bufonidae	*Pseudobufo subasper*	2016/12	LC			17/06/2019
7	Amphibian	Dicroglossidae	*Fejervarya cancrivora*	2016/12	LC			17/06/2019
8	Amphibian	Dicroglossidae	*Fejervarya limnocharis*	2016/12	LC			17/06/2019
9	Amphibian	Dicroglossidae	*Limnonectes paramacrodon*	2016/12	NT			17/06/2019
10	Amphibian	Microhylidae	*Phrynella pulchra*	2016/12	LC			17/06/2019
11	Amphibian	Ranidae	*Hylarana baramica*	2016/12	LC			17/06/2019
12	Amphibian	Ranidae	*Hylarana chalconota*	2016/12	LC			17/06/2019
13	Amphibian	Ranidae	*Hylarana erythraea*	2016/12	LC			17/06/2019
14	Amphibian	Ranidae	*Hylarana glandulosa*	2016/12	LC			17/06/2019
15	Amphibian	Ranidae	*Hylarana parvaccola*	2016/12	LC			17/06/2019
16	Amphibian	Ranidae	*Hylarana raniceps*	2016/12	LC			17/06/2019
17	Amphibian	Ranidae	*Hylarana rawa*	2016/12	LC			17/06/2019
18	Amphibian	Ranidae	*Hylarana sp1.*	2016/12	NA			17/06/2019
19	Amphibian	Rhacophoridae	*Nyctixalus pictus*	2016/12	NT			17/06/2019
20	Amphibian	Rhacophoridae	*Polypedates colletti*	2016/12	LC			17/06/2019
21	Amphibian	Rhacophoridae	*Polypedates leucomystax*	2016/12	LC			17/06/2019
22	Amphibian	Rhacophoridae	*Polypedates macrotis*	2016/12	LC			17/06/2019
23	Reptile	Agamidae	*Aphaniotis fusca*	2016/12	LC			17/06/2019
24	Reptile	Agamidae	*Bronchocela cristatella*	2016/12	NA			17/06/2019
25	Reptile	Agamidae	*Draco quinquefasciatus*	2016/12	NA			17/06/2019
26	Reptile	Agamidae	*Draco sp.*	2016/12	NA			17/06/2019
27	Reptile	Agamidae	*Draco sumatranus*	2016/12	LC			17/06/2019
28	Reptile	Agamidae	*Gonocephalus liogaster*	2016/12	NA			17/06/2019
29	Reptile	Gekkonidae	*Cnemaspis sp.*	2016/12	NA			17/06/2019
30	Reptile	Gekkonidae	*Cyrtodactylus marmoratus*	2016/12	LC			17/06/2019
31	Reptile	Gekkonidae	*Cyrtodactylus majulah*	2016/12	NA			17/06/2019
32	Reptile	Gekkonidae	*Cyrtodactylus sp.2*	2016/12	NA			17/06/2019
33	Reptile	Gekkonidae	*Gehyra mutilata*	2016/12	NA			17/06/2019

34	Reptile	Gekkonidae	*Gekko gecko*	2016/12	LC			17/06/2019
35	Reptile	Gekkonidae	*Gekko smithii*	2016/12	LC			17/06/2019
36	Reptile	Gekkonidae	*Gekko sp.*	2016/12	NA			17/06/2019
37	Reptile	Gekkonidae	*Hemidactylus frenatus*	2016/12	LC			17/06/2019
38	Reptile	Gekkonidae	*Hemidactylus platyurus*	2016/12	NA			17/06/2019
39	Reptile	Gekkonidae	*Hemiphyllodactylus typus*	2016/12	NA			17/06/2019
40	Reptile	Gekkonidae	*Ptychozoon kuhlii*	2016/12	NA			17/06/2019
41	Reptile	Gekkonidae	*Ptychozoon sp.*	2016/12	NA			17/06/2019
42	Reptile	Lacertidae	*Takydromus sexlineatus*	2016/12	LC			17/06/2019
43	Reptile	Scincidae	*Dasia olivacea*	2016/12	LC			17/06/2019
44	Reptile	Scincidae	*Lygosoma bowringii*	2016/12	NA			17/06/2019
45	Reptile	Scincidae	*Eutropis multifasciata*	2016/12	LC			17/06/2019
46	Reptile	Scincidae	*Eutropis rudis*	2016/12	NA			17/06/2019
47	Reptile	Scincidae	*Eutropis rugifera*	2016/12	LC			17/06/2019
48	Reptile	Scincidae	*Eutropis sp.*	2016/12	NA			17/06/2019
49	Reptile	Scincidae	*Sphenomorphus bowringii*	2016/12	NA			17/06/2019
50	Reptile	Varanidae	*Varanus bengalensis*	2016/12	LC		II	17/06/2019
51	Reptile	Varanidae	*Varanus dumerilii*	2016/12	NA		II	17/06/2019
52	Reptile	Varanidae	*Varanus rudicollis*	2016/12	NA		II	17/06/2019
53	Reptile	Varanidae	*Varanus salvator*	2016/12	LC		II	17/06/2019
54	Reptile	Acrochordidae	*Acrochordus javanicus*	2016/12	LC			17/06/2019
55	Reptile	Homalopsidae	*Enhydris enhydris*	2016/12	LC			17/06/2019
56	Reptile	Homalopsidae	*Homalopsis buccata*	2016/12	LC			17/06/2019
57	Reptile	Colubridae	*Ahaetulla prasina*	2016/12	LC			17/06/2019
58	Reptile	Colubridae	*Boiga dendrophila*	2016/12	NA			17/06/2019
59	Reptile	Colubridae	*Boiga drapiezii*	2016/12	LC			17/06/2019
60	Reptile	Colubridae	*Boiga jaspidea*	2016/12	LC			17/06/2019
61	Reptile	Colubridae	*Boiga nigriceps*	2016/12	LC			17/06/2019
62	Reptile	Colubridae	*Chrysopelea paradisi*	2016/12	LC			17/06/2019
63	Reptile	Colubridae	*Coelognathus flavolineatus*	2016/12	LC			17/06/2019
64	Reptile	Colubridae	*Coelognathus radiatus*	2016/12	LC			17/06/2019
65	Reptile	Colubridae	*Dendrelaphis caudolineatus*	2016/12	NA			17/06/2019
66	Reptile	Colubridae	*Dendrelaphis formosus*	2016/12	LC			17/06/2019
67	Reptile	Colubridae	*Dendrelaphis pictus*	2016/12	NA			17/06/2019
68	Reptile	Colubridae	*Dryocalamus subannulatus*	2016/12	LC			17/06/2019
69	Reptile	Colubridae	*Gongylosoma baliodeirus*	2016/12	LC			17/06/2019
70	Reptile	Colubridae	*Lepturophis albofuscus*	2016/12	LC			17/06/2019
71	Reptile	Colubridae	*Lycodon effraenis*	2016/12	LC			17/06/2019
72	Reptile	Colubridae	*Lycodon subcinctus*	2016/12	LC			17/06/2019
73	Reptile	Colubridae	*Ptyas korros*	2016/12	NA			17/06/2019
74	Reptile	Colubridae	*Xenelaphis hexagonotus*	2016/12	LC			17/06/2019
75	Reptile	Natricidae	*Rhabdophis subminiatus*	2016/12	LC			17/06/2019

76	Reptile	Natricidae	*Macropisthodon flaviceps*	2016/12	LC			17/06/2019
77	Reptile	Natricidae	*Xenochrophis maculatus*	2016/12	LC			17/06/2019
78	Reptile	Crocodylidae	*Crocodylus porosus*	2016/12	LC	√	II	17/06/2019
79	Reptile	Crocodylidae	*Tomistoma schlegelii*	2016/12	VU	√	I	17/06/2019
80	Reptile	Lamprophiidae	*Psammodynastes pictus*	2016/12	NA			17/06/2019
81	Reptile	Lamprophiidae	*Psammodynastes pulverulentus*	2016/12	NA			17/06/2019
82	Reptile	Natricidae	*Macropisthodon rhodomelas*	2016/12	LC			17/06/2019
83	Reptile	Pythonidae	*Malayopython reticulatus*	2016/12	LC		II	17/06/2019
84	Reptile	Pareatidae	*Aplopeltura boa*	2016/12	LC			17/06/2019
85	Reptile	Pareatidae	*Asthenodipsas malaccanus*	2016/12	LC			17/06/2019
86	Reptile	Pareatidae	*Pareas carinatus*	2016/12	LC			17/06/2019
87	Reptile	Xenopeltidae	*Xenopeltis unicolor*	2016/12	LC			17/06/2019
88	Reptile	Pythonidae	*Python curtus*	2016/12	LC		II	17/06/2019
89	Reptile	Pythonidae	*Python molurus*	2016/12	NA		II	17/06/2019
90	Reptile	Viperidae	*Calloselasma rhodostoma*	2016/12	LC			17/06/2019
91	Reptile	Viperidae	*Popeia nebularis*	2016/12	LC			17/06/2019
92	Reptile	Viperidae	*Trimeresurus sp.1*	2016/12	NA			17/06/2019
93	Reptile	Viperidae	*Trimeresurus sp.2*	2016/12	NA			17/06/2019
94	Reptile	Viperidae	*Tropidolaemus wagleri*	2016/12	LC			17/06/2019
95	Reptile	Elapidae	*Bungarus flaviceps*	2016/12	LC			17/06/2019
96	Reptile	Elapidae	*Naja sumatrana*	2016/12	LC		II	17/06/2019
97	Reptile	Elapidae	*Ophiophagus hannah*	2016/12	VU		II	17/06/2019
98	Reptile	Geoemydidae	*Batagur borneoensis*	2016/12	CR	√	II	17/06/2019
99	Reptile	Geoemydidae	*Cuora amboinensis*	2016/12	EN		II	17/06/2019
100	Reptile	Geoemydidae	*Cyclemys dentata*	2016/12	NT		II	17/06/2019
101	Reptile	Geoemydidae	*Heosemys spinosa*	2016/12	EN		II	17/06/2019
102	Reptile	Geoemydidae	*Orlitia borneensis*	2016/12	CR	√	II	17/06/2019
103	Reptile	Geoemydidae	*Siebenrockiella crassicollis*	2016/12	VU		II	17/06/2019
104	Reptile	Testudinidae	*Manouria emys*	2016/12	CR	√	II	17/06/2019
105	Reptile	Trionychidae	*Amyda cartilaginea*	2016/12	VU		II	17/06/2019
106	Reptile	Trionychidae	*Pelochelys cantorii*	2016/12	EN		II	17/06/2019
107	Reptile	Trionychidae	*Trionichidae sp.*	2016/12	NA			17/06/2019

Birds

No	Family	Scientific Name	English Name	Recorded	IUCN	GoI (P.106)	CITES	Last Updated
1	Phasianidae	*Rollulus rouloul*	Crested Partridge	2016/12	NT			14/08/2020
2	Phasianidae	*Melanoperdix nigra*	Black Partridge	2016/12	VU			14/08/2020
3	Phasianidae	*Synoicus chinensis*	Blue-breasted Quail	2004/08	LC			14/08/2020
4	Phasianidae	*Gallus gallus*	Red Junglefowl	2016/12	LC			14/08/2020
5	Phasianidae	*Lophura erythrophthalma*	Malay Crestless Fireback	2016/12	VU			14/08/2020

6	Anatidae	*Dendrocygna javanica*	Lesser Whistling-duck	2004/08	LC			14/08/2020
7	Anatidae	*Asarcornis scutulata*	White-winged Duck	2013/07	EN	√	I	14/08/2020
8	Anatidae	*Aythya fuligula*	Tufted Duck	2010/04	LC			14/08/2020
9	Columbidae	*Spilopelia chinensis*	Eastern Spotted Dove	2016/12	LC			14/08/2020
10	Columbidae	*Macropygia unchall*	Barred Cuckoo-Dove	2010/04	LC			14/08/2020
11	Columbidae	*Geopelia striata*	Zebra dove	2016/12	LC			14/08/2020
12	Columbidae	*Chalcophaps indica*	Emerald Dove	2016/12	LC			14/08/2020
13	Columbidae	*Treron fulvicollis*	Cinnamon-headed Green-Pigeon	2016/12	NT			14/08/2020
14	Columbidae	*Treron olax*	Little Green Pigeon	2016/12	LC			14/08/2020
15	Columbidae	*Treron vernans*	Pink-necked Green Pigeon	2004/08	LC			14/08/2020
16	Columbidae	*Treron curvirostra*	Thick-billed Green Pigeon	2016/12	LC			14/08/2020
17	Columbidae	*Treron capellei*	Large Green-pigeon	2010/04	VU			14/08/2020
18	Columbidae	*Ducula aenea*	Green Imperial Pigeon	2013/07	LC			14/08/2020
19	Columbidae	*Ramphiculus jambu*	Jambu Fruit Dove	2016/12	NT			14/08/2020
20	Podargidae	*Batrachostomus stellatus*	Gould's Frogmouth	2016/12	NT			14/08/2020
21	Podargidae	*Batrachostomus poliolophus*	Short-tailed Frogmouth	2016/12	NT			14/08/2020
22	Podargidae	*Batrachostomus javensis*	Horsfield's Frogmouth	2016/12	LC			14/08/2020
23	Podargidae	*Batrachostomus cornutus*	Sunda Frogmouth	2016/12	LC			14/08/2020
24	Caprimulgidae	*Lyncornis macrotis*	Great Eared Nightjar	2016/12	LC			14/08/2020
25	Caprimulgidae	*Lyncornis temminckii*	Malaysian Eared Nightjar	2004/08	LC			14/08/2020
26	Caprimulgidae	*Caprimulgus concretus*	Bonaparte's Nightjar	2016/12	VU	√		14/08/2020
27	Caprimulgidae	*Caprimulgus affinis*	Savanna Nightjar	2016/12	LC			14/08/2020
28	Caprimulgidae	*Caprimulgus macrurus*	Large-tailed Nightjar	2016/12	LC			14/08/2020
29	Hemiprocnidae	*Hemiprocne comata*	Whiskered Treeswift	2016/12	LC			14/08/2020
30	Hemiprocnidae	*Hemiprocne longipennis*	Grey-rumped Treeswift	2016/12	LC			14/08/2020
31	Apodidae	*Rhaphidura leucopygialis*	Silver-rumped Spinetail	2004/08	LC			14/08/2020
32	Apodidae	*Hirundapus giganteus*	Brown-backed Needletail	2004/08	LC			14/08/2020
33	Apodidae	*Collocalia esculenta*	Glossy Swiftlet	2016/12	LC			14/08/2020
34	Apodidae	*Aerodramus fuciphagus*	Edible-nest Swiftlet	2016/12	LC			14/08/2020
35	Apodidae	*Cypsiurus balasiensis*	Asian Palm Swift	2016/12	LC			14/08/2020
36	Apodidae	*Apus pacificus*	Pacific Swift	2010/04	LC			14/08/2020
37	Apodidae	*Apus nipalensis*	House Swift	2016/12	LC			14/08/2020
38	Cuculidae	*Centropus rectunguis*	Short-toed Coucal	2016/12	VU	√		14/08/2020
39	Cuculidae	*Centropus sinensis*	Greater Coucal	2016/12	LC			14/08/2020
40	Cuculidae	*Centropus bengalensis*	Lesser Coucal	2016/12	LC			14/08/2020
41	Cuculidae	*Rhinortha chlorophaea*	Raffles's Malkoha	2013/12	LC			14/08/2020
42	Cuculidae	*Zanclostomus javanicus*	Red-billed Malkoha	2016/12	LC			14/08/2020
43	Cuculidae	*Phaenicophaeus diardi*	Black-bellied Malkoha	2016/12	NT			14/08/2020
44	Cuculidae	*Phaenicophaeus sumatranus*	Chestnut-bellied Malkoha	2016/12	NT			14/08/2020
45	Cuculidae	*Phaenicophaeus tristis*	Green-billed Malkoha	2016/12	LC			14/08/2020

46	Cuculidae	*Phaenicophaeus curvirostris*	Chestnut-breasted Malkoha	2014/10	LC			14/08/2020
47	Cuculidae	*Clamator coromandus*	Chestnut-winged Cuckoo	2013/10	LC	√		14/08/2020
48	Cuculidae	*Chrysococcyx xanthorhynchus*	Violet Cuckoo	2016/12	LC			14/08/2020
49	Cuculidae	*Cacomantis sonneratii*	Banded Bay Cuckoo	2016/12	LC			14/08/2020
50	Cuculidae	*Cacomantis merulinus*	Plaintive Cuckoo	2016/12	LC			14/08/2020
51	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	2016/12	LC			14/08/2020
52	Cuculidae	*Surniculus lugubris*	Square-tailed Drongo-cuckoo	2016/12	LC			14/08/2020
53	Cuculidae	*Cuculus micropterus*	Indian Cuckoo	2016/12	LC			14/08/2020
54	Cuculidae	*Cuculus canorus*	Common Cuckoo	2016/12	LC			14/08/2020
55	Cuculidae	*Cuculus saturatus*	Oriental Cuckoo	2013/07	LC			14/08/2020
56	Rallidae	*Lewinia striata*	Slaty-breasted Rail	2010/04	LC			14/08/2020
57	Rallidae	*Zapornia fusca*	Ruddy-breasted Crake	2004/08	LC			14/08/2020
58	Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen	2016/12	LC			14/08/2020
59	Rallidae	*Gallicrex cinerea*	Watercock	2014/03	LC			14/08/2020
60	Ciconiidae	*Leptoptilos javanicus*	Lesser Adjutant	2016/12	VU	√		14/08/2020
61	Ciconiidae	*Mycteria cinerea*	Milky Stork	2011/06	EN	√	I	14/08/2020
62	Ciconiidae	*Ciconia stormi*	Storm's Stork	2012/06	EN	√		14/08/2020
63	Ardeidae	*Ixobrychus sinensis*	Yellow Bittern	2014/10	LC			14/08/2020
64	Ardeidae	*Ixobrychus cinnamomeus*	Cinnamon Bittern	2016/12	LC			14/08/2020
65	Ardeidae	*Ixobrychus flavicollis*	Black Bittern	2016/12	LC			14/08/2020
66	Ardeidae	*Butorides striata*	Green-backed Heron	2016/12	LC			14/08/2020
67	Ardeidae	*Nycticorax nycticorax*	Black-crowned Night-Heron	2018/01	LC			14/08/2020
68	Ardeidae	*Gorsachius melanolophus*	Malay Night-Heron	2018/03	LC			14/08/2020
69	Ardeidae	*Ardeola bacchus*	Chinese Pond-heron	2010/04	LC	√		14/08/2020
70	Ardeidae	*Bubulcus ibis*	Cattle Egret	2014/03	LC			14/08/2020
71	Ardeidae	*Ardea cinerea*	Grey Heron	2004/08	LC			14/08/2020
72	Ardeidae	*Ardea purpurea*	Purple Heron	2016/12	LC			14/08/2020
73	Ardeidae	*Ardea sumatrana*	Great-billed Heron	2010/04	LC	√		14/08/2020
74	Ardeidae	*Ardea alba*	Great Egret	2016/12	LC	√		14/08/2020
75	Ardeidae	*Ardea intermedia*	Intermediate Egret	2017/01	LC			14/08/2020
76	Ardeidae	*Egretta garzetta*	Little Egret	2013/10	LC			14/08/2020
77	Ardeidae	*Egretta sacra*	Pacific Reef Egret	2010/04	LC			14/08/2020
78	Pelecanidae	*Pelecanus philippensis*	Spot-billed Pelican	2010/04	NT	√		14/08/2020
79	Phalacrocoracidae	*Microcarbo niger*	Little Cormorant	2010/04	LC			14/08/2020
80	Anhingidae	*Anhinga melanogaster*	Oriental Darter	2010/04	NT			14/08/2020
81	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	2004/08	LC			14/08/2020
82	Charadriidae	*Charadrius dubius*	Little-ringed Plover	2008/11	LC			14/08/2020
83	Charadriidae	*Charadrius alexandrinus*	Kentish Plover	2019/01	LC	√		14/08/2020
84	Charadriidae	*Charadrius mongolus*	Lesser Sand-Plover	2004/08	LC			14/08/2020

85	Charadriidae	*Charadrius leschenaultii*	Greater Sand-Plover	2019/01	LC			14/08/2020
86	Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	2008/11	LC	√		14/08/2020
87	Scolopacidae	*Calidris ruficollis*	Red-necked Stint	2004/08	NT			14/08/2020
88	Scolopacidae	*Xenus cinereus*	Terek Sandpiper	2004/08	LC			14/08/2020
89	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	2004/08	LC			14/08/2020
90	Scolopacidae	*Tringa nebularia*	Common Greenshank	2004/08	LC			14/08/2020
91	Scolopacidae	*Tringa totanus*	Common Redshank	2004/08	LC			14/08/2020
92	Scolopacidae	*Tringa glareola*	Wood Sandpiper	2016/12	LC			14/08/2020
93	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	2014/03	LC			14/08/2020
94	Turnicidae	*Turnix suscitator*	Barred Buttonquail	2016/12	LC			14/08/2020
95	Glareolidae	*Glareola maldivarum*	Oriental Pratincole	2004/08	LC	√		14/08/2020
96	Laridae	*Sternula albifrons*	Little Tern	2004/08	LC	√		14/08/2020
97	Laridae	*Gelochelidon nilotica*	Gull-billed Tern	2018/01	LC	√		14/08/2020
98	Laridae	*Chlidonias hybrida*	Whiskered Tern	2016/03	LC	√		14/08/2020
99	Laridae	*Chlidonias leucopterus*	White-winged Tern	2016/12	LC	√		14/08/2020
100	Tytonidae	*Phodilus badius*	Oriental Bay-Owl	2004/08	LC		II	14/08/2020
101	Strigidae	*Ninox scutulata*	Brown Boobook	2016/12	LC		II	14/08/2020
102	Strigidae	*Otus lempiji*	Sunda Scops-owl	2016/12	LC		II	14/08/2020
103	Strigidae	*Strix leptogrammica*	Brown Wood-owl	2016/12	LC		II	14/08/2020
104	Strigidae	*Bubo sumatranus*	Barred Eagle-Owl	2016/12	LC		II	14/08/2020
105	Strigidae	*Ketupa ketupu*	Buffy fish-owl	2014/05	LC		II	14/08/2020
106	Accipitridae	*Elanus caeruleus*	Black-winged Kite	2014/04	LC	√	II	14/08/2020
107	Accipitridae	*Pernis ptilorhynchus*	Oriental Honey-buzzard	2013/03	LC	√	II	14/08/2020
108	Accipitridae	*Aviceda jerdoni*	Jerdon's Baza	2010/04	LC	√	II	14/08/2020
109	Accipitridae	*Aviceda leuphotes*	Black Baza	2004/08	LC	√	II	14/08/2020
110	Accipitridae	*Spilornis cheela*	Crested Serpent-eagle	2010/11	LC	√	II	14/08/2020
111	Accipitridae	*Circaetus gallicus*	Short-toed Snake-eagle	2010/04	LC	√	II	14/08/2020
112	Accipitridae	*Macheiramphus alcinus*	Bat Hawk	2016/12	LC	√	II	14/08/2020
113	Accipitridae	*Nisaetus nanus*	Wallace's Hawk-eagle	2016/12	VU	√	II	14/08/2020
114	Accipitridae	*Nisaetus cirrhatus*	Changeable Hawk-eagle	2014/01	LC	√	II	14/08/2020
115	Accipitridae	*Lophotriorchis kienerii*	Rufous-bellied Eagle	2017/03	NT	√	II	14/08/2020
116	Accipitridae	*Ictinaetus malaiensis*	Black Eagle	2016/12	LC	√	II	14/08/2020
117	Accipitridae	*Butastur indicus*	Gray-faced Buzzard	2018/03	LC	√	II	14/08/2020
118	Accipitridae	*Circus spilonotus*	Eastern Marsh-harrier	2004/08	LC	√	II	14/08/2020
119	Accipitridae	*Accipiter trivirgatus*	Crested Goshawk	2014/06	LC	√	II	14/08/2020
120	Accipitridae	*Accipiter soloensis*	Chinese Sparrowhawk	2016/12	LC	√	II	14/08/2020
121	Accipitridae	*Accipiter gularis*	Japanese Sparrowhawk	2004/08	LC	√	II	14/08/2020
122	Accipitridae	*Accipiter virgatus*	Besra	2004/08	LC	√	II	14/08/2020
123	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-eagle	2012/04	LC	√	II	14/08/2020
124	Accipitridae	*Ichthyophaga humilis*	Lesser Fish Eagle	2004/08	NT	√	II	14/08/2020

125	Accipitridae	*Icthyophaga ichthyaetus*	Grey-headed Fish Eagle	2014/12	NT	√	II	14/08/2020
126	Accipitridae	*Haliastur indus*	Brahminy Kite	2014/06	LC	√	II	14/08/2020
127	Accipitridae	*Milvus migrans*	Black Kite	2010/04	LC	√	II	14/08/2020
128	Trogonidae	*Harpactes oreskios*	Orange-breasted Trogon	2016/12	LC	√		14/08/2020
129	Trogonidae	*Harpactes duvaucelii*	Scarlet-rumped Trogon	2016/12	NT	√		14/08/2020
130	Trogonidae	*Harpactes diardii*	Diard's Trogon	2010/11	NT	√		14/08/2020
131	Trogonidae	*Harpactes kasumba*	Red-naped Trogon	2016/12	NT	√		14/08/2020
132	Bucerotidae	*Rhinoplax vigil*	Helmeted Hornbill	2007/11	CR	√	I	14/08/2020
133	Bucerotidae	*Buceros bicornis*	Great Hornbill	2010/11	VU	√	I	14/08/2020
134	Bucerotidae	*Buceros rhinoceros*	Rhinoceros Hornbill	2007/11	VU	√	II	14/08/2020
135	Bucerotidae	*Anorrhinus galeritus*	Bushy-crested Hornbill	2010/11	NT	√	II	14/08/2020
136	Bucerotidae	*Anthracoceros malayanus*	Black Hornbill	2007/11	VU	√	II	14/08/2020
137	Bucerotidae	*Anthracoceros albirostris*	Oriental Pied Hornbill	2014/03	LC	√	II	14/08/2020
138	Bucerotidae	*Rhabdotorrhinus corrugatus*	Wrinkled Hornbill	2007/11	EN	√	II	14/08/2020
139	Bucerotidae	*Rhyticeros undulatus*	Wreathed Hornbill	2016/12	VU	√	II	14/08/2020
140	Meropidae	*Merops viridis*	Blue-throated Bee-eater	2004/08	LC			14/08/2020
141	Meropidae	*Merops philippinus*	Blue-tailed Bee-eater	2016/12	LC			14/08/2020
142	Coraciidae	*Eurystomus orientalis*	Oriental Dollarbird	2016/12	LC			14/08/2020
143	Alcedinidae	*Ceyx erithaca*	Oriental Dwarf-kingfisher	2016/12	LC			14/08/2020
144	Alcedinidae	*Alcedo meninting*	Blue-eared Kingfisher	2016/12	LC			14/08/2020
145	Alcedinidae	*Alcedo atthis*	Common Kingfisher	2010/04	LC			14/08/2020
146	Alcedinidae	*Pelargopsis capensis*	Stork-billed Kingfisher	2016/12	LC			14/08/2020
147	Alcedinidae	*Halcyon coromanda*	Ruddy Kingfisher	2010/04	LC			14/08/2020
148	Alcedinidae	*Halcyon smyrnensis*	White-breasted Kingfisher	2016/12	LC			14/08/2020
149	Alcedinidae	*Halcyon pileata*	Black-capped Kingfisher	2004/08	LC			14/08/2020
150	Alcedinidae	*Todirhamphus chloris*	Collared Kingfisher	2014/03	LC			14/08/2020
151	Megalaimidae	*Caloramphus hayii*	Malay Brown Barbet	2016/12	NT	√		14/08/2020
152	Megalaimidae	*Psilopogon haemacephalus*	Coppersmith Barbet	2010/04	LC			14/08/2020
153	Megalaimidae	*Psilopogon duvaucelii*	Black-eared Barbet	2016/12	LC			14/08/2020
154	Megalaimidae	*Psilopogon mystacophanos*	Red-throated Barbet	2010/04	NT	√		14/08/2020
155	Megalaimidae	*Psilopogon rafflesii*	Red-crowned Barbet	2016/12	NT	√		14/08/2020
156	Megalaimidae	*Psilopogon henricii*	Yellow-crowned Barbet	2010/04	NT	√		14/08/2020
157	Indicatoridae	*Indicator archipelagicus*	Malay Honeyguide	2010/04	NT	√		14/08/2020
158	Picidae	*Sasia abnormis*	Rufous Piculet	2013/09	LC			14/08/2020
159	Picidae	*Hemicircus sordidus*	Grey-and-buff Woodpecker	2016/12	LC			14/08/2020
160	Picidae	*Chrysocolaptes validus*	Orange-backed Woodpecker	2016/12	LC			14/08/2020
161	Picidae	*Dinopium rafflesii*	Olive-backed Woodpecker	2010/04	NT			14/08/2020
162	Picidae	*Dinopium javanense*	Common Flameback	2016/12	LC			14/08/2020
163	Picidae	*Micropternus brachyurus*	Rufous Woodpecker	2016/12	LC			14/08/2020
164	Picidae	*Meiglyptes grammithorax*	Buff-rumped Woodpecker	2016/12	LC			14/08/2020

165	Picidae	*Meiglyptes tukki*	Buff-necked Woodpecker	2016/12	NT			14/08/2020
166	Picidae	*Chrysophlegma miniaceum*	Banded Woodpecker	2016/12	LC			14/08/2020
167	Picidae	*Picus puniceus*	Crimson-winged Woodpecker	2016/12	LC			14/08/2020
168	Picidae	*Dryocopus javensis*	White-bellied Woodpecker	2016/12	LC			14/08/2020
169	Picidae	*Picoides moluccensis*	Sunda Pygmy Woodpecker	2016/12	LC			14/08/2020
170	Falconidae	*Microhierax fringillarius*	Black-thighed Falconet	2016/12	LC	√	II	14/08/2020
171	Falconidae	*Falco tinnunculus*	Common Kestrel	2016/12	LC	√	II	14/08/2020
172	Falconidae	*Falco peregrinus*	Peregrine Falcon	2016/12	LC	√	I	14/08/2020
173	Psittacidae	*Psittinus cyanurus*	Blue-rumped Parrot	2016/12	NT	√	II	14/08/2020
174	Psittacidae	*Psittacula longicauda*	Long-tailed Parakeet	2016/12	VU	√	II	14/08/2020
175	Psittacidae	*Loriculus galgulus*	Blue-crowned Hanging-parrot	2016/12	LC	√	II	14/08/2020
176	Pittidae	*Erythropitta granatina*	Garnet Pitta	2016/12	NT	√		14/08/2020
177	Pittidae	*Pitta moluccensis*	Blue-winged Pitta	2017/04	LC	√		14/08/2020
178	Pittidae	*Pitta megarhyncha*	Mangrove Pitta	2016/12	NT	√		14/08/2020
179	Pittidae	*Pitta sordida*	Western Hooded Pitta	2016/12	LC	√		14/08/2020
180	Eurylaimidae	*Corydon sumatranus*	Dusky Broadbill	2016/12	LC			14/08/2020
181	Eurylaimidae	*Cymbirhynchus macrorhynchos*	Black-and-red Broadbill	2004/08	LC			14/08/2020
182	Eurylaimidae	*Eurylaimus ochromalus*	Black-and-yellow Broadbill	2016/12	NT			14/08/2020
183	Eurylaimidae	*Eurylaimus harterti*	Banded Broadbill	2016/12	LC			14/08/2020
184	Calyptomenidae	*Calyptomena viridis*	Green Broadbill	2016/12	NT			14/08/2020
185	Acanthizidae	*Gerygone sulphurea*	Golden-bellied Gerygone	2016/12	LC			14/08/2020
186	Oriolidae	*Oriolus xanthonotus*	Dark-throated Oriole	2016/12	NT			14/08/2020
187	Oriolidae	*Oriolus chinensis*	Black-naped Oriole	2016/12	LC			14/08/2020
188	Pachycephalidae	*Pachycephala cinerea*	Mangrove Whistler	2016/12	LC			14/08/2020
189	Campephagidae	*Pericrocotus flammeus*	Scarlet Minivet	2014/10	LC			14/08/2020
190	Campephagidae	*Pericrocotus igneus*	Fiery Minivet	2016/12	NT			14/08/2020
191	Campephagidae	*Coracina striata*	Bar-bellied Cuckoo-shrike	2016/12	LC			14/08/2020
192	Campephagidae	*Lalage nigra*	Pied Triller	2016/12	LC			14/08/2020
193	Artamidae	*Artamus leucoryn*	White-breasted Woodswallow	2016/12	LC			14/08/2020
194	Vangidae	*Philentoma pyrhoptera*	Rufous-winged Philentoma	2016/12	LC			14/08/2020
195	Vangidae	*Tephrodornis virgatus*	Large Wood Shrike	2016/12	LC			14/08/2020
196	Vangidae	*Hemipus hirundinaceus*	Black-winged Flycatcher-shrike	2016/12	LC			14/08/2020
197	Aegithinidae	*Aegithina tiphia*	Common Iora	2016/12	LC			14/08/2020
198	Aegithinidae	*Aegithina viridissima*	Green Iora	2016/12	NT			14/08/2020
199	Rhipiduridae	*Rhipidura javanica*	Sunda Pied Fantail	2016/12	LC	√		14/08/2020
200	Rhipiduridae	*Rhipidura perlata*	Spotted Fantail	2016/12	LC			14/08/2020
201	Dicruridae	*Dicrurus aeneus*	Bronzed Drongo	2016/12	LC			14/08/2020
202	Dicruridae	*Dicrurus paradiseus*	Greater Racquet-tailed Drongo	2016/12	LC			14/08/2020
203	Dicruridae	*Dicrurus annectens*	Crow-billed Drongo	2010/04	LC			14/08/2020
204	Dicruridae	*Dicrurus macrocercus*	Black Drongo	2016/12	LC			14/08/2020

205	Monarchidae	*Hypothymis azurea*	Black-naped Monarch	2014/10	LC			14/08/2020
206	Monarchidae	*Terpsiphone affinis*	Oriental Paradise-flycatcher	2016/12	LC			14/08/2020
207	Laniidae	*Lanius tigrinus*	Tiger Shrike	2016/12	LC			14/08/2020
208	Laniidae	*Lanius cristatus*	Brown Shrike	2016/12	LC			14/08/2020
209	Laniidae	*Lanius schach*	Long-tailed Shrike	2016/12	LC			14/08/2020
210	Corvidae	*Platysmurus leucopterus*	Malay Black Magpie	2004/08	LC	√		14/08/2020
211	Corvidae	*Corvus macrorhynchos*	Large-billed Crow	2004/08	LC			14/08/2020
212	Corvidae	*Corvus enca*	Slender-billed crow	2014/01	LC			14/08/2020
213	Cisticolidae	*Cisticola juncidis*	Zitting Cisticola	2012/12	LC			14/08/2020
214	Cisticolidae	*Prinia familiaris*	Bar-winged Prinia	2016/12	NT			14/08/2020
215	Cisticolidae	*Prinia flaviventris*	Yellow-bellied Prinia	2016/12	LC			14/08/2020
216	Cisticolidae	*Orthotomus sericeus*	Rufous-tailed Tailorbird	2016/12	LC			14/08/2020
217	Cisticolidae	*Orthotomus atrogularis*	Dark-necked Tailorbird	2016/12	LC			14/08/2020
218	Cisticolidae	*Orthotomus ruficeps*	Ashy Tailorbird	2016/12	LC			14/08/2020
219	Hirundinidae	*Hirundo tahitica*	Pacific Swallow	2016/12	LC			14/08/2020
220	Hirundinidae	*Hirundo rustica*	Barn Swallow	2016/12	LC			14/08/2020
221	Hirundinidae	*Delichon dasypus*	Asian House Martin	2004/08	LC			14/08/2020
222	Pycnonotidae	*Brachypodius atriceps*	Black-headed Bulbul	2004/08	LC			14/08/2020
223	Pycnonotidae	*Tricholestes criniger*	Hairy-backed Bulbul	2016/12	LC			14/08/2020
224	Pycnonotidae	*Setornis criniger*	Hook-billed Bulbul	2016/12	VU	√		14/08/2020
225	Pycnonotidae	*Alophoixus ochraceus*	Ochraceous Bulbul	2016/12	LC			14/08/2020
226	Pycnonotidae	*Alophoixus bres*	Brown-cheeked Bulbul	2010/04	NT			14/08/2020
227	Pycnonotidae	*Iole olivacea*	Buff-vented Bulbul	2016/12	NT			14/08/2020
228	Pycnonotidae	*Ixos malaccensis*	Streaked Bulbul	2010/04	NT			14/08/2020
229	Pycnonotidae	*Alophoixus phaeocephalus*	Yellow-bellied Bulbul	2016/12	LC			14/08/2020
230	Pycnonotidae	*Pycnonotus simplex*	Cream-vented Bulbul	2016/12	LC			14/08/2020
231	Pycnonotidae	*Pycnonotus brunneus*	Red-eyed Bulbul	2016/12	LC			14/08/2020
232	Pycnonotidae	*Pycnonotus plumosus*	Olive-winged Bulbul	2016/12	LC			14/08/2020
233	Pycnonotidae	*Pycnonotus goiavier*	Yellow-vented Bulbul	2016/12	LC			14/08/2020
234	Pycnonotidae	*Pycnonotus dispar*	Ruby-throated Bulbul	2016/12	VU			14/08/2020
235	Pycnonotidae	*Pycnonotus aurigaster*	Sooty-headed Bulbul	2016/12	LC			14/08/2020
236	Pycnonotidae	*Pycnonotus erythropthalmos*	Spectacled Bulbul	2016/12	LC			14/08/2020
237	Phylloscopidae	*Phylloscopus borealis*	Arctic Warbler	2016/12	LC			14/08/2020
238	Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye	2010/04	LC			14/08/2020
239	Timaliidae	*Macronous ptilosus*	Fluffy-backed Tit-babbler	2016/12	NT			14/08/2020
240	Timaliidae	*Mixornis gularis*	Pin-striped Tit-babbler	2016/12	LC			14/08/2020
241	Timaliidae	*Cyanoderma erythropterum*	Chestnut-winged Babbler	2016/12	LC			14/08/2020
242	Timaliidae	*Stachyris nigricollis*	Black-throated Babbler	2016/12	NT			14/08/2020
243	Timaliidae	*Stachyris maculata*	Chestnut-rumped Babbler	2016/12	NT			14/08/2020
244	Timaliidae	*Stachyris poliocephala*	Grey-headed Babbler	2016/12	LC			14/08/2020

245	Pellorneidae	*Malacopteron affine*	Sooty-capped Babbler	2016/12	NT			14/08/2020
246	Pellorneidae	*Malacopteron albogulare*	Grey-breasted Babbler	2016/12	NT			14/08/2020
247	Pellorneidae	*Malacopteron cinereum*	Scaly-crowned Babbler	2016/12	LC			14/08/2020
248	Pellorneidae	*Malacopteron magnirostre*	Moustached Babbler	2016/12	LC			14/08/2020
249	Pellorneidae	*Malacopteron magnum*	Rufous-crowned Babbler	2016/12	NT			14/08/2020
250	Pellorneidae	*Kenopia striata*	Striped Wren-babbler	2010/04	NT			14/08/2020
251	Pellorneidae	*Malacocincla abbotti*	Abbott's Babbler	2016/12	LC			14/08/2020
252	Pellorneidae	*Trichastoma bicolor*	Ferruginous Babbler	2016/12	LC			14/08/2020
253	Pellorneidae	*Trichastoma rostratum*	White-chested Babbler	2016/12	NT			14/08/2020
254	Pellorneidae	*Trichastoma malaccense*	Short-tailed Babbler	2016/12	NT			14/08/2020
255	Pellorneidae	*Pellorneum nigrocapitatum*	Black-capped Babbler	2016/12	LC			14/08/2020
256	Leiotrichidae	*Alcippe brunneicauda*	Brown Fulvetta	2010/04	NT			14/08/2020
257	Sittidae	*Sitta frontalis*	Velvet-fronted Nuthatch	2004/08	LC			14/08/2020
258	Sturnidae	*Agropsar sturninus*	Purple-backed Starling	2017/03	LC			14/08/2020
259	Sturnidae	*Acridotheres javanicus*	Javan Myna	2004/08	VU			14/08/2020
260	Sturnidae	*Gracula religiosa*	Common Hill Myna	2016/12	LC	√	II	14/08/2020
261	Sturnidae	*Aplonis panayensis*	Asian Glossy Starling	2016/12	LC			14/08/2020
262	Turdidae	*Turdus obscurus*	Eye-browed Thrush	2004/08	LC			14/08/2020
263	Muscicapidae	*Copsychus saularis*	Oriental Magpie-robin	2016/12	LC			14/08/2020
264	Muscicapidae	*Trichixos pyrropygus*	Rufous-tailed Shama	2016/12	NT			14/08/2020
265	Muscicapidae	*Kittacincla malabarica*	White-rumped Shama	2016/12	LC			14/08/2020
266	Muscicapidae	*Muscicapa sibirica*	Dark-sided Flycatcher	2016/12	LC			14/08/2020
267	Muscicapidae	*Muscicapa dauurica*	Asian Brown Flycatcher	2016/12	LC			14/08/2020
268	Muscicapidae	*Cyornis umbratilis*	Grey-chested Jungle-flycatcher	2016/12	NT			14/08/2020
269	Muscicapidae	*Cyornis olivaceus*	Fulvous-chested Jungle-flycatcher	2016/12	LC			14/08/2020
270	Muscicapidae	*Cyornis turcosus*	Malaysian Blue Flycatcher	2016/12	NT			14/08/2020
271	Muscicapidae	*Niltava grandis*	Large Niltava	2018/01	LC			14/08/2020
272	Muscicapidae	*Larvivora cyane*	Siberian Blue Robin	2016/12	LC			14/08/2020
273	Muscicapidae	*Ficedula zanthopygia*	Yellow-rumped Flycatcher	2014/10	LC			14/08/2020
274	Muscicapidae	*Monticola solitarius*	Blue Rock-thrush	2016/12	LC			14/08/2020
275	Irenidae	*Irena puella*	Asian Fairy-bluebird	2016/12	LC			14/08/2020
276	Chloropseidae	*Chloropsis sonnerati*	Greater Green Leafbird	2016/12	EN	√		14/08/2020
277	Chloropseidae	*Chloropsis cyanopogon*	Lesser Green Leafbird	2016/12	NT	√		14/08/2020
278	Chloropseidae	*Chloropsis moluccensis*	Blue-winged Leafbird	2016/12	LC	√		14/08/2020
279	Dicaeidae	*Prionochilus thoracicus*	Scarlet-breasted Flowerpecker	2016/12	NT			14/08/2020
280	Dicaeidae	*Prionochilus percussus*	Crimson-breasted Flowerpecker	2016/12	LC			14/08/2020
281	Dicaeidae	*Dicaeum everetti*	Brown-backed Flowerpecker	2016/12	NT			14/08/2020
282	Dicaeidae	*Dicaeum chrysorrheum*	Yellow-vented Flowerpecker	2016/12	LC			14/08/2020
283	Dicaeidae	*Dicaeum trigonostigma*	Orange-bellied Flowerpecker	2016/12	LC			14/08/2020
284	Dicaeidae	*Dicaeum cruentatum*	Scarlet-backed Flowerpecker	2004/08	LC			14/08/2020

285	Nectariniidae	*Arachnothera crassirostris*	Thick-billed Spiderhunter	2004/08	LC			14/08/2020
286	Nectariniidae	*Arachnothera robusta*	Long-billed Spiderhunter	2016/12	LC			14/08/2020
287	Nectariniidae	*Arachnothera longirostra*	Little Spiderhunter	2016/12	LC			14/08/2020
288	Nectariniidae	*Arachnothera hypogrammica*	Purple-naped Spiderhunter	2016/12	LC			14/08/2020
289	Nectariniidae	*Arachnothera flavigaster*	Spectacled Spiderhunter	2016/12	LC			14/08/2020
290	Nectariniidae	*Arachnothera modesta*	Grey-breasted Spiderhunter	2016/12	LC			14/08/2020
291	Nectariniidae	*Chalcoparia singalensis*	Ruby-cheeked Sunbird	2016/12	LC			14/08/2020
292	Nectariniidae	*Anthreptes simplex*	Plain Sunbird	2016/12	LC			14/08/2020
293	Nectariniidae	*Anthreptes malacensis*	Brown-throated Sunbird	2016/12	LC			14/08/2020
294	Nectariniidae	*Anthreptes rhodolaemus*	Red-throated Sunbird	2004/08	NT	√		14/08/2020
295	Nectariniidae	*Leptocoma brasiliana*	Maroon-bellied Sunbird	2016/12	LC			14/08/2020
296	Nectariniidae	*Leptocoma calcostetha*	Copper-throated Sunbird	2016/12	LC			14/08/2020
297	Nectariniidae	*Cinnyris jugularis*	Olive-backed Sunbird	2016/12	LC			14/08/2020
298	Nectariniidae	*Aethopyga siparaja*	Crimson Sunbird	2016/12	LC	√		14/08/2020
299	Ploceidae	*Ploceus hypoxanthus*	Asian Golden Weaver	2010/04	NT			14/08/2020
300	Estrildidae	*Lonchura striata*	White-rumped Munia	2004/08	LC			14/08/2020
301	Estrildidae	*Lonchura leucogastra*	White-bellied Munia	2010/04	LC			14/08/2020
302	Estrildidae	*Lonchura malacca*	Tricoloured Munia	2016/12	LC			14/08/2020
303	Estrildidae	*Lonchura maja*	White-headed Munia	2016/12	LC			14/08/2020
304	Passeridae	*Passer montanus*	Eurasian Tree Sparrow	2016/12	LC			14/08/2020
305	Motacillidae	*Anthus rufulus*	Paddyfield Pipit	2016/12	LC			14/08/2020
306	Motacillidae	*Motacilla cinerea*	Grey Wagtail	2016/03	LC			14/08/2020
307	Motacillidae	*Motacilla tschutschensis*	Eastern Yellow Wagtail	2016/12	LC			14/08/2020

Plants

No.	Family	Scientific Name	Recorded	IUCN	GoI (P.106)	CITES	Last Updated	Notes	Habits
1	Anacardiaceae	*Campnosperma coriaceum*	2016/12	NA			14/08/2020		Tree
2	Anacardiaceae	*Mangifera parvifolia*	2016/12	LC			14/08/2020		Tree
3	Anisophylleaceae	*Combretocarpus rotundatus*	2016/12	LC			14/08/2020		Tree
4	Annonaceae	*Artabotrys suaveolens*	2018/07	NA			14/08/2020		Liana
5	Annonaceae	*Goniothalamus sp.*	2018/07	NA			14/08/2020		Tree
6	Annonaceae	*Maasia sumatrana*	2016/12	LC			14/08/2020	syn. *Polyalthia sumatrana*	Tree
7	Annonaceae	*Xylopia fusca*	2016/12	NA			14/08/2020		Tree
8	Annonaceae	*Polyalthia?*	2016/12	NA			14/08/2020		Tree
9	Annonaceae	*Xylopia malayana*	2016/12	NA			14/08/2020		Tree
10	Apocynaceae	*Alstonia scholaris*	2016/12	LC			14/08/2020		Tree
11	Apocynaceae	*Dischidia sp.*	2018/07	NA			14/08/2020		Liana

12	Apocynaceae	*Hoya elliptica*	2018/07	NA			14/08/2020		Liana
13	Apocynaceae	*Hoya sp.2*	2016/12	NA			14/08/2020		Liana
14	Apocynaceae	*Leuconotis sp.*	2018/07	NA			14/08/2020		Liana
15	Aquifoliaceae	*Ilex cymosa*	2016/12	LC			14/08/2020		Tree
16	Aquifoliaceae	*Ilex hypoglauca*	2016/12	NA			14/08/2020		Tree
17	Araceae	*Aglaonema nitidum*	2016/12	NA			14/08/2020		Herbs
18	Araceae	*Alocasia longiloba*	2016/12	NA			14/08/2020		Herbs
19	Araceae	*Rhapidophora lobbii*	2016/12	NA			14/08/2020		Herbs
20	Araceae	*Schindapsus sp.*	2016/12	NA			14/08/2020		Liana
21	Arecaceae	*Caryota mitis*	2018/07	LC			14/08/2020		Tree
22	Arecaceae	*Cyrtostachys renda*	2016/12	NA			14/08/2020		Tree
23	Arecaceae	*Daemonorops grandis*	2016/12	NA			14/08/2020		Liana
24	Arecaceae	*Eleiodoxa conferta**	2016/12	NA			14/08/2020		Shrub
25	Arecaceae	*Licuala spinosa*	2018/07	NA			14/08/2020		Tree
26	Arecaceae	*Plectocomia elongata*	2018/07	NA			14/08/2020		Liana
27	Asparagaceae	*Dracaena cantleyi*	2016/12	NA			14/08/2020		Tree
28	Asphodelaceae	*Dianella ensifolia*	2018/07	NA			14/08/2020		Herbs
29	Aspleniaceae	*Asplenium longissimum*	2016/12	NA			14/08/2020		Fern
30	Aspleniaceae	*Asplenium nidus*	2016/12	NA			14/08/2020		Fern
31	Aspleniaceae	*Asplenium sp.*	2019/10	NA			14/08/2020	TBOT blok B	Fern
32	Blechnaceae	*Blechnum orientale*	2018/07	NA			14/08/2020		Fern
33	Blechnaceae	*Stenochlaena palustris*	2016/12	NA			14/08/2020		Fern
34	Bonnetiaceae	*Ploiarium alternifolium*	2019/07	LC			14/08/2020		Tree
35	Burseraceae	*Dacriodes sp.*	2016/12	NA			14/08/2020		Tree
36	Burseraceae	*Santiria laevigata*	2016/12	LC			14/08/2020		Tree
37	Calophyllaceae	*Calophyllum cf hosei*	2016/12	NA			14/08/2020		Tree
38	Calophyllaceae	*Calophyllum ferrugineum*	2016/12	NA			14/08/2020		Tree
39	Cecropiaceae	*Poikilospermum suaveolens*	2016/12	NA			14/08/2020		Liana
40	Celastraceae	*Lophopetalum sp.*	2016/12	NA			14/08/2020		Tree
41	Celastraceae	*Siphonodon celastrinus*	2018/07	NA			14/08/2020		Tree
42	Chrysobalanaceae	*Licania sp.*	2016/12	NA			14/08/2020		Tree
43	Chrysobalanaceae	*Parastemon urophyllus*	2016/12	NA			14/08/2020		Tree
44	Clusiaceae	*Garcinia apetala*	2016/12	NA			14/08/2020		Tree
45	Clusiaceae	*Garcinia bancana*	2016/12	NA			14/08/2020		Tree
46	Clusiaceae	*Garcinia sp*	2016/12	NA			14/08/2020		Tree
47	Clusiaceae	*Garcinia sp 1*	2016/12	NA			14/08/2020		Tree
48	Clusiaceae	*Garcinia urophyllus*	2016/12	NA			14/08/2020		Tree
49	Commelinaceae	*Pollia sp.*	2018/07	NA			14/08/2020		Herbs
50	Ctenolophonaceae	*Ctenolophon parvifolius*	2016/12	VU			14/08/2020		Tree
51	Cyperaceae	*Carex sp.*	2019/01	NA			14/08/2020		Herbs

52	Cyperaceae	*Lepironia articulata*	2018/07	NA			14/08/2020		Herbs
53	Cyperaceae	*Scleria sumatrensis*	2016/12	NA			14/08/2020		Herbs
54	Cyperaceae	*Thoracostachyum bancanum*	2016/12	NA			14/08/2020		Herbs
55	Dilleniaceae	*Dillenia excelsa*	2016/12	NA			14/08/2020		Tree
56	Dilleniaceae	*Dillenia pumila*	2018/07	NA			14/08/2020		Tree
57	Dipterocarpaceae	*Anisoptera marginata*	2016/12	VU			14/08/2020		Tree
58	Dipterocarpaceae	*Shorea platycarpa*	2016/12	CR			14/08/2020		Tree
59	Dipterocarpaceae	*Shorea teysmanniana*	2016/12	EN			14/08/2020		Tree
60	Dipterocarpaceae	*Shorea uliginosa*	2016/12	VU			14/08/2020		Tree
61	Dipterocarpaceae	*Vatica pauciflora*	2016/12	VU			14/08/2020		Tree
62	Dipterocarpaceae	*Vatica teysmanniana*	2016/12	CR			14/08/2020		Tree
63	Ebenaceae	*Diospyros buxifolia*	2016/12	NA		II	14/08/2020		Tree
64	Ebenaceae	*Diospyros siamang*	2016/12	NA			14/08/2020		Tree
65	Ebenaceae	*Diospyros sp.*	2016/12	NA			14/08/2020		Tree
66	Elaeocarpaceae	*Elaeocarpus sp.*	2016/12	NA			14/08/2020		Tree
67	Euphorbiaceae	*Blumeodendron kurzii*	2016/12	NA			14/08/2020		Tree
68	Euphorbiaceae	*Blumeodendron tokbrai*	2016/12	NA			14/08/2020		Tree
69	Euphorbiaceae	*Macaranga bancana*	2016/12	NA			14/08/2020		Tree
70	Euphorbiaceae	*Macaranga caladiifolia*	2016/12	NA			14/08/2020		Tree
71	Euphorbiaceae	*Macaranga hosei*	2016/12	NA			14/08/2020		Tree
72	Euphorbiaceae	*Macaranga pruinosa*	2018/07	NA			14/08/2020		Tree
73	Fabaceae	*Archidendron clypearia*	2016/12	LC			14/08/2020		Tree
74	Fabaceae	*Dialium indum*	2016/12	NA			14/08/2020		Tree
75	Fabaceae	*Ormosia sumatrana*	2016/12	LC			14/08/2020		Tree
76	Fagaceae	*Lithocarpus ewyckii*	2016/12	NA			14/08/2020		Tree
77	Fagaceae	*Lithocarpus sp*	2016/12	NA			14/08/2020		Tree
78	Flagellariaceae	*Flagellaria indica*	2016/12	NA			14/08/2020		Herbs
79	Gentianaceae	*Fagraea volubilis*	2016/12	NA			14/08/2020		Tree
80	Gesneriaceae	*Aeschynanthus parvifolius*	2016/12	NA			14/08/2020		Herbs
81	Hanguanaceae	*Hanguana malayana*	2016/12	LC			14/08/2020		Herbs
82	Hypericaceae	*Cratoxylum arborescens*	2016/12	LC			14/08/2020		Tree
83	Junglandaceae	*Engelhardtia serrata*	2016/12	LC			14/08/2020		Tree
84	Lauraceae	*Actinodaphne sp.*	2015/01	NA			14/08/2020		Tree
85	Lauraceae	*Litsea gracilipes*	2016/12	LC			14/08/2020		Tree
86	Lauraceae	*Litsea grandis*	2016/12	LC			14/08/2020		Tree
87	Lauraceae	*Litsea machilifolia*	2016/12	LC			14/08/2020		Tree
88	Lauraceae	*Litsea sp 1*	2016/12	NA			14/08/2020		Tree
89	Lauraceae	*Nothaphoebe coriacea*	2016/12	NA			14/08/2020		Tree
90	Lentibulariaceae	*Utricularia aurea*	2019/01	LC			14/08/2020		Herbs
91	Lycopodiaceae	*Huperzia phlegmaria*	2016/12	NA			14/08/2020		Fern

92	Lycopodiaceae	*Lycopodiella cernua*	2018/07	LC			14/08/2020		Fern
93	Magnoliaceae	*Magnolia sp?*	2016/12	NA			14/08/2020		Tree
94	Malvaceae	*Durio carinatus*	2016/12	NA			14/08/2020		Tree
95	Malvaceae	*Sterculia gilva*	2016/12	NA			14/08/2020		Tree
96	Melastomataceae	*Medinilla crassifolia*	2016/12	NA			14/08/2020		Shrub
97	Melastomataceae	*Melastoma malabathricum*	2016/12	NA			14/08/2020		Shrub
98	Meliaceae	*Aglaia rubiginosa*	2016/12	NT			14/08/2020		Tree
99	Meliaceae	*Sandorichum beccarianum*	2016/12	NA			14/08/2020		Tree
100	Menispermaceae	*Diploclisia cf. glaucescens*	2016/12	NA			14/08/2020		Liana
101	Moraceae	*Ficus deltoidea*	2016/12	NA			14/08/2020		Shrub
102	Moraceae	*Ficus spp.*	2016/13	NA			14/08/2020		Tree
103	Moraceae	*Ficus sumatrana*	2016/12	LC			14/08/2020		Tree
104	Moraceae	*Ficus cf tristaniifolia*	2018/07	NA			14/08/2020	Simmilar to F. spathulifolia but inconspicuously trinerved	Tree
105	Moraceae	*Ficus xylophylla*	2014	NA			14/08/2020		Tree
106	Moraceae	*Paratocarpus venenosus*	2016/12	NA			14/08/2020		Tree
107	Myristicaceae	*Horsfieldia crassifolia*	2016/12	NT			14/08/2020		Tree
108	Myristicaceae	*Knema glauca var glauca*	2016/12	NA			14/08/2020		Tree
109	Myristicaceae	*Knema intermedia*	2016/12	NT			14/08/2020		Tree
110	Myristicaceae	*Myristica elliptica*	2016/12	LC			14/08/2020		Tree
111	Myristicaceae	*Myristica lowiana*	2016/12	NT			14/08/2020		Tree
112	Myrtaceae	*Syzygium antisepticum*	2016/12	NA			14/08/2020	Syn. *Syzygium cf muelleri*	Tree
113	Myrtaceae	*Syzygium incarnatum*	2016/12	NA			14/08/2020	Syn. *Syzygium cerinum*	Tree
114	Myrtaceae	*Syzygium cf napiforme*	2016/12	NA			14/08/2020		Tree
115	Myrtaceae	*Syzygium chloranthum*	2016/12	NA			14/08/2020		Tree
116	Myrtaceae	*Syzygium glaucum*	2016/12	NA			14/08/2020		Tree
117	Myrtaceae	*Syzygium lineatum*	2016/12	NA			14/08/2020		Tree
118	Myrtaceae	*Syzygium zeylanicum*	2016/12	NA			14/08/2020		Tree
119	Myrtaceae	*Syzygium sp 1*	2016/12	NA			14/08/2020		Tree
120	Myrtaceae	*Syzygium sp_gelam*	2016/12	NA			14/08/2020		Tree
121	Myrtaceae	*Syzygium sp_jambu*	2016/12	NA			14/08/2020		Tree
122	Myrtaceae	*Syzygium sp_merah*	2016/12	NA			14/08/2020		Tree
123	Myrtaceae	*Tristaniopsis merguensis*	2016/12	NA			14/08/2020		Tree
124	Nepenthaceae	*Nepenthes ampullaria*	2016/12	LC		II	14/08/2020		Herbs
125	Nepenthaceae	*Nepenthes gracilis*	2016/12	LC		II	14/08/2020		Herbs
126	Nepenthaceae	*Nepenthes rafflesiana*	2016/12	LC		II	14/08/2020		Herbs
127	Nephrolepidaceae	*Nephrolepis bisserata**	2016/12	NA			14/08/2020		Herbs
128	Orchidaceae	*Acriopsis floribunda*	2018/07	NA		II	14/08/2020		Herbs
129	Orchidaceae	*Bromheadia finlaysoniana*	2018/07	LC		II	14/08/2020		Herbs
130	Orchidaceae	*Bulbophyllum macrochilum*	2018/07	NA		II	14/08/2020		Herbs

131	Orchidaceae	*Bulbophyllum patens*	2018/07	NA		II	14/08/2020		Herbs
132	Orchidaceae	*Bulbophyllum vaginatum*	2016/12	NA		II	14/08/2020		Herbs
133	Orchidaceae	*Calanthe triplicata*	2018/07	NA		II	14/08/2020		Herbs
134	Orchidaceae	*Cymbidium finlaysonianum*	2018/07	NA		II	14/08/2020		Herbs
135	Orchidaceae	*Dendrobium kentrophyllum*	2018/07	NA		II	14/08/2020		Herbs
136	Orchidaceae	*Dendrobium leonis*	2016/12	NA		II	14/08/2020		Herbs
137	Orchidaceae	*Dendrobium rhodostele*	2016/12	NA		II	14/08/2020		Herbs
138	Orchidaceae	*Dendrobium secundum*	2018/07	NA		II	14/08/2020		Herbs
139	Orchidaceae	*Dipodium scandens*	2019/03	NA		II	14/08/2020		Herbs
140	Orchidaceae	*Eulophia graminea*	2018/07	NA		II	14/08/2020		Herbs
141	Orchidaceae	*Grammatophyllum speciosum*	2018/07	NA		II	14/08/2020		Herbs
142	Orchidaceae	*Liparis cf. lacerata*	2018/07	NA		II	14/08/2020		Herbs
143	Orchidaceae	*Liparis cf. tricallosa*	2018/07	NA		II	14/08/2020		Herbs
144	Orchidaceae	*Microsaccus griffithii*	2018/07	NA		II	14/08/2020		Herbs
145	Orchidaceae	*Oberonia sp.*	2018/07	NA		II	14/08/2020		Herbs
146	Orchidaceae	*Phaius sp.*	2016/12	NA		II	14/08/2020		Herbs
147	Orchidaceae	*Vanilla sp.*	2018/07	NA		II	14/08/2020		Liana
148	Pandanaceae	*Freycinetia angustifolia*	2016/12	NA			14/08/2020		Herbs
149	Pandanaceae	*Pandanus atrocarpus*	2016/12	NA			14/08/2020		Tree
150	Pandanaceae	*Pandanus helicopus*	2016/12	NA			14/08/2020		Tree
151	Pentaphylacaceae	*Ternstroemia coriacea*	2016/12	NA			14/08/2020		Tree
152	Phyllanthaceae	*Antidesma coriaceum*	2016/12	NA			14/08/2020		Tree
153	Phyllanthaceae	*Antidesma montanum*	2016/12	LC			14/08/2020		Tree
154	Picrodendraceae	*Austrobuxus nitidus*	2016/12	NA			14/08/2020		Tree
155	Piperaceae	*Piper betle*	2016/12	NA			14/08/2020		Liana
156	Polygalaceae	*Xanthophyllum sp.*	2016/12	NA			14/08/2020		Tree
157	Polygalaceae	*Xanthophyllum stipitatum*	2016/12	NA			14/08/2020		Tree
158	Polypodiaceae	*Lecanopteris sp.*	2018/07	NA			14/08/2020		Fern
159	Polypodiaceae	*Platycerium coronarium*	2016/12	NA			14/08/2020		Fern
160	Polypodiaceae	*Platycerium ridleyi*	2018/07	NA			14/08/2020		Fern
161	Pteridaceae	*Acrostichum aureum*	2018/07	LC			14/08/2020		Fern
162	Pteridaceae	*Ceratopteris thalictroides*	2018/07	LC			14/08/2020		Fern
163	Rhizophoraceae	*Carallia brachiata*	2016/12	NA			14/08/2020		Tree
164	Rubiaceae	*Aidia sp.*	2016/12	NA			14/08/2020		Tree
165	Rubiaceae	*Lecananthus erubescens*	2016/12	NA			14/08/2020		Shrub
166	Rubiaceae	*Morinda umbellata*	2018/07	NA			14/08/2020		Liana
167	Rubiaceae	*Myrmecodia sp.*	2016/12	NA			14/08/2020		Herbs
168	Rubiaceae	*Pavetta cf. indica*	2016/12	NA			14/08/2020		Tree
169	Rubiaceae	*Psichotria sp.*	2016/12	NA			14/08/2020		Tree
170	Rubiaceae	*Ridsdalea grandis*	2016/12	NA			14/08/2020	syn. *Rothmannia grandis*	Tree

171	Rubiaceae	*Timonius flavescens*	2016/12	LC			14/08/2020		Tree
172	Rubiaceae	*Uncaria sp. 1*	2016/12	NA			14/08/2020		Liana
173	Rubiaceae	*Uncaria sp. 2*	2018/07	NA			14/08/2020		Liana
174	Rutaceae	*Melicope lunu-ankenda*	2016/12	LC			14/08/2020		Tree
175	Rutaceae	*Tetractomia parvifolia*	2016/12	NA			14/08/2020		Tree
176	Rutaceae	*Tetractomia tetrandra*	2016/12	NA			14/08/2020		Tree
177	Sapotaceae	*Madhuca motleyana*	2016/12	NT			14/08/2020		Tree
178	Sapotaceae	*Madhuca sp*	2016/12	NA			14/08/2020		Tree
179	Sapotaceae	*Madhuca sp 1*	2016/12	NA			14/08/2020		Tree
180	Sapotaceae	*Palaquium cf ridleyi*	2016/12	NA			14/08/2020		Tree
181	Sapotaceae	*Palaquium cf walsurifolium*	2016/12	NA			14/08/2020		Tree
182	Sapotaceae	*Palaquium sp_suntai*	2016/12	NA			14/08/2020		Tree
183	Simaroubaceae	*Quassia borneensis*	2016/12	NA			14/08/2020		Tree
184	Stemonuraceae	*Stemonurus scorpioides*	2016/12	NA			14/08/2020		Tree
185	Stemonuraceae	*Stemonurus secundiflorus*	2016/12	NA			14/08/2020		Tree
186	Tetrameristaceae	*Tetramerista glabra*	2016/12	VU			14/08/2020		Tree
187	Thymelaeaceae	*Gonystylus bancanus*	2016/12	CR		II	14/08/2020		Tree
188	Vitaceae	*Cissus discolor*	2016/12	NA			14/08/2020		Liana
189	Vitaceae	*Tertrastigma sp.*	2016/12	NA			14/08/2020		Liana
190	Zingiberaceae	*Globa sp.*	2018/05	NA			14/08/2020		Herbs

Fish

No	Family	Scientific Name	Recorded	IUCN	GoI (P.106)	CITES	Last Updated
1	Schilbeidae	*Pseudeutropius brachypopterus*	2017/1	LC			14/08/2020
2	Schilbeidae	*Pseudeutropius moolenburgae*	2017/1	NA			14/08/2020
3	Siluridae	*Phalacronotus apogon*	2017/1	LC			14/08/2020
4	Siluridae	*Kryptopterus limpok*	2017/1	LC			14/08/2020
5	Siluridae	*Kryptopterus macrocephalus*	2017/1	NT			14/08/2020
6	Siluridae	*Ompok bimaculatus*	2017/1	NT			14/08/2020
7	Siluridae	*Ompok hypophthalmus*	2017/1	LC			14/08/2020
8	Siluridae	*Ompok leiacanthus*	2017/1	NT			14/08/2020
9	Siluridae	*Silurichthys hasselti*	2017/1	NA			14/08/2020
10	Siluridae	*Silurichthys phaiosoma*	2017/1	NT			14/08/2020
11	Siluridae	*Wallago leeri*	2017/1	NA			14/08/2020
12	Siluridae	*Wallago sp.*	2017/1	NA			14/08/2020
13	Bagridae	*Hemibagrus nemurus*	2017/1	LC			14/08/2020
14	Bagridae	*Leiocassis aculeatus*	2017/1	NA			14/08/2020

15	Bagridae	*Leiocassis hosii*	2017/1	NA			14/08/2020
16	Bagridae	*Leiocassis micropogon*	2017/1	LC			14/08/2020
17	Bagridae	*Leiocassis sp.*	2017/1	NA			14/08/2020
18	Bagridae	*Mystus bimaculatus*	2017/1	NT			14/08/2020
19	Bagridae	*Mystus sp.*	2017/1	NA			14/08/2020
20	Bagridae	*Nanobagrus armatus*	2017/1	LC			14/08/2020
21	Chachidae	*Chaca bankanensis*	2017/1	NT			14/08/2020
22	Claridae	*Clarias leicanthus*	2017/1	NA			14/08/2020
23	Claridae	*Clarias meladerma*	2017/1	LC			14/08/2020
24	Claridae	*Clarias nieuhofii*	2017/1	LC			14/08/2020
25	Claridae	*Enceloclaria velatus*	2017/1	NA			14/08/2020
26	Channidae	*Channa lucius*	2017/1	LC			14/08/2020
27	Channidae	*Channa marulioides*	2017/1	LC			14/08/2020
28	Channidae	*Channa micropeltes*	2017/1	LC			14/08/2020
29	Channidae	*Channa pleuropthalmus*	2017/1	NA			14/08/2020
30	Channidae	*Channa striata*	2015/10	LC			14/08/2020
31	Pangasidae	*Pangasius nieuwenhuisii*	2017/1	DD			14/08/2020
32	Pangasidae	*Pangasius sp.*	2017/1	NA			14/08/2020
33	Cyprinidae	*Brevibora dorsiocellata*	2017/1	EN			14/08/2020
34	Cyprinidae	*Desmopuntius foerschi*	2017/1	NA			14/08/2020
35	Cyprinidae	*Desmopuntius gemellus*	2017/1	NA			14/08/2020
36	Cyprinidae	*Desmopuntius hexazona*	2017/1	LC			14/08/2020
37	Cyprinidae	*Desmopuntius pentazona*	2017/1	NA			14/08/2020
38	Cyprinidae	*Eirmotus octozona*	2017/1	NA			14/08/2020
39	Cyprinidae	*Osteochilus spilurus*	2017/1	LC			14/08/2020
40	Cyprinidae	*Osteochilus melanopleura*	2017/1	LC			14/08/2020
41	Cyprinidae	*Paedocypris progentica*	2017/1	NA			14/08/2020
42	Cyprinidae	*Parachela oxygastroides*	2017/1	LC			14/08/2020
43	Cyprinidae	*Pectenocypris nigra*	2017/1	NA			14/08/2020
44	Cyprinidae	*Pectenocypris rubra*	2017/1	NA			14/08/2020
45	Cyprinidae	*Puntius sp.*	2017/1	NA			14/08/2020
46	Cyprinidae	*Rasbora sumatrana*	2017/1	NA			14/08/2020
47	Cyprinidae	*Rasbora argyrotaenia*	2017/1	NA			14/08/2020
48	Cyprinidae	*Rasbora cephalotaenia*	2017/1	LC			14/08/2020
49	Cyprinidae	*Rasbora dorsiocellata*	2017/1	NA			14/08/2020
50	Cyprinidae	*Rasbora kalochroma*	2017/1	LC			14/08/2020
51	Cyprinidae	*Rasbora sp.*	2017/1	NA			14/08/2020
52	Cyprinidae	*Rasbora tornieri*	2017/1	LC			14/08/2020
53	Cyprinidae	*Rasbora trifasciata*	2017/1	DD			14/08/2020
54	Cyprinidae	*Striuntius lineatus*	2017/1	NA			14/08/2020

55	Cyprinidae	*Sundadanio axelrodi*	2017/1	VU			14/08/2020
56	Cyprinidae	*Trigonopoma gracile*	2017/1	NA			14/08/2020
57	Cyprinidae	*Trigonopoma pauciperforatum*	2017/1	LC			14/08/2020
58	Cobitidae	*Kottelatlimia pristes*	2017/1	VU			14/08/2020
59	Balitoridae	*Neohomaloptera cf. johorensis*	2017/9	NA			14/08/2020
60	Mastachembelidae	*Macrognathus maculatus*	2017/1	LC			14/08/2020
61	Ambassidae	*Parambassis macrolepis*	2017/1	NA			14/08/2020
62	Datniodidae	*Datnioides microlepis*	2017/1	NA			14/08/2020
63	Nandidae	*Nandus nebulosus*	2017/1	LC			14/08/2020
64	Pristolepidae	*Pristolepis fasciata*	2017/1	LC			14/08/2020
65	Pristolepidae	*Pristolepis grootii*	2017/1	LC			14/08/2020
66	Tetraodontidae	*Pao palembangensis*	2017/1	NA			14/08/2020
67	Zenarchopteridae	*Hemirhamphodon kuekenthali*	2017/1	NA			14/08/2020
68	Zenarchopteridae	*Hemirhamphodon phaiosoma*	2017/1	NA			14/08/2020
69	Zenarchopteridae	*Hemirhamphodon pogonognathus*	2017/1	LC			14/08/2020
70	Zenarchopteridae	*Hemirhamphodon tengah*	2017/1	NA			14/08/2020
71	Anabantidae	*Anabas testudineus*	2017/1	LC			14/08/2020
72	Helostomatidae	*Helostoma temminckii*	2017/1	LC			14/08/2020
73	Osphronemidae	*Belontia hasselti*	2017/1	LC			14/08/2020
74	Osphronemidae	*Betta cf. anabatoides*	2017/1	NA			14/08/2020
75	Osphronemidae	*Betta cracens*	2017/1	CR			14/08/2020
76	Osphronemidae	*Betta cf. enisae*	2017/1	NA			14/08/2020
77	Osphronemidae	*Betta picta*	2017/1	NT			14/08/2020
78	Osphronemidae	*Betta pugnax*	2017/1	LC			14/08/2020
79	Osphronemidae	*Betta sp.*	2017/1	NA			14/08/2020
80	Osphronemidae	*Betta cf. waseri*	2017/1	NA			14/08/2020
81	Osphronemidae	*Luciocephalus pulcher*	2017/1	LC			14/08/2020
82	Osphronemidae	*Parosphromenus phoenicurus*	2017/1	NA			14/08/2020
83	Osphronemidae	*Sphaerichthys osphromenoides*	2017/1	DD			14/08/2020
84	Osphronemidae	*Trichopodus pectoralis*	2017/1	LC			14/08/2020
85	Osphronemidae	*Trichopodus trichopterus*	2017/1	LC			14/08/2020
86	Osphronemidae	*Trichogaster leeri*	2017/1	NA			14/08/2020
87	Osphronemidae	*Trichopsis vittata*	2015/12	LC			14/08/2020
88	Cyprinidae	*Luciosoma cf. trinema*	2016/03	NA			14/08/2020

Odonata

No.	Order	Family	Scientific Name	Record	IUCN	GoI (P.106)	CITES	Last Updated

1	Zygoptera	Lestidae	*Orolestes wallacei*	2020/1	LC			14/08/2020
2	Zygoptera	Argiolestidae	*Podolestes buwaldai*	2020/1	NT			14/08/2020
3	Zygoptera	Chlorocyphidae	*Libellago hyalina*	2020/1	LC			14/08/2020
4	Zygoptera	Euphaeidae	*Dysphaea dimidiata*	2020/1	LC			14/08/2020
5	Zygoptera	Platycnemididae	*Copera vittata*	2020/1	LC			14/08/2020
6	Zygoptera	Platycnemididae	*Elattoneura aurantiaca*	2020/1	NT			14/08/2020
7	Zygoptera	Platycnemididae	*Elattoneura coomansi*	2020/1	NT			14/08/2020
8	Zygoptera	Platycnemididae	*Prodasineura interrupta*	2020/1	LC			14/08/2020
9	Zygoptera	Platycnemididae	*Pseudocopera ciliata*	2020/1	LC			14/08/2020
10	Zygoptera	Coenagrionidae	*Agriocnemis femina*	2020/1	LC			14/08/2020
11	Zygoptera	Coenagrionidae	*Agriocnemis minima*	2020/1	LC			14/08/2020
12	Zygoptera	Coenagrionidae	*Agriocnemis pygmaea*	2020/1	LC			14/08/2020
13	Zygoptera	Coenagrionidae	*Amphicnemis bebar*	2020/1	DD			14/08/2020
14	Zygoptera	Coenagrionidae	*Amphicnemis hoisen*	2020/1	EN			14/08/2020
15	Zygoptera	Coenagrionidae	*Amphicnemis* sp.	2020/1	NA			14/08/2020
16	Zygoptera	Coenagrionidae	*Archibasis melanocyana*	2020/1	LC			14/08/2020
17	Zygoptera	Coenagrionidae	*Archibasis viola*	2020/1	LC			14/08/2020
18	Zygoptera	Coenagrionidae	*Ceriagrion auranticum*	2020/1	LC			14/08/2020
19	Zygoptera	Coenagrionidae	*Ceriagrion cerinorubellum*	2020/1	LC			14/08/2020
20	Zygoptera	Coenagrionidae	*Ceriagrion praetermissum*	2020/1	LC			14/08/2020
21	Zygoptera	Coenagrionidae	*Ischnura senegalensis*	2020/1	LC			14/08/2020
22	Zygoptera	Coenagrionidae	*Mortonagrion aborense*	2020/1	LC			14/08/2020
23	Zygoptera	Coenagrionidae	*Pseudagrion microcephalum*	2020/1	LC			14/08/2020
24	Zygoptera	Coenagrionidae	*Pseudagrion williamsoni*	2020/1	LC			14/08/2020
25	Zygoptera	Coenagrionidae	*Teinobasis ruficollis*	2020/1	NT			14/08/2020
26	Zygoptera	Coenagrionidae	*Teinobasis* sp. cf *suavis*	2020/1	NA			14/08/2020
27	Anisoptera	Aeshnidae	*Gynacantha* sp.	2020/1	NA			14/08/2020
28	Anisoptera	Gomphidae	*Ictinogomphus acutus*	2020/1	VU			14/08/2020
29	Anisoptera	Gomphidae	*Ictinogomphus decoratus*	2020/1	LC			14/08/2020
30	Anisoptera	Macromiidae	*Epophthalmia vittigera*	2020/1	LC			14/08/2020
31	Anisoptera	Macromiidae	*Macromia cincta*	2020/1	NA			14/08/2020
32	Anisoptera	Libellulidae	*Acisoma panorpoides*	2020/1	LC			14/08/2020
33	Anisoptera	Libellulidae	*Aethriamanta aethra*	2020/1	LC			14/08/2020
34	Anisoptera	Libellulidae	*Aethriamanta brevipennis*	2020/1	LC			14/08/2020
35	Anisoptera	Libellulidae	*Aethriamanta gracilis*	2020/1	LC			14/08/2020
36	Anisoptera	Libellulidae	*Agrionoptera insignis*	2020/1	LC			14/08/2020
37	Anisoptera	Libellulidae	*Brachydiplax chalybea*	2020/1	LC			14/08/2020
38	Anisoptera	Libellulidae	*Brachygonia oculata*	2020/1	LC			14/08/2020
39	Anisoptera	Libellulidae	*Chalybeothemis fluviatilis*	2020/1	LC			14/08/2020
40	Anisoptera	Libellulidae	*Crocothemis servilia*	2020/1	LC			14/08/2020

41	Anisoptera	Libellulidae	*Diplacodes trivialis*	2020/1	LC			14/08/2020
42	Anisoptera	Libellulidae	*Hydrobasileus croceus*	2020/1	LC			14/08/2020
43	Anisoptera	Libellulidae	*Lathrecista asiatica*	2020/1	LC			14/08/2020
44	Anisoptera	Libellulidae	*Nannophya pygmaea*	2020/1	LC			14/08/2020
45	Anisoptera	Libellulidae	*Neurothemis fluctuans*	2020/1	LC			14/08/2020
46	Anisoptera	Libellulidae	*Orthetrum chrysis*	2020/1	LC			14/08/2020
47	Anisoptera	Libellulidae	*Orthetrum sabina*	2020/1	LC			14/08/2020
48	Anisoptera	Libellulidae	*Pantala flavescens*	2020/1	LC			14/08/2020
49	Anisoptera	Libellulidae	*Pornothemis serrata*	2020/1	NA			14/08/2020
50	Anisoptera	Libellulidae	*Rhodothemis rufa*	2020/1	LC			14/08/2020
51	Anisoptera	Libellulidae	*Rhyothemis aterrima*	2020/1	LC			14/08/2020
52	Anisoptera	Libellulidae	*Rhyothemis obsolescens*	2020/1	LC			14/08/2020
53	Anisoptera	Libellulidae	*Rhyothemis phyllis*	2020/1	LC			14/08/2020
54	Anisoptera	Libellulidae	*Tholymis tillarga*	2020/1	LC			14/08/2020
55	Anisoptera	Libellulidae	*Tramea transmarina*	2020/1	LC			14/08/2020
56	Anisoptera	Libellulidae	*Urothemis signata*	2020/1	LC			14/08/2020
57	Anisoptera	Libellulidae	*Zyxomma petiolatum*	2020/1	LC			14/08/2020

Summary

Taxa	Total	CR	EN	VU	CITES	GOI
Mammals	76	2	6	11	24	15
Amphibians & Reptiles	107	3	3	4	20	5
Birds	307	1	5	15	45	45
Plants	190	3	1	5	25	0
Fish	88	1	1	2	0	0
Odonata	57	0	1	1	0	0
TOTAL	825	10	17	38	114	65

Appendix 3. Community Reports

The Project will make community and stakeholder reports available to the audit team upon request

Appendix 3a. Report on Household Economic Study Activities and Community Perceptions of Welfare (Laporan Kegiatan Kajian Ekonomi Rumah Tangga dan Persepsi Masyarakat Tentang Kesejahteraan)

Appendix 3a is a study which reports on household economic activities and community perceptions of villages near the project area.

Appendix 3b. Report on Socialisation of the Ecosystem Restoration Management Area (Sosialisasi Pengelolaan Kawasan Restorasi Ekosistem Riau RER)

Appendix 3b is a report on socialisation of villages near the project area.

Appendix 3c. RER Ethnographic Assessment, Kap. Pelalawan, Province of Riau (KAJIAN SOSIAL BUDAYA DAN KELEMBAGAAN DI SEKITAR WILAYAH RESTORASI EKOSISTEM SEMENANJUNG KAMPAR PT. RAPP KABUPATEN PELALAWAN PROVINSI RIAU)

Appendix 3c is a report on ethnographic assessment of the villages near the project area.

Appendix 3d. Report on Mapping Potential and Conflict Resolution in the Riau Ecosystem Restoration Area (Laporan Pemetaan Potensi Dan Resolusi Konflik Di Kawasan Restorasi Ekosistem Riau)

Appendix 3d is a report on mapping potential and conflict resolution of villages near the project area.

Appendix 4. RER Certifications

Appendix 4a. ISO Certification 9001

ISO 9000 - Quality management



Certificate ID04/00369

The management system of

APRIL GROUP'S RIAU COMPLEX
(Comprising:
PT. Riau Andalan Pulp and Paper;
PT. Riau Andalan Kertas;
PT. Anugrah Kertas Utama;
PT. Intiguna Primatama)

Pangkalan Kerinci, Pekanbaru, Riau, Sumatera, 28000, Indonesia

has been assessed and certified as meeting the requirements of

ISO 9001:2015

For the following activities

Manufacture of ECF Bleached Hardwood Kraft Pulp, Uncoated Wood Free Fine Paper, Buatan Port and Futong Port operations

This certificate is valid from 2 March 2018 until 17 January 2021 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 16 September 2020
Issue 11. Certified since 15 September 2006

Authorised by

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Appendix 4b. ISO Certification 14001

ISO 14000 - Environmental management



Certificate ID08/01181

The management system of

APRIL GROUP'S RIAU COMPLEX
(Comprising:
PT. Riau Andalan Pulp and Paper;
PT. Riau Andalan Kertas;
PT. Intiguna Primatama;
PT. Anugrah Kertas Utama;
PT. Riau Prima Energi)

Pangkalan Kerinci, Pekanbaru, Riau Province, 28000, Indonesia

has been assessed and certified as meeting the requirements of

ISO 14001:2015

For the following activities

Bleached hardwood kraft market pulp and integrated wood-free fine paper manufacture, plus associated utilities, chemical recovery operations and process chemical production

This certificate is valid from 12 February 2018 until 14 November 2020 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 11 September 2020
Issue 4. Certified since 14 November 2008

Authorised by

SGS United Kingdom Ltd
Rossmore Business Park Ellesmere Port Cheshire CH65 3EN UK
t +44 (0)151 350-6666 f +44 (0)151 350-6600 www.sgs.com

HC SGS14001 2015 0118

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UKAS MANAGEMENT SYSTEMS
0005

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Appendix 4c. ISO Certifications: OHSAS 18001

ISO Certifications: OHSAS 18001 - International Standard for Occupational Health and Safety Management Systems.



SGS

Certificate CH17/1241

The management system of

APRIL GROUP'S RIAU COMPLEX
Comprising:
PT. Riau Andalan Pulp and Paper
PT. Riau Andalan Kertas
PT. Anugrah Kertas Utama
PT. Intiguna Primatama
PT. Riau Prima Energi

Pangkalan Kerinci, Pekanbaru, Riau Province, 28000, Indonesia

has been assessed and certified as meeting the requirements of

OHSAS 18001:2007

For the following activities

Bleached hardwood kraft market pulp and integrated wood-free fine paper manufacture, plus associated utilities, chemical recovery operations and process chemical production and Futong Port operation

This certificate is valid from 19 November 2017until 14 November 2020
and remains valid subject to satisfactory surveillance audits
Recertification audit due before 11 September 2020
Issue 1. Certified since June 2006

Authorised by

SYSTEM CERTIFICATION OHSAS 18001 SGS

SWISS ACCREDITATION sas.admin.ch SCESm 0017

SGS Société Générale de Surveillance SA
Technoparkstrasse 1 8005 Zurich Switzerland
t +41 (0)44 445-16-80 f +41 (0)44 445-16-88 www.sgs.com

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SGS

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Appendix 4d. ISO Certification 45001

ISO 45001 - Occupational health and safety



CERTIFICATE

SUCOFINDO

Certificate No. OHS 00062

SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Graha Sucofindo B1 Floor - Jl. Raya Pasar Minggu Kav. 34 Jakarta 12780
Phone : +62-21-7983666 ext. 1021; Fax : +62-21-7987015 / 7987029; Email : cs.sics@sucofindo.co.id

Menyatakan bahwa
Certify that

PT. GEMILANG CIPTA NUSANTARA (GCN)

Estate Restorasi Pulau Padang
Kabupaten Kepulauan Meranti, Riau - INDONESIA

telah menerapkan sistem manajemen keselamatan & kesehatan kerja yang memenuhi
has implemented occupational health and safety management system that comply with

ISO 45001:2018
Occupational Health and Safety Management System-Requirements

Ruang lingkup sertifikasi :
The scope of certification :

Restorasi Ekosistem Hutan.

SECTOR CODE : 01

Sertifikat ini berlaku dengan ketentuan bahwa organisasi selalu memenuhi kriteria sebagaimana ditetapkan oleh SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES
This certificate is valid provided that the organization continues to meet the criteria as laid down by SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Ir. Triyan Aidilfitri, M.M.
Vice President

Sertifikat ini berlaku dari 04 Februari 2020 sampai 03 Februari 2023
This certificate is valid from February 04th, 2020 until February 03rd, 2023

3445796
SCI-2007A

CERTIFICATE

SUCOFINDO

Certificate No. OHS 00061

SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Graha Sucofindo B1 Floor - Jl. Raya Pasar Minggu Kav. 34 Jakarta 12780
Phone : +62-21-7983666 ext. 1021; Fax : +62-21-7987015 / 7987029; Email : cs.sics@sucofindo.co.id

Menyatakan bahwa
Certify that

PT. GEMILANG CIPTA NUSANTARA (GCN)

Estate Restorasi Kampar Peninsula
Kabupaten Pelalawan, Riau - INDONESIA

telah menerapkan sistem manajemen keselamatan & kesehatan kerja yang memenuhi
has implemented occupational health and safety management system that comply with

ISO 45001:2018

Occupational Health and Safety Management System-Requirements

Ruang lingkup sertifikasi :
The scope of certification :

Restorasi Ekosistem Hutan.

SECTOR CODE : 01

Sertifikat ini berlaku dengan ketentuan bahwa organisasi selalu memenuhi kriteria sebagaimana ditetapkan oleh SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES
This certificate is valid provided that the organization continues to meet the criteria as laid down by SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Ir. Triyan Aidilfitri, M.M.
Vice President

Sertifikat ini berlaku dari 04 Februari 2020 sampai 03 Februari 2023
This certificate is valid from February 04th, 2020 until February 03rd, 2023

3445788
SCI-2007A

CERTIFICATE

SUCOFINDO

Certificate No. OHS 00077

SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Graha Sucofindo B1 Floor - Jl. Raya Pasar Minggu Kav. 34 Jakarta 12780
Phone : +62-21-7983666 ext. 1021; Fax : +62-21-7987015 / 7987029; Email : cs.sics@sucofindo.co.id

Menyatakan bahwa
Certify that

PT. GLOBAL ALAM NUSANTARA (GAN)

Estate Restorasi Kampar Peninsula
Kabupaten Pelalawan, Riau - INDONESIA

telah menerapkan sistem manajemen keselamatan & kesehatan kerja yang memenuhi
has implemented occupational health and safety management system that comply with

ISO 45001:2018

Occupational Health and Safety Management System-Requirements

Ruang lingkup sertifikasi :
The scope of certification :

Restorasi Ekosistem Hutan.

SECTOR CODE : 01

Sertifikat ini berlaku dengan ketentuan bahwa organisasi selalu memenuhi kriteria sebagaimana ditetapkan oleh SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES
This certificate is valid provided that the organization continues to meet the criteria as laid down by SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Ir. Triyan Aidilfitri, M.M.
Vice President

Sertifikat ini berlaku dari 04 Februari 2020 sampai 03 Februari 2023
This certificate is valid from February 04th, 2020 until February 03rd, 2023

3445790

SCI-2007A

CERTIFICATE

SUCOFINDO

Certificate No. OHS 00079

SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Graha Sucofindo B1 Floor - Jl. Raya Pasar Minggu Kav. 34 Jakarta 12780
Phone : +62-21-7983666 ext. 1021; Fax : +62-21-7987015 / 7987029; Email : cs.sics@sucofindo.co.id

Menyatakan bahwa
Certify that

PT. THE BEST ONE UNITIMBER (TBOT)

Estate Restorasi Kampar Peninsula
Kabupaten Pelalawan, Riau - INDONESIA

telah menerapkan sistem manajemen keselamatan & kesehatan kerja yang memenuhi
has implemented occupational health and safety management system that comply with

ISO 45001:2018

Occupational Health and Safety Management System-Requirements

Ruang lingkup sertifikasi :
The scope of certification :

Restorasi Ekosistem Hutan.

SECTOR CODE : 01

Sertifikat ini berlaku dengan ketentuan bahwa organisasi selalu memenuhi kriteria sebagaimana ditetapkan oleh SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES
This certificate is valid provided that the organization continues to meet the criteria as laid down by SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Ir. Triyan Aidilfitri, M.M.
Vice President

Sertifikat ini berlaku dari 04 Februari 2020 sampai 03 Februari 2023
This certificate is valid from February 04th, 2020 until February 03rd, 2023

3445792
SCI-2007A

CERTIFICATE

SUCOFINDO

Certificate No. OHS 00078

SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Graha Sucofindo B1 Floor - Jl. Raya Pasar Minggu Kav. 34 Jakarta 12780
Phone : +62-21-7983666 ext. 1021; Fax : +62-21-7987015 / 7987029; Email : cs.sics@sucofindo.co.id

Menyatakan bahwa
Certify that

PT. SINAR MUTIARA NUSANTARA (SMN)

Estate Restorasi Kampar Peninsula
Kabupaten Pelalawan, Riau - INDONESIA

telah menerapkan sistem manajemen keselamatan & kesehatan kerja yang memenuhi
has implemented occupational health and safety management system that comply with

ISO 45001:2018

Occupational Health and Safety Management System-Requirements

Ruang lingkup sertifikasi :
The scope of certification :

Restorasi Ekosistem Hutan.

SECTOR CODE : 01

Sertifikat ini berlaku dengan ketentuan bahwa organisasi selalu memenuhi kriteria sebagaimana ditetapkan oleh SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES
This certificate is valid provided that the organization continues to meet the criteria as laid down by SUCOFINDO INTERNATIONAL CERTIFICATION SERVICES

Ir. Triyan Aidilfitri, M.M.
Vice President

Sertifikat ini berlaku dari 04 Februari 2020 sampai 03 Februari 2023
This certificate is valid from February 04th, 2020 until February 03rd, 2023

3445794
SCI-2007A

Appendix 4e. PEFC Certification

Programme for the Endorsement of Forest Certification



Appendix 4e

CERTIFICATE OF CONFORMITY
AJAEU/PEFC/15/00068

PEFC Certification – Chain of Custody

This is to certify that the process of Chain of Custody of forest based products applied by Company

PT RIAU ANDALAN PULP AND PAPER

Legal Representative:	**Eduward Ginting**
Sites:	**N. 10 sites according to Annex A**
Fiscal code / P.IVA:	**01.341.857.9-092.000**
Products:	**Pulp and Paper mill and traders of rough wood, wood chips, pulp and paper certified PEFC**
Certification's level:	**Group**
Chain of Custody method:	**Physical Separation and Percentage Based**
Complies with:	**IFCC ST 2002-1:2013** *PEFC ST 2002:2013*

This Certificate is valid (unless cancelled, suspended or withdrawn by AJA Registrars Europe Srl) under the conditions laid down in the Code of Practice for of product (XPRD_REG_000) Code of Practice for of product (XPRD_REG_000) and the Code of Practice PEFC (XPRD_REP_PEFC).
The partial reproduction of this document is not permitted. This certificate is property of AJA Registrars Europe and must be returned on request.

Data di prima emissione: 25/05/2015
Date of original registration:

Data di scadenza: 24/05/2025
Date of expiry:

Data di emissione corrente: 19/06/2020
Date of current registration:
Rev. 12

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

Alfonso Pagliuca Presidente del CdA

PEFC
PEFC/39-44-02

IFCC
IFCC/39-44-02

AJA

AJA Registrars Europe Srl

V.a delle Arti, 123 - 00054 Fiumicino (RM) ITALY

www.ajaeurope.eu info@ajaeurope.eu

PEFC Certification – Chain of Custody

Annex A to Certificate No. AJAEU/PEFC/15/00068

Issued on 25 May 2015, Renewed on 19 June 2020 rev.12

PT RIAU ANDALAN PULP AND PAPER

Central Office: Pangkalan Kerinci, PO Box 1080, Pekanbaru, Riau, Sumatera, 28000 Indonesia

Pulp Producers:

PT. Riau Andalan Pulp and Paper
Pangkalan Kerinci, PO Box 1080, Pekanbaru, Riau, Sumatra, 28000 Indonesia

PT. Intiguna Primatama (pulp lines Kerinci)
Pangkalan Kerinci, PO Box 1080, Pekanbaru, Riau, Sumatra, 28000 Indonesia

Group company:

Paper Producers:

PT. Riau Andalan Kertas (paper lines Kerinci)
Pangkalan Kerinci, PO Box 1080, Pekanbaru, Riau, Sumatra, 28000 Indonesia

PT. Anugrah Kertas Utama (paper lines Kerinci)
Pangkalan Kerinci, PO Box 1080, Pekanbaru, Riau, Sumatra, 28000 Indonesia

PT Asia Pacific Rayon
Pangkalan, Kerinci, PO Box 1080, Pekanbaru, Riau, Sumatra, 28000 Indonesia

Sales Administration Offices:

Primeyield Enterprise Pte. Limited
80 Raffles Place, #50-01 UOB Plaza 1, Singapore 048624

Greenpoint Global Trading (Macao Commercial Offshore) Limited
Avenida Doutor Mario Soares, s/n Edificio Finance and IT Center of Macao, 10 andar F em Macau

APRIL Far East (Malaysia) Sdn Bhd
Level 5, Wisma Averis, Tower 2, Avenue 5, Bangsar South No 8, Jalan Kerinchi 59200 - Kuala Lumpur – Malaysia

APRIL International Enterprise Pte. Ltd.
80, Raffles Place, #50-01, UOB Plaza 1, Singapore 048624

Asia Symbol Japan Trading Co. Ltd.
Arco Tower, 16F, 1-8-1, Shimomeguro, Meguro-ku, Tokyo, 153-0064, Japan

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ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

PRD N° 176 B

Alfonso Pagnozzi, Presidente del CdA
AJA Registrars Europe Srl

PEFC PEFC/39-44-02
IFCC IFCC/39-44-02
AJA

Via delle Arti, 123 - 00054 Fiumicino (RM) ITALY
www.ajaeurope.eu info@ajaeurope.eu

Appendix 4f. Singapore Green Label Certification



Appendix 4f

The Singapore Environment Council Secretariat hereby grant

April International Enterprise Pte Ltd

80 Raffles Place #50-01 UOB Plaza 1 Singapore 310061

the right to use the Singapore Green Label for

PAPERONE ALL PURPOSE (75gsm/80gsm)
074-005-3223
"Printing Paper From Sustainable Source"
(Accordance to Category 74: Enhanced Pulp & Paper Version 1)

Validity: 1 July 2018 to 30 June 2021

JEN TEO
Executive Director
Singapore Environment Council

Singapore Environment Council
1 Kay Siang Road
#07-01 S(248922)

Appendix 5. Methods for Aboveground Biomass Inventory / Permanent Sample Plot Establishment

Appendix 5 describes the methods for measuring aboveground biomass and establishment of the number and location of permanent sample plots. It will be made available to the audit team.

Appendix 6. Methods for Peatland Identification and Peat Thickness

Appendix 6 describes the methods for measuring peat thickness and peatland identification. It will be made available to the audit team.

Appendix 7. Carbon Assessment Report (2017)

Appendix 7 describes the methods for carbon assessment. It will be made available to the audit team.

Appendix 8. Aboveground Biomass Inventories of the Project Area

Appendix 8 provides a detailed calculation of aboveground biomass inventories in an excel spreadsheet. It will be made available to the audit team.

Appendix 9. Peat Inventories of the Project Area

Appendix 9 provides a detailed calculation of peat inventories in an excel spreadsheet. It will be made available to the audit team.

Appendix 10. Default Values Used in Quantification of GHG Emissions

Appendix 10 provides a list of default values used in quantification of GHG emissions. It will be made available to the audit team.

Appendix 11. Climate Modelling of the Project Area

Appendix 11 provides detailed calculations of climate of the project area and model calibration for the project area. It will be made available to the audit team.

Appendix 12. Peat Bulk Density Measurement and Statistical Analysis

Appendix 12 provides a detailed calculation of measurements of peat bulk density and statistical analysis in an excel spreadsheet. It will be made available to the audit team.

Appendix 13. Subsidence Calculation Method/Model

Appendix 13 provides detailed calculations of peat subsidence and model calibration for the project area. It will be made available to the audit team.

Appendix 14. Hydrological Modelling

Appendix 14 provides detailed calculations of hydrological modelling and calibration for the project area. It will be made available to the audit team.

Appendix 15. - Withdrawn

Appendix 16. Baseline Stratification based on Landcover

Appendix 16 provides detailed calculations of the baseline stratification based on landcover. It will be made available to the audit team.

Appendix 17. Baseline Stratification based on Plantation Development and Drainage

Appendix 17 provides detailed calculations of baseline stratification based on plantation development and drainage characteristics. It will be made available to the audit team.

Appendix 18. Landcover Classification Analysis of the Project Area

Appendix 18 provides detailed calculations of landcover classification of the project area. It will be made available to the audit team.

Appendix 19. Proxy Analysis of Reference Regions for Baseline Rate of Deforestation

Appendix 19 provides the proxy analysis of reference regions for estimation of the deforestation baseline rate. It will be made available to the audit team.

Appendix 20. LiDAR-derived DTM Modelling

Appendix 20 provides detailed calculations of LiDAR-derived DTM modelling. It will be made available to the audit team.

Appendix 21. Uncertainty Calculations

Appendix 21 provides the detailed calculation of uncertainty analysis. It will be made available to the audit team.

Appendix 22 Activity Shifting Leakage Calculations and Quantifications

Appendix 22 provides the detailed calculations of leakage due to activity shifting. It will be made available to the audit team.

Appendix 23. List of Project SOP

Appendix 23 provides a list of SOP for within the RER Carbon Project. All of the SOPS will be made available to the audit team.

SOP (Standard Operation Procedure)		Status			
		Complete	Draft	Planned	*Update
A. Carbon Stock MRV					
1	Aboveground Biomass Inventory Method	X			
2	Belowground Biomass Inventory Method	X			
B. Peat Survey MRV					
1	Assessment of Peat Thickness	X			
2	Peat Analysis	X			
3	Elevation Measurement	X			
4	Peat Subsidence Monitoring	X			
5	Peat Moisture Monitoring			X	
C. Hydrology MRV					
1	RER-PGR-007-PR SOP Monitoring Hydrology	X			
2	RER-RPG-003- PR Canal Blocking (Dual Language) rev 00_bms	X			

3	RER-ENV-001-PR River Water Quality Monitoring (Dual Language) rev 00	X			
D. Weather Monitoring					
1	Temperature Monitoring	X			
2	Rainfall Monitoring	X			
3	Humidity Monitoring	X			
4	Wind Monitoring	X			
E. Biodiversity Monitoring					
1	Biodiversity Survey and Monitoring	X			
2	Flora Survey	X			
3	Fauna Survey	X			
4	RER-ENV-003-PR Sumatran tiger management in the RER concession area	X			
F. Community Relations					
1	Community Meeting	X			
2	Community Mapping	X			
3	Village Monitoring	X			
4	Livelihood Assessment	X			
5	Complaint and Grievance Response Mechanism	X			
G. Fire and Forest Protection MRV					
1	RER FSS-001-PR Forest and Land Fire Management	X			
2	RER-FSS-002- PR FIRE HANDLING CRISIS POSTS (Dual Language) rev 00	X			
3	RER-FSS-003- PR Fixed procedure (Dual Language) rev 00	X			
4	RER-FSS-004- PR Emergency Response (Dual Language) rev 00	X			
5	RER-FSS-005- PR Communication, K3 Consultation Participation	X			
6	RER-FSS-006- PR Installation and Dissemination	X			
7	RER-FSS-008- PR Investigation and Occupational Incident Reporting	X			
8	RER-FSS-010- PR Regulatory Identification	X			
9	RER-FSS-011- PR Emergency First Aid	X			
H. Restoration and Rehabilitation					
1	Wild Canal Blocking & Canal Methods & MRV	X			
2	Forest Restoration and Regeneration – Methods & MRV	X			
3	RER-NPT-001-PR Nursery Management for Local Type (Dual Language) _MIQ + HA_CP	X			
4	RER-RPG-001- PR Identification of Rehabilitation Areas (Dual Language) rev 00-MIQ	X			
5	RER-RPG-002- PR Silvicultural Forest Restoration and Rehabilitation (Dual Language) rev 00	X			
6	RER-ECO-001- PR Forest Restoration rev 00	X			

7	RER-FPT-001-PR Forest Protection (Dual Language)	X			
I. Planning					
1	RER-PGR-004-PR Preparation of RKU RKT (Dual Language) rev 00_ TBOT	X			
2	RER-PGR-004-PR Preparation of RKU RKT (Dual Language) rev 00_RER	X			
3	RER-PGR-004-PR Preparation of RKU RKT (Dual Language) rev 00_ SMN	X			
4	RER-PGR-004- Preparation of RKU RKT (Dual Language) rev 00_ GAN	X			
5	RER-PGR-004- Preparation of RKU RKT (Dual Language) rev 00_ GCN	X			
6	RER-PGR-006- PR Aerial Photography Data Collection with Drone (D L) rev 00	X			
5	RER-IMS-003- PR Internal Audit (Dual Language) rev 00	X			
J. Others					
1	RER-IMS-001-PR Document Management	X			
2	RER-IMS-002- PR Record Management (Dual Language) rev 00	X			
3	RER-IMS-003- PR Internal Audit (Dual Language) rev 00	X			
4	RER-IMS-004- PR Regulatory Monitoring, Analysis and Compliance (Dual Language) rev 00	X			
5	RER-IMS-006- PR Environmental Aspects Identification and Evaluation (Dual Language) rev 00	X			
6	RER-IMS-007- PR Hazard Identification, Risk Assessment and Determination of Control Measures rev 00	X			
7	RER-IMS-008- PR Objective Target Programme (Dual Language) rev 00	X			
8	RER-IMS-009- PR Accidents, Incidents, Nonconformity, Corrective, and Preventive (Dual Language) rev 00	X			
9	RER-IMS-010- PR Management Review (Dual Language) rev 00	X			

*Updates are for annual review requirements and other minor updates

Appendix 24 RER-CP MRV Plan (Detailed)

Appendix 24 provides the detailed monitoring plan for the project and It will be made available to the audit team.

Appendix 25 Data and Parameters Available at Validation

Appendix 25 provides a list of data and parameters available at validation and It will be made available to the audit team.

Appendix 26. Data and Parameters Available at Monitoring

Appendix 26 provides a list of data and parameters available at monitoring and It will be made available to the audit team.

Appendix 27. VCS Non-Permanence Risk Report Tool

Appendix 27 provides the VCS non-permanence risk report tool.

Appendix 28. VCS Non-Permanence Risk Report

Appendix 28 provides the VCS non-permanence risk report.

Appendix 29. Baseline RKU with Year 1-7

Appendix 29 provides the baseline RKU planning for years 1-7

Appendix 30. RER Organization Chart 2021

Appendix 30 provides the RER Organization Chart 2021

7 REFERENCES

[1] APRIL is the former owner of the four concession, however, because of statutory requirements of Indonesian corporation law, they no longer formally own the concessions or any corporate stock related to the four concessions. PT. GCN, PT. SMN, PT. TBOT and PT. GAN. They are wholly domestic corporations without any foreign ownership. Any references in the PD related to APRIL's policies, procedures, staff etc. are made in the context that although APRIL sponsors RER-CP activity, both on its own and through its Pulp and Paper business entity RAPP, that it has no actual corporate share-holding in the four concession and said concession operate as wholly separate legal entities, but is nonetheless a Project Proponent.

[2] RER and RER-Carbon Project are not legal entities as such, they are programmes that are sponsored and supported as part of APRIL's conservation efforts in Riau Province, Indonesia.

[3] PT GCN is the lead concession of the four concessions that make up RER-Carbon Project; it is the decision maker and first among equals of the four concession (PT. GCN, PT. SMN, PT. TBOT and PT. GAN). PT. GCN's corporate decisions are implemented uniformly through all four concessions and PT GCN takes the lead in all RER-CP decision making.

[4] Geo-Reinfox is a woven Geotextile made of thermoplastic polymers which is specifically processed to give it a high tensile strength. The addition of UV stabilizers gives Geo-Reinfox the resistance it needs during construction period. Geo-Reinfox has been used for decades in Indonesia in applications such as road constructions, slope and wall reinforcements, basal reinforcements, railways, etc. See https://www.geosinindo.co.id/products accessed on 16 September 2020.

[5] Government Regulation 6/2007 Chapter IV, Part 4, Article 38, section 3

[6] See appendix 22 for Wild Canal Blocking SOP

[7] Wikipedia. 2020. *Riau*. https://en.wikipedia.org/wiki/Riau, accessed on 1 May 2020

[8] Wikipedia. 2020. *Pelalawan Regency.* https://en.wikipedia.org/wiki/Pelalawan_Regency, accessed on 1 May 2020

[9] Flora & Fauna International. 2017. *HCVA for PT the Best One Unitimber, Jakarta.*

[10] Wantzen, KM et al. 2008. *Riparian wetlands of tropical streams*. Tropical Stream Ecology. Elsilver, London: 199-218.

[11] Published in 1983 and re-assessed in 1990, with the cooperation of the Southern Sumatra Geological and Mineral Exploration Project, a technical cooperation scheme between the overseas development Administration of the United Kingdom Government and the Ministry of Mines and Energy of Government of Republic of Indonesia and carried out jointly by the Geological Research and Development Centre, Bandung and British Geological Survey. Reviewed and edited by M.T. Holder

[12] Whitten T, Damanik SJ, Anwar J, Hisyam N. 2000. *Freshwater Habitats. In: The ecology of Sumatra, Indonesia series.* Periplus Editions (HK) Ltd.

[13] Whitten, A., Damanik, S. J., Anwar, J. & Hisyam, N., 1997. *The Ecology of Sumatra.* Oxford, UK: Oxford University Press.

[14] Whitten, T. & Laumonier, Y. 1997. *The vegetation and physiography of Sumatra.* Geobotany 22. Kluwer Academic Publishers, Dordrecht, The Netherlands. ix 222 pp 3 maps. ISBN 0-7923-3761-1. Price £156.00 (hardback). Journal of Tropical Ecology, 14(5): 723-724. doi:10.1017/S0266467498290523.

[15] Whitten, A., Damanik, S. J., Anwar, J. & Hisyam, N., 1997. *The Ecology of Sumatra.* Oxford, UK: Oxford University Press.

[16] Anderson, J., 1963. *The Flora of the Peat Swamp Forest of Sarawak and Brunei, Including a Catalogue of All Recorded Species of Flowering Plants, Ferns, and Fern Allies.* Singapore Garden Bulletin, Volume 20, pp. 131-228.

[17] Page, S. E., Rieley, J. O., Shotyk, O. W. & Weiss, D., 1999. *Interdependence of peat and vegetation in a tropical peat swamp forest.* Philosophical Transactions of the Royal Society B: Biological Sciences, 354 (1391), pp. 1885-1897.

[18] See appendix 3 for full list of flora and fauna

[19] Indonesia Secretariat for Sustainable Development Goals, *Roadmap of SDGs Indonesia, a highlight*, (2018), Ministry of National Development and Planning. https://www.unicef.org/indonesia/media/1626/file/Roadmap%20of%20SDGs.pdf accessed on 01 Oct 2020.

[20] Indonesia Secretariat for Sustainable Development Goals, *supra*, p. 80.

[21] Indonesia Secretariat for Sustainable Development Goals, *supra*, p. 81.

[22] Indonesian NDCs as provided to the UNFCCC Secretariat: https://unfccc.int/sites/default/files/resource/163_Indonesia%20Input%20for%20TalanPoPpra%20Dialogue%20-%202%20April%202018%20clean.pdf accessed on 01 Oct 20120P

[23] The RER-Carbon Project contracted with validators prior to the 19 March 2020 Safeguards deadline. The Project does not anticipate that the inclusion of the Safeguards Section into this VCS-PD will be part of the assessed VCS-PD. Nonetheless, the Project determined that it was useful and appropriate to show that the Project considered community opinions, was pro-community and did not create any net harm. This section was included as "indicative" despite the VCS-PD not having to have complete a Section 2 Safeguards as part of its VCS PD process.

[24] Badan Pusat Statistik, 2018. *Luas Wilayah Provinsi Riau Menurut Kabupaten/Kota, 2016-2019 (Km2)* https://riau.bps.go.id/dynamictable/2018/01/25/45/luas-wilayah-provinsi-riau-menurut-kabupaten-kota-2016-2019-km2-.html accessed on 02 July 2020

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[26] Aris Ananta; Evi Nurvidya Arifin; M. Sairi Hasbullah; Nur Budi Handayani; Agus Pramono 2015. *Demography of Indonesia's Ethnicity.* Institute of Southeast Asian Studies dan BPS. Statistics Indonesia

[27] Reiche, J, et al. 2018. *Characterizing Tropical Forest Cover Loss Using Dense Sentinal-1 Data and Active Fire Alerts*. Remote Sensing (10): 777.

[28] Restorasi Ekosistem Riau – APRIL. 2016. Sosialisasi Pengelolaan Kawasan.

[29] Yusti Aiden. 2016. *Kajian Ekonomi Rumah Tangga & Persepsi Kesejahteraan Masyarakat Di 6 (Enam) Desa*. Kelurahan Di Semenanjung Kampar

[30] This issue relates RAPP and not RER. The claimed areas is outside of the RER Project Area.

[31] Singapore Green Label adheres to Forestry Stewardship Council standards (FSC)

[32] Krisnawati *et al.* (2015) *Standard Model for estimating GreenHouse Gas Emissionsfrom Forests and Peatlands in Indonesia* (version 2) Table 2-3. Indonesian Nantional Carbon Accounting System

[33]https://data.globalforestwatch.org/datasets/d52e0e67ad21401cbf3a2c002599cf58_10?geometry=98.454%2C-1.818%2C112.264%2C2.027 accessed on 22 Mar 2021 and MoARI [Ministry of Agriculture Republic of Indonesia], Indonesia peat lands, Accessed through Global Forest [www.globalforestwatch.org]

[34] 159 plots were derived from the results of the *Carbon Stock Estimation Interim Report* (ver. 8) (2017) and an additional 10 plots were as a result of the 2020 limited biomass assessment conducted by APRIL in Q3 2020.

[35] J. Penman, M. Gytarsky, T. Hiraishi, T. Krug, D. Kruger, R. Pipatti, L. Buendia, K. Miwa, T. Ngara, K. Tanabe, and F. Wagner. 2003. *Intergovernmental Panel on Climate Change, Good Practice Guidance for LULUCF, CH5, Section 5.2 Identifying and Quantifying Uncertainties.* (eds) IGES, Japan.

[36] see http://webgis.menlhk.go.id:8080/kemenhut/index.php/id/peta/peta-cetak/59-peta-cetak/314-peta-kesatuan-hidrologi-gambut , and http://webgis.menlhk.go.id:8080/kemenhut/index.php/id/peta/peta-interaktif

[37] Hooijer, A., Vernimmen, R., Mawdsley, N., Page, S., Mulyadi, D., Visser, M., 2015. *Assessment of impacts of plantation drainage on the Kampar Peninsula peatland, Riau*. Deltares Report 1207384 to Wetlands International, CLUA and Norad.

[38] Ritung, S., Wahyunto, Nugroho, K., Sukarman, Hikmatullah, Suparto, Tafakresnanto, C. 2011. *Peta Lahan Gambut Indonesia Skala 1:250.000 (Indonesian peatland map at the scale 1:250,000*). Indonesian Center for Agricultural Land Resources Research and Development, Bogor, Indonesia.

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[40] Anshari, G. Z., Afifudin, M., Nuriman, M., Gusmayanti, E., Arianie, L., Susana, R., Nusantara, R. W., Sugardjito, J., and Rafiastanto, A. 2010. *Drainage and land use impacts on changes in selected peat properties and peat degradation in West Kalimantan Province, Indonesia*, Biogeosciences, 7, 3403–3419, https://doi.org/10.5194/bg-7-3403-2010.

[41] Page, S & Rieley, J & Banks, C. 2010. *Global and regional importance of the tropical peatland carbon pool*. Global Change Biology. 17.

[42] Hooijer, A. et al. 2012. *Subsidence and carbon loss in drained tropical peatlands*. Biogeosciences 9, 1053–1071

[43] The section on the difference between canals and rail systems has been included in order to ensure the reader is able to understand and differentiate on remotely sensed images canals and what may appear to be canals but are in fact legacy rail systems. They appear to be very similar in RS images and sometimes can generally can only be distinguished on the ground with ground truthing activity. Without the distinction being made it would be easy to believe that there are far more legacy canals in the RER landscape then there in actuality.

[44] In 2015, three experimental dams were established as a pilot activity, only one survived, two collapsed. Project activity related to dam construction began in 2016.

[45] The determination of WRC categories is made in reference to VM0007 version 1.6, Table 3.

[46] Hooijer, A. et al. 2015. *Assessment of impacts of plantation drainage on the Kampar Peninsula peatland, Ria.* Deltares Report 1207384 to Wetlands International. CLUA and Norad.

[47] Govt. Regulation 6/2007

[48] Although APRIL originally acquired the concession licenses, they are now separate legal entities and not formally part of the APRIL group because of the restrictions on foreign entities owning ER concessions.

[49] *Carbon Stock Estimation in RER Concessions Interim Report*. (2017)see Annex 8

[50] Ambar, T.R., Hamindy, R. & Thamrin. 2008. Pendugaan Kandungan Karbon pada *Acacia* crassicarpa di Hutan Rawa Gambut (Studi Kassus di IUPHHK-HT PT. RAPP, Kabupaten Pelalawan). J. Environ. Sci. 1: 26-32.

[51] *Supra* Hooijer, A. et al. 2012:34.

[52] Renstra Kementerian LHK. 2018. *Kementerian Lingkungan Hidup Republik Indonesia*. Rencana Strategis Kementerian Lingkungan.

[53] Hooijer, A. et al. 2015. *Assessment of impacts of plantation drainage on the Kampar Peninsula peatland, Ria.* Deltares Report 1207384 to Wetlands International. CLUA and Norad.

[54] Miettinen J, et al, (2016) Land cover distribution in the peatland of Peninsular Malaysia, Sumatra and Borneo in 2015 with changes since1990, Global Ecology & Conservation, 67-78, p73.

[55] Statistik Lingkungan Hidup Indonesia. 2018. *Statistik Lingkungan Hidup dan Kehutanan 2018.* Table 4.25: 168.

[56] Statistik Lingkungan Hidup Indonesia. 2018. *Statistik Lingkungan Hidup dan Kehutanan 2018.* Table 4.29: 172.

[57] Mizuno, K. et al. 2016. *Catastrophe and Regeneration in Indonesia's Peatlands. NUS* Press: 173-174.

[58] The Ministry of Forestry (MoF) was combined in 2015 to include the Environment and renamed to the Ministry of Environment and Forestry (MoEF) at that time. The two terms, MoF andMoEF are used interchangeably here.

[59] Statistik Lingkungan Hidup Indonesia. 2018. *Statistik Lingkungan Hidup dan Kehutanan 2018.* Table 4.24: 167.

[60] Verchot, L. V et al. 2010. *Reducing forestry emissions in Indonesia*. CIFOR: 1–12.

[61] Ramesh, V. et al. 2015. *Peat Characteristics and its Impact on Oil Palm Yield.* Wageningen Journal of Life Sciences. 72-73: 33-40.

[62] Fitzherbert, E.B., M. Struebig, A. Morel et al. 2008. *How will oil palm expansion affect biodiversity?* Trends in Ecology & Evolution. 23(10): 538-545.

[63] Wicke, B., R. Sikkema, V. Dornburg et al. 2011. *Exploring land-use changes and the role of palm oil production in Indonesia and Malaysia.* Land-use Policy. 28(1): 193-206.

[64] GAPKI. 2019. *About Gabungan Pengusaha Kelapa Sawit Indonesia.* IPOA. Retrieved from https://gabki.id/

[65] Food & Fertilizer Technology Center for the Asian Pacific Region. 2020. *Milestone and Plan of FFTC-AP Project.* http://ap.fftc.agnet.org/ap_db.php?id=996. Accessed 1 June 2020.

[66] *Supra Hooijer, A. et al. 2015:31.*

[67] *Supra Hooijer, A. et al. 2015:26.*

[68] Susanti, A. 2016. *Oil Palm Expansion in Riau Province, Indonesia.* Eburon Academic Publishers: 106-108.

[69] *Supra.* GAPKI. 2019.

[70] *Supra. Food & Fertilizer Technology Center for the Asian Pacific Region. 2020.*

[71] *Supra Hooijer, A. et al. 2015:26.*

[72] *Supra Hooijer, A. et al. 2015:31.*

[73] Widyaningrum, IK. 2012. *Financing Strategy of National Park Model.* International Institute of Social Studies.

[74] The Jakarta Post. 2019. *Pertamina finds new oil, gas reserves in Q1 exploration.* https://www.thejakartapost.com/news/2019/04/10/pertamina-finds-new-oil-gas-reserves-in-q1-exploration.html.

[75] World Bank. 2018. *Report on Indonesia Mining Sector Diagnostic*: 20.

[76] Mineral Commodity Summaries. 2018. *United States Geological Survey.* BP Statistical Review of World Energy 2017.

[77] Gasandoil.com. 2002. *Riau province takes control of CPP oil block.* http://www.gasandoil.com/news/south_east_asia/8f30ec4d38479fdc7cd90e47fb926b4e accessed 16 June 2020.

[78] PT. BSP. 2019. *Block CPP: Operation*. https://www.bsp.co.id/block-cpp/ accessed 16 June 2020.

[79] Sugih Energy. 2018. *Sugih Energy Company Profile 2018.* https://www.sugihenergy.com/ 14-15.

[80] ESDM OneMap. 2020. *Daftar Peta.* https://geoportal.esdm.go.id/indonesia-overview/ accessed on 17 June 2020.

[81] Sugih Energy. 2015. *MNK Selat Panjang PSC Block (Selat Panjang Non-Conventional).* http://www.sugihenergy.com/index.php/operations/mnk-selat-panjang-psc accessed on 16 June 2020.

[82] Small farms do exist in the landscape close to the rivers/water's edge and also on the populated islands directly to the north of the Kampar Peninsula. They are generally related to the local villages that lie at low elevations and where mineral soils allow for a variety of tree and non-tree crops including but not limited to rubber, oil palm, banana, cassava, chiles, tomatoes and other local food crops.

[83] Enrici, E.M. & Hubacek, K. 2018. *Challenges for REDD+ in Indonesia: a case study of three project sites.* Ecology & Society. 23(2):7 & Boer, H.J. 2018. *The role of government in operationalising markets for REDD+ in Indonesia*. Forest Policy & Economics. 86:4-12.

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[92] *ibid* UNFCCC/CCNUCC-CDM Executive Board, p 7.

[93] *ibid* UNFCCC/CCNUCC-CDM Executive Board, p 11.

[94] Margono, B. A., Turubanova, S., Zhuravleva, Potapov, P., Tyukavina, A., Baccini, A., Goetz, S., Hansen, M. C. (2012). *Mapping and monitoring deforestation and forest degradation in Sumatra (Indonesia) using Landsat time series data sets from 1990 to 2010*. Environ. Rest. Lett., 7:034010*.*

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[98] The majority of IUPHHK-HT licenses are held by Asia Pulp & Paper Co. Ltd (APP) and Asia Pacific Resources Internationl (APRIL) Group. Both own pulp and paper mills in Riau Province. License holders that are not directly owned by these main two concession hoders typically are dedicated suppliers to oneor the other, as there are no other pulp and paer production facilities in Riau Province.

[99] Intergovernmental Panel on Climate Change. 2016. 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 4.3 Carbon Fraction of Aboveground Forest Biomass

[100] *Supra Warren. et al. 2017.*

[101] VMD0042 ver. 1.1 §5.1.1 at bullet point 5 (p. 6) indicates that "In peatland rewetting and conservation projects, emissions from peat fires are always lower compared to the baseline emissions and emissions from peat fires can conservatively be neglected. Accounting for peat fires emissions in the baseline is therefore optional.

[102] *Supra Indonesian National Carbon Accounting System. 2015:1*

[103] Intergovernmental Panel on Climate Change. 2016. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Table 4.7 Above-Ground Biomass in Forests

[104] *Supra Warren. et al. 2017.*

[105] *Supra Indonesian National Carbon Accounting System. 2015:1*

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[107] VMD0016 v1.2 (X-STR) requires 4 measurements per km^2, which effectively means 5,200 depth point measurements in the 130,000 ha (1,300 km^2) Project area. The methodological requirement of VMD0016 at §5.3.1 is neither reasonable nor necessary to produce an accurate peat depth map.