Forest Carbon Partnership Facility (FCPF)
Carbon Fund

ER Monitoring Report (ER-MR)

ER Program Name and Country:	East Kalimantan - Jurisdictional Emission Reductions (EK-JER) Program, INDONESIA
Reporting Period covered in this report:	01-07-2019 to 31-12-2020
Number of FCPF ERs:	26,248,238 $tonCO_2e$
Quantity of ERs allocated to the Uncertainty Buffer:	0 $tonCO_2e$
Quantity of ERs to allocated to the Reversal Buffer:	7,448,823 $tonCO_2e$
Quantity of ERs to allocated to the Reversal Pooled Reversal buffer:	1,773,529 $tonCO_2e$
Date of Submission:	v. 11-12-2023

WORLD BANK DISCLAIMER

The boundaries, colors, denominations, and other information shown on any map in ER-MR does not imply on the part of the World Bank any legal judgment on the legal status of the territory or the endorsement or acceptance of such boundaries.

The Facility Management Team and the REDD Country Participant shall make this document publicly available, in accordance with the World Bank Access to Information Policy and the FCPF Disclosure Guidance.

TABLE OF CONTENTS

1 IMPLEMENTATION AND OPERATION OF THE ER PROGRAM DURING THE REPORTING PERIOD

1.1 Implementation status of the ER Program and changes compared to the ER-PD

Implementation of ER (emission reduction) program under this reporting period is reported from 1 July 2019 – 31 December 2020.

The implementation of ER Program compared to ER-PD (Emission Reduction Program Document) is summarized per component as follows:

1) Component 1: Forest and Land Governance

1.1. Strengthening the licensing regime

- License processes related mining and forestry are improved for efficiency and effectiveness, that are integrated into one single system (OSS). The system is under management of Provincial Investment and Licensing Integrated Service (DPMPTSP). The number of permits decreased after verification (clean and clear) was conducted during the reporting period. In ERPD, total mining permits up to 2017 were 1434 units. In 2019, the total mining permits decreased to 386 permits due to verification processes. Up to December 2020, there are only 272 mining permits that passed the annual assessment.

  In forestry sector, up to 2017 the social forestry permit was only 38 units. Government accelerated the program. As a result, the number of social forestry permits increased. Up to December 2020, there are 75 social forestry permits that have been issued to communities in East Kalimantan with the total of 193,000 ha.

  In Estate crops sector, East Kalimantan Government issued High Conservation Value (HCV) Policy on Sustainable Estate Crops (No.7/2018[1]). The regulation emphasises restoration of high conservation value (HCV) areas. The implementation of this regulation was followed up by Berau Bupati's decree[2] no 287/2020 about designation of HCV area inside an oil palm plantation for 83,876ha. Development partners involved in supporting designation of High Conservation Value (HCV) area are *Yayasan Konservasi Alam Nusantara* (YKAN), German Sustainable and Climate-Friendly Palm Oil Production and Procurement (GIZ SCPOPP), German Low-Emissions Oil Palm Development (GIZ LEOPALD), *Dewan Daerah Perubahan Iklim* (DDPI) Kaltim, Kalimantan Forest United National Development Program (Kalfor-UNDP), *Forum Perkebunan* (Estate Crops Multi-stakeholders Forum), Mulawarman University, private companies and others government institutions. Another efficiency for license issuance is the development of spatial databases, in which the licensing process is through a web-platform system that can be previewed. This web platform can assess whether the area is overlapped or not. If the area is overlapped then the license must be postponed until the issue is solved. The area here has to be not overlapped as follows: a) with the indicative map for termination of the issuance of new permits for primary natural forest and peatland (MoEF Decree No 851/2020)[3], b) with existing legal permits (forest,

[1] PERDA Prov. Kalimantan Timur No. 7 Tahun 2018 tentang Pembangunan Perkebunan Berkelanjutan [JDIH BPK RI]

[2] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_of_the_Head_of_Berau_District_No_287_2020_regarding_indicative_map_of_HCVA_for_plantations.pdf

[3] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_of_MoEF__No.851_of_2020_concerning_Indicative_Maps_and_termination_of_the_issuance_of_new_permits_for_Primary_Natural_Forest_and_P eatlands.pdf

mining, social forestry[4], estate crops, hutan adat, and other land use permits), and c) with the indicative map for directions of the production Forest Utilization that are not encumbered with permits for forest utilization business[5].

1.2. Dispute Settlement

- Dispute settlement has been addressed. At national level, a national policy under National Agrarian Reform Program (TORA) on the change of forest boundary area has been issued (S.698/Menlhk/Setjen/Pla.2/9/2021 on 10 September 2021)[6]. The revision of forest boundary area in the province between private lands and social forestry areas has been conducted with the size of 119.4ha and 142.8ha respectively. The revision is still on-going in several districts (Paser Penajam Utara, East Kutai, Berau, and Kutai Kartanegara). The partner is directly from Ministry of Environment and Forestry (MoEF). Due to Covid-19, field activities are limited. The budget allocation for field surveys were transferred to combatting Covid-19. In order to minimise conflict within stakeholders, the provincial government has developed standard operation procedure (SOP) for conflict resolution in forestry sector. The standard operational procedure (SOP)[7] provides guidance for EK Forestry Agency staff to implement conflict resolution and to ensure the State's rights, individual or group rights, customary community rights, concession holders rights, and to protect forest and its resources. Fifteen (15) disputes have been addressed using this SOP up to July 2020. Most of disputes were about tenurial rights. The disputes have been decreased from 27 cases in 2019 to 15 cases in 2020. Parties who supported conflict resolution are as follows: the Forest Management Unit (FMU), MoEF Social Forestry and Environmental Partnership (*Balai Perhutanan Sosial dan Kemitraan Lingkungan*/BPSKL), MoEF Regional Forest Gazettement Agency (*Balai Pemantapan Kawasan Hutan*/BPKH), local government, village government, concession holders and local or customary community. The EK government has developed the grievance system called "*Aspirasi Etam*" through Governor Regulation No 69/2019[8]. The "*Aspirasi Etam*" (meaning "our aspirations") is an online portal for the community to report the complaints issued in East Kalimantan (EK). For FCPF, this "*Aspirasi Etam*" is used by the community/public to give feedback and grievances related to FCPF activities.

1.3 Support for the recognition of adat land

- A total of seven adat communities have received formal MHA recognition in East Kalimantan, five of them during the reporting period. These were facilitated through partnership between the Village and Community's Empowerment Agencies (DPMPD) at provincial and district levels and adat-right advocates NGOs. There are 36 adat communities who are in process of applying for formal recognition, of which thirty receive Program facilitation through DPMPD and the Forestry Service together with adat-rights advocates.

1.4 Strengthening village spatial planning

- In order to prevent overlapping land use, and to strengthen the village programs inside the village areas, the spatial land use plan was developed. Up to December 2020, 6 village spatial plans in peatland areas have been completed. In addition, 7 villages in Kombeng sub-district, with the support from GIZ-SCPOPP, have been finalised. So, total villages that have been mapped are 13 out of 150 villages. After the village spatial plan was completed, the process continued at the

[4] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_MoEF__No.2111_of_2020_concerning_Indicative_Maps_and_Social_Forestry_Areas.pdf

[5] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree of MoEF_No.10199_of_2019_concerning_Indicative Map_of_Production_Forest_Utilization_Directions_for_2020.pdf

[6] https://drive.google.com/file/d/1FMouiE2CBYxN5vakgxkB0O4HWM7ihXCt/view?usp=sharing

[7] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Forestry_Confict_Resolution_SOP_2020.pdf

[8] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/PERGUB_69_2019-aspirasi etam.pdf

higher scale, sub-district/*kecamatan* and finally at the *kabupaten*/district level. At the kabupaten level, the village spatial plan will be synchronized with other sectors' spatial plans such as forestry, fishery and plantation. The development partners involved for village spatial plan are TNC/YKAN, GIZ -SCPOPP, WWF Indonesia, Yasiwa, and Yayasan Bumi.

2) Component 2: Improving Forest Supervision and Administration

2.1 Strengthening management capacity within the State Forest Area: FMU development

- From a total of 19 Forest Management Unit (*Kesatuan Pemangkutan Hutan*/KPH) in East Kalimantan, up to December 2020 there were 10 out of 19 Long Term Forest Management Plans (RPHJPs) that have been ratified and approved by MoEF. To complete the other 9 RPHJPs, capacity building was conducted, such as strengthening KPH staff on development of KPH RPHJP (on 22-25 November 2020 in Samarinda). One of the activities is patrolling for Prevention and Suppression from Forest and Land fires in conservation and forest production areas (Kutai National Park for 53 times during the reporting period and 14 times with communities known as Community Partner Rangers/*Masyarakat Mitra Polhut*). KPH conducts forest patrolling every year. Twenty (20) cases of illegal logging were reported in East Kalimantan during the reporting period. Nine (9) Business plans of KPHs were developed with the support from development partners (GGGI, GIZ, WWF, TNC/YKAN, etc). In order to accelerate the development of business plans for other KPHs, a coaching clinic (capacity building) was conducted by Forestry Service of East Kalimantan. A baseline study on the application of environmental economic instruments and other incentive schemes was conducted as part of pre-assessment on sustainability of environmental services of Manggar Watershed in order to supply raw water for 79% of Balikpapan city residents.

2.2 Strengthening provincial and district governments to supervise and monitor the implementation of sustainable Estate Crops

- Strengthening provincial and district governments in monitoring implementation of sustainable estate crops were conducted through identification and development of HCV area maps. In early 2020 Bupati Berau signed a Decree on HCV indicative map No 287/2020[9] covering 83,876ha.

3) Component 3: Reducing deforestation and forest degradation within licensed areas

3.1. Implementation of HCV policies for Oil Palm Estates

- Private sectors have a key role in reducing deforestation and forest degradation within their licensed aeras such as implementation of HCV policies for oil palm estates. Commitments from district governments to implement HCV policies have been acknowledged. Meeting coordination within Estate Crops Services of East Kalimantan (Rakor Perkebunan) was conducted in Balikpapan on 18 October 2019. Seven (7) Regencies in East Kalimantan proposed HCV indicative maps within plantation businesses concessions or plantations. The HCV is designated areas by district governments with total coverage of 417,505 ha. Up to December 2020, Berau district has put the committed areas of 83,876ha as HCV protection into Bupati's Decree on HCV indicative map No 287/2020[10]. Assistance to oil palm smallholders towards sustainability in order to gain Indonesia

[9] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_of_the_Head_of_Berau_District_No_287_2020_regarding_indicative_map_of_HCVA_for_plantations.pdf

[10] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_of_the_Head_of_Berau_District_No_287_2020_regarding_indicative_map_of_HCVA_for_plantations.pdf

Sustainable Palm Oil (ISPO) & Roundtable Sustainable Palm Oil (RSPO) Certificates was conducted. Up to 2020, there are 60 companies that have obtained ISPO, whereas 12 companies obtained RSPO certificates. The area of the ISPO-certified is 520,605ha, and the area of RSPO-certified is 87,070ha.

3.2 Support for smallholders and Community Based Fire Management and Monitoring Systems (CBFMMS)

- In order to prevent forest and land fires, EK Estate Crops Service with the support of private companies established the Farmer Group on Fires Management and Prevention known as Fire Prevention Farmers Group (*Kelompok Tani Peduli Api*/KTPA). The total KTPA are 81 KTPAs. The KTPAs are key players in helping district government and private companies in combating forest and land fires. In the forestry sector, the private companies also contributed to the development of Community-based Fire Management and Prevention (MPA). The contribution includes training, gears and tools for firefighters, and patrol. Sinarmas Forestry and partners (PT. Surya Hutani Jaya, PT. Sumalindo Hutani Jaya II, PT. Acacia Andalan Utama, PT. Kelawit Wana Lestari) had 43 activities (patroli, training, and providing gears and tools to MPA) across six sub-districts in East Kalimantan until December 2020.

3.3 Implementation of HCV and RIL-C policies for Forestry Concessions

- The private sector implemented HCV and RIL policies inside their forest concession areas (IUPHHK-HA). The implementation was monitored by Production Forest Management Agency (BPHP) East Kalimantan region (MoEF's branch office in East Kalimantan). Up to 2019, three (3) out of 64 IUPHHK-HA have implemented reduced impact logging for carbon (RIL-C). The RIL-C training on the field site has been done for eight (8) companies. In terms SFM certification for timber plantation, it has reached 21 out of 42 timber plantation concession (IUPHHK-HT), whereas for natural forest has reached 53 out of 64 IUPHHK-HA.

4) Component 4: Sustainable Alternatives for Communities

4.1 Sustainable livelihoods

- Capacity building on strengthening village owned entrepreneurship (BUMDes) has been conducted in 45 out of 150 villages during 1 July 2019 – 31 December 2020. The contents of training included financial management and village assets, innovation, etc. Partnerships between government and communities in conserving wildlife have been conducted such as restoration of orangutan habitats in East Kutai district, conservation of sea turtle in Derawan islands, Berau district, conservation of black crocodile Siam (Siamensis) in Mesangat-Kenohan Suwi, East Kutai District, conservation of Sumatran Rhino in Kelian West Kutai district, and also conservation education that aims to increase awareness of the community on the importance of conservation in East Kalimantan.

4.2 Conservation partnerships

- **BKSDA Kaltim has implemented development of partnerships with communities for conservation of 100,000 hectares of Managed Traditional Zones and Community Empowerment in 10 Villages on Management of Conservation Areas and for livelihood development.**

4.3 Social forestry

- Up to December 2020, there are 75 social forestry (SF) permits that have been issued to communities in East Kalimantan with a total of 193,000ha. The target area for SF is 250,000ha. Most permits are issued for village forests (34 licenses – 165,000ha), community-based timber

plantation/HTR (15 licenses – 13,000ha), community forestry/Hkm (13 licenses – 2,200ha), forest partnerships (11 licenses – 5,400ha), and customary forest/HA (2 licenses – 7,700ha).

5) Component 5: Project Management and Monitoring

5.1 Project coordination and management

- Coordination meetings during 1 July 2019 – 31 December 2020 were hosted by different EK government services such as the EK Forestry Service for Safeguards issues, the Bureau Economy for BSM, and the EK Environmental Service for Measurement, Monitoring and Reporting (MMR) and Free, Prior and Informed Consent (FPIC). Coordination meetings were conducted with the purpose to strengthen and increase awareness of OPD (provincial government services) about their important roles in the implementation of ER Programs.
- Working Groups for Benefit Sharing, Safeguards, MMR, and Budget and Planning were established. These working groups are under Secretariat Office of Provincial Government East Kalimantan. Outputs are Draft Governor Regulation on Benefit Sharing, Draft SOP for Working Group Safeguards, MMR portal (website MMR), Technical correction on Emission Factor for FREL East Kalimantan, Data revision on Forest Cover for ER Calculation, and extrapolation of plot sample permanents (583 PSPs) under different 11 forest cover types.
- During the reporting period, the budget was mostly implemented according to the plan. However, since the Covid-19 pandemic in Indonesia started in March 2020, most of the field activities were limited. Social distancing was applied. As a result, meetings face to face were avoided. The budget plan for 2020 was revised and allocated to support combating Covid-19. For example, EK forestry Service had to revise its budget for facilitating RIL-C. The budget was reallocated to support the purchase of antigen detection rapid diagnostic test for Covid-19.

5.2 Monitoring and evaluation

- At the early stage of the reporting period most coordination between and within government agencies and partner agencies was conducted by *Sub National Prorgram Namangemetn Unit (SN-PMU) under Economic Bureau of Provincial Secretariat.,* At the end of the reporting period, the FCPF Readiness Fund was limited (the program was ended in December 2020). Most of the financial support for implementation of the ER program in the province was taken from the EK government budget and partly from the development partners. Since working groups (safeguards, benefit sharing, MMR, and budgeting and planning) have been established, coordination of ER programs is led by the chairman of each working group. The Safeguards issue, for example, is led by EK Forestry Service, whereas MMR is led by EK Environment Service. The development partners are invited and actively participate in the issues related to the ER program.

5.3 Program communication

- The communication process is carried out by SN-PMU with the executor at the Provincial Secretariat Public Relations Bureau. Publication is carried out on the provincial website (www.kaltimprov.go.id), social media (instagram.com/pemprov_kaltim), as well as local newspapers, radio and television.

For further details of activities during the reporting period can be found in MMR Web Portal East Kalimantan (https://mrv.kaltimprov.go.id/).

Key changes or deviations in the ER Program's design and key assumptions compared to the description of the ER Program in the ER-PD

There has been a change in ongoing partner activities in East Kalimantan, where The Nature Conservancy has changed to the Yayasan Konservasi Alam Nusantara, the Belantara Foundation is no longer working in

East Kalimantan, and there are additional development partners, namely UNDP-KalFor works for the protection and management of forest areas outside the state forest area.

Several regulations and policies have also undergone changes, such as MoEF Regulation No P.83/2016 which changed to MoEF Regulation No. P.9 of 2021 and the existence of Government Regulation No. 23 of 2021 concerning Forestry Administration, which strengthens the implementation of Social Forestry and also strengthens the role of FMUs in forest management and facilitating the use of forest areas.

In the estate crops sector, there are Provincial Regulations and Governor Regulations regarding sustainable plantations and HCVF management in plantation areas. There is also the addition of the Maritime Affairs and Fisheries Agency in program implementation, related to the management of mangroves and fishery areas.

Another key change in law context was the issuance of omnibus law in 2020 by Government of Indonesia (*Undang-Undang Nomor 3 Tahun 2020 tentang Cipta Kerja*), which directs forest utilization in the form of multi-business, as well as strengthens certainty in doing business.

1.2 Update on major drivers and lessons learned

Seven main drivers of deforestation and forest degradation in East Kalimantan were qualitatively identified through a series of consultative meetings with local stakeholders between October 2015 and March 2018. The main drivers are as follows:

1. Timber plantations
2. Estate crops
3. Mining
4. Subsistence agriculture
5. Unsustainable logging practices
6. Forest and land fires
7. Aquaculture

During the reporting period, those above drivers were then assessed through land cover changes from 1 July 2019 – 31 December 2020.

Land Cover changes in the period of 1 July 2019 – 31 December 2020

It was found that 19,310ha of forest was lost during 1 July 2019 – 31 December 2020. The main drivers of deforestation for such period were caused by unlicensed land clearing (32.7%), oil palm (23.8%), Agriculture (15%), timber plantation (12.7%), unsustainable forest management (10.6%), mining (3%), and fishpond (2.2%).

Table 1. Area Deforested 1 July 2019 – 31 December 2020

Driver	Area deforested 1 July 2019 – 31 December 2020 (hectare)	Share of total deforestation (%)
Unlicensed Land clearing	6,310.37	32.7%
Estate crops - oil palm	4,597.77	23.8%
Agriculture	2,888.84	15.0%
Timber Plantation	2,450.48	12.7%
Unsustainable Forest Management	2,047.01	10.6%
Mining	587.85	3.0%
Fishpond	428.10	2.2%
Total Deforestation 2019-2020	**19,310.41**	**100.0%**

Comparing between the drivers from the baseline period (2006-2016) and reporting period (1 July 2019 – 31 December 2020), unlicensed land clearing became the main driver of deforestation following up with the oil palm. However, the deforestation rate has sharply decreased compared to the baseline. The announcement and commitments from seven districts/regencies to provide areas for HCV protections (remaining natural forest inside concessions) contributed to the slowing down of land clearing in oil palm sector. Up to 31 December 2020, one district, Berau, has put the committed areas of 83,876ha as HCV protection into Bupati's Decree on HCV indicative map No 287, year 2020. The other six districts will follow it in the following years. Policy or regulation on HCV management in oil palm has been formulated, and will be issued soon. Prior to commitments of the province and districts to protect HCV areas, the enforcement to manage HCV inside the oil palm concession was weak. As a result, forest conversion from natural forest to oil palm was dominant in deforestation. In the mining sector, deforestation was sharply down. During the reporting period, mining activity significantly decreased due to the low demand for coal in the international market. The mining policy (moratorium on coal mining license) issued by the Provincial Government to evaluate mining license seems effective to reduce the number of coal mining operations in the province.

1.2.1 Update on the strategy to mitigate and/or minimize potential Displacement

The progress of strategic actions to mitigate and minimize potential displacement are as follows:

1.	**Conversion of forest to estate crops (oil palm)**	
	Risk of displacement	**Medium**
	Progress of the strategy in Place	The issuance of the Provincial Regulation on Sustainable Plantations[11] (2018) and the Governor's Regulation on the Identification of HCV areas[12] (2021), as well as the identification of HCVs in each district have been done and will be continued. These provincial regulations are essential and important in order to ensure that the Plantation development is not only harming the environment but also maintaining high conservation values inside the concessions. Berau District has issued the indicative maps for high conservation values inside the oil palm plantation for 83,876ha[13]. The Plantation Office has also established a Sustainable Plantation Communication Forum (*Forum Komunikasi Perkebunan Berkelanjutan*/FKPB).
2.	**Conversion of natural forest to industrial timber plantations**	
	Risk of displacement	**Low**
	Progress of the strategy in Place	Accelerate the implementation of Sustainable Forest Management (*Pengelolaan Hutan Produksi Lestari*/PHPL) and SVLK in IUPHHK-HT, including the determination of HCV in concession areas. Cooperation between MoEF and the Forestry Agency, as well as KPHs has enhanced to supervise and monitor implementation. Up to 31 December 2020, 21 out of 42 timber plantation concessions have been certified under PHPL certificates.
3.	**Unsustainable Forest Management**	
	Risk of	**Low**

[11] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/PERDA Kaltim.7.2018.pdf

[12] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/PERGUB.12.2021-Kriteria ANKT.pdf

[13] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_of_the_Head_of_Berau_District_No_287_2020_regarding_indicative_map_of_HCVA_for_plantations.pdf

	Displacement	
	Progress of the strategy in Place	Accelerate the implementation of PHPL and SVLK in IUPHHK-HA, including the determination of HCV and implementation of RIL in concession areas. Cooperation between MoEF and the Forestry Agency, as well as KPHs is enhanced to supervise and monitor implementation. Up to 31 December 2020, there are 53 out of 64 natural forest concessions having PHPL certificates.
4.	**Forest clearing for subsistence agriculture**	
	Risk of Displacement	**Medium**
	Progress of the strategy in Place	Social forestry program aims to reduce the pressure of natural forests from the expansion of subsistence agriculture. The program has been included into Provincial Mid Term Development Plan (*Rencana Pembangunan Jangka Menengah Daerah/RPJMD*) 2019-2023 and Provincial Strategic Development Plan (*Rencana strategis Pembangunan/Renstra*). The annual target for SF in RPJMD is 32,000ha. Up to 31 December 2020, there are 75 SF licenses that have been issued by MoEF with the total size of SF area for 193,000 ha.
5.	**Forest clearing for mining**	
	Risk of Displacement	**Medium**
	Progress of the strategy in Place	Mining licenses have been assessed and integrated into one single system (OSS). There is a significant decrease of licenses from 386 to 272 licenses. With the new Job Creation Act 2020, the authority of issuing licenses is now controlled under Ministry of Energy and Minerals (National Government Ministry).
6.	**Destruction of mangroves for aquaculture**	
	Risk of Displacement	**Low**
	Progress of the strategy in Place	The dispute settlement in coastal area that potentially accelerate mangrove conversion to fishponds has been decreasing since the national agrarian reform program (TORA) was launched in East Kalimantan in 2021.
7.	**Unlicensed Land clearing**	
	Risk of displacement	**Medium**
	Progress of the strategy in Place	Strengthen forest security patrols, as well as develop and strengthen Forest Protection Communities in areas prone to illegal clearing activities. This includes strengthening the law enforcement process.

2 SYSTEM FOR MEASUREMENT, MONITORING AND REPORTING EMISSIONS AND REMOVALS OCCURRING WITHIN THE MONITORING PERIOD

2.1 Forest Monitoring System

The ER Program has two sets of organizational structures for measurement, monitoring and reporting of emissions estimates as presented in Figure 1.

Figure 1. Organizational Structure for measurement, monitoring and reporting of the implementation of ER Program

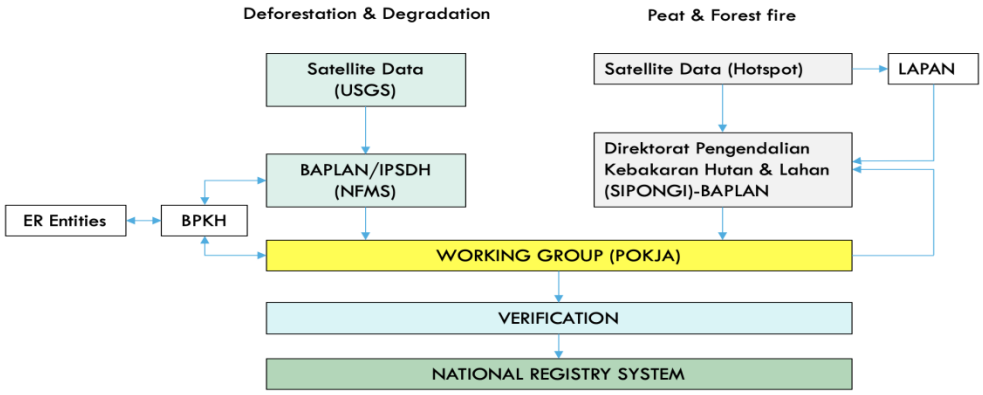


Figure 1 above shows the institutional bodies that responsible for producing annual national land cover (LC) map (scale 250.000). Indonesian national space agency (LAPAN = *Lembaga Penerbangan dan Antariksa Nasional*) provides satellite imageries from various sources and various spatial resolution to MoEF as main input for LC map production. In order to maintain the cosistency with earliest LC map year 1990, the image sources used is Landsat products. SPOT 6/7 also provides by LAPAN and often used for validation and accuracy assessment of LC map as well as accuracy assesment Land Cover Change between 2 different LC maps. LAPAN was established on 27 November 1963 and responsible for development and utilization of aerospace technology and research including remote sensing data utilization and production.

BAPLAN (*now changed to PKTL - Forestry Planning and Environmental Management)* as one of DG of MoEF, produces LC map annually since 2011. BAPLAN has several directorate and Forest Resource Inventory and Monitoring Directorate (IPSDH = *Inventarisasi dan Pemantauan Sumber Daya Hutan*) is resonsible for producing national LC assisted by 22 Regional Office for the Management of Forest Area (BPKH = *Balai Pemantapan Kawasan Hutan*) spread from Sumatera to Papua including one office in EK. Most staff of IPSDH dan BPKH have adequate GIS and Remote Sensing knowledge and skills needed for LC production. BPKH did visual interpretation of Landsat imageries and conducting ground check for accuracy assessment (Figure 2). IPSDH will conducting quality control and quality assurance (QC/QA) of BPKH LC map. During the process of LC map production, BPKH may receives input from various institution (ER entities) for ensuring the map is more accurate. Meanwhile, another directorate under BAPLAN named PKHL is responsible to produce annual burn area map based on hotspot information provides by LAPAN. LC and burn area map is used as main input for monitoring and reporting of ER program implementation in Indonesia and East Kalimantan (EK). The EK working group of MMR has responsible to analysed LC and burn area map data to calculate various sources of emission from deforestation, forest deradation, fire, soil mangrove and peats at certain period. In EK, Enviroment Service (DLH = *Dinas Lingkungan Hidup*) was appointed as coordinator for working group of MMR. DLH is provincial government body that responsible for environmental management

including waste and pollutant management, prevention and controlling environmental degradation. In ER program, EK DLH facilitates MMR working group meeting and resonsible for any administration work as well as submission of emission calculation reports. The MMR system of the ER Program is also integrated with the national forest monitoring system (NFMS) as described in Regulation of Director General of Forest Planning Number P.1/VII- IPSDH/2015[14].

Data Process at National Level

The BPKH receives satellite data from Forest Resource Inventory and Monitoring (IPSDH). The satellite data is first acquired by LAPAN, which also does pre-processing of data up to mosaicking before sending the data to the respective institutions (including IPSDH). The visual interpretation is conducted by the BPKH using a standard methodology for land cover mapping (Margono *et al*, 2014, 2016). Results of the processing and ground check by BPKHs are sent back to IPSDH for validation by IPSDH including some necessary edge-matching as appropriate, as part of the QA/QC process. Finally, the accuracy of the interpretation is assessed by comparing the land cover maps to field data from the ground check using a contingency matrix (MoFor, 2012, Margono *et al.*, 2012). There are about 300 points for ground checking in East Kalimantan (MoEF, 2017), which are determined randomly by land cover classes. All the data from the BPKH are then consolidated to generate data on forest cover change. About 300 points samples as initial samples were planned to check in East Kalimantan and North Kalimantan (before separated from East Kalimantan) in 2016[15]. These samples were generated randomly based on land cover map in both provinces. Due to the limited time for ground check as well as the topography roughly that caused some of samples cannot be accessed. Only 57 samples could be assessed and calculated for accuracy as below:

No	Classification of Accuracy	Accuracy (%)
1.	Accuracy of 23 classes of land cover	50.88
2.	Accuracy of forest – non forest	78.95
3.	Accuracy of forest - forest	100.00
4.	Accuracy of non forest – non forest	56.76

The report of ground check process as well as accuracy analysis of land cover can be access to link: https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Report_groundcheck_East-North_Kalimantan_2017.pdf

Data Process at sub-national level

The ER Program (through the Working Group[16] of MMR) analyses the data from the IPSDH/BPKH to calculate emissions from deforestation and degradation, peat decomposition, fire, and loss of mangrove soil from the conversion of mangrove to aquaculture using 2 LCLU maps (T_0 and T_1). Results of the estimation are then submitted to the EK Environmental Service (*Dinas Lingkungan Hidup*/DLH) for internal validation. The DLH then submits the results of the validated calculation to the national registry system.

[14] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/PERDIRJEN Planologi Kehutanan No P.1-VII-IPSDH-2015 Tentang Pedoman Pemantauan Penutupan Lahan.pdf

[15] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Report_groundcheck_East-North_Kalimantan_2017.pdf

[16] The Working Group of MMR is led by Provincial Environmental Service. The members are from Bureau Economy of Governor Office, Forestry Service, Estate Crop Service, Dipteropa Agency – MoEF, Forest Ecocsytem Wregion IV – MoEF, Climate Change Regional Council/Dewan Daerah Perubahan Iklim/DDPI, Mulawarman University, Bioma Foundation, Yasiwa Foundation, Planet Urgence, Conservation Foundation, GGGI, GiZ, and YKAN)

To facilitate the work of the Working Group, the Government of East Kalimantan has developed a web portal for the Sub-national MMR System for managing all the processed data from the national and also from local governments. The system is operated by the Provincial Environmental Office (DLH) as Coordinator of the East Kalimantan MMR Working Group. The menu on the web portal (http://mrv.kaltimprov.go.id) consists of Measurement (data input pages) and Reporting section. In order to access and input data into those sections, it needs a user account that has to be registered to DLH. On the other hand, data related to Emission Factor (*Faktor Emisi*), Activity Data (*Data Aktivitas*) and Emission include Reference Emission Level (*Tingkat Emisi Rujukan*), Actual Emission after reference period (Emisi *Aktual*) and Performance of Emission Reduction (*Kinerja Penurunan Emisi)* are publicly available.

The MMR web portal has been tested using national data. The infrastructure for the server has been ready and installed in Samarinda, East Kalimantan. This MMR web portal increases public participation of Government Services to village communities or indigenous people to update their ER activities and participate in monitoring the condition of forests and changes in the forest/land that occurs.

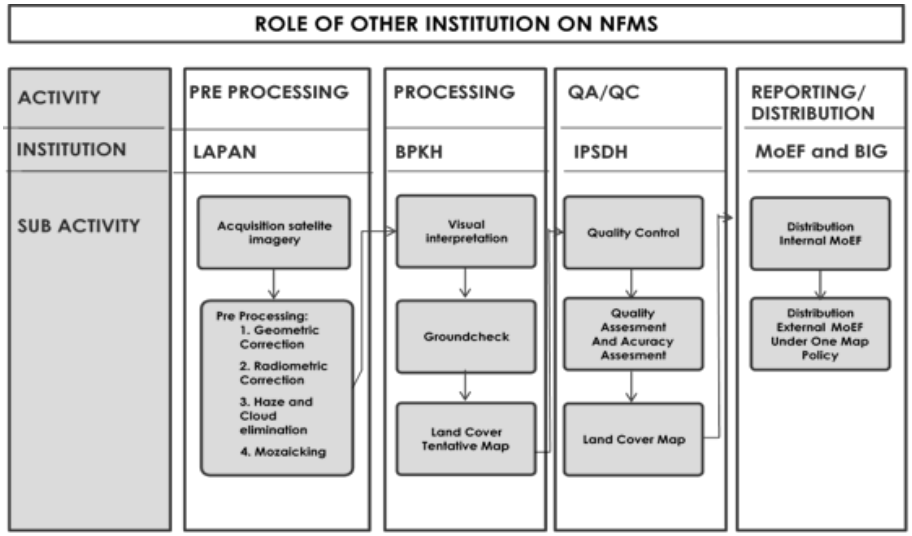


Figure 2. Related institutions on NFMS management (MoEF, 2017)

The process of the production of land cover maps will be on an annual basis as defined in the Regulation of the Director General of Forest Planology Number P.1/VII- IPSDH/2015[17]. The timeline of the process is shown in **Error! Reference source not found.**. The collection of the LANDSAT images is conducted throughout the year by LAPAN and the pre-processing of the image is conducted as the data becomes available for producing the mosaic. The mosaic will be available by June to be distributed to IPSDH and to BPKH.

Design and maintenance of the Forest Monitoring System

This sub-section describes the selection and management of GHG related data and information. The design of Indonesia forest monitoring system is formally regulated using MoEF regulation No. P7/2021[18]. Indonesia forest monitoring system includes two main components which is forest inventory and land cover mapping. National forest inventory is conducted by MoEF at least once in a five-year period using more than 4000 sample plots distributed systematically (20 km × 20 km) across Indonesia. The national forest inventory started for the first time in 1989 as supported by FAO and WB. The sample plots is set as rectangle shape with size 100 m × 100 m (for non mangrove forest) and 50 m × 50 m (for mangrove forest). Approximately

[17] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/PERDIRJEN Planologi Kehutanan No P.1-VII-IPSDH-2015 Tentang Pedoman Pemantauan Penutupan Lahan.pdf

[18] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/2021pmlhk007_menlhk.pdf

74% of these sample plots were used for calculating Indonesia FREL. One of the pivotal result from national forest inventory is emission factor (biomass stock) for each land cover classes after calculated using allometric equations by Manuri *et.al* (2017)[19] and Chave (2014)[20].

Complementing to national forest inventory is land cover mapping. Land cover mapping is not limited to forest area but to all land cover that appropriate to mapping product scale 250,000. Twenty three of land cover classes (including cloud class) has been mapped since 1990 for entire Indonesia mass land. Since 2011, MoEF has successfully produced annual land cover maps of Indonesia. The LC map is used for monitoring the forest coverage that can be further analysed for deforestation and forest degradation by comparing two set of LC map data. Interpretation of satellite image is conducted by trained and skilled personel in BPKH using visual method in GIS enviroment combine with ground checking. The budget for ground checking is always prepared by BPKH since it is necessary to calculate the accuracy.

The interpretation process is often conducted in July-October, while ground check is conducted in June-September. In October-December, all the results of the interpretation by BPKH will be compiled to the national by IPSDH for QA/QC and accuracy assessment. By February Y+1, the result of the interpretation is normally finalized and reported. Table below shows the LC map production under current national forest monitoring system (NFMS).

Table 2. Timeline of land cover map production under the current NFMS

No	Activity	Year (n-1)						Year (n)											
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
A	**LAPAN**																		
	Collecting Landsat Satelite Image																		
	Finalization of Mozaik (M)													M					
B	**IPSDH**																		
	Techncail evaluation																		
	Supervision																		
	Quality Control																		
	Data finalization (DF)																		DF
	Reporting ®																		R
C	**IPSDH/BPKH**																		
	Data distribution (DD)																		
	Interpretation																		
	Ground Checking																		
	National Compilation of results (NC)																NC		

For Measurement, Monitoring and Reporting (MMR) of peat and forest fire, as seen in Figure 2, estimation of peat and forest burnt area is based on Director General of Climate Change (DG-CC) MoEF's Regulation No. P.11/PPI/PKHL/Kum.1/12/2018[21]. The interpretation of the burned area uses remote sensing data, such as Landsat, SPOT and others, and is supported by hotspot data obtained from monitoring satellite imagery of NOAA-AVHRR, SNPP-VIIRS, ATSR, Terra/Aqua MODIS, Himawari and others. It is also supported by information based on the results of ground check reports and forest fire extinguishing locations. Such data analysis was done by the Directorate for Forest and Land Fire Prevention, of the MoEF. The ER Program (through the Working Group) gets access to and analyses the burn scar data in order to estimate burnt area and greenhouse gas emissions. Results of the estimation are then submitted to IPSDH for internal verification.

[19] https://link.springer.com/article/10.1007/s13595-017-0618-1

[20] https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.12629

[21] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Perdirjen P. 11 Pedoman Teknis Penaksiran Luas Karhutla (2).pdf

Indonesia forest monitoring system continue to evolve and improve the method and tools for getting trustworthy data on land cover map and biomass stock by involving uncertainty analysis started in 2020. Other than land cover map and biomass stock, Indonesia forest monitoring system is currently producing burn scare map at montly period that pivotal for calculating emission from fire.

Systems and processes that support the Forest Monitoring System, including Standard Operating Procedures and QA/QC procedures

At national level, Indonesia forest monitoring system is supported by MoEF (IPSDH) and LAPAN as shown in Figure 1 and 2. At sub-national level (East Kalimantan province), the system is supported by DLH especially for emission calculation. LAPAN provides mozaics of Landsat imageries to be further interpreted by BPKH. LAPAN has two ground stations (located in Pare-pare, South Sulawesi and Rumpin, Bogor, West Java) for receiving and processing Landsat raw data sets (in daily basis) into L1 level (image scene was corrected using ground control points dan digital elevation model). Collection of L1 level imageries send to LAPAN office in Jakarta for further processing into L2 level or Analysis Ready Data (ARD). Analysis Ready Data (ARD) are pre-packaged and pre-processed bundles of Landsat data products that make the Landsat archive more accessible and easier to analyse, and reduce the amount of time users spend on data processing for time-series analysis. Collection of Landsat ARD image in a single year are then processed into RGB mosaics by LAPAN Jakarta office before distributed to end user (e.g. IPSDH). Further information on Landsat processing procedure by LAPAN see page 20 on this link.

MoEF (IPSDH) has already provided procedure for interpreting medium resolution satellite images i.e. Landsat images from LAPAN (click to see the document). The procedure contains key interpretation of 23 land cover classes as guidance for operator GIS in BPKH during interpretation process. For calculating accuracy and uncertainty, another separate document is provided by IPSDH[22]. These 2 procedures ensure the quality and accuracy of LC data that will be used to calculate land cover change and emission from deforestation and forest degradation in ER program.

The ER Program in East Kalimantan uses the data generated by the above mentioned NFMS that consist of forest inventory data and LC map. The system provides continuous information on activity data and emission factors that can ensure the sustainability of activity data supply needed for estimating emission reductions from the implementation of the ER Program, thus ensuring consistency. The ER Program will continue to apply these samples-based area estimation for ER purposes, and will consider whether this approach is also applicable to the NFMS for national reporting purposes.

In addition, the ER Program also includes ground checking activities, as mentioned above, to increase the number of points required for the accuracy assessment. At present, due to limited budget BPKH can only do ground checks in a small number of observation points. Through the ER Program, it is planned for ER Entities, as shown in Figure 2.

Role of communities and non-government in the forest monitoring system

The community and non-government parties can provide input to the MoEF through Directorate Forest Resource Inventory and Monitoring (IPSDH), if they find data that is not in accordance with field conditions. Reports are accompanied by field photo documentation, as well as GPS location points. Regarding forest fire information, based on real-time hotspot data, short messages are sent from the national to the provincial level, then forwarded to the district to the village head. The village then carried out a field check, and re-informed the actual situation on the ground. Capacity buildings for communities in measuring carbon stocks as part of monitoring systems and landscape restoration have been conducted[23][24][25].

[22] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

[23] https://ddpi.kaltimprov.go.id/berita/ddpi-kaltim-menggelar-pelatihan-mrv-redd

[24] https://fsc.org/en/newscentre/joint-forest-landscape-restoration-initiative-starts-in-east-kalimantan-indonesia

[25] https://wwf.panda.org/wwf_news/?312610/Forests-and-community-in-East-Kalimantan

For forest monitoring purpose, it is commonly to use land cover map. However, community is limited to have access to monitor their forest using the land cover map produced by IPSDH (MoEF). It requires a formal letter to send it to the relevant authority (IPSDH/MoEF). In most cases, community can obtain the map if visitors such as government officers (FMU/KPH or NGOs or researchers) bring the land cover map in order to check the village areas for monitoring purpose (such as hotspot for fires). The information about the land cover condition from community were then used as input for updating land cover maps. Similar situation can happen when university researcher uses the map to find the inconsistency between data from the map and data from the ground truth. Information from community is very important to confirm and update the land cover map data. So, the role of community in forest monitoring system in this case is only limited as informants for government monitoring officers.

We highlight a minor alteration of Indonesia national forest monitoring system (NFMS) URL (uniform resource locator) from http://webgis.menlhk.go.id:8080/nfms_simontana/ as it is mentioned in ERPD, to the new URL that is https://nfms.menlhk.go.id/

2.2 Measurement, monitoring and reporting approach

2.2.1 Line Diagram

The ER Program applies methods for monitoring activity data and for estimating emission factors that are aligned with the approach used in developing Indonesia's FREL and that comply with established standards for the measurement of satellite imagery (LANDSAT) interpretation to estimate forest cover changes (SNI 8033:2014).[26] These standards have been defined in the annex of the Regulation of the Director General of Forest Planology Number P.1/VII- IPSDH/2015[27]. Technical guidelines for field observation and ground check procedures for land cover accuracy assessment can be seen in Annex 9.1 ERPD and Annex 9.2 ERPD, respectively. In the implementation phase (June 2019-December 2024), activity data (AD) and emission factors (EF) are monitored in the Accounting Area to measure emissions from deforestation and forest degradation. Monitoring follows the procedures defined in the NFMS (national forest monitoring system) and in the East Kalimantan Forest inventory. Parameters to be monitored include the same parameters used to develop the REL, specifically:

Activity Data

- Forest cover change resulting in deforestation or forest degradation for all land that was forested in 2006.
- Areas of burned forest land in stable secondary forest and peat land starting in 2006.

Emission Factors

- Emission factors for live biomass by land cover classes (forested and non-forested)
- Emission factors for peat and mangrove soils
- Emission factors for fires

Table 3. Characterization of forest and non-forests in Indonesia used in national land cover mapping

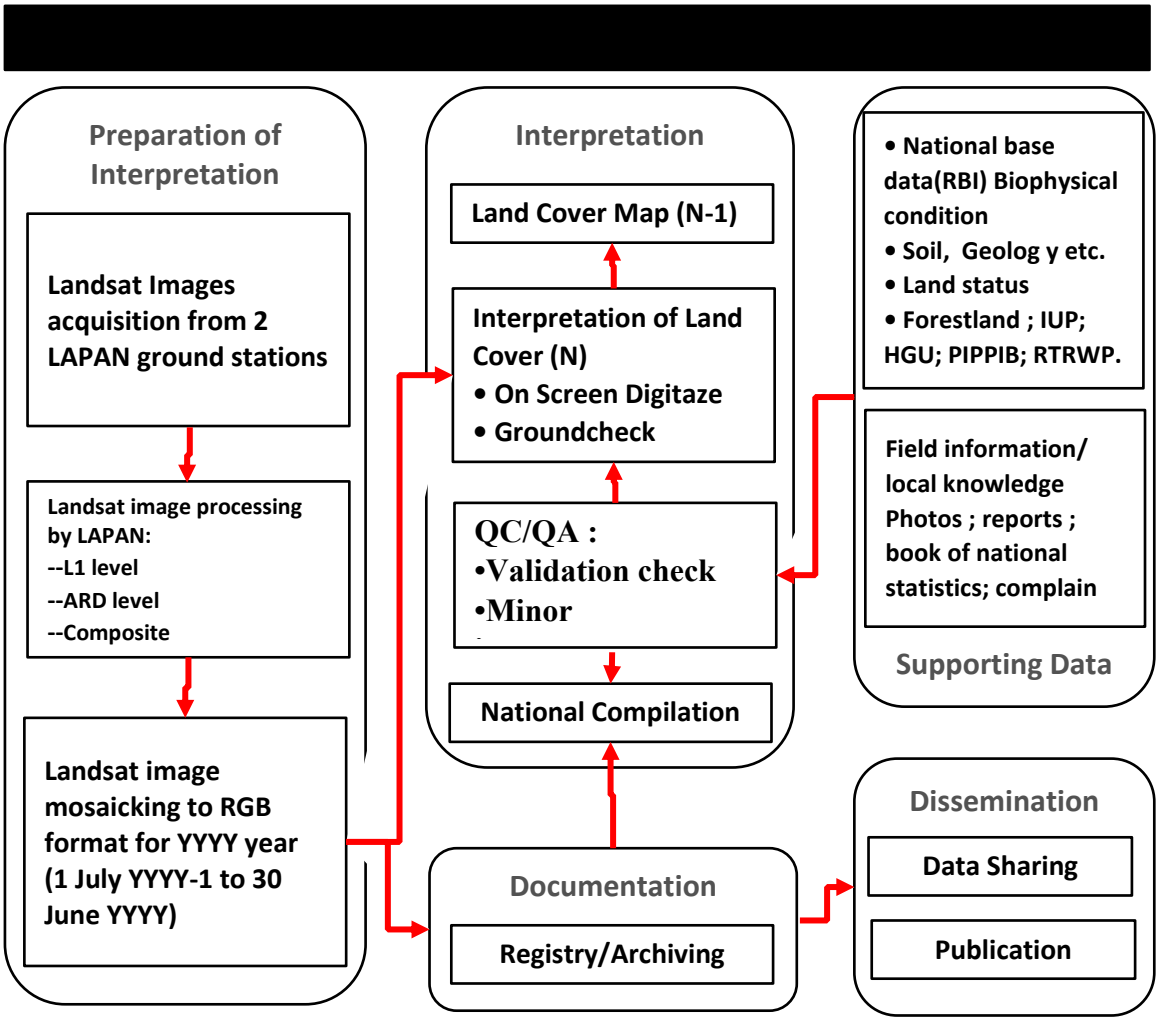
No	Land cover type	Code	Description
	Forests		

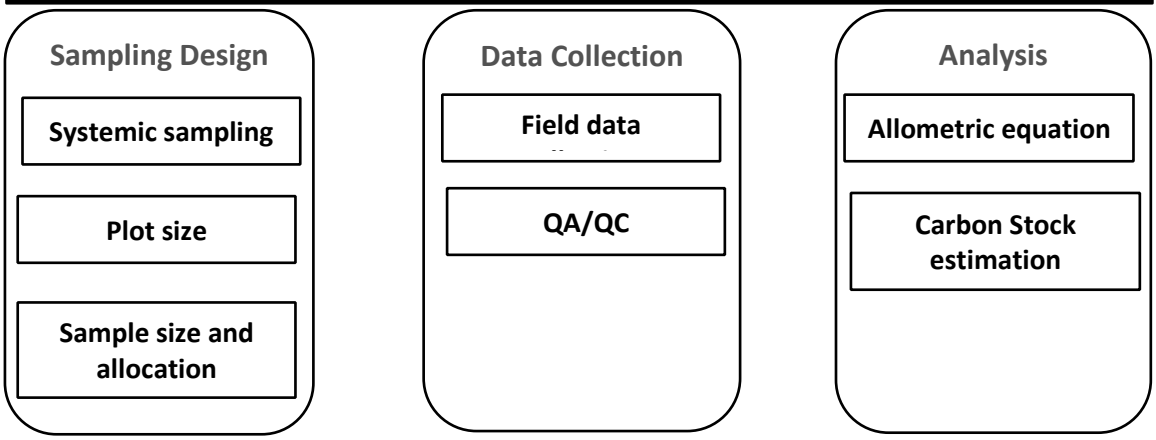
[26] Standar Nasional Indonesia (Indonesia National Standard) No. 8033 year 2014 regarding Method for Estimation of Forest Cover Changes based on Result of Visual Interpretation of Optical Remote Sensing Imagery (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf).

[27] Perdirjen Planologi (2015). Pedoman pemantauan penutupan lahan (guidance for monitoring land cover change). https://sigap.menlhk.go.id/sigap-trial/files/pages/perdirjen-planologi-2015-pedoman-pemantauan-penutupan-lahan.pdf

No	Land cover type	Code	Description
1	Primary dry land forest	2001	Natural tropical forests growing on non-wet habitat including lowland, upland, and montane forests with no signs of logging activities. The forest includes heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest, which shows no, or little, influence from human activities such as logging.
2	Secondary dry land forest	2002	Natural tropical forests growing on non-wet habitat including lowland, upland, and montane forests that exhibit signs of logging activities indicated by patterns and signs of logging (appearance roads and patches of logged-over area). The forest includes heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest.
3	Primary swamp forest	2005 biics2020test	Natural tropical forests growing on wet habitat in swamp form, including, brackish swamp, marshes, sago and peat swamp, which shows no, or little, influence from human activities such as logging.
4	Secondary swamp forest / logged forest	20051	Natural tropical forests growing on wet habitat in swamp form, including brackish swamp, marshes, sago and peat swamp that exhibit signs of logging activities indicated by patterns and signs of logging (appearance roads and logged-over patches).
5	Primary mangrove forest	2004	Wetland forests in coastal areas such as plains that are still influenced by the tides, muddy and brackish water and dominated by species of mangrove including Nipa (Nipafrutescens), which shows no, or little, influence from human activities such as logging.
6	Secondary mangrove forest / logged forest	20041	Wetland forests in coastal areas such as plains that are still influenced by the tides, muddy and brackish water and dominated by species of mangrove and Nipa (Nipa frutescens), and exhibit signs of logging activities, indicated by patterns and signs of logging activities.
7	Plantation forest	2006	The appearance of the structural composition of the forest vegetation in large areas, dominated by homogeneous trees species, and planted for specific purposes. Planted forests include areas of reforestation, industrial plantation forest and community plantation forest.
	Non-Forests		
8	Dry shrub	2007	Highly degraded logged over areas on non-wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs.
9	Wet shrub	20071	Highly degraded logged over areas on wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs.
10	Savanna and Grasses	3000	Areas with grasses and scattered natural trees and shrubs. This is typical of natural ecosystem and appearance on Sulawesi Tenggara, Nusa Tenggara Timur, and south part of Papua island. This type of cover could be on wet or non-wet habitat.

No	Land cover type	Code	Description
11	Pure dry agriculture	20091	All land covers associated with agriculture activities on dry/non-wet land, such as tegalan (moor), mixed garden and ladang (agriculture fields).
12	Mixed dry agriculture	20092	All land covers associated with agriculture activities on dry/non-wet land that is mixed with shrubs, thickets, and log over forest. This cover type often results of shifting cultivation and its rotation, including on karts.
13	Estate crop	2010	Estate areas that has been planted, mostly with perennials crops or other agriculture trees commodities.
14	Paddy field	20093	Agriculture areas on wet habitat, especially for paddy, that typically exhibit dyke patterns (pola pematang). This cover type includes rainfed, seasonal paddy field, and irrigated paddy fields.
15	Transmigration areas	20122	Kind of unique settlement areas that exhibit association of houses and agroforestry and/or garden at surrounding.
16	Fish pond/aquaculture	20094	Areas exhibit aquaculture activities including fish ponds, shrimp ponds or salt ponds.
17	Bare ground	2014	Bare grounds and areas with no vegetation cover yet, including open exposure areas, craters, sandbanks, sediments, and areas post fire that has not yet exhibit regrowth.
18	Mining areas	20141	Mining areas exhibit open mining activities such as open-pit mining including tailing ground.
19	Settlement areas	2012	Settlement areas including rural, urban, industrial and other settlements with typical appearance.
20	Port and harbor	20121	Sighting of port and harbor that big enough to independently delineated as independent object.
21	Open water	5001	Sighting of open water including ocean, rivers, lakes, and ponds.
22	Open swamps	50011	Sighting of open swamp with few vegetation.
23	Clouds and no-data		Sighting of clouds and clouds shadow with size more than 4 cm2 at 100.000 scales display.





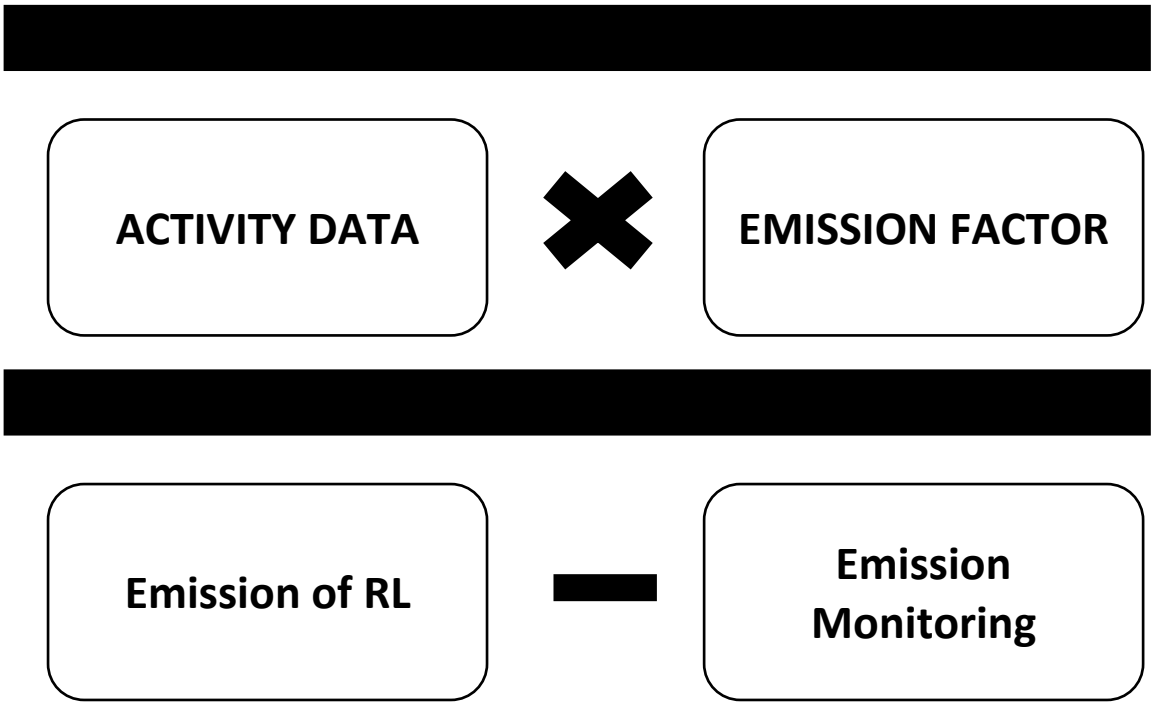


Figure 3. Flow chart for calculation of emissions from deforestation and forest degradation

2.2.2 Calculation

As described in the line diagram above, the basic equation to estimate carbon stock within a specific land cover type in one monitoring year is as follow:

$$GHG_{LC,t} = \left(A_{LC,t} \times B_{LC,t} \times CF_{BC} \times CF_{CCE}\right) \quad \textit{Equation 1a}$$

$$B_{LC,t} = \left(AGB_{LC,t} + \left(RS_{LC} \times AGB_{LC,t}\right)\right) \quad \textit{Equation 1b}$$

Where:

$GHG_{LC,t}$	=	*Gross emissions from deforestation and forest degradation at year t; $tCO_2e*year^{-1}$;*
$A_{LC,t}$	=	*Extent of the land cover type LC in year t; hectare*
$B_{LC,t}$	=	*Average Total Biomass of land cover type LC; ton*
$AGB_{LC,t}$	=	*Average Aboveground Biomass of land cover type LC; ton*
RS_{LC}	=	*Average Root:Shoot ratio of land cover type LC, unitless*
CF_{BC}	=	*Carbon Fraction; biomass to carbon conversion factor, unitless (0.47)*
CF_{CCE}	=	*CO_2eq Fraction; carbon to CO2eq conversion factor, unitless (44/12)*

Further explanation of the terms are given below.

Emission reduction calculation

$$ER_{ERP,t} = RL_t - GHG_t \quad \textit{Equation 1c}$$

Where:

ER_{ERP}	=	*Emission Reductions under the ER Program in year t; $tCO_2e*year^{-1}$.*
RL_{RP}	=	*Gross emissions of the RL from deforestation and forest degradation over the Reference Period; $tCO_2e*year^{-1}$. This is sourced from Annex 4 to the ER Monitoring Report and equations are provided below.*
GHG_t	=	*Monitored gross emissions from deforestation and forest degradation at year t; $tCO_2e*year^{-1}$;*

t = *Number of years during the monitoring period; dimensionless.*

Reference Level (RL_t)

Following the TAP assessment of the ERPD, Indonesia notified the FMT on the intention to apply technical corrections to the reference level for the ER-Program before the signing of the ERPA. The corrected RL estimation may be found in Annex 4, yet a description of the equations is provided below.

Gross emissions of the RL from deforestation over the Reference Period (RL_{RP}) are estimated as the sum of annual change in total biomass carbon stocks (ΔC_{B_t}) during the reference period.

Reference level calculation

$$RL_{RP} = (\sum_{RPs}^{RPe} (GHG_{DD} + GHG_{SM} + GHG_{FIRE}))/t) + GHG_{DEK} \qquad \textit{Equation 1d}$$

Where:

RL_{RP} = *Gross emissions of the RL from deforestation and forest degradation over the Reference Period; $tCO_2e*year^{-1}$. This is sourced from Annex 4 to the ER Monitoring Report and equations are provided below.*

GHG = *Gross emissions from deforestation and forest degradation at year (2005/2006 until 2015/2016); $tCO_2e*year^{-1}$;*

DD = *Annual emission above ground biomass – deforestation and forest degradation*

SM = *Annual emission soil mangrove*

FIRE = *Annual emission fire*

DEK = *Emission from decomposition on year 2017/2018*

t = *Number of years during the reference level period (10 years); dimensionless.*

RPs = *Start of reference period – 2005/2006- 2006/2007*

RPe = *End of reference period – 2014/2015-2015/2016*

The calculations of Emissions in the Monitoring period using the same method as the Reference Level. The calculation of the emission over the reference period and the monitoring period are given in files, fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx. The calculation of the monitored emission (combining Activity Data and Emission Factors) is given in the same file where specific calculation for each carbon pool is given in different sheets with naming convention listed in the following table.

AD_ER_DEF_XXYY	:	Activity Data and Monte Carlo Simulation of Carbon Emission from Deforestation between year 20XX to year 20YY
AD_ER_DEG_XXYY	:	Activity Data and Monte Carlo Simulation of Carbon Emission from Forest Degradation between year 20XX to year 20YY
AD_ER_DEK_XXYY	:	Activity Data and Monte Carlo Simulation of Carbon Emission from Peat Decomposition between year 20XX to year 20YY
ER_SMangrove	:	Activity Data and Monte Carlo Simulation of Carbon Emission from Mangrove Soil for reference and monitoring periods
Peat_Def_Fire	:	Activity Data and Monte Carlo Simulation of Carbon Emission from Fire on Peatland for reference and monitoring periods
FireStableForest	:	Activity Data and Monte Carlo Simulation of Carbon Emission from Fire on Stable Forest for reference and monitoring periods

Beside these main worksheets, the following sheets are also available to help understand the calculation of carbon emission:

EF_EKJERP	:	Above ground biomass, root:shoot ratio, carbon fraction, below ground biomass, emissions factors for mangrove, peat and fire used in this work
UncertaintyAD	:	Reference tables for Uncertainties for each land cover change status
ActivityData0616	:	Attribute table of the land cover change map in reference period
ActivityData1521	:	Attribute table of the land cover change map in monitoring period
Sum All	:	Summary of Carbon Emission from each Carbon Pools
Sum Def	:	Summary of Monte Carlo Simulation for Emission from Deforestation
Sum Deg	:	Summary of Monte Carlo Simulation for Emission from Degradation
Sum SMgrv	:	Summary of Monte Carlo Simulation for Emission from Mangrove Soil
Sum PeatDek	:	Summary of Monte Carlo Simulation for Emission from Peat Decomposition
Sum PeatFire	:	Summary of Monte Carlo Simulation for Emission from Fire on Peatland
Sum StableForest	:	Summary of Monte Carlo Simulation for Emission from Fire on Stable Forest
SumSensitivityAnalysis		Summary of Sensitivity Analysis for Each Carbon Pools

The following sections show the calculations of emissions for the different components discussed above.

●CARBON STOCK AND EMISSION FACTOR

The estimation of the carbon stock of the above ground biomass of the six forest-types uses local allometric models, i.e.

- Primary and Secondary Dryland forest (Manuri et al., 2017)
  $AGB = 0.167 \times DBH^{2.56} \times WD^{0.889}$ (Equation 2)

- Primary and Secondary Swamp forest (Manuri et al., 2014)
  $AGB = 0.242 \times DBH^{2.473} \times WD^{0.736}$ (Equation 3)
- Primary and Secondary Mangrove forest (Komiyama et al., 2005)
  $AGB = 0.251 \times WD \times DBH^{2.46}$ (Equation 4)

where:
AGB= Above ground biomass
DBH= Diameter at chest height
WD= Weight density

To convert AGB (t/ha) to C (t/ha) for each forest types, carbon fraction of 0.47 is used as suggested by the IPCC 2006 (C = 0.47 * AGB).

The below ground biomass (BGB) for dry forest is estimated using root-shoot ratio from the IPCC GPG LULUCF (Table 3A.1.8. page 3.168). The value of the ratio is 0.24 for dry forest. For mangrove forest the value is 0.36 based on measurement reported in Komiyama et al., 2005 for mangrove forest in Indonesia. For swamp forest is assumed to be the same as that of mangrove forest in Indonesia.

The data source for the carbon stock of non-forest lands is derived from mainly Indonesian literatures (ER-PD Annex 8.3.). The below ground biomass (BGB) of non-forest classes is also estimated using root-shoot ratio based on IPCC default values (IPCC GPG GL for LULUCF page 3.168 table 3A.1.8). The values of the ratio vary between land cover types, i.e. 0.32 for forest plantation and estate crops), 0.48 for dry and wet shrubs, mix dryland agriculture and transmigration area, and 1.58 for savanna/grassland, pure dryland agriculture, rice paddy, bare ground and settlement.

Emission factors EF_f for biomass consumed by fire can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$$L_{fire} = A * EF_f \quad \text{(Equation 5)}$$

$$EF_f = M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 6)}$$

$$L_{fire} = A * M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 7)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO_2, CH_4, N_2O
A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Chapter 2-page 2.48). The default value of the IPCC combustion factor, C_f, is 0.36

G_{ef} = emission factor, g kg^{-1} dry matter burnt (1580 for CO2, 6.8 for CH4 and 0.20 for N2O, Table 2.5 of 2006 IPCC Guideline, Chapter 2- Page 2.47)

Emission factors EF_f for the peat fires can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$$L_{fire} = A * EF_f \quad \text{(Equation 8)}$$

$$EF_f = M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 9)}$$

$$L_{fire} = A * M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 9)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO2, CH_4, N_2O
A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Volume 4, Chapter 2-page 2.48)

G_{ef} = mission factor, g kg^{-1} dry matter burnt (default values in Table 2.7, Chapter 2 of 2013 Supplement to 2006 IPCC, page 2.41)

The M_B for the peat is 353 tons dry matter per hectare following IPCC default (Table 2.6 of the Chapter 2 in page 2.40, 2013 Supplement to the 2006 IPCC). The M_B depends on depth of peat and bulk density of the peat. Based on measurement in Central Kalimantan, the M_B is about 505 tons dry matter per hectare with assumption that the average depth of peat burn is 0.33 m and bulk density 0.153 t/m^3 (MRI 2013). The MRI (2013) document is provided in this following link https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/8_Final Report_EN_Mitsubishi.pdf. However, we adopt the IPCC default as the default considering the data was based on measurement from multiple locations that may represent better general condition. The C_f is taken from the IPCC default value (Tables 2.6 of 2006 IPCC Vol. 4 Chapter 2). The G_{EF} for CO_2 is 1,703 g/kg dry matter burnt referring to Christian et al. (2013) in Table 2.7 of the Chapter 2 of the 2013 Supplement to the 2006 IPCC, page 2.41 and for CH_4 is 21 g/kg dry matter burnt.

Calculation of emission factor of mangrove soil, i.e. the difference between amount of carbon in the mangrove soil (C_M) and amount of carbon in soil on the floor of the aquaculture system (C_{AQ}). Data on the soil carbon of mangrove and abandoned pond is taken from Kauffman *et al.* (2017) based on measurement from the 20 locations in East Kalimantan. The procedure for the sampling is described in Kauffman et al. (2016). Based on measurement in 20 locations in East Kalimantan, the value of C_M is 902.91 tC/ha and the

value of C_{AQ} is 487.31 tC/ha, thus the EF for conversion of mangrove soil to aquaculture system is 415.6 tC/ha (Kauffman, 2017[28]).

- **EMISSIONS FROM DEFORESTATION**

Emissions from deforestation include the following:

- Emissions associated with loss of living forest biomass
- Emissions associated with soil carbon

As described in the previous section, the carbon pools used to measure emissions from deforestation depend on the land type. For deforestation on mineral soils AGB and BGB are included. For deforestation on organic soils (peat forests and mangroves) soil carbon is also included. The methods for calculating emissions from deforestation are described below.

a. Deforestation emissions from living biomass

The method used for the calculation of average annual historical emissions follows the national method (MoEF, 2015)[29] that is consistent with the IPCC. Emissions from deforestation at a given period were calculated by aggregating CO_2 emissions resulting from newly identified deforested areas within that period.

The calculation of CO_2 emissions from deforested areas used the following equation:

$$GE_{ijk=} = A_{ijk} \times EF_{jk} \times (44/12) \qquad \text{(Equation 10)}$$

GE_{ijk} = CO_2 emissions from deforested area-i at forest change class-j to non-forest class-k, in tCO_2e

A_{ijk} = Deforested area-i in forest change class-j to non-forest class-k, in hectare (ha).

EF_j = Emission Factor which is calculated as the difference between carbon stock of forest class-j and carbon stock of non-forest class-k, in ton carbon per ha (tC ha-1). Emission factors for each forest and non-forest class are listed in sub-chapter 3.1.1 ER-PD/Annex 4 ER-MR.

(44/12) is conversion factor from tC to tCO_2e

Carbon stock of the lands after the conversion used in the calculation of the emission from the deforestation is the lifetime average carbon stock. It is assumed that land-cover types after deforestation will not change. This assumption is adopted since it is not practical to track the changes of land cover after deforestation, and it is unlikely that the natural forest that have been converted to non-forest lands will change back to natural forest. The deforestation of primary or secondary forest to non-forested was also counted only once that occur at one particular area. Identification of primary or secondary forest area in particular year is filtered using the primary or secondary forests of the previous years. Thus, the deforestation of primary and secondary forest to non-forested will be detected only in remaining primary or secondary forests of the previous years that have never been deforested before.

The emission from gross deforestation at period t (GEt), was estimated using equation below,

[28] https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1482

[29] https://redd.unfccc.int/files/national_frel_for_redd__in_indonesia_2015.pdf

$$GE_t \sum_{i=1}^{N} \quad \sum_{j=1}^{p} \quad GE_{ijk} \qquad \text{(Equation 11)}$$

GE_t = total emission at period t from deforested area-I in forest class-j to non-forest class-k, expressed in tCO_2

N = number of deforested area units at period t (from t0 to t1), expressed without unit

P = number of forest classes which meet natural forest criterion.

Further, average emissions from deforestation from all periods were calculated as follows:

$$MGE_P = \frac{1}{T} \sum_{t=1}^{p} \quad GE_t \qquad \text{(Equation 12)}$$

MGEP = mean or average emissions from deforestation from all period P (expressed in tCO_2yr^{-1})

t = number of years in period P

The estimation of emission from deforestation from the loss of living biomass between two years (period) used the land use transition matrix.

The emissions from the change of a land use category to other land use category from the transition matrix used the equation 2 and their corresponding emission factors as defined in sub- chapter 3.1.1.

Indonesia's National Forest Monitoring System (NFMS) categorize the whole land uses into six different forest types and 17 land cover types. Ideal carbon emission accounting shall consider every land cover types since they have different carbon content. However, combining 6 forest cover types and 17 non-forest cover types is indeed a tedious work, so the East Kalimantan Carbon Accounting Task Force decided to weight the emission factors of all non-forest cover types and ended up with only six different combinations of the carbon emissions.

b. Deforestation emissions from soil carbon

b1. Emissions from Peat decomposition in deforested areas

The procedures of calculating peat decomposition from deforestation follow three steps as shown in Figure 4. First is defining natural forest in 2006 over peat land, and then step 2 is generating land cover change from each interval year to define a transition area matrix for the associated year of interval. The third step is calculating total annual emissions by multiplying the transition matrix of both areas and associated emission factors.

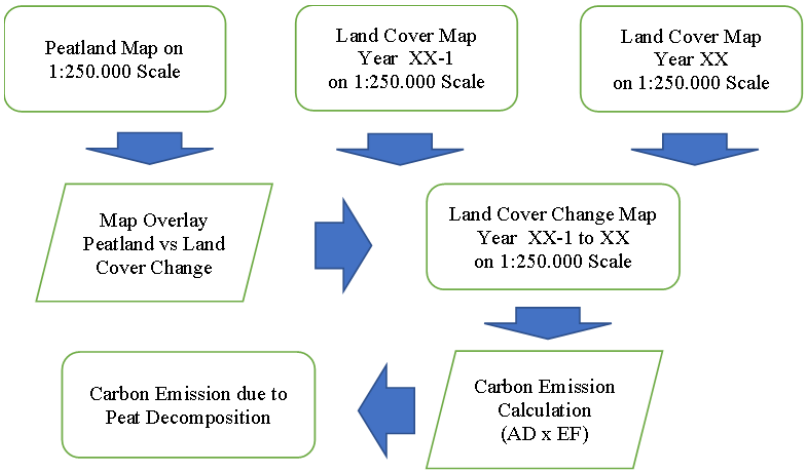


Figure 4 Flow chart for calculation of emissions from peat decomposition

Calculation of emissions from peat decomposition used the same basis as emissions from deforestation. This is due to the fact that once deforestation occurs in peat forest, there will be emissions from removal of the ABG at the time of conversion as describe above, and plus from peat decomposition subsequently. The formula for estimating the emission from peat decomposition is the following:

$$PDE_{ijt} = A_{ijt} \times EF_j \qquad \text{(Equation 13)}$$

PDE = CO_2 emission ($tCO_2yr\text{-}1$) from peat decomposition in peat forest area-i changed into land cover type-j within time period-t
A = area-i of peat forest changed into land cover type-j within time period-t
EF = the emission factor from peat decomposition of peat forest changed into land cover class-j (tcO_2 ha yr-1) [30]

Emission factor for peat decomposition of peat forest change using Paciornik and Rypdal (2006) and IPCC (2014). These emission factors are reported in 2013 Supplement Guideline to 2006 IPCC Guidelines for National GHG Inventory: Wetlands[31]. Most of the data reported in the guideline come from Indonesian experiences.

b2. Emissions from Peat Fire in deforested areas

Emission factors EF_f for the peat fires can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$L_{fire} = A * EF_f$ (Equation 14)

$EF_f = M_B * C_f * G_{ef} * 10^{-3}$ (Equation 15)

$L_{fire} = A * M_B * C_f * G_{ef} * 10^{-3}$ (Equation 16)

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO_2, CH_4, N_2O
A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Volume 4, Chapter 2-page 2.48)[32]

G_{ef} = mission factor, g kg^{-1} dry matter burnt (default values in Table 2.7, Chapter 2 of 2013 Supplement to 2006, page 2.41)[33]

[30] Emission factor for an area of change is an average of the emission factors of the respective land cover before and after. This reflects the assumption that conversion of land cover on peatland between two time periods gradually affects the peat water table implying a gradual peat decomposition emission. For example, the emission factor of secondary forest is 19 tCO2 ha-1 y-1 and the emission factor of bare ground is 51 tCO2 ha-1 y-1, so that the average emission factor for an area changing from secondary forest to bare ground is 35 tCO2 ha-1 y-1.

[31] CHAPTER 1 (ipcc.ch)

[32] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[33] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

The M_B for the peat is 353 tons dry matter per hectare following IPCC default (Table 2.6 of the Chapter 2 in page 2.40, 2013 Supplement to the 2006 IPCC)[34]. The M_B depends on depth of peat and bulk density of the peat. Based on measurement in Central Kalimantan, the M_B is about 505 tons dry matter per hectare with assumption that the average depth of peat burn is 0.33 m and bulk density 0.153 t/m^3 (MRI 2013). However, we adopt the IPCC default as the default considering the data was based on measurement from multiple locations that may represent better general condition. The C_f is taken from the IPCC default value (Tables 2.6 of 2006 IPCC Vol. 4 Chapter 2)[35]. The G_{EF} for CO_2 is 1,703 g/kg dry matter burnt referring to Christian et al. (2013) in Table 2.7 of the Chapter 2 of the 2013 Supplement to the 2006 IPCC, page 2.41 and for CH_4 is 21 g/kg dry matter burnt

Calculation of emissions from peat fire in the deforested area (L_{fire}) is calculated using the following formula (IPCC, 2014):

$$L_{fire} = A * EF_f = A * M_B * C_f * G_{ef} * 10^{-3} \qquad \text{(Equation 17)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CH_4, N_2O, etc.

A = area burnt, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Volume 4 Chapter 2-page 2.48)[36]

G_{ef} = emission factor, g kg^{-1} dry matter burnt (default values in Table 2.5 of the 2006 IPCC Guideline, Volume 4 Chapter 2-page 2.47)[37]

b3. Emissions from *Mangrove Soil in deforested areas*

When mangrove forests are converted to aquaculture, they normally are being cleared and the soil being removed or excavated, normally 1.5 to 2 meters deep. When the organic soils are excavated, they exposed to aerobic condition and being oxidized that emit CO_2. Considering that soil mangrove has very high organic content (Kauffman et al, 2017[38] and Murdiyarso et al, 2015[39]), conversion of mangroves will result in a significant amount of CO_2 emissions.

Calculation of emissions from mangrove soil in the ER program is considered only for conversion to aquaculture. Emissions released are calculated as potential emissions assuming that emissions from organic soil removed from the floor of the aquaculture system are emitted once at the time of the conversion. Thus, the calculation of the emissions from conversion of mangrove to aquaculture (E_{MS}) used the following formula:

---

[34] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

[35] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[36] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[37] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[38] https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1482

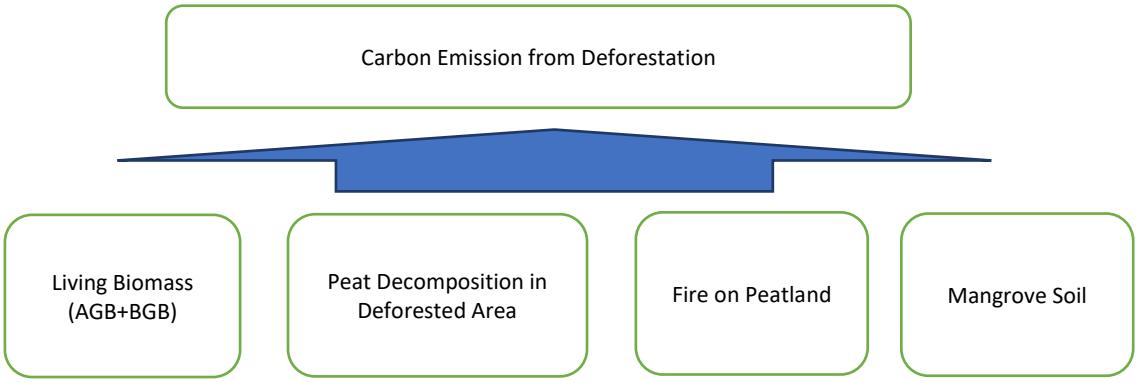
[39] https://www.nature.com/articles/nclimate2734

$$E_{MS} = A_{MA} \times EF_{MA}$$ (Equation 18)

A_{MA} is area of mangrove converted to aquaculture, EF_{MA} is emission factor, i.e. the difference between amount of carbon in the mangrove soil (C_M) and amount of carbon in soil on the floor of the aquaculture system (C_{AQ}).

Summary: Average Historical Emissions from Deforestation

Emissions from deforestation is calculated based on the emissions associated with loss of living forest biomass (AGB and BGB), and the emissions associated with soil carbon. The Emission from soil includes the emission from peat soil due to decomposition process, and fire events, and also the emission from mangroves soil due to mangrove conversion to aquaculture.



- **EMISSIONS FROM FOREST DEGRADATION**

The emission from degradation of natural forest include:

1. *Emissions due to the degradation of primary forest into secondary forest*
2. *Emissions due to further degradation of secondary forest caused by fire*
3. *Emissions from peat decomposition in secondary forests*

a. Emissions from forest degradation of primary forest to secondary forest

The assessment of changes of primary forest to secondary forest and the estimation of emissions from the removal of the living biomass (AGB and BGB) and decomposition of organic soils follows a similar procedure as that of the deforestation (Equations 2-4). The degradation of primary forest to secondary forest was also counted only once that occur at one particular area, similar to the procedure used in calculating the deforested area. Identification of secondary forest area in particular year is filtered using the primary forests of the previous years. Thus, the degradation of primary forest to secondary forest will be detected only in remaining primary forests of the previous years that have never been degraded before.

The estimation of emission from forest degradation from the loss of living biomass (change of primary to secondary forest) between two years (period) used the land use transition matrix in all forests (production and non-production forests).

The emissions from the change of primary to secondary used the equation 19. For example, the emission from 41,722.33 ha degraded area (Primary dryland forest to Secondary dryland forests; 2001-2002) occurred in the period 2006 and 2009 is calculated as follow:

$E_{2001\text{-}2002} = A * (EF_{BC} – EF_{AC}) *44/12$ (Equation 19)

Where:

EF_{BC} = *Emission Factor of the specific area with previous land cover type before forest degradation occured; tC*year^{-1};*

EF_{AC} = *Emission Factor of the specific area with current land cover type after forest degradation occured; tC*year^{-1};*

$E_{2001\text{-}2002}$ = 41,722.33*(167.3-122.06)*44/12 = 6,922,432.35 ton CO_2 or about 2,307,477.45 tCO_2e per year.

b. Emissions due to further degradation of stable secondary forest caused by fire

Emission factors EF_f for biomass consumed by fire can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following equation 14,15 and 16. Gas emission factor from dry matter burnt for CO_2, CH_4 and N_2O is 1701.33 g kg^{-1}, 21 g kg^{-1} and 0.20 g kg^{-1} respectively.

Fire in secondary forest will result in further degradation and in more emissions. Estimation of the stable forest area affected by fire is by delineating burnt area of the stable forest (forests that remained as secondary forest throughout the reference period) hotspot (see Annex 4 section 8.4.3). This is to avoid double counting of emissions in which the loss of biomass due to fire in the deforested forest is not included. The implication of this is that when the secondary forests affected by fire are deforested during the future ERP reporting period, we will have to use separate emission factors in the calculation of the emission from deforestation which take into account the loss of carbon due to fire that occurred in the reference period.

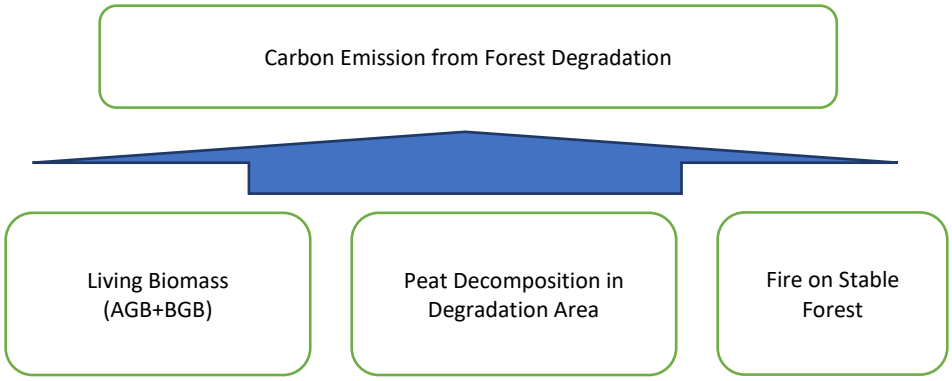
For example, the area of stable secondary forests affected by fire in 2007 was 280.39 ha which is all secondary dryland forest (2002). The total fire emission reached 46,787.70 ton CO_2e (using equation 6). A similar approach was taken for all other years to estimate the emissions from fire in stable secondary forest.

c. Emissions from peat decomposition in secondary forests

The loss of carbon from the decomposition of organic soil occurs in secondary forest (IPCC, 2014). These are considered to be inherited emissions because the disturbance (which changed the forest from primary to secondary) occurred prior to 2006. The estimation of the emission from peat decomposition uses equation 5. Similar to those in deforestation, considering the inherited carbon emissions on peatland, the carbon emission from peat decomposition between year 2017-2018 is considered as total carbon emission for the whole reference period (2006-2016).

Summary: Average Historical Emissions from Forest Degradation

Emissions from forest degradation is calculated based on the emissions associated with loss of living forest biomass (AGB and BGB) due to transition of primary forest to secondary forest, and fires in stable secondary forest. In addition, the emissions associated with soil carbon on peat secondary forest is also included. The Emission calculation from peat soil on secondary forest follows the method of peat decomposition process.


Carbon Emission from Forest Degradation
Living Biomass (AGB+BGB)
Peat Decomposition in Degradation Area
Fire on Stable Forest

3 DATA AND PARAMETERS

3.1 Fixed Data and Parameters

3.1.1 Carbon Stock for Deforestation and Forest Degradation

Parameter:	Carbon stock used for the estimation of emission from deforestation and degradation
Description:	Emission Factor for deforestation and forest degradation, i.e. living biomass (AGB+BGB) of the six forest classes, (primary and secondary dryland forests; primary and secondary swamp forests; primary and secondary mangrove forests); and 17 type of non-forest lands (Plantation forest; Dry shrub; Wet shrub; Savanna and Grasses; Dry agriculture; Mixed dry agriculture; Estate crop' Paddy field' Transmigration areas; Bareland; Settlement; Others (pond, mining, port, open water, open swamp, ponds)
Data unit:	ton /hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	The primary data source for the carbon stock of natural forests is derived from the measurement of AGB from the Permanent Sampling Plots in of National Forest Inventory (NFI) in East Kalimantan (see sheet 'TC_AGB' on file TC_AGB lokal_Uncertainty_23Jul2022 - The estimation of AGB used local allometric equations (Manuri et al , 2017[40] for dryland forest; Manuri et al., 2014[41] for swamp forests; Komiyama et al., 2005[42] for mangrove. The value of the root shoot ratio can be seen on sheet 'TC_Uncertainty' on file TC_AGB ocal_Uncertainty_23Jul2022 – The estimation of the carbon stock of the above ground biomass of the six forest-types uses local allometric models, i.e. ● Dryland forest (Manuri et al., 2017) AGB = 0.167 x $DBH^{2.56}$ x $WD^{0.889}$ ● Swamp forest (Manuri et al., 2014) AGB = 0.242 x $DBH^{2.473}$ x $WD^{0.736}$ ● Mangrove forest (Komiyama et al., 2005) AGB = 0.251 x WD x $DBH^{2.46}$ The data source for the carbon stock of non-forest lands is derived from mainly Indonesian literatures (see sheet 'AGB_Other Studies 'on file TC_AGB ocal_Uncertainty_23Jul2022 – The carbon stock data used are total of above ground (AGB) and below ground biomass (BGB). Calculation for BGB = AGB * Root shoot ratio. The value of the ratio is 0.24 for primary forest. For mangrove and swamp forest the value is 0.36

[40] https://link.springer.com/article/10.1007/s13595-017-0618-1

[41] https://www.sciencedirect.com/science/article/abs/pii/S0378112714005209

[42] https://www.cambridge.org/core/journals/journal-of-tropical-ecology/article/abs/common-allometric-equations-for-estimating-the-tree-weight-of-mangroves/6067C26CECE5B0EF18A319B8DB89B771

<table>
<tr><td></td><td>based on measurement from Komiyama et al., 2005 for mangrove. The values of the ratio vary between land cover types, i.e. 0.32 for forest plantation and estate crops), 0.48 for dry and wet shrubs, mix dryland agriculture and transmigration area, and 1.58 for savanna/grassland, pure dryland agriculture, rice paddy, bare ground and settlement.[43]

Spatial level: regional (province)</td></tr>
<tr><td>Value applied:</td><td>Forest lands
<table>
<tr><th>Land cover</th><th>Code</th><th>AGB (t/ha)</th><th>AGB+BGB (t/ha)</th></tr>
<tr><td>Primary Dryland Forest</td><td>2001</td><td>287.08</td><td>355.98</td></tr>
<tr><td>Secondary dryland forest</td><td>2002</td><td>209.44</td><td>259.70</td></tr>
<tr><td>Swamp primary forest</td><td>2005</td><td>538.56</td><td>731.60</td></tr>
<tr><td>Swamp secondary forest</td><td>20051</td><td>365.30</td><td>496.24</td></tr>
<tr><td>Mangrove primary forest</td><td>2004</td><td>263.38</td><td>357.78</td></tr>
<tr><td>Mangrove secondary forest</td><td>20041</td><td>181.83</td><td>247.01</td></tr>
</table>
Non-forest lands
<table>
<tr><th>Land cover</th><th>Code</th><th>AGB (t /ha)</th><th>AGB+BGB (t/ha)</th></tr>
<tr><td>Plantation forest</td><td>2006</td><td>133.11</td><td>175.71</td></tr>
<tr><td>Dry shrub</td><td>2007</td><td>41.36</td><td>61.21</td></tr>
<tr><td>Wet shrub</td><td>20071</td><td>46.53</td><td>68.86</td></tr>
<tr><td>Savanna and Grasses</td><td>3000</td><td>5.96</td><td>15.37</td></tr>
<tr><td>Pure dry agriculture</td><td>20091</td><td>15.96</td><td>41.17</td></tr>
<tr><td>Mixed dry agriculture</td><td>20092</td><td>47.89</td><td>70.88</td></tr>
<tr><td>Estate crop</td><td>2010</td><td>105.75</td><td>139.59</td></tr>
<tr><td>Paddy field</td><td>20093</td><td>9.36</td><td>24.15</td></tr>
<tr><td>Transmigration areas</td><td>20122</td><td>21.28</td><td>31.49</td></tr>
<tr><td>Bare ground</td><td>2014</td><td>5.32</td><td>13.72</td></tr>
<tr><td>Settlement</td><td>2012</td><td>8.51</td><td>21.96</td></tr>
<tr><td>Port and harbor</td><td>20121</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Open water</td><td>5001</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Open swamps</td><td>50011</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Mining areas</td><td>20141</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Fish pond/aquaculture</td><td>20094</td><td>0.00</td><td>0.00</td></tr>
</table>
After the AGB successfully calculated, the BGB was estimated by multiplying the AGB with the Root:Shoot Ratio, then multiplying the result with the carbon fraction to estimate the carbon content (C /Ha).</td></tr>
<tr><td>QA/QC procedures applied</td><td>Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018[44])</td></tr>
</table>

[43] https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

[44] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

<table>
<tr><td></td><td>QC/QA activity for Indonesia GHG inventory is intended to ensure the quality of GHG reported from various sources in Indonesia. First step of QC is to fill data gap. It is quite normal that some data are not completed. To fill the gap, methods like interpolation and extrapolation are used.
Another process of QC for every GHG data is calculation of the uncertainty. It is widely known that most of GHG data do not represent population instead of collection of the samples. In this situation, bias or uncertainty is something that cannot be avoided. Therefore, uncertainty value is pivotal to describe the character of data and it is good information to make data more proper for the next GHG reporting by program entities (i.e. government agencies).
When GHG data has been collected and pooled in the authorized agency, the next step is to identify the main contributor of emissions from various sources (key category). It can be taken from annual emissions and projected trend. The process also is taken from any anomaly of GHG data reported such as extra ordinary changing of GHG (increase or decrease) in two periods of reported data. Further clarifications are then needed in order to ensure data valid or invalid.</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Key uncertainty comes from (1) sampling error (between 13 to 31%), (2) allometric model (27%-31%), (3) biomass conversion factor to carbon (5.3% Table 4.3 of the 2006 IPCC) and (5) root: shoot ratio (based on the IPCC GPG for LULUCF. And measurement, i.e. between 9% & 32%; See Annex 12.1ERPD for details).

The uncertainty of above ground biomass (AGB) for each land cover type was determined through standard statistical measures combining the mean and the 95% confidence interval. For a complete work regarding the uncertainty of the estimates of AGB, please consult the following file TC_AGB ocal_Uncertainty_23Jul2022 .

For the case of Deforestation, it was too complex to perform all calculations involving all 23 land cover types with 6 forest types and 17 non-forest types. Therefore, a weighting approach was applied to estimate the AGB while error propagation approach was applied to estimate uncertainty values of those non-forest classes. In the end, there were only 6 values for AGB along with uncertainty and standard error for 6 classes of forest.

For forests
<table>
<tr><th>Land cover</th><th>Code</th><th>Uncertainty (%)</th></tr>
<tr><td>Primary Dryland Forest</td><td>2001</td><td>9.27</td></tr>
<tr><td>Secondary dryland forest</td><td>2002</td><td>5.24</td></tr>
<tr><td>Swamp primary forest</td><td>2005</td><td>22.11</td></tr>
<tr><td>Swamp secondary forest</td><td>20051</td><td>29.87</td></tr>
<tr><td>Mangrove primary forest</td><td>2004</td><td>14.61</td></tr>
<tr><td>Mangrove secondary forest</td><td>20041</td><td>18.45</td></tr>
</table>
For non-forests
<table>
<tr><th>Land cover</th><th>Code</th><th>Uncertainty (%)</th></tr>
<tr><td>Plantation forest</td><td>2006</td><td>14.57</td></tr>
<tr><td>Dry shrub</td><td>2007</td><td>31.79</td></tr>
</table></td></tr>
</table>

	Wet shrub	20071	42.19
	Savanna and Grasses	3000	31.79
	Pure dry agriculture	20091	14.57
	Mixed dry agriculture	20092	31.79
	Estate crop	2010	15.86
	Paddy field	20093	14.57
	Transmigration areas	20122	31.79
	Bare ground	2014	14.57
	Settlement	2012	14.57
	Port and harbor	20121	0.00
	Open water	5001	0.00
	Open swamps	50011	0.00
	Mining areas	20141	0.00
	Fish pond/aquaculture	20094	0.00
Any comment:			

*3.1.2 **Fire in Secondary Forest***

Parameter:	Emission factors used for the estimation of emission from Fire in Secondary Forest
Description:	*Emission Factor for biomass fire*
Data unit:	*t CO_2e/ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	*See chapter 2.2.2.* Spatial level: regional (province) with data provided nationally by MoEF.
Value applied:	

Parameter	Value	Unit
Combustion Factor	0.36	Unitless
EF CO_2	1580	(g/kg DM)
EF CH_4	6.8	(g/kg DM))
EF N_2O	0.2	(g/kg DM)
Pooled EF	756.24	(g/kg DM)

<table>
<tr><td>QA/QC procedures applied</td><td>Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)[45].
QC/QA activity for Indonesia GHG inventory is intended to ensure the quality of GHG reported from various sources in Indonesia. First step of QC is to fill data gap. It is quite normal that some data are not completed. To fill the gap, methods like interpolation and extrapolation are used.
Another process of QC for every GHG data is calculation of the uncertainty. It is widely known that most of GHG data do not represent population instead of collection of the samples. In this situation, bias or uncertainty is something that cannot be avoided. Therefore, uncertainty value is pivotal to describe the character of data and it is good information to make data more proper for the next GHG reporting by program entities (i.e. government agencies).
When GHG data has been collected and pooled in the authorized agency, the next step is to identify the main contributor of emissions from various sources (key category). It can be taken from annual emissions and projected trend. The process also is taken from any anomaly of GHG data reported such as extra ordinary changing of GHG (increase or decrease) in two periods of reported data. Further clarifications are then needed in order to ensure data valid or invalid.</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>
<table>
<tr><th>Parameter</th><th>Uncertainty</th><th>Unit</th></tr>
<tr><td>Combustion Factor</td><td>16.67</td><td>%</td></tr>
<tr><td>EF CO_2</td><td>8.29</td><td>%</td></tr>
<tr><td>EF CH_4</td><td>27.94</td><td>%</td></tr>
<tr><td>EF N_2O</td><td>35.00</td><td>%</td></tr>
<tr><td>Pooled EF</td><td>256.60</td><td>%</td></tr>
</table>
</td></tr>
<tr><td>Any comment:</td><td>Key of uncertainty is error in estimating the amount of biomass available for burning, combustion factor and EFs of three gases (CO_2, CH_4 and N_2O).</td></tr>
</table>

3.1.3 ***Peat Fire***

Parameter:	Emission Factor for deforested peat fire
Description:	*Emission Factor for peat fire*
Data unit:	*t CO_2e/ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	*See chapter 2.2.2 .* Spatial level: regional (province)
Value applied:	756.24 t CO_2e/ha.

[45] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

	The value is estimated from the summation of the result of the multiplication of MB, C_f, and G_{ef} for CO_2 and CH_4 (see equation 11)
QA/QC procedures applied	*Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)*[46] QC/QA activity for Indonesia GHG inventory is intended to ensure the quality of GHG reported from various sources in Indonesia. First step of QC is to fill data gap. It is quite normal that some data are not completed. To fill the gap, methods like interpolation and extrapolation are used. Another process of QC for every GHG data is calculation of the uncertainty. It is widely known that most of GHG data do not represent population instead of collection of the samples. In this situation, bias or uncertainty is something that cannot be avoided. Therefore, uncertainty value is pivotal to describe the character of data and it is good information to make data more proper for the next GHG reporting by program entities (i.e. government agencies). When GHG data has been collected and pooled in the authorized agency, the next step is to identify the main contributor of emissions from various sources (key category). It can be taken from annual emissions and projected trend. The process also is taken from any anomaly of GHG data reported such as extra ordinary changing of GHG (increase or decrease) in two periods of reported data. Further clarifications are then needed in order to ensure data valid or invalid.
Uncertainty associated with this parameter:	Key of uncertainty is error in estimating the amount of biomass available for burning, combustion factor and EFs of three gases (CO_2, and CH_4). Uncertainty level is 66.5% (Pooled uncertainty based on confidence interval EF of Tables 2.6 and 2.7 of the 2013 Supplement to the 2006 IPCC Guidelines, $U_{Polled} = \sqrt{(U_{CO2}^2+U_{EF\text{-}CH4}^2)}$
Any comment:	

3.1.4 Emission Factor from Soil

b. Emission Factors from peat soils

Parameter:	Emission Factor for peat decomposition
Description:	Peat emissions happen slowly over time once land is cleared for a number of years depending on the depth of the peat soil. The emissions from peat decomposition do not continue indefinitely, as they cease when the peat has completely decomposed or reached the water table.
Data unit:	*t CO2e/ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	*See chapter 2.2.2* Spatial level: national

[46] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

Value applied:

Land cover	Code	EF (t CO_2/ha/yr)
Primary dryland forest	2001	0
Primary mangrove forest	2004	0
Primary swamp forest	2005	0
Secondary dryland forest	2002	19
Secondary mangrove forest	20041	19
Secondary swap forest	20051	19
Plantation forest	2006	73
Estate crop	2010	40
Pure dry agriculture	20091	51
Mixed dry agriculture	20092	51
Dry shrub	2007	19
Wet shrub	20071	19
Savanna and Grasses	3000	35
Paddy Field	20093	35
Open swamp	50011	0
Fish pond/aquaculture	20094	0
Transmigration areas	20122	51
Settlement areas	2012	35
Port and harbor	20121	0
Mining areas	20141	51
Bare ground	2014	51
Open water	5001	0
Clouds and no-data		Nd

QA/QC procedures applied

Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)[47]

QC/QA activity for Indonesia GHG inventory is intended to ensure the quality of GHG reported from various sources in Indonesia. First step of QC is to fill data gap. It is quite normal that some data are not completed. To fill the gap, methods like interpolation and extrapolation are used.

Another process of QC for every GHG data is calculation of the uncertainty. It is widely known that most of GHG data do not represent population instead of collection of the samples. In this situation, bias or uncertainty is something that cannot be avoided. Therefore, uncertainty value is pivotal to describe the character of data and it is good information to make data more proper for the next GHG reporting by program entities (i.e. government agencies).

When GHG data has been collected and pooled in the authorized agency, the next step is to identify the main contributor of emissions from various sources (key category). It can be taken from annual emissions and projected trend. The process also is taken from any anomaly of GHG data reported such as extra ordinary changing of GHG (increase or decrease) in two periods of reported

[47] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

<table>
<tr><td></td><td>data. Further clarifications are then needed in order to ensure data valid or invalid.</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Key uncertainty comes from sampling error (number of samplings, timing of sampling, length of the time between sampling taken to processing in laboratory).

The uncertainty is taken from the 2013 supplement for 2006 IPCC Guideline (IPCC, 2014)[48]

<table>
<tr><th>Land cover</th><th>Code</th><th>Uncertainty (%)</th></tr>
<tr><td>Primary dryland forest</td><td>2001</td><td>0.0</td></tr>
<tr><td>Primary mangrove forest</td><td>2004</td><td>0.0</td></tr>
<tr><td>Primary swamp forest</td><td>2005</td><td>0.0</td></tr>
<tr><td>Secondary dryland forest</td><td>2002</td><td>84.2</td></tr>
<tr><td>Secondary mangrove forest</td><td>20041</td><td>84.2</td></tr>
<tr><td>Secondary swap forest</td><td>20051</td><td>84.2</td></tr>
<tr><td>Plantation forest</td><td>2006</td><td>20.5</td></tr>
<tr><td>Estate crop</td><td>2010</td><td>55.0</td></tr>
<tr><td>Pure dry agriculture</td><td>20091</td><td>86.3</td></tr>
<tr><td>Mixed dry agriculture</td><td>20092</td><td>86.3</td></tr>
<tr><td>Dry shrub</td><td>2007</td><td>84.2</td></tr>
<tr><td>Wet shrub</td><td>20071</td><td>84.2</td></tr>
<tr><td>Savanna and Grasses</td><td>3000</td><td>108.6</td></tr>
<tr><td>Paddy Field</td><td>20093</td><td>108.6</td></tr>
<tr><td>Open swamp</td><td>50011</td><td>0.0</td></tr>
<tr><td>Fish pond/aquaculture</td><td>20094</td><td>0.0</td></tr>
<tr><td>Transmigration areas</td><td>20122</td><td>86.3</td></tr>
<tr><td>Settlement areas</td><td>2012</td><td>108.6</td></tr>
<tr><td>Port and harbor</td><td>20121</td><td>0.0</td></tr>
<tr><td>Mining areas</td><td>20141</td><td>86.3</td></tr>
<tr><td>Bare ground</td><td>2014</td><td>86.3</td></tr>
<tr><td>Open water</td><td>5001</td><td>0</td></tr>
<tr><td>Clouds and no-data</td><td></td><td>Nd</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

b. Emission Factors from mangrove soils

Parameter:	Emission Factor for mangrove soil and shrimp pond

[48] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

Description:	Calculation of emissions from mangrove soil in the ER program is considered only for mangrove forest converted to aquaculture. Emissions released are calculated as potential emissions assuming that emissions from organic soil removed from the floor of the aquaculture system are emitted once at the time of the conversion.
Data unit:	*Ton CO_2e /hectare*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	Data on the soil carbon of mangrove and abandoned pond is taken from Kauffman et al. (2017)[49] based on measurement from the 20 locations in East Kalimantan. The procedure for the sampling is described in Kauffman et al. (2016)[50] Data can see at sheet 'Mangrove Soils 'on file TC_AGB ocal_Uncertainty_23Jul2022. Spatial level: province
Value applied:	902.91 tCO_{2e}/ha (mangrove) 487.31 tCO_{2e}/ha (abandoned shrimp pond) EF = 415.6 tCO_{2e}/ha Uncertainty = 33.4%.
QA/QC procedures applied	*Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)*[51] QC/QA activity for Indonesia GHG inventory is intended to ensure the quality of GHG reported from various sources in Indonesia. First step of QC is to fill data gap. It is quite normal that some data are not completed. To fill the gap, methods like interpolation and extrapolation are used. Another process of QC for every GHG data is calculation of the uncertainty. It is widely known that most of GHG data do not represent population instead of collection of the samples. In this situation, bias or uncertainty is something that cannot be avoided. Therefore, uncertainty value is pivotal to describe the character of data and it is good information to make data more proper for the next GHG reporting by program entities (i.e. government agencies). When GHG data has been collected and pooled in the authorized agency, the next step is to identify the main contributor of emissions from various sources (key category). It can be taken from annual emissions and projected trend. The process also is taken from any anomaly of GHG data reported such as extra ordinary changing of GHG (increase or decrease) in two periods of reported data. Further clarifications are then needed in order to ensure data valid or invalid.
Uncertainty associated with this parameter:	Key uncertainty comes from sampling error
Any comment:	

3.2 Monitored Data and Parameters

This section outlines all data and parameters that are monitored during the Period 1 July 2019 – 31 December 2020.

[49] https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1482

[50] https://link.springer.com/article/10.1007/s11273-015-9453-z

[51] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

3.2.1. DEFORESTATION

Deforestation

a. Deforestation from forest categories to non-forest categories

<table>
<tr><td>Parameter:</td><td>Land cover change from forest to non-forest</td></tr>
<tr><td>Description:</td><td>Area of land cover change between 1 July 2019 – 31 December 2020. The land use transition matrices between these periods are generated to estimate the change of area from forest categories to non-forest categories.</td></tr>
<tr><td>Data unit:</td><td>hectare</td></tr>
<tr><td>Value monitored during this Monitoring/Reporting Period:</td><td>Area:

<table>
<tr><th>Land Cover Transition</th><th>1 July 2019 - 30 June 2020 (Ha)</th><th>1 July 2020 – 30 June 2021 (Ha)*</th></tr>
<tr><td>Primary Dryland Forest to Non-Forest</td><td>0.00</td><td>68.05</td></tr>
<tr><td>Primary Mangrove Forest to Non-Forest</td><td>0.00</td><td>32.64</td></tr>
<tr><td>Primary Swamp Forest to Non-Forest</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Secondary Dryland Forest to Non-Forest</td><td>4,397.15</td><td>12,142.51</td></tr>
<tr><td>Secondary Mangrove Forest to Non-Forest</td><td>80.48</td><td>430.54</td></tr>
<tr><td>Secondary Swamp Forest to Non-Forest</td><td>1,167.22</td><td>463.67</td></tr>
</table>
* The land cover transition in 1 July 2020 – 30 June 2021 considered only half of the value since the data used for this monitoring period ranges from 1 July 2020 to 31 December 2020
Please note that the land cover transition area presented here is so called adjusted area since it was adjusted according to the level of uncertainty in land cover change classification process. Further details about adjusting the land cover change can be found in the next chapter related to uncertainties.

Detail calculation on excel file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx</td></tr>
<tr><td>Source of data and description of measurement/calculation methods and procedures applied:</td><td>Activity data used in the monitoring period came from Ministry of Environment and Forestry national land cover data (NFMS).
The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land</td></tr>
</table>

	cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail in MS Excel file named: https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/AccuracyAssessmentEK_LandCover2020_2021_v02U.xlsx It is available online at https://nfms.menlhk.go.id/ , which is coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of geospatial portal under the one map policy. Further details on the method for land cover mapping conducted by MoEF , including the method for remote sensing data processing and analysis including type of sensors and the details of the images used can be found here https://jurnal.ugm.ac.id/ijg/article/view/12496/9041
QA/QC procedures applied	SNI 8033-2014 - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf) and Tosiani, et.al (2020) Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf).
Uncertainty for this parameter:	Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and that of land cover changes. The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[52], substituting a post stratified estimator of variance (Olofsson 2019, pers. com.)[53]. The uncertainty of the land cover change (deforestation) for the period of 1 July 2019- 30 June 2020 and 1 July 2020 – 30 June 2021 are 4,69% and 5.78%, respectively.
Any comment:	

b. Peat decomposition

Parameter:	Peat decomposition
Description:	Area of land cover changes between 1 July 2019 – 30 June 2020 and 1 July 2020 – 30 June 2021. The land use transition matrices between these periods are generated to estimate the change of areas from forest categories to non-forest categories that occurred in the peatland for the estimation of emissions from peat decomposition from the deforested areas. The use of 1 July 2017 – 30 June 2018 period, which is different than the reference period of other carbon pools (2006-2016) for peatland deforestation is part of an **agreement with CFPs** considering the Indicator 13.1 of the Methodological Framework. Indonesia is not eligible for applying an upward adjustment to its reference level, while Indonesia

[52] https://www.sciencedirect.com/science/article/abs/pii/S0034425714000704 or https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[53] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_Indonesia_AD_Estimation_2019.pdf

	has peatland in which such indicator is not possible to be applied for countries that have peatland forest. For reference level using period between 1 July 2017 – 30 June 2018.
Data unit:	Hectare
Value monitored during this Monitoring/Reporting Period:	

Land cover change	1 July 2019 – 30 June 2020 (Ha)	1 July 2020 – 30 June 2021 (Ha)*
2002-2002	69.10	69.10
2004-2004	1,359.74	1,360.63
2005-2005	6,463.37	6,463.37
2007-2007	9.62	9.62
2010-2010	1,898.13	1,935.03
2012-2012	4.26	4.26
2014-2014	130.51	145.98
2014-2010	36.07	0.00
5001-5001	2.69	45.58
20041-20041	4,423.79	4,380.18
20051-20051	43,189.86	43,189.86
20051-2014	15.31	0.00
20071-20071	646.67	1,357.91
20092-20092	32.17	32.02
20141-20141	45.07	45.07
Total	59,038.59	59,038.59

Note: The first column shows land cover change using cover class codes

* The land cover transition in 1 July 2020 – 30 June 2021 considered only half of the value since the data used for this monitoring period ranges from 1 July 2020 to 31 December 2020

Source of data and description of measurement/calculation methods and procedures applied:	Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS). The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries was prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analysed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analysed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail in MS Excel file named:

<table>
<tr><td></td><td>https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/AccuracyAssessmentEK_LandCover2020_2021_v02U.xlsx

It is available online at https://nfms.menlhk.go.id/ , which is coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of geospatial portal under the one map policy.
The peat area map is provided by the Ministry of Agriculture (2011), through national survey of peatland, updated by the MoEF.
The description of methods for data derived from remote sensing images including type of sensors and the details of the images used can be found here https://jurnal.ugm.ac.id/ijg/article/view/12496/9041</td></tr>
<tr><td>QA/QC procedures applied</td><td>SNI 8033-2014[54] - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries and Tosiani, et.al (2020) Standard Operating Procedure (SOP)[55]: Calculation of Accuracy and Uncertainty of Land Cover Change.</td></tr>
<tr><td>Uncertainty for this parameter:</td><td>Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and that of land cover changes.

The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[56], substituting a post-stratified estimator of variance (Olofsson 2019[57], pers. com.).

1 July 2019 – 30 June 2020
<table>
<tr><th>Land cover change</th><th>Uncertainty (%)</th></tr>
<tr><td>20051-2014</td><td>11.05</td></tr>
<tr><td>2002-2002</td><td>10.28</td></tr>
<tr><td>2004-2004</td><td>10.28</td></tr>
<tr><td>2005-2005</td><td>10.28</td></tr>
<tr><td>20041-20041</td><td>10.28</td></tr>
<tr><td>20051-20051</td><td>10.28</td></tr>
<tr><td>2007-2007</td><td>10.45</td></tr>
<tr><td>2010-2010</td><td>10.45</td></tr>
<tr><td>2012-2012</td><td>10.45</td></tr>
<tr><td>2014-2010</td><td>10.45</td></tr>
<tr><td>2014-2014</td><td>10.45</td></tr>
<tr><td>5001-5001</td><td>10.45</td></tr>
<tr><td>20071-20071</td><td>10.45</td></tr>
<tr><td>20092-20092</td><td>10.45</td></tr>
<tr><td>20141-20141</td><td>10.45</td></tr>
</table></td></tr>
</table>

[54] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

[55] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

[56] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[57] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/11_Olofsson_Indonesia_AD_Estimation.pdf

	1 July 2020 – 30 June 2021 Land cover change / Uncertainty (%) 2002-2002: 10.52 2004-2004: 10.52 2005-2005: 10.52 2007-2007: 10.38 2010-2010: 10.38 2012-2012: 10.38 5001-5001: 10.38 20041-20041: 10.52 20051-20051: 10.52 20071-20071: 10.38 20092-20092: 10.38 2014-2014: 10.38 20141-20141: 10.38
Any comment:	Deforestation and subsequent land cover changes for peat lands. Tracking change over time is necessary to estimate the future inherited emissions because emissions are related to future land cover.

c. Deforestation: Mangrove Forest to aquaculture

Parameter:	Deforestation: Mangrove forest to aquaculture
Description:	Area of land cover changes between 1 July 2019 – 30 June 2020 and 1 July 2020 – 30 June 2021. The land use transition matrices between these periods are generated to estimate the change of areas from mangrove forests to aquaculture/fishpond for the estimation of emission from the loss of soil carbon
Data unit:	Hectare
Value monitored during this Monitoring/Reporting Period:	Land use change / Area 1 July 2019 – 30 June 2020 (ha) / Area 1 July 2020 – 30 June 2021 (ha) Primary mangrove forest to pond: 0 / 28.35 Primary mangrove forest to pond: 0 / 223.46 Total mangrove forest to Pond: 0 / 251.81
Source of data and description of measurement/calculation methods and procedures applied:	Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS). The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014[58]. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon

[58] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

<table>
<tr><td></td><td>emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes.

The result of this assessment is presented in detail in MS Excel file named:
Accuracy Assessment EK Land Cover 2020-2021 v02U.xlsx

It is available online at https://nfms.menlhk.go.id/, which is coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of geospatial portal under the one map policy.
The description of methods for data derived from remote sensing images including type of sensors and the details of the images used is can be found https://jurnal.ugm.ac.id/ijg/article/view/12496/9041</td></tr>
<tr><td>QA/QC procedures applied</td><td>SNI 8033-2014 - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries; and
Tosiani, et.al (2020) Standard Operating Procedure (SOP)[59]: Calculation of Accuracy and Uncertainty of Land Cover Change,</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and that of land cover changes.

The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[60], substituting a post-stratified estimator of variance (Olofsson 2019, pers. com.)[61].
<table>
<tr><th>Land use change</th><th>Uncertainty 2019-2020 (%)</th><th>Uncertainty 2020-2021 (%)%</th></tr>
<tr><td>Mangrove forest to pond</td><td>4.69</td><td>5.78</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td>Deforestation and subsequent land cover changes for peat lands. Tracking change over time is necessary to estimate the future inherited emissions because emissions are related to future land cover.</td></tr>
</table>

3.2.2. FOREST DEGRADATION

a. Forest degradation – from primary forest to secondary forest

Parameter:	*Forest degradation - – from primary forest to secondary forest*

[59] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

[60] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[61] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_Indonesia_AD_Estimation_2019.pdf

<table>
<tr><td>Description:</td><td>Area of degradation, change of primary forest into secondary forests between 1 July 2019 – 30 June 2020 and 1 July 2020 – 30 June 2021, that occurred in all forested land. The land use transition matrices between these periods are generated to estimate the change of area from Primary forests to Secondary Forests</td></tr>
<tr><td>Data unit:</td><td>hectare</td></tr>
<tr><td>Value monitored during this Monitoring/Reporting Period:</td><td>
<table>
<tr><th>Land use change</th><th>Area 1 July 2019 – 30 June 2020 (ha)</th><th>Area 1 July 2020 – 30 June 2021 (ha)</th></tr>
<tr><td>Primary dryland forest to Secondary forest</td><td>0.00</td><td>2,803.26</td></tr>
<tr><td>Primary mangrove forest to secondary forest</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Primary swamp forest to secondary forest</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Total area</td><td>0.00</td><td>2,803.26</td></tr>
</table>
</td></tr>
<tr><td>Source of data and description of measurement/calculation methods and procedures applied:</td><td>Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS).
The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014[62]. The land cover map series then further analysed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analysed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes.

It is available online at https://nfms.menlhk.go.id/ , which coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of the geospatial portal under the one map policy.
The description of methods for data derived from remote sensing images including type of sensors and the details of the images used is can be found https://jurnal.ugm.ac.id/ijg/article/view/12496/9041

The result of this assessment is presented in detail in MS Excel file named:
Accuracy Assessment EK Land Cover 2020-2021 v02U.xlsx</td></tr>
</table>

[62] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

<table>
<tr><td>QA/QC procedures applied</td><td>SNI 8033-2014[63] – Methods for Forest Cover Change Interpretation from Optical Satellite Imageries; and
Tosiani, et.al (2020)[64] Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change,</td></tr>
<tr><td>Uncertainty for this parameter</td><td>
<table>
<tr><th>Land use change</th><th>1 July 2019 – 30 June 2020
(U %)</th><th>1 July 2020 – 30 June 2021
(U %)</th></tr>
<tr><td>Primary dryland forest to Secondary forest</td><td>0.00</td><td>6.89</td></tr>
<tr><td>Primary mangrove forest to secondary forest</td><td>0.00</td><td>6.89</td></tr>
<tr><td>Primary swamp forest to secondary forest</td><td>0.00</td><td>6.89</td></tr>
</table>
</td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

b. Forest degradation – secondary forest affected by fires

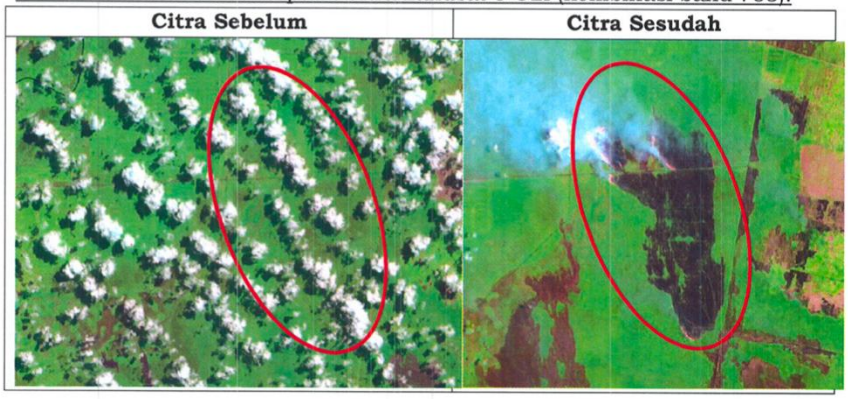
<table>
<tr><td>Parameter:</td><td>Forest degradation – Forest degradation – secondary forest affected by fires</td></tr>
<tr><td>Description:</td><td>Area of secondary forest affected by fires in 1 July 2019 – 30 June 2020, that identified using burnt scare area (NFMS – https://nfms.menlhk.go.id), which coupled with webGIS at geoportal.menlhk.go.id for display and viewing.</td></tr>
<tr><td>Data unit:</td><td>Hectare</td></tr>
<tr><td>Value monitored during this Monitoring/Reporting Period:</td><td>This data is the three secondary forest classes (Dry land forest, swamp forest and mangrove forest).
<table>
<tr><th>Land Cover Change</th><th>1 July 2019 – 30 June 2020
Burnt scare area (ha)</th><th>1 July 2020 – 30 June 2021
Burnt scare area (ha)</th></tr>
<tr><td>Secondar dryland forest</td><td>0.00</td><td>0.03</td></tr>
<tr><td>Secondary mangrove forest</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Secondary swamp forest</td><td>0.57</td><td>0.00</td></tr>
<tr><td>Total</td><td>0.57</td><td>0.03</td></tr>
</table>
</td></tr>
<tr><td>Source of data and description of measurement/calculation methods and procedures applied:</td><td>Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS).
The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014[65]. The land cover map series then further analysed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan</td></tr>
</table>

[63] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

[64] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

[65] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

	MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail In MS Excel file named: Accuracy Assessment EK Land Cover 2020-2021 v02U.xlsx It is available online at https://nfms.menlhk.go.id/ which coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of the geospatial portal under the one map policy. The description of methods for data derived from remote sensing images including type of sensors and the details of the images used is can be found https://jurnal.ugm.ac.id/ijg/article/view/12496/9041 The geospatial data used for estimating the fire on secondary forest are produced by the DGCC especially the Forest Fire Mitigation and Control Directorate under the DGCC of MoEF. The technical procedures are given in the DGCC Regulations No P.11/PPI/PKHL/KUM/1/12/2018 (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Perdirjen P. 11 Pedoman Teknis Penaksiran Luas Karhutla (2).pdf) . Data Source (before and after fire events): 1. Optical medium-resolution satellite imagery data (Landsat, Sentinel) 2. Hotspot indication from NOAA-AVHRR, SNPP-VIIRS, ATSR, Terra/Aqua MODIS, Himawari and other potential satellite missions Technical Procedures: 1. Geometric and Radiometric Corrections 2. Visual Interpretation and Delineation of Fire-Affected Forest Areas 2.1. Remote Sensing Image Fusion (as necessary) 2.2. Image Sharpening 2.3. Spatial Filtering 2.4. Geometric and Metadata Format Preparation 2.5. Compiling optical data with hotspot data 2.6. Delineation of Fire Affected Forest The fire-affected forest is detected by comparing the previous and current optical satellite imageries by looking at the color of the area. Dark brownish of black dominated areas meant that those particular area were burnt.

<table>
<tr><td></td><td>Contoh ciri area terbakar pada Citra Landsat 8 OLI (kombinasi band 753):
 
</td></tr>
<tr><td>QA/QC procedures applied</td><td>SNI 8033-2014[66] - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries, Tosiani, et.al (2020)[67] Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change, and DGCC regulation number P.11/PPI/PKHL/KUM.112/2018 on Technical Guidelines for the Assessment of Forest and Land Fire Areas[68].</td></tr>
<tr><td>Uncertainty for this parameter</td><td>Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and from land cover changes (uncertainty of land cover changes).
The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[69], substituting a post-stratified estimator of variance (Olofsson 2019)[70].

<table>
<tr><th>Land Cover Change</th><th>Uncertainty 1 July 2019 – 30 June 2020 (%)</th><th>Uncertainty 1 July 2020 – 30 June 2021 (%)</th></tr>
<tr><td>Secondar dryland forest</td><td>2.39</td><td>3.26</td></tr>
<tr><td>Secondary mangrove forest</td><td>2.39</td><td>3.26</td></tr>
<tr><td>Secondary swamp forest</td><td>2.39</td><td>3.26</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td>Forest degradation. This is to estimate the loss of above ground biomass of the stable secondary forest due to fire.</td></tr>
</table>

[66] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

[67] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

[68] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Perdirjen_P._11_Pedoman_Teknis_Penaksiran_Luas_Karhutla.docx

[69] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[70] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_Indonesia_AD_Estimation_2019.pdf

4 QUANTIFICATION OF EMISSION REDUCTIONS

4.1 ER Program Reference level for the Monitoring/Reporting Period covered in this report

Under the corrected Reference Level (see Annex 4), the average annual historical emissions from deforestation reached 23,949,437.32 tCO_2e per year, whereas from forest degradation reached 3,520,419.08 tCO_2e per year. 'Deforestation' includes all emissions associated with change from forest to non-forest cover, including living biomass, peat decomposition, peat fires in deforested areas, and mangrove soil in deforested areas. 'Degradation' includes all emissions associated with change from high biomass forest to lower biomass forest and includes living biomass, and peat decomposition and fires in secondary forest. Based on that, the reference level for this reporting period is 27,469,856.40 tCO_2e per year.

Table 4 - 1. Comparison of Reference Level between 2019 ERPD and Technical Correction

	ER Program Document		Technical Correction	
	Deforestation (ton CO_2e/yr)	**Forest degradation (ton CO_2e/yr)**	**Deforestation (ton CO_2e/yr)**	**Forest degradation (ton CO_2e/yr)**
Living biomass	49,735,619.29	14,701,507.87	23,058,668.41	2,391,882.73
Peat decomposition	109,330.85	929,875.96	55,852.42	987,517.06
Fire	33,555.69	1,804,726.13	105,267.80	141,019.29
Mangrove soil	1,091,581.22	0.00	729,648.69	0.00
Total	**50,970,087.05**	**17,436,109.96**	**23,949,437.32**	**3,520,419.08**
	68,406,197.00		**27,469,856.40**	

From Table 4 -1 above, the emission calculation in 2019 ERPD is most likely overestimated. There is significant different in term of adjusted total deforestation area in reference period 2006-2016 from the previous calculation in ERPD (2019) and technical correction. The deviation is 422,796 hectares as shown in Table A4.1. Adjusted forest degradation is also reduced quite significant from ERPD and technical correction, from 276,780 hectares to 140,974 hectares. On the other hand, emission factor (EF) in technical correction is recalculated using NFI samples rather than PSP FCPF samples, and the EF value for 6 forest classes is higher that EF using in ERPD. As consequences, once deforestation happened in this forest classes, the emission will systematically increase. Therefore, the size of deforestation area is the major contributor of different emission calculation between ERPD (2019) and technical correction.

Table 4-2. The emission of deforestation and forest degradation during monitoring and reporting period based on emission reference Level from technical correction 2006 - 2016

Year of Monitoring/ Reporting period *t*	**Average annual historical emissions from deforestation over the Reference Period (tCO_{2-e}/yr)**	**If applicable, average annual historical emissions from forest degradation over the Reference**	**If applicable, average annual historical removals by sinks over the Reference**	**Adjustment, if applicable (tCO_{2-e}/yr)**	**Reference level (tCO_{2-e}/yr)**

		Period (tCO_{2-e}/yr)	Period (tCO_{2-e}/yr)		
MONITORING PERIOD					
1 July 2019 – 30 June 2020	23,949,437.32	3,520,419.08			27,469,856.40
1 July 2020 – 30 June 2021	23,949,437.32	3,520,419.08			27,469,856.40
Total	47,898,874.64	7,040,838.17			54,939,712.80
REPORTING PERIOD					
1 July 2019 – 30 June 2020	23,949,437.32	3,520,419.08			27,469,856.40
1 July 2020 – 31 December 2020	11,974,718.66	1,760,209.54			13,734,928.20
Total	35,924,155.98	5,280,628.62			41,204,784.60

See sheet 'Sum All' on file for emission calculation – https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx

4.2 Estimation of emissions by sources and removals by sinks included in the ER Program's scope

Based on calculation emissions by sources from the ER program during the Monitoring period of 1 July 2019 – 30 June 2021, emissions from deforestation reached 7,874,351.40 tCO_2e whereas from forest degradation reached 1,485,351.53 tCO_2e using the same categories described above, and program during the Monitoring period 1 July 2020 – 30 June 2021, emissions from deforestation reached 5,765,850.22 tCO_2e whereas from forest degradation reached 1,485,166.81 tCO_2e. So, total net emissions for period 1 July 2019 – 30 June 2020 is 2,108,685.90 tCO_2e and 1 July 2020 – 30 June 2021 is 7,251,017.03 tCO_2e. See sheet 'Sum All' on file for emission calculation – https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx

Table 4-3. Emissions from Deforestation and Degradation **1 July 2019 – 30 June 2021**

Year of Monitoring/Reporting Period	Emissions from deforestation (tCO_{2-e}/yr)	If applicable, emissions from forest degradation (tCO_{2-e}/yr)*	If applicable, removals by sinks (tCO_{2-e}/yr)	Net emissions and removals (tCO_{2-e}/yr)
1 July 2019 – 30 June 2020	2,108,501.18	184.72		2,108,685.90
1 July 2020 – 30 June 2021	5,765,850.22	1,485,166.81		7,251,017.03
Total	7,874,351.40	1,485,351.53		9,359,702.93

Since the reporting period is from **1 July 2019 to 31 December 2020**, then the net emissions and removals need to be adjusted as follows:

Table 4-4. Emissions from Deforestation and Degradation 1 July 2019 – 31 December 2020

Year of Monitoring/Reporting Period	Emissions from deforestation (tCO_{2-e}/yr)	If applicable, emissions from forest degradation (tCO_{2-e}/yr)*	If applicable, removals by sinks (tCO_{2-e}/yr)	Net emissions and removals (tCO_{2-e}/yr)
1 July 2019 – 30 June 2020	2,108,501.18	184.72		2,108,685.90
1 July 2020 – 31 December 2021*	2,882,925.11	742,583.40		3,625,508.51
Total	4,991,426.29	742,768.12		5,734,194.41

* The carbon emission in 1 July 2020 – 31 December 2021 in this table represents **only half** of the carbon emission value between 1 July 2020 to 30 June 2021. The data used for this monitoring period ranges is from 1 July 2020 to 30 June 2021, while the reporting period lasts is from 1 July 2020 to 31 December 2020.

Please see the summary of the calculation here
https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_summary_26Juli2022c.xlsx

4.3 Calculation of emission reductions

Based on reference level emissions with deduction from net emissions under the ER program during the monitoring period (1 July 2019 – 30 June 2020 and 1 July 2020 – 31 December 2020), the East Kalimantan has produced emission reductions of 35,470,590 tCO_2e. See sheet 'Sum All' on file for emission calculation –
https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx

Table 4-4. Emissions Reduction During Reporting Period

Total Reference Level emissions during the Reporting Period (tCO_2-e)	41,204,784.60
Net emissions and removals under the ER Program during the Reporting Period (tCO_2-e)	5,734,194.41
Emission Reductions during the Reporting Period (tCO_2-e)	35,470,590.19

Table 4-5. Emissions Reduction Calculation

Total Reference Level emissions during the Monitoring Period (tCO_2-e)	54,939,712.80
Net emissions and removals under the ER Program during the Monitoring Period (tCO_2-e)	9,359,702.92
Emission Reductions during the Monitoring Period (tCO_2-e)	45,580,009.88
Length of the Reporting period/Length of the Monitoring Period (# days/# days)	549/730 days
Emission Reductions during the Reporting Period (tCO_2-e)	35,470,590.19 *+.

*) Emission Reduction Calculation during the reporting period presented in table 4-4 covers the period of 549 days, started from 1 July 2019 to 31 December 2020. Therefore, calculation of Emission Reduction in the reporting period is confined to between 1 July 2019 to 30 June 2020 and 1 July 2020 to 30 June 2021 (as defined in section 1). The Emission Reduction calculation is then done with the sum of emissions reductions for 1 July 2019 – 30 June 2020 + half of emission reductions for 1 July 2020 – 30 June 2021. This makes the calculation balanced since both reference period and crediting period lasts 1.5 years (549 days).

[+)] AENOR has received an official communication from FCPF Secretariat that confirms as acceptable that East Kalimantan ER Program deviates from the schedule set on the ERPA for the first reporting period of Tranches A and B (June 18, 2019 – December, 2020) and use the July 1, 2019 as the start date of the Crediting Period. Please see the letter from FCPF Secretariat to AENOR here.

Please see the summary of the calculation here
https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_summary_26Juli2022c.xlsx

5 UNCERTAINTY OF THE ESTIMATE OF EMISSION REDUCTIONS

5.1 Identification, assessment and addressing sources of uncertainty

Identification, assessment and addressing sources of uncertainty are presented below as follows:

Table 5. Identification, assessment and addressing sources of uncertainty

Sources of uncertainty	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Activity Data				
Measurement	Annual land cover map produced by MOEF is the primary sources of activity data in this ER program. The map accuracy relies on the interpreter which varies in term of experience when the manual interpretation took place. This situation may lead to inconsistency during delineation of Landsat image to land cover class. As deforestation and forest degradation are identified using this map, therefore the accuracy of land cover map is pivotal and contribute significantly to overall ER uncertainty. In order to maintain consistency of the delineation process, the Landsat interpreter must have equal capacity and basic understanding about the interpretation process. Through training program, the capacity of interpreter will be upgraded and refreshed. MOEF as institution that responsible to produce the map, provides Standard Operating Procedures (SOPs) and manuals to guide the interpreters to do the satellite image interpretation. Another unit in MOEF running the QC/QA process is to quantify the land cover map accuracy and to fix any inappropriate data. All this measure action will ensure that the land cover map is accurate and suitable for further analysis including deforestation and forest degradation calculation.	*High (random)*	*YES*	*NO*
Representativeness	As much as 150 points samplings were distributed for each land cover change (LCC) categories. There are 6 possible categories as a result of analysing two land cover maps (T_0 and T_1) that is area of deforestation, forest degradation, forest gain, stable primary forest, stable secondary forest and stable non forest. If all land cover change categories applicable, therefore there will be 900 sample points. Each sample point will be representing an area of 6.25 hectare, so that in total there will be 5,625 hectares of sampling area for assessing the accuracy of East Kalimantan land cover change. In relation to East Kalimantan jurisdictional area, the sampling intensity for all East Kalimantan area is about 0.04% but for deforestation alone, the sampling intensity is 0.15%.	*Low (bias)*	*YES*	*NO*

Sources of uncertainty	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
	Using this guideline, the representatives is well addressed therefore the contribution to overall uncertainty is low.			
Sampling	150 sample points is distributed using stratified simple random sampling for evaluating each land cover change. This is called as probability sampling. This approach ensures that ER program follows a robust sampling design in term of activity data preparation. Robust sampling design will increase the confidentiality of land cover change estimation. Probability sampling is expected to reduce uncertainty and therefore the contribution of sampling is essential.	*High (random / bias)*	*YES*	*YES*
Extrapolation	There is no extrapolation conducted to prepare activity data for this ER program. Deforestation is estimated per forest class, based on reference data. Therefore, this source of uncertainty is not applicable to our approach.	*Intentionally left blank*	*Intentionally left blank*	*NO*
Approach 3	The source of uncertainty of Approach 3 in East Kalimantan ER program may come from massive cloud cover that persist in Landsat images as sources for land cover interpretation. However, as mentioned in the interpretation guideline (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/petunjuk-teknis-penafsiran-citra-satelit-resolusi-sedang.pdf) , on the area where cloud exists, the interpreter may use additional imageries such as mosaics of Landsat image from previous year or high resolution image (SPOT 6/7 if available) or download additional Landsat scene from here http://landsat-catalog.lapan.go.id/	*Low (bias)*	*YES*	*NO*
Emission Factor				
DBH measurement	DBH is variable of tree measured directly during field survey. DBH is proxy data to estimate biomass and carbon using allometric equation. Another variable is tree height. Compare to DBH, tree height is difficult to measure. Both variables are then very important and are contributor for any uncertainty in emission estimation. Plot delineation is also important to ensure only tree inside sample plot that is measured. Technically, during sample plot establishment in the ground, the plot line boundary or delineation is open clear at least 1 meter wide. Flagging tape often puts along the plot line. The process to measure DBH, height and establishing plot delineation follow manual or guideline that already provide by IPSDH MOEF (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Petunjuk Teknis Enumerasi TSP dan PSP.pdf).	*High (bias) Low (random)*	*YES*	*NO*
H measurement		*Low (random)*	*YES*	*NO*
Plot delineation		*Low (random)*	*YES*	*NO*

Sources of uncertainty	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
	Field surveyor is expected one person who has forestry background. The survey team is preferable led by researcher or universities -forestry staff. Training is mandatory prior survey.			
Wood density estimation	The complexity of forests structure and tree species composition in East Kalimantan make wood density important variable for estimating biomass. The inclusion of wood-density classes improves the performance of allometric equation for lowland tropical forests. Furthermore, diameter and wood density are essential variables in estimating AGB in highly diverse tropical ecosystems (Manuri et al., 2017). The source error of wood density is possibly due to limited data availability and variation among samples from the same species. Therefore, it is necessary to encourage more research to add wood density database of tropical forests in East Kalimantan.	*Low (random)*	*YES*	*NO*
Biomass allometric model	Biomass allometric equation directly affects emission factor for each land cover classes. In this ER program, EF uncertainty is expected to get lower and lower. At this point, uncertainty of EF of primary and secondary dryland forest are 9.27% and 5.24%, respectively. This uncertainty is low. It is expected that other land cover classes will have EF uncertainty less than 10% as well. However, the sample tree data used to construct biomass allometric models is still relatively limited to trees of a certain size. Since biomass is calculated using allometric model of one or two measured variables, therefore the contribution of error is quite high to emission prediction. In order to control the error source from allometric equation, it is recommended to add more available field data to update the existing allometric model.	*High (random)*	*YES*	*NO*
Sampling	Sampling error is the statistics representing error due to collecting data using sample (part of population) rather than all population element. Emission factor is generated from sample plots therefore sampling is also contributor of overall uncertainty of EF. This source of error is random and is considered to be high if sample do not represent all variation of population. By adding more sample plots and the plot is distributed following probability sampling, then the error is expected low.	*High (random)*	*YES*	*YES*
Carbon Fraction	Carbon fraction uses the values listed in Table 4.3 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4: Agriculture, Forestry and Other Land Use https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf	*Low (bias / random)*	*YES*	*YES*

Sources of uncertainty	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
	Carbon fraction default values is expressed as 0.47. In tropical and subtropical forest, the lowest value of carbon fraction is 0.43 while the highest one is 0.49. Deviation is quite small, therefore carbon fraction contribution to overall EF uncertainty is low.			
Root to-shoot ratio)	Root shoot ratio using the IPCC GPG LULUCF Table 3A.1.8 - https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf Root to shoot ratio (R:S ratio) varies depending on the land cover type. From 23 land cover classes in Indonesia, the lowest R:S ratio is 0.24 while the highest one is 1.58 (savanna & grasses, pure dry agriculture, bare ground and Settlement). The deviation of lowest and highest value of R:S ratio is quite significantly different, therefore R:S ratio most likely have high contribute to overall uncertainty. Similar to carbon fraction, ER program managemeny is encouraged to support any research on this topics at local scale.	*High (bias / random)*	*YES*	*YES*
Representativeness	From regional point of view, 23 classes of land cover are suitable enough to accommodate all physical variation on the ground. Emission factor has been set to all these land cover class (forest and non-forest classes). It is expected emission uncertainty from deforestation and forest degradation would be lower. The potential error sources regarding to representativeness is the sample plot is not randomly distributed. With lack of access to reach all forest area, sample plot may be distributed purposively following road or stream network. In this case, the error would be increased. Representativeness should be accommodated through robust sampling design using stratified random sampling.	*High (bias)*	*YES*	*NO*
Integration				
Model	The combination of AD & EF does not necessarily need to result in additional uncertainty. Usually, sources of both random and systematic error are the calculations conducted in spreadsheets. Common error is incomplete equation script during data processing. The MRV team of East Kalimantan has implemented an automated script to calculated emissions and uncertainty in spreadsheet as well as in GIS web-based platform. These efforts should greatly reduce the possibility of mistakes in the calculations. The outputs of the activity data and emissions spreadsheets were double checked by MRV team member through MRV working group meeting.	*Low (bias)*	*YES*	*NO*

Sources of uncertainty	Analysis of contribution to overall uncertainty	Contribution to overall uncertainty (High / Low)	Addressed through QA/QC?	Residual uncertainty estimated?
Integration	This source of error is linked to the lack of comparability between the transition classes of the Activity Data and those of the Emission Factors. Using Landsat image (spatial resolution 30 m), some of land cover classes may looks similar and therefore it is difficult to differentiate. On the other hand, there is physical feature that really unique as seen on Landsat (such as karst) but there is no class for this landscape. Meanwhile, we almost agree that forest structure and composition in karst area is unique and quite different compare to primary or secondary dryland forest.	*Low (bias)*	*YES*	*NO*

5.2 Uncertainty of the estimate of Emission Reductions

Parameters and assumptions used in the Monte Carlo method

The calculation for uncertainty of emissions reduction was based on Monte Carlo method. The parameters and assumptions are presented as follows:

Table 6. Parameter and assumptions used in Monte Carlo Method

Parameter included in the model	Parameter values	Error sources quantified in the model (e.g. measurement error, model error, etc.)	Probability distribution function	Assumptions
Carbon Fraction	0.47	Measurement error	Triangular (lower bound = 0.44, upper bound = 0.49, mode = 0.47)	IPCC 2006
Root to shoot ratio (R:S ratio)	0.24 0.32 0.36 0.48 1.58	Measurement error	Intentionally left blank	2006 IPCC GPG LULUCF Table 3A.1.8. See sheet 'EF_EKJERP' excel file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx
AGB stock	See sheet 'EF_EKJERP' excel file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx	Sampling error Measurement error	Normal distribution	Intentionally left blank
Activity data	See sheet 'UncertaintyAD' excel file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx	Measurement error	Non-parametric bootstrapping	Intentionally left blank

Quantification of the uncertainty of the estimate of Emission Reductions

The calculation of uncertainty from deforestation and forest degradation in the monitoring period has been done with exactly the same method to keep the consistency with those calculated during the reference period. The Monte Carlo technique has also been applied in the monitoring period. The calculation of uncertainty of Emission Reduction at the 90% confidence level is presented as follows:

Table 7. Uncertainty of aggregated Emissions Reduction

		Total Emission Reductions*
A	**Median**	35,404,709.61
B	**Upper bound 90% CI** (Percentile 0.95)	31,595,294.53
C	**Lower bound 90% CI** (Percentile 0.05)	39,343,003.80
D	**Half Width Confidence Interval at 90% ((B – C)/2)**	3,873,854.63
E	**Relative margin (D/A)**	11%
F	**Uncertainty discount**	0

In the table above, emission sources are not presented in order to simplify the table. In this ER program there are six sources of emission that is deforestation and forest degradation of living biomass, mangrove soil, peat decomposition, peat fire and fire in stable forest. All the emission sources have been calculated as well as the uncertainty that evaluated using Monte Carlo. Complete information on emission reduction calculation using Monte Carlo for each emission sources is available through https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx .

5.3 Sensitivity analysis and identification of areas of improvement of MRV system

Sensitivity analysis is conducted by switching off each source of uncertainty at a time and assess the impact to the overall uncertainty of Emission Reductions, and generate the error estimates using Monte Carlo. The uncertainty level of these parameters shall be reduced in the next monitoring cycle/period. The results of sensitivity analysis are given in the following table.

Table 8. Sensitivity Analysis

Sensitivity Test	**Median**	**Lower bound (5th percentile)**	**Upper bound (95th percentile)**	**Half-width confidence interval at 90%**	**Relative Margin**	**Uncertainty (%)**
All on	35,404,709.61	31,595,294.53	39,343,003.80	3,873,854.63	0.10	10.94
R:S Uncertainty	35,471,602.13	35,001,607.79	35,949,894.69	474,143.45	0.01	1.34
CF Uncertainty	35,463,547.88	34,959,756.78	35,968,679.38	504,461.30	0.01	1.42
Sampling uncertainty	35,479,001.24	33,736,204.15	37,220,024.41	1,741,910.13	0.05	4.91
Emission Factor uncertainty	35,447,106.81	33,535,207.34	37,352,701.23	1,908.746.94	0.05	5.38
Activity Data	35,476,198.51	32,158,638.15	38,852,025.32	3,346,693.58	0.09	9.43

The sensitivity analysis was done using Monte Carlo approach by removing one estimation parameter at a time, i.e.:

Table 9. Parameter Used in Sensitive Analysis

No	Parameter Used	Approach
1	All on	Using the uncertainty for Root shoot ratio, Carbon Fraction, Sampling uncertainty AGB, and Activity Data
2	R:S Uncertainty	Using the uncertainty for Root shoot ratio, and other uncertainty parameter near zero.
3	CF Uncertainty	Using the uncertainty for carbon fraction ratio, and other uncertainty parameter near zero
4	Sampling uncertainty	Using the uncertainty for AGB biomass sampling, and other uncertainty parameter near zero
5	Emission Factor uncertainty	Using the uncertainty for Root shoot ratio, carbon fraction, and AGB biomass sampling, but uncertainty for activity data near zero
6	Activity Data	Using the uncertainty for activity data (AD), and other parameter near zero

6 TRANSFER OF TITLE TO ERS

6.1 Ability to transfer title

Based on Criterion 36, the ability of a Program Entity to transfer title to ERs needs to be demonstrate through various means, namely: reference to existing legal and regulatory frameworks; sub-arrangements with potential land and resource tenure holders (including those holding legal and customary rights as identified by the assessments conducted under Criterion 28); and benefit sharing arrangements under the Benefit Sharing Plan.

Based on the 1945 Constitution of the Republic of Indonesia, the Government through MoEF has the mandate to regulate natural resources for people, prosperity and welfare. The specific mandate to regulate forest resources, including forest carbon stock, is from Forestry Act 1999 (Article 4 Point 1) through implementation of REDD+, as part of the legal forestry activities. Based on President Regulation No.98/2021 (Article 1 Point 22), carbon right is regulated and managed by the Central Government. In this regard, the MoEF is by law considered as Program Entity as having ability to transfer the title of ERs resulting from the REDD+ program, that is conceptualized as "a national approach with sub-national implementation". The Minister of Environment and Forestry has also an exclusive right to authorize the transfer of carbon right to overseas (MoEF's Decree No.21/2022, article 21 point 2d)[71]. The MoEF decree here also regulates implementation of carbon trade including guidelines to conduct verification and validation at national scale. In addition, based on Law of Republic of Indonesia No. 23 of 2014 concerning Sub National Governance page 118 which clearly states that Provincial Government has only the authority on "environmental services utilization with exception of carbon utilization, carbon storage and/or carbon sequestration". In other words, carbon utilization, its storage or sequestration is regulated and managed by the Central Government.

Several regulatory updates regarding carbon governance were issued between 2021 and 2024, particularly the issuance of Minister of Environment and Forestry Regulation Number 21 of 2022 ("MoEFR 21/2022") and Presidential Regulation Number 98 of 2021[72] ("PR 98/2021), which was replaced by Presidential Regulation Number 110 of 2025[73] ("PR 110/2025). In addition, the Ministry of Environment and Forestry was split into the Ministry of Environment and the Ministry of Forestry, as stipulated in the Presidential Regulation number 139 of 2024 on the Arrangement of Duties and Functions of State Ministries for the 2024-2029 period.

Considering these changes, a legal opinion was issued on October 27, 2025 to update the previous legal opinion submitted on October 15, 2021, which had affirmed the ability of Indonesia to transfer the title of ER under the ERPAs. The 2025 legal opinion reconfirmed that Indonesia has an adequate legal basis to support the transfer of Title over ERs. The legal opinion also confirmed Indonesia's ability to the transfer of rights over additional ERs (call option) in a manner that is consistent with the national law and relevant international agreements. To complement the information provided in the 2025 legal opinion, the Government submitted a supplemental legal opinion to further clarify the Program Entity's ability to transfer ER title. The updated legal opinion and supplemental legal opinion were cleared by the World Bank's legal team on December 10, 2025.

In relation to the Title of Emission Reductions (ERs), the term "Title" here is not necessarily identical to "Carbon Rights". Rather, title is intended to capture an environmental service derived from forests. As such, the volume of ERs is a measure of the performance of this service. Hence, the legal title corresponds to the performance results. Furthermore, the "transfer of Title to ERs" applies both to Contract ERs (22 million ERs) and a Call Option Volume of 20 million tons (for additional ERs). The Title to ERs as referred to the FCPF ERPA document is in the form of "Contract

[71] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/permen-lhk-no.-21-tahun-2022-1.pdf

[72] Presidential Regulation Number 98 of 2021 on the Implementation of Carbon Economic Values to Achieve Nationally Determined Contribution Targets and Greenhouse Gas Emissions Control in the National Development

[73] Presidential Regulation Number 110 of 2025 on The Implementation of Carbon Economic Value Instruments and Control of National Greenhouse Gas Emissions

ER Volumes" reflecting the emissions reduction performance achieved by the GoI. Therefore, the Carbon Rights is owned and governed by the GoI in accordance with the prevailing laws and regulation.

In order to ensure the implementation of the ER program at sub-national level, a Memorandum of Understanding (MoU) between the national (through MoEF) and sub-national level was signed (No.PKS.3/SETJEN/ROKLN/KLN.0/3/2020 and No.197/2439/B.Humas-III)[74]. The sub-national level hereafter represented by Provincial Government of East Kalimantan, which also represent beneficiaries from province, district, village including indigenous people for the ER implementation in East Kalimantan. The MoU covers a) strategy and program for REDD+ activity in the province, b) working plan of REDD+, c) benefit sharing mechanism between national and sub-national level, d) safeguards implementation, e) carbon rights managed by Central Government, f) data and information exchange on forest and land cover change. It is clear in the MoU that Central Government manages and regulates the rights of carbon. The commitments to implement the ER program from village and indigenous people were also stated in the FPIC Process[75]. The FPIC is a process to get approval from the village and indigenous people to participate the ER Program. The commitment for participation in ER Program of the village and indigenous people is then put into the village approval statement (see FPIC Report[76]).

Furthermore, we confirm our understanding that as part of the agreed provisions of ERPA Tranche B, the contract ERs/additional ERs transferred from Indonesia will be re-transferred to Indonesia as soon as possible, but no later than 30 calendar days and claimed as part of Indonesia's achievements under the Nationally Determined Contributions (NDC), as already stated in the signed ERPA.

6.2 Implementation and operation of Program and Projects Data Management System

The EK-JERP program was designed through a series of multi-stakeholder consultations from 2017-2019. Based on Criterion 37, the ER Program host country should decide whether to maintain its own comprehensive national REDD+ Program and Projects Data Management System. The National REDD+ program and Projects Data Management system are hosted by Ministry of Environment and Forestry (MoEF). However, in order to fulfil the data into the MoEF's database, then sub-national level (province) submits their data and information to the national level. Since the Government of Indonesia has appointed the Ministry of Environment and Forestry (MoEF) as a National Focal Point for climate change mitigation and adaptation, such national REDD+ Program and Projects Data Management System are managed by MoEF. So, the data management system is a national centralized.

On the other hand, in order to back up data and information that have been submitted to national system (srn.menlhk.go.id), sub-national level develops Portal Measurement Monitoring Report/MMR (https://mrv.kaltimprov.go.id/). The data and information are sourced from ER activities at Provincial level that have formatted and put onto both web-based and excel-based. Trainings on how to fulfil and submit the reports have been conducted in 7 districts during the reporting period. The field ER activities done by Forest Management Unit (FMU) are reported to the Portal MMR (mrv.kaltimprov.go.id) through online system and copied to Forestry Service (see Figure 5). For FMU that has difficulty to access to the Portal MMR, it needs to go to the nearest capital sub-district with the internet coverage. The Portal MMR is managed by Provincial Environmental Service. The Provincial government through The Provincial Environmental Service then submits an annual report of the EK-JER program to the MoEF. The Report is automatically embedded into the MoEF website for the National Registration System known as SRN-PPI (http://srn.menlhk.go.id/). All REDD+ initiatives in East Kalimantan have to be registered into SRN-PPI. Up to now, there is no voluntary REDD+ initiatives such as VERRA Projects implemented in East Kalimantan (see the list of REDD+ project registered under VERRA[77]) and no also Plan VIVO project in East Kalimantan[78].

[74] MoU REDD+ di Kaltim_Materai Sekjen KLHK.pdf (kaltimprov.go.id)

[75] PADIATAPA IMPLEMENTATION REPORT_ENG.pdf (kaltimprov.go.id)

[76] PADIATAPA IMPLEMENTATION REPORT_ENG.pdf (kaltimprov.go.id)

[77] allprojects Verra in Indonesia.xlsx (live.com)

[78] All Plan Vivo Project in Indonesia.xlsx (live.com)

The Figure 5 shows the flow of ER data and information from fields to the MMR East Kalimantan Web Portal (mrv.kaltimprov.go.id). The ER annual report will be submitted to the SRN Portal of MoEF (srn.menlhk.go,id).

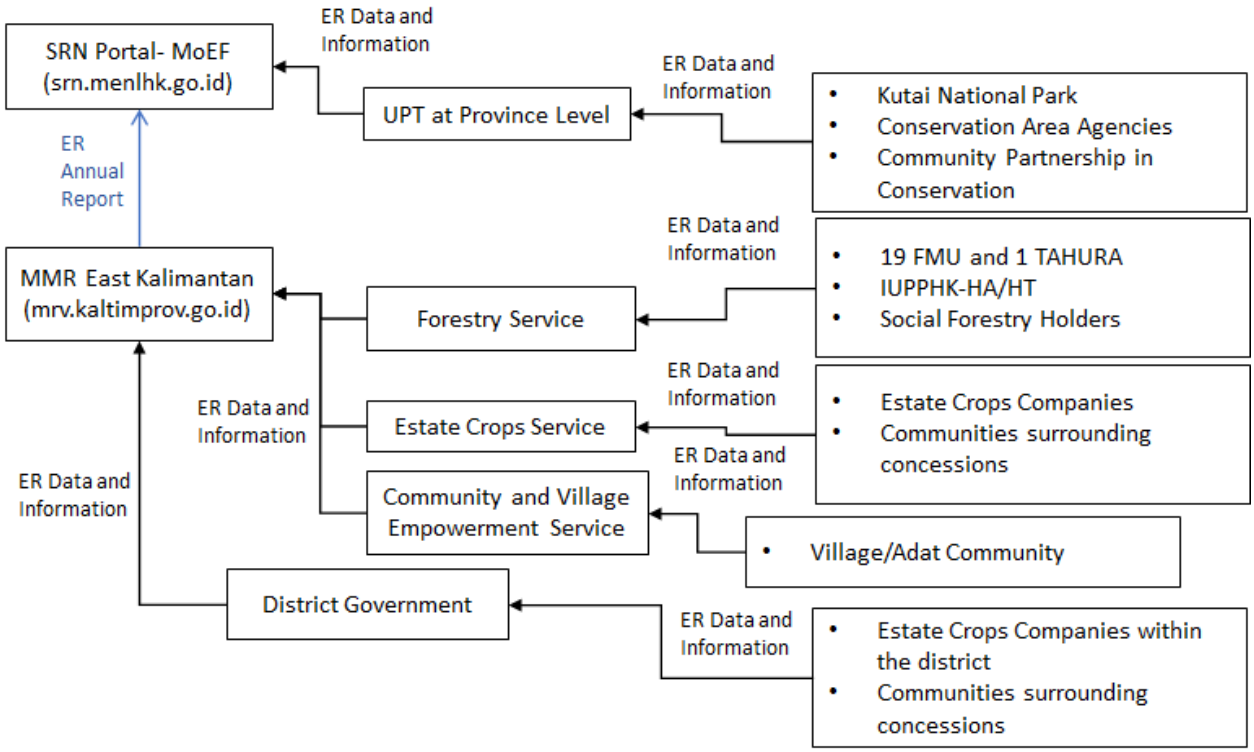


Figure 5. Project Management on ER Data and Information System

Several standard operational procedures (SOPs), such as reporting, data entry, data validation, and data and information exchange are being developed for data management.

6.3 Implementation and operation of ER transaction registry

Up to now, the ER transaction registry system for Indonesia has not been developed yet. The MoEF agreed that emission reductions from East Kalimantan Province in the framework of FCPF will be registered first in the National Registry System (SRN) under MoEF[79], prior to submission to the FCPF-CF through the World Bank CATS for the first and subsequent reporting periods, until the Indonesian transaction registry system is developed.

Based on Government Regulation No. 46/2017[80], BPDLH is appointed as fund manager and has a mandate (President Regulation No 77/2018[81]) to collect environment or climate change funds either from government, private, or international donor countries. The future role of BPDLH will be not only to disburse the funds to beneficiaries, but also as the host for domestic carbon trade. The carbon project/REDD+ initiatives in the future might need to register to BPDLH for selling their carbon in domestic market, so that the government target for Indonesia's NDC can be achieved by 2030.

[79] President Regulation No.98/2021 (Article 69, Point 1) stated that emissions reported by each entity have to be reported to national registry system. https://peraturan.bpk.go.id/Home/Details/187122/perpres-no-98-tahun-2021

[80] https://peraturan.bpk.go.id/Home/Details/64701

[81] https://peraturan.bpk.go.id/Home/Details/94707/perpres-no-77-tahun-2018

6.4 ERs transferred to other entities or other schemes

The estimated ERs produced during the first reporting period was 31.9 $MtCO_2e$ (subject to validation and verification). The Program Entity proposes to offer 22 million Contract ERs to the FCPF Carbon Fund. In addition, the Program Entity will offer 9.9 million Additional ERs for purchase under the Call Option with the price to be negotiated in accordance with the ERPA. No ERs in East Kalimantan are transferred to other entities or other schemes during the reporting period. The negotiation of this excess ER between GoI (MoEF), East Kalimantan government and FCPF will be started soon after ERMR1 verification is accomplished. East Kalimantan government and MoEF also need to carefully discuss about the excess ER based on ERPA and existing regulation. Initial discussion about this issue has been carried out during several WB trips to East Kalimantan. More intensive discussion will be set on first week of March 2023

7 REVERSALS

7.1 Occurrence of major events or changes in ER Program circumstances that might have led to the Reversals during the Reporting Period compared to the previous Reporting Period(s)

As this first reporting period, the occurrence of major events or changes in the ER program circumstances that might have reversals during the reporting report compared to the previous reporting report is “Not Applicable”.

7.2 Quantification of Reversals during the Reporting Period

As this is the first reporting period, the quantification of reversals during the reporting period is “Not Applicable”

7.3 Reversal risk assessment

Risk Factor A: Lack of comprehensive and sustained support of the relevant stakeholders

The successful implementation and sustainability of emission reductions is dependent on active contributions from the various levels of government, from the private sector, and from local communities. It is confirmed that much of the ER Program’s sustainability depends on the continued political will of the national, provincial, and district governments to implement the policies that the ER Program is supporting. These policies include the policy on sustainable estate crops, the HCV and RIL policies, social forestry, and other key policies linked to land governance.

Current support for these policies is strong at the national and provincial levels, and many of the policies are integrated into the medium-term development plan. Up to 2020, policies to support ER implementation have been formulated and issued such as continuation of moratorium licenses on coal mining, application of one service for all licenses policy, issuance of regulation on sustainable estate crops (No.7/2018[82]), East Kalimantan Governor Regulation on Criteria of High Conservation Area (HCVA)[83], and Berau District’s decree on HCVA (No.287/2020[84]). This HCVA decree from Berau District is one of important efforts to avoid negative impacts on local development of oil palm expansion to natural forests. The indicative maps for High Conservation Values for each district have been completed and are used as references for district regulation to the HCV policies. Later on, the other districts have followed to produce districts’ decrees on High Conservation Area. By end 2022, all seven disticts have issued the HCV policies that effectively being implemented in the fields.

The total areas for HCV in seven districts are 456,827ha. It means these designated areas for HCV are not allowed to be cleared for forest conversion. In order to ensure those areas are protected from clear cutting, then each district has published district regulation regarding to the protection of HCV area.

The scope of protection areas designated as High Conservation Areas include as follows:

a. Wildlife protection and its habitat inside the oil palm concession (species with status of critical endangered such as orangutan)
b. Reservation of intact forest landscape within the management unit that is connected to the wider expanse of forest (for concession with the core licensed area more than 20k ha)
c. Reservation of areas that can provide clean water for the people who are downstream of the management unit (such as riparian areas)

[82] https://peraturan.bpk.go.id/Home/Details/185205/perda-prov-kalimantan-timur-no-7-tahun-2018

[83] https://jdih.kaltimprov.go.id/produk_hukum/detail/75185be6-ac76

[84] hhttps://mrv.kaltimprov.go.id/storage/guest/ERMR1/Regulation/Decree_of_the_Head_of_Berau_District_No_287_2020_regarding_indicative_map_of_HCVA_for_plantations.pdf

d. Protection of areas within management units that are important and have cultural values for communities around the forest.

The seven district regulations are compiled into this document that consists of sustainable estate crops management including the HCV policy for each district.

The compiled document consists of as follows:

1. Provincial Regulation No.7 Year 2018 about sustainable of estate crops management[85]
2. Governor Regulation No.12 year 2021 about Criteria of High Conservation Value[86]
3. Governor Regulation No.43 Year 2021 about HCV Management in Estate Crops[87]
4. Governor's Decree No.525/K.244/2022 about Designated Areas for HCV inside Oil Plam Concessions in East Kalimantan[88]
5. Head of Berau District Decree No.287 Year 2020 about indicative maps for HCV in Berau District[89]
6. Head of Kutai Barat District Decree No.800.05.521.12/K.1489/2021 about indicative maps for HCV in Kubar District[90]
7. Head of Kutai Kartanegara District Decree No.475/SK-BUP/HK/2021 about indicative maps for HCV in Kukar District[91]
8. Head of Mahakam Ulu District Decree No.520/K.205/2021 about indicative maps for HCV in Mahulu District[92]
9. Head of Penajam Paser Utara District Decree No .525/83/2022 about indicative maps for HCV in Penajam Paser Utara District[93]
10. Head of Paser District Decree No525/KEP-73/2022 about indicative maps for HCV in Paser District[94]
11. Head of Kutai Timur District Decree No.525//K.498/2022 about indicative maps for HCV[95] in Kutai Timur.

In order to ensure the sustainability of ERs during the Crediting Period and beyond the Crediting Period, the provincial estate crops regularly every year conduct evaluation on the implementation of those provincial and district regulations/decrees.

There is some risk from issues related to benefit sharing. However, in order to give clear understanding the mechanism of benefit sharing for ER payments, consultations with related stakeholders including beneficiaries have been conducted since 2015. In East Kalimantan, benefit sharing working group has been formed. Inputs and feedbacks from beneficiaries through FPIC process in 2019 and 2020 were adopted to benefit sharing document. Based on these consultations, benefit sharing regulation through governor regulation is being formulated and ready to be issued this year.

To support coordination and supports from relevant stakeholders, the other working groups namely MMR working group, Safeguard working group, and Planning and Budgetary working group also have been formed. Each group has exclusively task to invite relevant development partners and government services to discuss and address certain topics of ER program.

---

[85] Page 7 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[86] Page 50 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[87] Page 61 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[88] Page 108 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[89] Page 126 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[90] Page 133 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[91] Page 139 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[92] Page 145 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[93] Page 151 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[94] Page 157 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)
[95] Page 163 (https://drive.google.com/open?id=1Dyd4nEnOiwp04a0hEAT-VoJY4bhMr5JT&usp=drive_fs)

Based on the above progress, the risk of reversal due to a lack of comprehensive and sustained support of the relevant stakeholders is categorized as **low**. The risk would be set as medium if the government entity representation of the ER program (both MOEF and East Kalimantan government) do not issue any supporting policies relating to ER program including transparency policy to community through FPIC. The worst case is if one of the two government entities (both MOEF and East Kalimantan government) is issued a contra policy to the ER policy such as policy to convert national park to production forest. In this situation, the risk is high.

In case of the national policy to move Indonesia capital city to East Kalimantan, it is known from the spatial planning that the new capital project is located in plantation forest in which in this ER design is labelled as non-forested area. Therefore, risk for deforestation is under control or **low**. At the other hand, GoI is committed to restore the remain forest near the project location and adopt a green and modern development project.

Risk Factor B: Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination

Poor coordination across sectors could hamper progress in improving land governance, which is an important part of the ER Program's sustainability strategy. Policy coordination, especially for the land-based sectors, is a challenge in Indonesia. Separate ministries are responsible for mining, agriculture, and forestry, and conflicts in the legal frameworks and overlapping mandates of each sector are a barrier to land governance. This is particularly the case for land administration which distinguishes between forest and non-forest land, each with separate regulatory frameworks and institutional arrangements.

In order to empower coordination across sectors, institutional arrangements for the ER program has been developed and implemented. At national level, there will be vertical coordination between the levels of government will be important for the program's implementation and its sustainability. As noted under Risk Factor A, the district governments play an important role in implementing reforms related to estate crops. Continued district support for policy implementation will in part depend on the coordination of districts with the province. For issues related to land registration, efforts of multiple agencies in particular of the MoEF and the national land agency (BPN) will need to be coordinated.

Lack of institutional capacities has been identified as an underlying driver of deforestation and is being addressed through the activities in Component 1.

Based on development and implementation of HCV policies within East Kalimantan, it has shown strong coordination between provincial and district government estate crops services. It shows HCV policies to protect 456,827ha (four hundred fiftysix thousand and eight hundred twenty seven hectare) have been developed and implemented in seven districts.

Another good example for coordination within central government and province and district government agencies is the regular meetings related to the reporting formats for finance and activities from field sites to central government (BPDLH and MoEF). The latest regular meeting was done on 7th July 2023 in Samarinda.

Based on the above assessment, the risk of reversal due to a lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination is categorized as **low**. The risk is medium when communication between provincial government with district government or between MOEF and provincial government of East Kalimantan is no longer intensive through formal meeting or informal discussion (e.g. coordination using email). Furthermore, the risk becomes high if one of the government entity withdrawals from this ER program.

Risk Factor C: Lack of long-term effectiveness in addressing the underlying causes

The expected long-term effectiveness in addressing the underlying causes of deforestation depends on the complexity of the driver and whether further support will be needed to address the driver after the program has ended. As discussed in the table, some drivers will require continued political will, while others require sustainable solutions to be in place.

In case of oil palm plantation, the government of East Kalimantan has issued several key policies to ensure the deforestation from the expansion of oil palm plantation is reduced. One of the policy is allocation of HCV area in non-designated forest area for each district in East Kalimantan. This policy is clear evidence that East Kalimantan government tried to address the underlying driver of emission in the province. By end 2022, all seven districts have completed the issuance of protection HCV areas through district decrees/regulations. The protection of HCV areas has being implemented in seven districts.

Related to the existence of a new capital city of Indonesia (IKN), we have already carried out emission calculations in that area with the assumption of forest clearance (deforestation). Based on our calculation in 2018, the potential to release emissions of 1.6 million tons of CO2e might happen if the 6,049 hectares of forested areas was clear-cut (deforested). However, the IKN Plan has stated that a "Forest City" will be built and protecting forested areas in the IKN area, including reforesting non-development areas[96]. "The Forest City concept requires at least 65% forest cover, which can be achieved by forest and land rehabilitation efforts in the 58,570 ha of IKN area" (-https://ikn.go.id/en/stay-connected#faq). With the vision of IKN as smart, green, beautiful, and sustainable city, the outside of IKN's core area (256,000ha) will be kept 70 – 75% as forested area[97].

Regarding the situation of the world's oil palm commodity including the condition of oil palm plantations in East Kalimantan (based on estate crops statistical data), the total area of oil palm plantations in East Kalimantan in 2019 was 1.23 million hectares with production of 18.34 million tons, and in 2021 it was 1.37 million hectares with production of 17.72 million tons. There was no significant increase in the area of oil palm plantations (0.14 million hectares in 2 years). So, such changes in the world do not have any impacts to the situation in East Kalimantan.

Table 10. Underlying Causes

Underlying Driver	Long-term effectiveness in addressing driver
Poor land governance	Improvements are expected to be long-term, but may not be fully in place by the end of the ER Program.
Ineffective forest supervision and administration	Long-term effectiveness in addressing this driver depends on continued political will (see Risk Factor A), and on the ability of FMUs to generate sufficient revenue or to receive budgetary or external funding.
Weak policies for forest protection	Improvements in policies are expected to be long-term, but effectiveness depends also on enforcement (political will and forest supervision).
Lack of incentives for sustainable management practices	The Program is expected to contribute to an improved incentives framework, but direct support will stop when the program ends.
Limited alternative livelihood opportunities for local communities	Long-term effectiveness will depend partly on the level of benefits that the alternative livelihood opportunities can provide.
Lack of fire management capacity and lack of alternatives for land clearing	Long-term effectiveness will depend on continued support and the long-term attractiveness of alternative livelihood options.
Climate factors	Cannot be directly addressed. See discussion under Risk Factor D.

The East Kalimantan RTRWP for 2023-2042 has been ratified as Provincial Regulation No. 1 of 2023 on April 8 2023 [https://jdih.kaltimprov.go.id/produk_hukum/detail/a39cb986-0f25] . The review of the RTRWP is based on adjustments to provincial boundaries and policies for the development of a new National Capital City in East Kalimantan. However, the RTRWP regulation does not change the function of forest areas because it needs further

[96] https://en.antaranews.com/news/259041/ikn-development-with-forest-city-concept-to-mitigate-climate-change

[97] IKN press release

steps and approvals from the National Government. It means conversion of the forests cannot be conducted until approval by the National Government . The procedure to change the function of forest areas has to follow Job Creation Law No. 6 of 2023 (paragraph 4 of article 35, which amends article 19 of Law No. 41 of 1999 concerning Forestry) and Government Regulation No. 23 of 2021, which requires experts' opinions from the integrated research team estabiished by MoEF to make changes to the designation or function of forest areas as part of Strategic Environmental Assessment (KLHS). The status changes of the forest areas need to be determined and approved by the National Government (President). Since the RTRWP policy has a potential change to change the status of the forests, then the change has to be based on the research from an independent and integrated team from different ministerial sectors. The integrated research team has been established (under Ministry Decree No. 349/Menlhk/Setjen/PLA.0/4/2023). The decision from the National Government has to refer to and consider the results of the research from the integrated team. Several consultations between East Kalimantan (Province and district government) and MoEF regarding proposed changes for the function of the forest areas have been conducted.

To ensure accountability, transparency, and representation during the revision of the RTRWP, the decision from MoEF has to consider the results of research from the Integrated team. The integrated research team consists of diverse government agencies from the central and provincial levels. Based on Ministry Decree No. 349/Menlhk/Setjen/PLA.0/4/2023, the main job description of the team is as follows:

- To develop an integrated research methodology based on biophysical aspects; social, economic and cultural as well as legal and institutional aspect;
- To carry out processing, analysis and discussion of changes in regulations, changes in the function of forest areas, and/or designation of non-forest areas as forest areas;
- To carry out consistency tests on the research results from the team towards change of designation and functions of the areas, for forest Area and/or not forest area; and
- To report the results of the research from the integrated team to the Minister with a copy to the Director General.

The institutions involved as members of the integrated team are as follows:

- Directorate General of Forest Planning and Environment, MoEF
- Directorate of Forest Area Planning and Use, MoEF
- Univesity of Bengkulu
- University of Mulawarman (East Kalimantan)
- IPB University
- Research and Innovation National Agency (BRIN)
- Agency of Standard and Instruiment, MoEF
- Directorate of Environmental Management from Forestry, Coordinating Ministry for Invesment and Marine
- Directorate of Development Division, National Planning Agency (Bappenas)
- Directorate of Foster Regional Development, Ministry of Home Affairs (MoHA)
- Directorate of Spatial Planning and Land Affairs, Coordinating Ministry of Economic Affairs
- Directorate General of Spatial Planning, Ministry of Agrarian Affairs and Spatial Planning
- Legal Bureau, MoEF
- Directorate of Conservation Awareness Planning, MoEF
- Directorate of Watershed Management Planning and Supervision, MoEF
- Directorate of Forest Utilization Plan, MoEF
- Directorate of Forest Area Confirmation and Management, MoEF
- Directorate of Environmental Impact Prevention, MoEF
- East Kalimantan Conservation Area Agency, MoEF

- Provincial Forestry Service, East Kalimantan Government
- Public Works, Spatial Planning, and Public Housing Service, East Kalimantan Government.

In addition, once a decision from the National Government comes out, the RTRWP regulation needs to be reviewed. The review of RTRWP can only be conducted one time in every 5 years. The review can be conducted more than one time (within 5 year period) if there is a change in the strategic environment in the form of (article 17 of Law No. 6 of 2023 regarding amendments to article 23 of Law No. 26 of 2007 concerning Spatial Planning):

- natural disasters as determined by statutory regulations,
- changes in state/national territorial boundaries as determined by law,
- changes to regional boundaries as determined by law; and
- strategic national policy changes.

So, the review/change of the East Kalimantan RTRWP is likely to take place in 2028.

Furthermore, EK Government has a strong commitment to mitigating and adapting to climate change as stated in Provincial Regulation No. 7 of 2019 [https://jdih.kaltimprov.go.id/produk_hukum/detail/57aeff30-3e58], which contains targets and indicators for climate change mitigation in the forestry and land sectors.

The estate crop sector has also committed to achieve sustainable estate crops through Provincial Regulation No. 7 of 2018 [https://jdih.kaltimprov.go.id/produk_hukum/detail/b1097eff-d81e], in which these commitments are being implemented within the province. In addition, the number of district policies related to protection of HCV values have been issued and implemented (see Risk A above).

The current media reports regarding changes in the function of forest areas in East Kalimantan, as explained above, have not been implemented and are not included in the changes to the Provincial RTRW this year. Although the shift in forest function has not occurred, the reversal might threaten the sustainability of the climate benefits that have been achieved and could reduce the amount of emissions recognized as a result of the reduction.

To understand the potential emissions released due to the New Provincial Spatial Plan (RTRWP) for 2023-2043, the GoI has calculated the estimation of annual emissions caused by the RTRWP policy about **a) changing the Designated Forest Areas to Non-Forest Areas, b) changing of the function of forest areas, and c) changing the designated forest areas from Non-Forest Areas to Forest Areas**. The detailed estimation of the calculation can be found here.

a) Change in forest areas to non-forest areas

Total designated area changing from forested areas to non-forest areas will be 89,481 ha. However, it is only 31,776.33 ha that has forest cover (or forested areas). The other 57,704.67 ha (or 64% of 89,481 hectares) is a non-forested area. The types of land cover in the non-forested areas are open land, grasslands, settlements, and plantations and water bodies. So these areas are not considered in the calculation of deforestation. The estimation of the potential annual emission because of this change will be from **481,046** to **522,671** tons CO2e.

Table 11. Changing forest areas to non-forest areas

	Potential Emissions Released Forests to non-forest areas	**tonCO2e**
a	Forested areas (31,776.33ha)	10,721,629.37

b	The forested areas (24,384.77ha out of 31,776.33ha) converted to Agricultural Lands	7,908,794.09	
c	10%-20% of the agricultural lands will remain as High Conservation Areas (c=10%*b) or (c= 20%*b)	20%	10%
		1,581,758.82	790,879.41
d	Total emission released (d= a-c)	9,139,870.55	9,930,749.96
	Annual emissions released 2024 - 2043	481,045.82	522,671.05

b) **Change of function of the forest areas**

The change of the function of the forest areas here is in two ways: i) to upgrade the function of the forest and ii) to downgrade the function of the forest.

i) Upgrading the function of the forest areas

The estimated areas of upgrading the forest function change are **± 37,407 hectares**. There is no potential forest degradation in these areas, on the contrary, it will prevent deforestation and forest degradation, especially in the areas in which the function has changed from Production Forest/Conversion Production Forest to Protected Forest/Conservation Forest, which has forest cover in the form of primary dryland forest, primary mangrove forest, and primary swamp forest.

ii) Downgrading the function of the forest areas

There are two types of forest areas that downgrade their functions as follows:

- Protected Forest (HL) to Production Forest
- Production Forest (HP) into Convertible Production Forest

The estimated areas of downgrading forest function are ± **45,263** hectares. There is potential deforestation and forest degradation because of these changes. Mainly found in areas of primary dryland forests, primary mangrove forests, and primary swamp forests.

Table 12. Upgrading and downgrading forest function area

Forested Area Cover	**Category Function Change Forest Area**	
	Upgrading Forest Function (hectares)	**Downgrading Forest Function (hectares)**
Primary Dryland Forests	1,645.57	25,522.63
Secondary Dryland Forest	23,451.06	14,978.12
Non-Forest	12,310.37	4,762.25
Total	**37,407.00**	**45,263.00**

The emissions as result from upgrading forest function area (avoiding forest degradation) for 37,407ha is ± **273,026.83** ton CO2e (Table 13). On the other hand, the emissions for downgrading forest function area might result in potential forest degradation of **± 4,234,629.49** tons of CO2e (Table 14).

Table 13. Avoided forest degradation as a result of **upgrading** forest function area

Forest Cover	Emission Factors	C to CO2	Potential - 1,645.57 ha	Prevented degradation
Primary Dryland Forests	167,31	613,47	1.009.505,40	273.026,83 CO2e
Secondary Dryland Forest	122,06	447,55	736.478,57	

Table 14. Potential forest degradation as a result of **downgrading** forest function area

Forest Cover	Emission Factors	C to CO2	Potential - 25,522.63 ha	Potential degradation
Primary Dryland Forests	167,31	613,47	15.657.367,07	4.234.629,49 CO2e
Secondary Dryland Forest	122,06	447,55	11.422.737,58	

c) Change the designated forest areas from Non-Forest Areas to Forest Areas

The estimated size of the forest area to be designated from Non-Forest Areas to Forest Areas is **15,095.66** hectares. When the non-forest areas are designated to forest areas, the legal status of the land changes. The activities such as land clearing for development purpose (agriculture, mining, industry) are stickly limited. If the function of forest areas becomes conservation area, then such development activities are not allowed. The potential avoided emissions due to the change of non-forest area to forest areas is **5,077,821 tons of CO2e.**

In summary, the potential emissions released due to the RTRWP policy until year 2043 is **±8,023,651.66 tons of CO2e**. In other words, the estimated potential annual emissions release is **±422,297.46 tons of CO2**e (see Table 15).

Table 15. Potential Emissions released due to RTRWP Policy up to 2043

Change Criteria	Potential Deforestation/Degradation	Potential to Avoid Deforestation/Degradation
a) Changes in Provisions (forests to non-forest areas)	9.139.870.00 tons CO2e	-
b) Changes in Function of forest		
- Upgrading the forest area function	-	273,026.83 tons CO2e
Downgrading the function of forest areas	4,234,629.49 tons CO2e	-
c) Changes designated forest area from non-forest area to forest area	-	5,077,821.00 tonS CO2e

Total	13,374,499.49 tons CO2e	5,350,847.83 tonS CO2e
Accumulated GHG Emissions up to Year 2043	**8,023,651.66 tons CO2e**	
Potential Annual Emission released	**422,297.46 tons CO2e/year**	

Because of the issuance of the RTRWP policy, there are forest areas potentially converted to non-forest areas, but also there are non-forest areas potentially converted to forest areas, including upgrading the function of forest areas. With this estimation calculation based on the RTRWP policy, as a precautionary principle, we assess this risk as **medium**.

Risk Factor D: Exposure and vulnerability to natural phenomena

Extreme fire events in East Kalimantan are linked to prolonged periods of drought, which in turn are closely linked to El Nino Southern Oscillation events. These occur on average every 3-7 years, with the last event occurring in 2016, so there is a high likelihood of an ENSO event occurring during the program period, and the accounting area will of course continue to be affected after the program ends. While the ER Program has no influence on the occurrence of ENSO events, the program includes a number of activities that should lead to a reduction in the scale of fires and their impact on forests. As noted in the table above, the long-term effectiveness of these measures will depend on continued support and on the long-term attractiveness of alternative livelihood options. The risk of future extreme fire impacting remaining forests contributes to the anticipated risk of reversal.

National, Provincial and district government all together with police are fully aware to halt and stop forest fire disaster as it happened in 2015. Forest management unit (KPH)'s has been prepared to face such catastrophic event by spending a significant budget for fire prevention program including purchasing equipment and established community-based fire prevention. The risk is getting high if there is no policy related to prevention of natural disaster especially fire prevention from government, while medium risk is given if there is no budget allocated to natural disaster prevention.

El-Nino is predicted to take place in 2023 from the middle to the end of the year. Since 2018 , the Estate Crops Agency (Dinas Perkebunan), Forestry Service (Dinas Kehutanan) and Forest Management Unit (FMU) have strengthened and increased the capacity of the Fire Brigade Farmers-based (KTPA/plantation sector) and Fire Brigade Community-based (MPA/forestry sector). The Government of East Kalimantan has also strengthened the capacity and facilities of forest and land fire brigades of each FMU as well as strengthening coordination for hydrometeorological disaster prevention, which is coordinated by the Provincial Disaster Management Agency. Districts/Cities in East Kalimantan have also prepared Disaster Risk Studies and Regional Disaster Management Plans, including hydrometeorological disasters Plan. The Government of East Kalimantan and also support from private sector have increased the capacity and facilities and infrastructure (such as reservoirs at field levels) of KTPA and MPA for dealing with forest and land fires.

The table below shows that the the size of areas (ha) affected by forest and fires from 2019 to 2022 decreased sharply from 68.525 ha to 373 ha in 2022. However, due to the El-Nino in 2023, the affected area increases up to 14.406 ha. By effective monitoring and enough numbers and participations from stakeholders to combat forest and land fires, the size of affected area in 2023 is much better than fires in 2019.

Table 16 . Areas in East Kalimantan affected by Forest and Land Fires 2018 - 2023

Year	Forest and land fire Area (ha)
2018	27.892,00
2019	68.525,00

2020	5.221,00
2021	3.029,00
2022	373,00
2023 (~Sep)	14.406,34

Herewith the number of community forest fires prevention group (**MPA**) that has been estabslihed and supported by Government of East Kalimantan.

Table 17 . Number of commnity forest fires prevention groups (MPA) established by Government of East Kalimantan

No	Agency/FMUs	# of Community Forest Fire Prevention Group (MPA)	# of members
1	EK FORESTRY AGENCY	3	33
2	FMU MERATUS	16	240
3	FMU BERAU BARAT	11	146
4	FMU BERAU PANTAI	8	120
5	FMU BERAU TENGAH	15	225
6	FMU BERAU UTARA	11	165
7	FMU SANTAN	12	180
8	FMU KENDILO	8	140
9	FMU BENGALON	11	251
10	FMU BONGAN	19	570
11	FMU SUB DAS BELAYAN	19	570
12	FMU TAHURA BUKIT SOEHARTO	14	176
13	FMU DELTA MAHAKAM	7	210
14	FMU TELAKE	24	357
15	FMU KELINJAU	9	135
16	FMU DAMAI	37	810
17	FMU MOOK MANOOR BULATN	9	135
18	FMU BATU AYAU	15	158
19	FMU MANUBAR	5	75
20	FMU BALIKPAPAN	5	111
21	FMU BATU ROOK	13	251
	Total MPA	**271**	**5.058**

Herewith also the number of Farmers Groups on Forest Fire Preventation (KTPA)

Table 18 . Number of Farmers groups (KTPA) in East Kalimantan

No	District-City	# of Farmers Groups on Forest Fire Prevention (KTPA)	# of members
1	BALIKPAPAN	5	75
2	BONTANG		
3	SAMARINDA	5	75
4	BERAU	34	510
5	EAST KUTAI	31	465
6	KUTAI KARTANEGARA	37	555
7	WEST KUTAI	13	195
8	MAHAKAM ULU		
9	PENAJAM PASER UTARA	8	120
10	PASER	13	195
	EAST KALIMANTAN PROVINCE	**146**	**2.190**

However, as a precautionary principle, we assess this risk as **medium**.

Based on the above assessment, the risk of reversal due to exposure and vulnerability to natural phenomena is categorized as **medium** .

Table 19 . Reversal Risk Assessment

Risk Factor	Risk indicators	Default Reversal Risk Set- Aside Percentage	Discount	Resulting reversal risk set-aside percentage
Default risk	*N/A*	**10%**	*N/A*	*10%*
Lack of broad and sustained stakeholder support	*Medium* ER Program Document recommend The ER Program to support the development and finalization of a number of other decrees, including the following: ● Policy development for improving transparency and access to information related to licensing ● Governor regulations by the Governor to settle disputes. ● Legal recognition of adat rights through district regulations and decrees ● Inclusion of ER activities in the Provincial Kalimantan Medium Term Development Plan 2018-2023	**10%**	*5%*	*5%*

Risk Factor	Risk indicators	Default Reversal Risk Set- Aside Percentage	Discount	Resulting reversal risk set-aside percentage
	● Integration of REDD+ programs in regional and district development planning at provincial, district/city and village levels. What is recommended and has been implemented is: ● FPIC with villages and communities has been carried out, and minutes of approval from the community are available. ● SOP for conflict resolution on Forestry agency and Estate Crops Agency , and also capacity building for government staff and non-government. ● Preparing District teams (Paser, West Kutai) for identification and recognize Adat Communitty ● Inclusion and integrating Program and Activities under ER-Program Document to RPJMD East Kalimantan province and districts 2019-2023 and 2024-2026 ● HCVA on estate crops area has identified and designated			
Lack of institutional capacities and/or ineffective vertical/cross sectorial coordination	*Medium* Capacity building for stakeholders (government, community, private sector, non-governmental organizations) has been carried out in program implementation, implementation of social and environmental safeguards, and management of reversals and leakage risks.	**10%**	*5%*	*5%*
Lack of long term effectiveness in addressing underlying drivers	*Medium* The program has been integrated into government development plans and strategic plans of government agencies, as well as development partners.	**5%**	*2%*	*3%*
Exposure and vulnerability to natural disturbances	*Medium* National, provincial and district governments already have disaster management plans, including forest and land fires, and have coordinated disaster management systems. At the site level, FMU has been prepared to handle any possible disaster especially fire by spending a significant budget for fire prevention program including purchasing equipment and established community-based fire prevention. Several activities that lead to a reduction in the scale of fires and their impact on forests. These includes activities that directly address fire	**5%**	*2%*	*3%*

Risk Factor	Risk indicators	Default Reversal Risk Set- Aside Percentage	Discount	Resulting reversal risk set-aside percentage
	management, and activities that improve forest governance and forest management. Activities that directly address fire monitoring and control are found within Components 1 to 3. (see information above)			
		Total reversal risk set-aside percentage		*26%*
		Total reversal risk set-aside percentage from ER-PD or previous monitoring report (whichever is more recent)		*26%*

Overall reversal risk in East Kalimantan ER program is low. Since the risk is low, sustainability of ER in East Kalimantan jurisdictional area is quite promising. As long as there is a clear commitment from government entity (national, provincial and districts government), any risk related to the ER program would be seriously handled using possible sources which is policies and budget. In case of East Kalimantan, there is strong bond between government and non government entities especially donor and project through various project and collaboration. It brings positive impact on the ER program implementation. Government not a single player on this ER program but many institutions also involves in active way. All relevant stakeholder have one vision to bring East Kalimantan as an pioneer province in Indonesia that succeed with result-based payment project to reduce emission from deforestation and forest degradation.

8 EMISSION REDUCTIONS AVAILABLE FOR TRANSFER TO THE CARBON FUND

			2019	2020	TOTAL
A.	**Emission Reductions during the Reporting period (tCO_2-e)**	*from section 4.3*	**12,749,878**	**22,720,712**	**35,470,590**
B.	**If applicable, number of Emission Reductions from reducing forest degradation that have been estimated using proxy-based estimation approaches (use zero if not applicable)**		-	-	-
C.	**Number of Emission Reductions estimated using measurement approaches (A-B)**		**12,749,878**	**22,720,712**	**35,470,590**
D	**Percentage of ERs (A) for which the ability to transfer Title to ERs is clear or uncontested**	*from section 6.1*	*100%*	*100%*	*100%*
E	**ERs sold, assigned or otherwise used by any other entity for sale, public relations, compliance or any other purpose including ERs accounted separately under other GHG accounting schemes or ERs that have been set-aside to meet Reversal management requirements under other GHG accounting schemes .**	*From section 6.4*	-	-	-
F	**Total ERs (B+C)*D-E**		12,749,878	22,720,712	**35,470,590**
G	**Conservativeness Factor to reflect the level of uncertainty from non-proxy based approaches associated with the estimation of ERs during the Crediting Period**	*from section 5.2*	0%	0%	0%
H	**Quantity of ERs to be allocated to the Uncertainty Reversal Buffer (0.15*B/A*F)+(G*C/A*F)**		-	-	-
I	**Total reversal risk set-aside percentage applied to the ER program**	*From section 7.3*	26%	26%	26%

J	**Quantity of ERs to allocated to the Reversal Buffer (F-H)*(I-5%)**		2,677,474	4,771,349	7,448,823
K	**Quantity of ERs to be allocated to the Pooled Reversal Buffer (F-H)*5%**		637,493	1,136,036	1,773,529
L	**Number of FCPF ERs (F-H-J-K).**		**9,434,911**	**16,813,327**	**26,248,238**

ANNEX 1: INFORMATION ON THE IMPLEMENTATION OF THE SAFEGUARDS PLANS

ANNEX 1: INFORMATION ON THE IMPLEMENTATION OF THE SAFEGUARDS PLANS

I. Requirements of FCPF on Managing the Environmental and Social Aspects of ER Programs

The East Kalimantan Emission Reduction Program (EK ER Program) aims to reduce deforestation and forest degradation in an area covering 12.7 million hectares that comprise the East Kalimantan provincial jurisdiction. The ER program supports enabling conditions and promotes sustainable management practices that directly address the underlying drivers of emissions.

The implementation of safeguards within the scope of ERPD complies with World Bank (WB) safeguards policies aligned with the UNFCCC safeguards related to REDD+. Relevant environmental and social safeguard policies triggered for the program include:

1) OP 4.01 Environmental Assessment
2) OP 4.04 Natural Habitat
3) OP 4.09 Pest Management
4) OP 4.10 Indigenous Peoples
5) OP 4.12 Involuntary Resettlement
6) OP 4.36 Forests

Relevant environmental and social assessments and consultation processes to define strategic options in the ERPD are presented in the Strategic Environmental and Social Assessment (SESA) for the ER Program. The principles and key requirements of the above WB safeguards policies are translated and operationalized into the Environmental and Social Management Framework (ESMF), Indigenous People Planning Framework (IPPF), Resettlement Policy Framework (RPF), and Process Framework (PF), as well as the Feedback Grievance Redress Mechanism (FGRM).

The World Bank reviewed and cleared these instruments, which were publicly disclosed at: https://mrv.kaltimprov.go.id/id/access-directory. The ESMF and its associated frameworks provide guidelines for assessing the potential environmental and social impacts and preparing the environmental and social management plans and required measures to minimize adverse environmental and social impacts under the ER Program in East Kalimantan. The other important documents for the reporting period include the safeguards due diligence report (*Due Diligence Report for Retroactive Emissions Reductions for July 2019 to December 2020 period or EK Retroactive Report*), and Environmental and Social Management Report 2021 - 2024, The safeguards due diligence represents one of the key requirements for ER Program effectiveness following the ERPA signature. This annex outlines key findings of the due diligence report and environmental and social management report. The due diligence report includes safeguards performance assessments within the reporting period and the proposed system enhancement measures. The due diligence report has been reviewed and cleared by the World Bank in November 2021. The Environmental and Social management Report 2021 - 2024 has assessed safeguards measures implemented from 2021 to 2024 based on the ESMF document. This document has been reviewed and cleared by the World Bank in August 2025.

Further operationalization of the ESMF and its associated frameworks are presented in the following action plans for the Environmental and Social Risk Management under the EK ER Program. The Environment and Social Management Plan (ESMP) document can be accessed at the link provided above.

The implementation's outcome of the Environmental and Social Risk Management is reported by the Program's Safeguards Working Group, under the supervision of the Directorate General of Climate Change and Carbon Economic Value Governance of the Ministry of Environment, and the Regional Secretary of East Kalimantan Provincial Government. In August 2025, the ESM report was finalized—capturing safeguards implementation of the Program between January 2021 and December 2024 in accordance with the reporting requirements under the Emission Reduction Payment Agreement (ERPA). The report details the arrangements for implementing, monitoring, and reporting on environmental and social safeguards, summarizes capacity building and stakeholder engagement activities, presents an overview of grievances submitted through the program's grievance redress mechanism, and identifies key gaps and remedial actions to address them. The ESM report can also be accessed at the link provided in the first page.

II. Monitoring and Reporting Requirements

1. Entities that are responsible for implementing the Safeguards Plans are adequately resourced to carry out their assigned duties and responsibilities as defined in the Safeguards Plans.

1.1 Summarize the key institutional arrangements, such as decision procedures, institutional responsibilities, budgets, and monitoring arrangements required under the Safeguards Plans.

A summary of the key institutional arrangements is provided in Table A1.1.

Table A1.1. Summary of Key Institutional Arrangements

Institutional Arrangements	Summary
Decision procedures	The decision procedures to implement Safeguards plans are conducted through culturally appropriate and inclusive decision-making mechanisms, such as involving adat representatives, ensuring communities' participation through Musrenbangdes, organizing public consultations, and increasing women's participation.
Institutional responsibilities	A safeguard working group was developed in 2019/2020 following extensive consultations amongst implementing agencies. It consists of stakeholders from governmental actors, NGOs, businesses, and academia ensures the implementation of the safeguards plans in the East Kalimantan Province. The Safeguards Working Group was formalised under the Governor's Decree No. 500/K/583/2022. The East Kalimantan Forestry Service is the coordinator of this working group.
Budgets	The primary funding sources for implementing the Safeguards Plans are the Regional Revenue and Expenditure Budget (Provincial APBD), regional transfer funds, the National Revenue and Expenditure Budget / APBN, grant funds, and ER Payment. Some government partners, like

	NGOs and CSOs, also have the budget for managing E&S risks. However, their budget is limited.
Monitoring	The Directorate General of Climate Change, MOEF, has established an MRV system known as the National Registry System (Sistem Registry Nasional/SRN) and the Safeguards Information System (SIS). As of October 2024, the system is managed by the Directorate General of Climate Change and Carbon Economic Value Governance at the Ministry of Environment, following the restructuring of MoEF. The ER Programs will be registered in the SRN to enhance a robust and transparent monitoring system. The EK Environment Agency leads the monitoring system at the sub-national level. The Environment agency at the district level will assist the monitoring process by gathering the reports from the implementing agencies. The reports will be submitted to DGCC and SEKDA, who will be responsible for distributing them to the World Bank. The SIS system was set up during the readiness phase, but it did not get implemented due to budgeting and capacity issues. The FGRM at the province level was first supported by Aspirasi Etam, a system that enables people to submit their feedback, grievances, and complaints online, established in 2019. The Aspirasi Etam is developed under the Governor Regulation, No. 69, Year 2019. Aspirasi Etam was then replaced by the national grievance system, SP4N-LAPOR. This was operationalized as outlined in the East Kalimantan Standards Operational Procedure (SOP) for SP4N LAPOR issued in January 2022.. SP4N-LAPOR! is a national information system that enables complainants to file grievances through various channels, including the SP4N-LAPOR! website, mobile app (available on the App Store and Google Play), Twitter/X account @lapor1708, and SMS service via 1708. Community-based fire management and Monitoring Systems (CBFMMS) are developed to involve communities in the monitoring process at the village level.

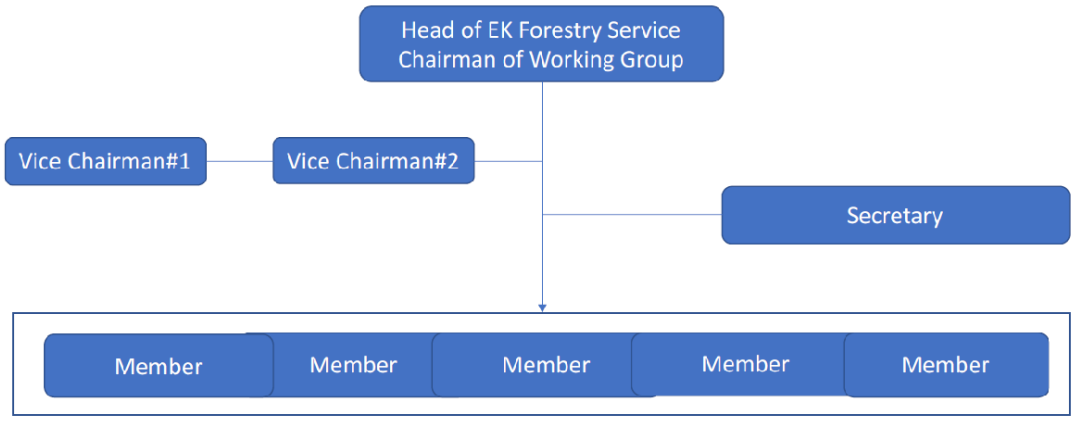
The Safeguards Working Group was established following consultations with the relevant agencies/services during the reporting period based on Safeguards Plans. The Safeguards Working Group was formalized under the Governor's Decree No. 500/K/583/2022. Before the formalization of the Safeguards Working Group, the Safeguards Working Group had prepared Standard Operating Procedures (SOP) to ensure safeguards plans are implemented accordingly. The preparation involved the national and provincial governments, AMAN (Indigenous Peoples Alliance of the Archipelago), universities, the private sector, and NGOs. For instance, a set of procedures for the FGRM was prepared to enable affected and interested stakeholders to raise their concerns and suggestions. In addition, the SOP also included instructions on how such concerns and suggestions would be followed up with the project's FGRM. When the FGRM still used the Aspirasi Etam, there were three steps for complainants to submit complaints through the Aspirasi Etam. The number of complaints submitted and resolved can be monitored on the following website: https://aspirasi.kaltimprov.go.id/. The mechanism has now been replaced by SP4N-LAPOR! Complaints and grievances submitted can be traced through SP4N-LAPOR! Website. Hence, it

has demonstrated the efforts of the East Kalimantan Government to support transparency in the FGRM implementation.

Day-to-day operating costs for the Working Group were from various sources as mentioned in the table above. During 2021 to 2022 the operation used the regional budget and funding from government development partners. The Government development partner also provided technical assistance. In 2023, the safeguards working group received funding from ER payments and managed around 2.5 billion Rupiah for coordination, communication, workplan development, capacity building programs, safeguards monitoring, and evaluation. In 2024, 4.8 billion rupiah was allocated to M&E, safeguards capacity building and forest monitoring with 2.2 billion rupiah spent. The budget allocation for MR, benefit sharing and strengthening the safeguards information system was 3.3 billion, yet only 4.82 million rupiah was spent. For public information dissemination, there was 1.2 billion rupiah allocated, and only 92 million rupiah was spent.

The organizational structure for the Safeguards Working Group is in Figure A1.1.

Figure A1.1. Structure Organization for Safeguards Working Group



Members:
1. EK Forest Agency
2. EK Environment Agency
3. EK Plantation Agency
4. EK Maritime affair and Fishery Agency
5. EK Village Government & Community Empowerment Agency
6. East Kalimantan Regional Secretariat Bureau of Economy
7. Development Partner Representatives (Working on Safeguards Issues)
8. Private Association Representative
9. Experts from University, related to Social, Biodiversity, Ecology, Environment.

The Working Group is chaired by the Head of EK Forestry Agency and supported by two Vice-Chairmen, namely 1) the Head of Watershed Management and Rehabilitation Division, and 2) the Head of Forest

Planning and Utilization Division. In addition, the Secretary of the Safeguard Working Group is housed by the Forest Planning and Governance in EK Forest Agency. In other words, the EK Forestry Service is responsible for the overall coordination, supervision, and reporting for the Safeguards Working Group. Based on the e-survey involving 24 institutions, the results show that those institutions have the adequate institutional capacity to function effectively in supporting the Working Group. There are six indicators: resource allocation, technical capacity, identification and management of environmental and social risks, stakeholder engagement and consultations, FGRM, and availability of supporting documentation. The results of the e-survey are provided through this link:

https://1drv.ms/x/s!ApxFBBsaVYWCgsYUiaM9p7ZwB12C7A?e=HqMRHY.

The members of the working group consist of the following representatives (See Figure A1.1):

1. EK Forest Agency
2. EK Environment Agency
3. EK Plantation Agency
4. EK Maritime affair and Fishery Agency
5. EK Village Government & Community Empowerment Agency
6. EK Law Agency
7. EK Borders, Regional Planning, and Cooperation Agency
8. EK Communication and Information Agency
9. East Kalimantan Regional Secretariat Bureau of Economy
10. Development Partner Representatives (Working on Safeguards Issues)
11. Private Association Representative
12. Experts from University, related to Social, Biodiversity, Ecology, Environment

The Safeguards Working Group has developed an institutional arrangement for a decision-making procedure, institutional responsibilities, and monitoring and reporting procedures in line with the ESMF and is currently implemented under the EK ER Program. The Governor's Decree No. 500/K/583/2022 was issued in 2022 as the legal basis for the Safeguards Working Group. In addition, specific responsibilities for FGRM management are outlined in the FGRM framework which is an integral part of the ESMF.

This Working Group expanded membership to include the EK Population and Women's Empowerment and Child Protection Agency, which was responsible for gender issues, and The Aliansi Masyarakat Adat Nusantara/AMAN Kaltim which facilitated the engagement with Adat communities, including supporting the program entities in the implementation of the Community Customary Law. To encourage the involvement of those two agencies, they were intensively engaged and involved in relevant workshops and FGDs related to the FCPF Carbon Fund in East Kalimantan.

To ensure adequate implementation of the safeguards requirements by the relevant agencies/implementing entities, the Working Group facilitated discussions, provide technical support, and reviewed safeguards documents, including any applicable environmental and social management plans (ESMPs) such as the AMDAL/RKL-RPL, UKL-UPL, SPPL, Forest Management Plan, or any other equivalent plans prepared by these entities. The Working Group assigned a team of specialists with expertise in Environmental and Social Safeguards, gender, CBNRM, and FGRM to ensure effective oversight of ERP safeguards. The working group then compiled all safeguards documents, including relevant site-specific ESMPs, into one provincial safeguards document on the ER program and submitted it to the Secretariat National REDD+

through the Provincial Project Management Unit (PPMU). The roles and responsibilities of the Safeguards Working Group, project management unit, and implementing entities in managing safeguards for the ERP are provided in Figure A1.2.

Figure A.1.2. Main Roles of implementing entities and safeguards working group in implementing, monitoring, and reporting the implementation of environmental and social aspects of the ER program

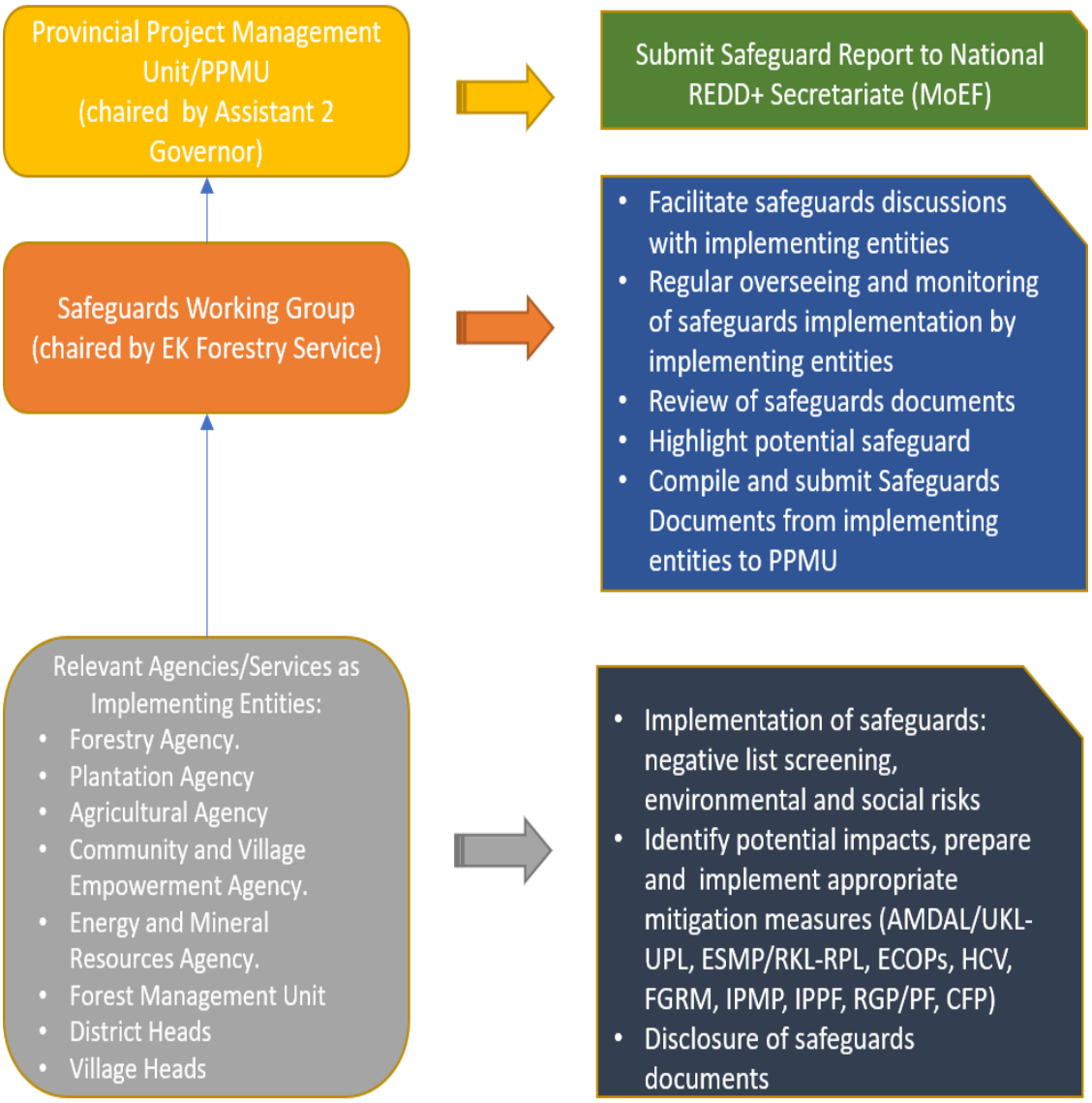
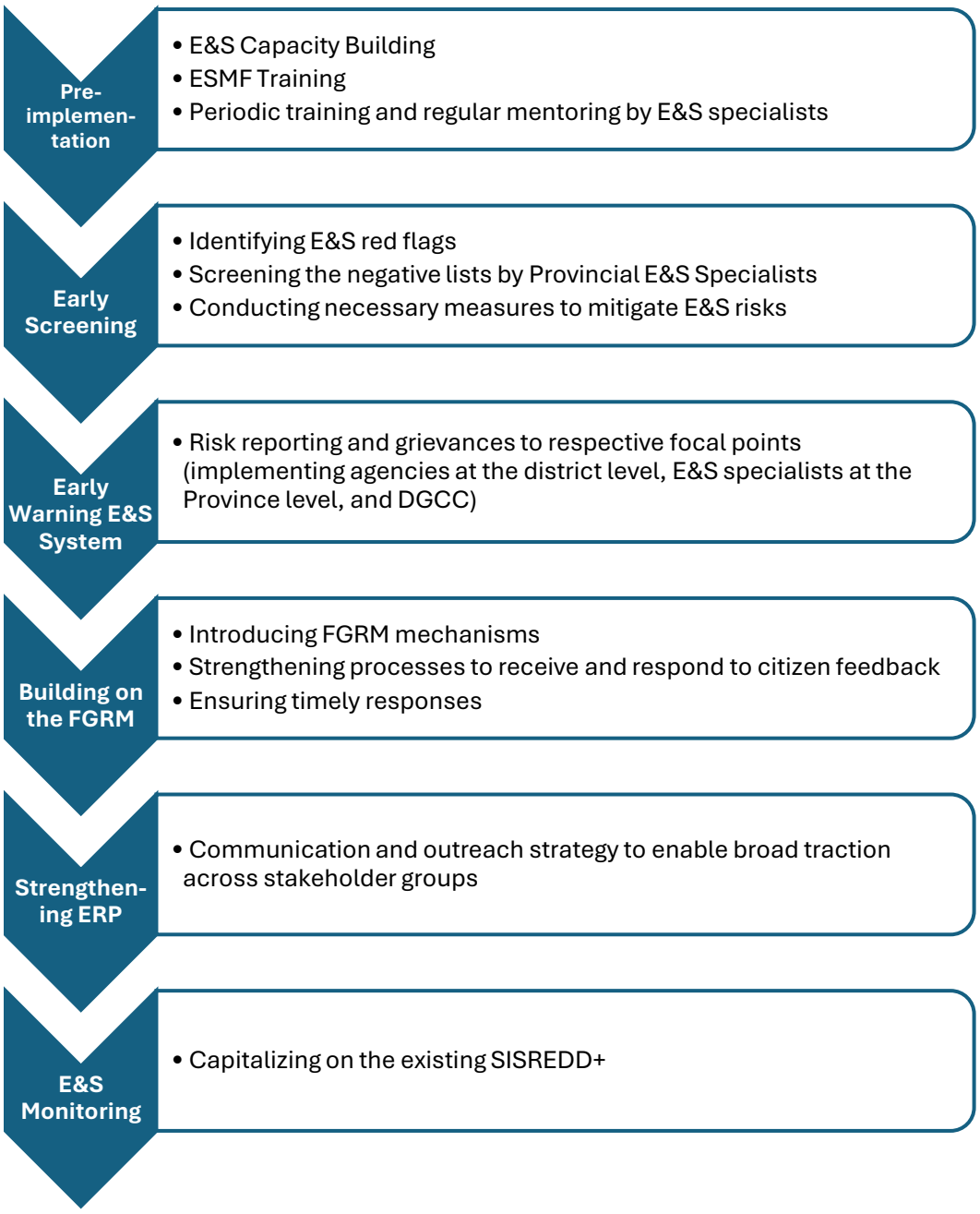


Figure A.1.3. Review and Clearance Procedure



The implementation structure for the environment and social management under the EK FCPF-Carbon Fund consists of government institutions (*Perangkat Daerah*/PD), NGOs/development partner representatives, the private sector, village government, and Forest Management Unit/*Kesatuan Pemangkuan Hutan* (KPH).

Referring to Figure A1.3 above, the implementing entities, with support from the E&S specialists, conduct environmental and social risk screening, analysis of risks, and preparation of relevant management plans as applicable for their respective activities and report the result to the PMU. Most of the entities have performed environmental and social risk screening. Thirteen out of 19 entities conduct E&S risks identification and management mechanisms. They have done the

screening process through reporting, reviewing, and examining the projects to identify risks, sources, impacts, and mitigation options. The detailed roles and responsibilities of relevant agencies for safeguards implementation under the ER program can be found in Table 5-2 ESMF Document.

The monitoring arrangement for the environmental and social risk and impact management under the ER Program focuses on the overall compliance of the applicable environmental and social requirements outlined in the ESMF and its associated frameworks. This includes planning and implementing social and environmental risk prevention and mitigation procedures under the reported activities.

1.2 Confirm whether the institutional arrangements summarized above have been put in place.

The institutional arrangements summarized above have met most of the relevant requirements for the Safeguards Working Group to perform accordingly. The relevant requirements are budget allocation, resources and skills, and coordination agreements.

The EK government uses the Regional Revenue and Expenditure Budget (Provincial APBD) as the main source to finance E&S risks management. Dependency on the APBD has risks that affect medium- to long-term funding sustainability. The EK government's liability to finance the E&S risks and management might change depending on the political and economic circumstances. The COVID-19 pandemic showed that the provincial government tightened the budget in response to the pandemic. Furthermore, the Provincial RPJMD has no specific budget allocation for E&S risk management. However, some budget allocations might provide funding for activities related to the E&S risk management. For instance, the EK Environmental Agency allocated IDR 446,250,000 in 2019 and IDR 2,720,000,000 in 2020 for grievance handling and conflict monitoring related to environmental and social cases. Meanwhile, in 2019 the Forest Management Units (FMUs) allocated around IDR 3,920,000,000 for grievance, conflict management, tenure, and customary forests. In addition, some development partners of EK government, including GiZ, Propeat, and Leopold, also allocated IDR 90,000,000 for conflict mediation strengthening support.

Referring to the EK Retroactive Report, the safeguards due diligence confirmed that social and environmental safeguards had been implemented quite well during the observation period of July 2019 to December 2020. The Aspirasi Etam website shows that from July 2019 to December 2020, 38 out of 45 aspirations and complaints had been solved. Most aspirations were about appreciation of government performance and suggestions for public development. Complaints were related to environmental pollution, public facilities, and tenurial conflicts.

However, some gaps in implementation remain including the availability of human resources for managing social and environmental issues, the availability of financing, and improving SOPs in risk identification, and monitoring and reporting on the implementation of the management of social and environmental issues. The EK government institutions have been concerned about improving technical capacities to conduct E&S risks management since the issuance of Law No. 23 of 2014 on regional government and the ensuing delegation of district forestry staff. Capacity building programs have included a broad range of safeguards topics such as gender and climate change, reversal and leakage, and SIS REDD+.

Based on the Environmental and Social Management report (2021-2024 reporting period), the institutional arrangements have been put in place. The EK Government had organized capacity building, conducted early screening, established FGRM, strengthened ERP, and monitored safeguards implementation. However, some gaps remain there and need further attention for improvement. The main problem was weak documentation of the screening process and FGRM. The records to demonstrate the screening, risk identification and process of selection of management measures in annual work plans are not always kept or reported to the Safeguards Working Party, but the safeguards management measures and outputs are recorded and reported. The accuracy in using the ERP category in SP4N-LAPOR! remains a challenge. Many of the complainants did not use this category when submitted their complaints related to ERP (such as a request for more forest rangers) and many complaints using the category were not related (e.g. a complaint about Balikpapan Port). Moreover, the SIS REDD+ as monitoring system for safeguards implementation did not work as planned due to capacity and budget limitations.

Coordination and agreements among the key stakeholders were achieved through the formation of the Safeguards Working Group. The EK Forestry Agency is appointed as the coordinator of the Working Group that involves multi-stakeholders, including governmental and non-governmental actors. The program implementation entities conduct the E&S risk management program on their activities and report the result to the PMU. However, several actions need to be taken by the EK government to enable the Safeguards Working Group to function effectively. First, the EK government needs to expedite the issuance of a gubernatorial decree to form the legal basis for the Safeguards Working Group. Second, not all implementing agencies have internal capacities for E&S risks identification and management mechanisms. Therefore, they depend on external E&S specialists. The EK government needs to strengthen the institutional capacities of the implementing agencies by improving the E&S management skills of internal government officials.

1.3 Confirm that the implementing entities and stakeholders understand their respective roles, have the technical capacity to execute their responsibilities, and have adequate human and financial resources.

This is confirmed. The following table describes the roles and responsibilities of relevant stakeholders regarding the ER program in implementing safeguards. The availability of financial resources currently comes from regular provincial budgets (ABPD). In other words, from the EK government services budgets. The financial resources during the reporting report were not yet sourced from ER Payments of the Carbon Fund. The ER program seeks to address the financial gaps (i.e., the vulnerability in solely relying on APBD budgets) by utilizing the first ER payments.

Table A.1.2. The Roles and Responsibilities, Technical Capacity, and Resources Availability of Relevant Stakeholders[98]

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
Forest and land governance	● BPSKL (*Balai Perhutanan Social dan Kemitraan Lingkungan)* ● EK Forestry Service ● EK Social Forestry Working Group ● EK Social Service ● EK Environment Service ● Development Partners	● Strengthen existing FGRM to promote accessibility, reliability, and transparency ● Capacity building for government agencies and the private sector in the ESMF, and ECOP, including aspects around community engagement and sustainable NRM ● Capacity building in participatory community mapping, database development/conflict	● 15 out of 24 entities have sufficient technical capacity for E&S risks management, including capacity for reporting, monitoring, evaluating, managing grievances system, managing natural resources, forest resources, and biodiversity, conducting inclusive public consultations, promoting sustainable living, solving conflicts, and gender mainstreaming. Four stakeholders stated that they have excellent capacities and the rest	Available. More than half of the stakeholders, 13 out of 24, have internal staff who have adequate capacity to conduct E&S risks management	Available. Almost all stakeholders depend on Provincial Budgets (APBD). Some of them receive alternative funding from Regency Budgets, regional transfer funds, and grants. 13 out of 24 stakeholders have the ability to finance capacity building programs. However, only four out of 24

[98] This refers to the EK Retroactive Report - https://mrv.kaltimprov.go.id/storage/guest/SAFEGUARDS/FCPF_EK_Retroactive_FINAL REPORT_GOI.docx..

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
	● DDPI ● EK Communication and Information Service ● EK *Adat* Council	inventory, and analysis of social problems ● Addressing access restriction risks through alternative livelihoods/employment/skills training ● Regular monitoring of the Social Forestry program to ensure capacity building and technical support to community groups and mitigate unintended environmental impacts ● Capacity building to engage with *Adat* communities and Indigenous Peoples and other vulnerable groups dependent on forest resources. A participatory Indigenous Peoples Plan (IPP) may be developed to establish a strategy for such engagement ● Addressing the risk of access restrictions through alternative	stated that they have no such capacities.		stakeholders have the ability to finance the operational budget for FGRM.

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
		livelihoods/jobs/skills training ● Periodic monitoring of the Social Forestry program to ensure capacity building and technical support to community groups and reduce unwanted environmental impacts ● Capacity building to engage with Indigenous and Indigenous Peoples and other vulnerable groups who depend on forest resources. A participatory Indigenous Peoples Plan (IPP) can be developed to develop a strategy for such engagement			
Improving Forest Supervision and Administration	● DGCC as the Project Executing Agency, and Provincial Forestry Agency as	● Capacity building for FMUs and relevant government institutions on sustainable NRM and ESMF in particular ● Effective scheduling for forest patrol as well as	● 15 out of 24 entities have sufficient technical capacity for E&S risks management, including capacity for reporting, monitoring, evaluating, managing grievances system, managing natural resources,	Available. More than half of the stakeholders, 13 out of 24, have internal staff who have adequate	Available. Almost all stakeholders depend on Provincial Budgets (APBD. Some of them receive alternative funding from Regency

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
	Implementing Agency ● Other entities: FOERDIA, DDPI, NGOs	planning of forest use and resource management as encapsulated in the RPHJP (long-term development plans) ● Proper identification of capacity building strategy, including pooling of credible and qualified trainers/champions and/or training institutions to deliver the required capacity building activities and mentoring	forest resources, and biodiversity, conducting inclusive public consultations, promoting sustainable living, solving conflicts, gender mainstreaming. Four stakeholders stated that they have excellent capacities and the rest stated that they have no such capacities.	capacity to conduct E&S risks management	Budgets, regional transfer funds, and grants. 13 out of 24 stakeholders have the ability to finance capacity building programs. However, there are only 10 out of 24 stakeholders having the ability to finance E&S monitoring and evaluation.
Reducing Deforestation, Forest Degradation Within Licensed Areas	● DGCC as the Executing Agency, and Provincial Forestry Agency as implementing agency responsible for monitoring and evaluation	● Community training/capacity development for small holders and private sector actors as well as government institutions on aspects related to good agroforestry practices, NTFP, zero-burning farming, etc. ● Community capacity building on forest and	● 15 out of 24 entities have sufficient technical capacity for E&S risks management, including capacity for reporting, monitoring, evaluating, managing grievances system, managing natural resources, forest resources, and biodiversity, conducting inclusive public consultations, promoting sustainable living, solving	Available. More than half of the stakeholders, 13 out of 24, have internal staff who have adequate capacity to conduct E&S risks management	Available. Almost all stakeholders depend on Provincial Budgets (APBD). Some of them get alternative funding from Regency Budgets, regional transfer funds, and grants. 13 out of 24 stakeholders have the ability to

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
	● Environmental Agency (East Kalimantan Province) for training and regulation enforcement. Implementation of ESMF, FGRM, IPPF, and BMF ● Involvement of conservation NGOs for establishing BMF and facilitate its implementation	land fire management/community-based forest and fire management ● Incentive development to promote participation from the private sectors in land and forest fire management ● Capacity building on participatory HCV mapping and strengthening engagement with *Adat* communities and Indigenous Peoples, including those dependent on forest resources for sustainable HCV management ● Development of a Biodiversity Management Framework (BMF) or inclusion of biodiversity management under HCV or non-carbon benefit	conflicts, gender mainstreaming. Four stakeholders stated that they have excellent capacities and the rest stated that they have no such capacities.		finance capacity building programs.

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
		● Enforcement and strengthening the existing safeguard including ESMF for relevant stakeholders especially private sectors as well as government institutions)			
Sustainable Alternative Livelihoods	● DGCC as the Executing Agency, and Provincial Forestry Agency as implementing agency responsible for monitoring and evaluation ● Environmental Agency (East Kalimantan Province) for training and regulation enforcement	● Strengthening FGRM, particularly to promote its accessibility and accountability ● Participatory village planning and community training on sustainable livelihoods options, including access to financing and inputs, good agricultural practices, and market ● Mainstreaming safeguards good practices in NRM, such as use of organic pesticides, revegetation, crop intensification, etc. ● Enhancing access to information and	● 15 out of 24 entities have sufficient technical capacity for E&S risks management, including capacity for reporting, monitoring, evaluating, managing grievances system, managing natural resources, forest resources, and biodiversity, conducting inclusive public consultations, promoting sustainable living, solving conflicts, gender mainstreaming. Four stakeholders stated that they have excellent capacities and the rest stated that they have no such capacities.	Available. More than half of the stakeholders, 13 out of 24, have internal staff who have adequate capacity to conduct E&S risks management	Available. Almost all stakeholders depend on Provincial Budgets (APBD). Some of them get alternative funding from Regency Budgets, regional transfer funds, and grants. 13 out of 24 stakeholders have the ability to finance public consultations and capacity building.

Component ER Program	List of stakeholders	Roles and Responsibilities related to safeguards	Assessment of technical capacity	Availability of human resources	Availability of financial resources
	● Involvement of conservation NGOs for establishing BMF and facilitate its implementation	participation in social forestry licensing processes ● Capacity building to engage with Adat communities and Indigenous Peoples as well as other vulnerable groups dependent on forest resources. A participatory Indigenous Peoples Plan (IPP) may be developed to establish a strategy for such engagement			

1.4 Where specific capacity building measures (e.g., training and professional development) have been required by the ER Program or Safeguards Plans, describe the extent to which these measures have been carried out.

A capacity assessment during ERP preparation identified capacity building requirements at all levels and all implementing agencies to improve 1) the delivery of the ERP and 2) implementation of safeguards. ERP capacity building has been integrated into activity design and operational budgets. Many of the ERP training activities have elements of environmental and social risk management such as participatory planning training and occupational health and safety training and equipment. Table A.1.3 describes the specific capacity building measures for implementing the safeguards plans, as proposed in the ESMF.

Table A.1.3 Summary of Proposed Safeguards Capacity Building Measures (Source: ESMF, 2019)

ESMF Capacity Building Plan			
Training Type	**Objective / Target Audience**	**Indicator of Success**	**Annual Target**
Basic Training	Disseminate information on the environmental and social risks of the ERP. PMU, Implementing entities, field facilitators	Implementing agencies/OPDs understand the basic environmental concepts, existing issues, and applicable regulations.	2 / semi annual
Technical / Thematic Training	Implementing agencies fully understand to implement the safeguards tools in the ERP at the project activity level. Economy bureau, Implementing entities, field facilitators.	Documented plans and or minutes of meeting on implementing the safeguard tools at the project activity level.	4 / quarterly
Public Workshops	Provide outreach on ERP components to a wider audience of stakeholders	Improved understanding and support from the public on ERP activities leading to overall success of the ERP.	2 / semi annually
Thematic Workshops	Provide a means of sharing of information and discussion in implementing the safeguards tools in the ESMF to manage the environmental and social risks of the ERP. Economy Bureau, implementing agencies (OPDs), SIS REDD administrator, field facilitators, safeguards specialists.	Implementing agencies (OPDs) and field facilitators at the project activity level can share information, raise constraints in project implementation and identify possible solutions.	4 / quarterly
Safeguards coaching / mentoring	Provide hands-on skills enhancement and awareness of environmental and social good practices, develop cadre of environmental and social champions and/or local experts within implementing agencies.	Improved understanding and awareness amongst implementing agencies and enhanced in-house skills for the management of environmental and social aspects.	4 quarterly
FGRM Strengthening and outreach			4 / quarterly

The following table describes training sessions that were carried out in 2020.

Table A.1.4. The Summary of Capacity Building Measures Carried Out from 2020 to 2024

Year	Capacity Building	Implementing Agencies	Target Groups
2020	Geographic Information System (GIS) and drone training. This training aimed to enable the stakeholders to manage and utilize spatial data.	the Plantation Agency	FMUs
	Management Effectiveness Tracking Tool (METT) training. This training was conducted in Lati Petangis Grand Forest.	The Forestry Agency	FMUs
	Conflict resolution training	The Forestry Agency and GIZ-SCPOPP	FMUs
	Village heads training	The Community and Village Empowerment Agency (DPMD)	Village heads
	FMU business plan development training. For example, this training was conducted in Lati Petangis	The Forestry Agency	FMUs
	Forest Integrity Assessment Tool (FIAT) training	Corporation (PT Gunung Gajah Abadi)	FMUs
2021	Emission reduction work plan preparation	The Ministry of Environment and Forestry	The East Kalimantan Regional Planning Agency (Bappeda)
	FGD to share best practices or lesson learned from emission reduction programs	The Forestry Agency	The East Kalimantan Government Agencies
2022	73 activities were conducted by the East Kalimantan Provincial Government, MoEF, and IEF. Activities focused on natural resource management, carbon emission reduction, and sustainable development	The East Kalimantan Provincial Government, MoEF, and IEF	The East Kalimantan Government Agencies

Year	Capacity Building	Implementing Agencies	Target Groups
	initiatives. These activities encompassed a wide range of methods, including workshops, coordination meetings, FGDs, technical assistance, and socialization programs.		
	Capacity building to raise awareness and technical capacity on how to conduct and facilitate participatory mapping. has also been conducted in partnership with NGOs or developing partners, such as Yayasan Bumi, BIOMA, *Permakultur Lanskap Berkelanjutan Indonesia* (Plan B), WWF and GIZ SCPOPP.	The EK Forestry Agency, Yayasan Bumi, BIOMA, *Permakultur Lanskap Berkelanjutan Indonesia* (Plan B), WWF and GIZ SCPOPP.	FMUs
	Several FGDs and workshops focused on key environmental issues such as peatland management, REDD+ implementation, and mangrove conservation. Notably, the "Workshop on Peatland Management and Rehabilitation" and the "FGD on Nature-Based Solutions and REDD+" were among the prominent activities to enhance East Kalimantan's environmental resilience.	The EK Forestry Agency	FMUs, the forestry agencies at the district level
2023	94 activities were conducted led by various agencies. These activities focused on coordination meetings, workshops, socialization programs, and training sessions, all aimed at improving capacity, fostering sustainable development, protecting the environment, and enhancing local livelihoods.	The East Kalimantan Provincial Government, East Kalimantan Development Planning Agency (Bappeda), DPMPD, Estate Crops Agency, and IEF.	Local communities, FMUs, government agencies at the district level.
	Safeguard Working Group participated in or led 12	Safeguard Working Group	The government agencies at the

Year	Capacity Building	Implementing Agencies	Target Groups
	capacity-building activities involving forest carbon management and stakeholder engagement.		province and district levels
	Relevant agencies and forestry units attended a training session in Balikpapan which aimed at improving complaint management through the SP4N-LAPOR! System. These activities collected essential feedback and data for the FGRM and successfully enhanced stakeholders' technical and operational capacity in safeguard management, emission reduction, and community engagement.	The EK Communication and Information Agency	The government agencies at the province and district levels
	DPMD of East Kalimantan has conducted several trainings to strengthen the Committee of Recognition and Protection of MHA. For example, DPMD of East Kalimantan trained 50 government officials from relevant agencies such as Environment Agencies, officials from subdistrict level on 23 Oct 2023. This was a strategic step to accelerate the MHA recognition program. The participants were trained how to conduct technical verification in the field.	DPMD of East Kalimantan Province	the Committee of Recognition and Protection of MHA, the Environment Agencies (district level)
	DPMD of East Kalimantan also conducted technical training for a specific issue, such as ethnographic data, since this data was needed for the application process of MHA recognition. DPMD of East Kalimantan organized a training involving representatives from OPD in West Kutai District, heads of villages, and the Head of Adat Kampung Institute of Kutai Barat on 15 February 2023.	DPMD of East Kalimantan Province	the Committee of Recognition and Protection of MHA, OPD at the district level

Year	Capacity Building	Implementing Agencies	Target Groups
	Capacity Strengthening on Forest Rangers Partnership with the Community of Balikpapan Implementation Unit, East Kalimantan, July 2023, for supporting socialization and establishment of Forest Ranger Community Partners (MMP).	The Forestry Agency	Local communities
	FPIC socialization, organized by DPMPD across Kutai Barat, Kutai Kartanegara, and Mahakam Ulu, which involved 44 villages.	DPMD of East Kalimantan Province	Local communities
2024	Regional Council on Climate Change hosted workshops and meetings on FPIC, Identifying potential gaps in the FPIC consultation process, June 13.	Regional Council on Climate Change	The government agencies at the province and district levels
	FGD on preparation of Indigenous Peoples Planning Document September, October	DPMD of East Kalimantan Province	The government agencies at the province and district levels
	Training of PPMHA Committee, West Kutai District and verification and validation of indigenous peoples, September.	DPMD of East Kalimantan Province	PPMHA Committees
	Safeguards Working Group Capacity Building Activities	Safeguards Working Group	The government agencies at the province and district levels
	Capacity building of plantation staff and agricultural extension personnel in the cocoa sector, related to sustainable plantations, protection of high conservation value areas and prevention of land and plantation fires (53 people, May).	The EK Plantation Agency	Farmers communities

Year	Capacity Building	Implementing Agencies	Target Groups
	Capacity Strengthening on Forest Rangers Partnership with the Community of Balikpapan Implementation Unit, East Kalimantan conducted Sept and Nov 2024, for supporting socialization and establishment of Forest Ranger Community Partners (MMP).	The EK Forestry Agency	Forest Ranger Communities

2. ER program activities are implemented in accordance with management and mitigation measures specified in the Safeguards Plans.

2.1 Confirm that environmental and social documents prepared during program implementation are based on the Safeguards Plans. Provide information on their scope, main mitigation measures specified in the plans, whether the plans are prepared in a timely manner, and whether disclosure and consultation on the plans are carried out in accordance with agreed measures.

It is confirmed that environmental and social documents prepared during program implementation are based on Safeguards Plans. However, there are some gaps as identified by the EK Retroactive Report that need to be addressed. The EK Retroactive Report clarified that the ER activities being reported were implemented prior to ERPA. Therefore, specific management plans per the ESMF requirements may not have been prepared.

Based on the EK Retroactive Report, 13 out of 24 stakeholders stated that they have mechanisms for E&S risks identification, management, and mitigation in place. However, the identification and management were not always implemented consistently. The implementation of E&S risks identification, management, and mitigation depends on the type of the project, whether large, medium, or small projects. According to Government Regulation Number 22 Year 2021, business or planned activities need an Environmental Impact Analysis (Analisis Mengenai Dampak Lingkungan / Amdal) or Environmental Monitoring Scheme (Upaya Pengelolaan Lingkungan Hidup / UKL – Upaya Pemantauan Lingkungan Hidup / UPL) to receive the Central or Local Government's approval. Large projects involving construction works that have the potential to cause significant environmental and/or social impacts are required to obtain a business license to begin the projects. They need to prepare an Amdal, Environmental Management Plan (Rencana Pengelolaan Lingkungan Hidup / RKL), and Environmental Monitoring Plan (Rencana Pemantauan Lingkungan Hidup / RPL) documents. The medium-scale projects only need UKL-UPL documents. Existing government regulations push the large and medium program activities to follow, but not for the smaller ER program activities. For the smaller projects, the risk management and mitigation measures depend on the internal mechanisms of implementing agencies. Not all of those implementing agencies have such mechanisms due to a lack of human resources, lack of experts in their institutions, lack of understanding of its urgency, no obligation to prepare E&S documents, and no funding. In order to fill the gap, the Governor's Decree 522/K.28/2022 on the establishment of Provincial Project Management Unit is issued. The decree mandates the Safeguard working group is in charge to facilitate capacity building processes and knowledge sharing for the sub-national staffs and members related to risk management and mitigation measures.

According to the ESM report, the program implementation from 2021 to 2024 always followed the safeguards plan documents (ESMF, RPF, and IPPF). However, there were no environmental or social documents needed for the program implementation. Most of the program activities were technical advisory (policies, planning, institutional strengthening, training, awareness raising) and the activities were designed to enhance environmental and social outcomes and integrate or mainstream the management of safeguards. There were no significant residual risks that required the implementing agencies to prepare specific environmental or social documents. The disclosure and consultation on the safeguards plan were conducted in accordance with agreed measures. For example, the socialization of ER Program was carried out in several phases and covered 155

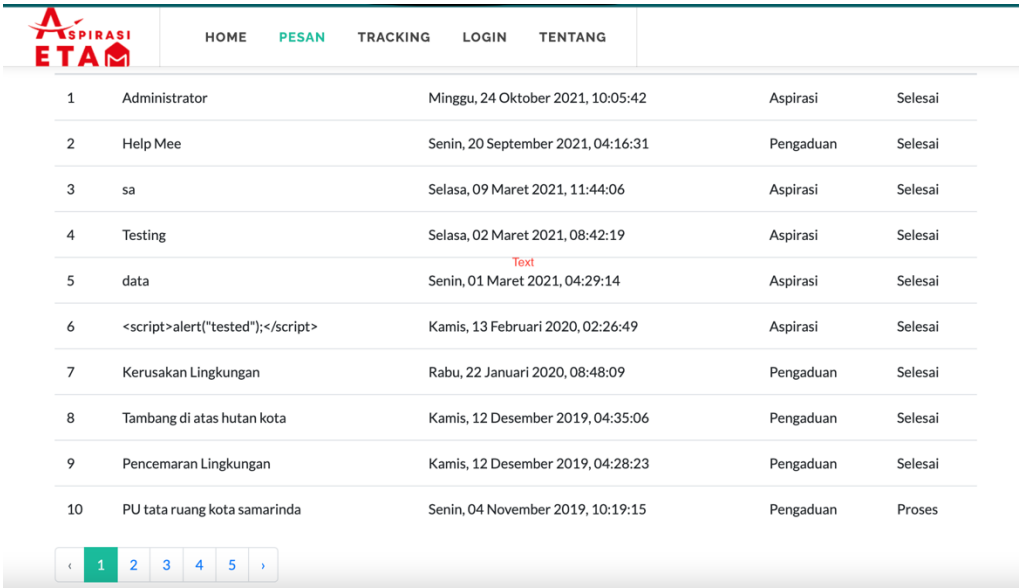
villages across eight districts/municipalities (Paser, Penajam Paser Utara, Balikpapan, Kutai Kartanegara, Berau, Kutai Timur, Kutai Barat, and Mahakam Ulu) through FPIC process. The FPIC process in the first phase involved a total of 5,096 participants (3,347 male and 1,749 female), and an attendance rate of 85%. In the second phase, 483 participants attended (413 male and 70 female). To date, FPIC documentation shows significant community support for the program; at least 43 signed FPIC documents have been completed up to 2023.

2.2 Confirm if entities responsible for implementing the Safeguards Plans maintain consistent and comprehensive records of ER Program activities such as records of administrative approvals, licenses, permits, documentation of public consultation, documentation of agreements reached with communities, records of screening process, due diligence assessments, and records of handling complaints and feedbacks under the ***Feedback and Grievance Redress Mechanism*** *(FGRM).*

Overall, the availability of supporting documentation for the above, including consultation records, is still lacking. Therefore, this gap needs to be addressed. Based on the e-survey conducted for the EK Retroactive Report, only 13 institutions have documentation and reporting mechanisms for public consultations. The e-survey process enabled the participants to upload documentation and administrative records samples. However, only four entities can provide those documents. Those four entities are Global Green Growth Institute, KPH Delta Mahakam, WWF, and (DDPI) Dewan Daerah Perubahan Iklim. The documents can be accessed through this link:
https://1drv.ms/u/s!ApxFBBsaVYWCgsYXGPq0PHxnxrki-g?e=aog5f0

The capability to provide records of handling complaints and feedback is also lacking as only eight of 24 institutions received public complaints. The e-survey results also show that only five of 24 institutions have a Standard Operating Procedure (SOP) for handling complaints and feedback. Three of them stated that they had solved all complaints received from July 2019 to July 2020. Despite gaps in providing well established FGRM mechanisms at the institutional level, the EK Province Government launched the Aspirasi Etam website (aspirasi.kaltimprov.go.id) in 2019 under Governor Regulation 69 of 2019. The EK Communication and Informatics Agency is the institution that develops this website to receive online complaints and aspirations from the public. The Aspirasi Etam has provided information on submitting complaints and aspirations online. The public can track the progress of each complaint and aspiration through this website. There were 45 complaints or aspirations received, and 43 cases were resolved from July 2019 to December 2020.

Figure A.1.4. Aspirasi Etam Website on FGRM records



Additional information obtained from the ESM report shows that the EK government has conducted consultation, screening process, due diligence assessment and addressed complaints. However, the problem was about the documentation, not all activities were recorded by implementing agencies. Some activities had been documented comprehensively. For example, all climate village program activities were recorded by using the National Registry System website managed by the Ministry of Environment and Forestry (DGCC). Other activities were documented by each implementing agency, but somehow scattered and took time to collect. For example, the DPMD always published FCPF progress reports yearly for each district, yet the activities documentation attached in the report were not complete and just samples. The DPMD also recorded technical verification for MHA recognition, but only for several MHA were available. The SP4N-LAPOR record shows that all complaints submitted through the SP4N-LAPOR website can be traced. However, some information was still missing, such as the information about how the complaints were handled. The information available in the system was only the complaints were solved. Moreover, not every complaint was recorded in the SP4N-LAPOR. Complainants could deliver their complaint through the FMU or Forestry agency officials, but the local officials might not record or submit their complaints via SP4N-LAPOR when they could handle it in the field.

The information about consultation involving Masyarakat Adat can be found in the Indigenous People Plan document. This document demonstrates consultation processes taken until 2024 for each activity. Not all documentation records are available, but this document can demonstrate that the EK government provided information before program implementation, gave enough time for Masyarakat Adat to learn about the program before making a decision, and reached communities in the remote areas. For example, the DPMD conducted consultation of MHA recognition program in Ujoh Bilang located 470 km from Samarinda and it took around 28 hours by taking a wooden ship via Mahakam River.

2.3 *Summarize the extent to which environmental and social management measures set out in the Safeguards Plans and any subsequent plans prepared during Program implementation are implemented in practice, the quality of stakeholder engagement, as well as whether field monitoring and supervision arrangements are in place.*

ERP Activities implemented in the reporting period are all part of the implementing agencies' annual work plans and followed their regulations, SOPs and other operational documents. Safeguards were mainstreamed into the annual work plans through a series of steps:

1. Safeguards screening and work planning prepared by implementing entities, using ESMF negative list and various internal screening processes. Activities that were on the negative list were not included in work plans. High risk activities were not included in work plans. Work plans included safeguards actions such as consultation, participatory planning, FPIC, FGRM and training.
2. Work plans submitted to BAPPEDA.
3. BAPPEDA consolidated regional work plans to BPKAD
4. BPKAD allocated budget.
5. Work plan implemented and outputs and costs recorded.
6. Outputs reported annually.

The ESMF process identifies screening as the key tool for identifying the *necessary management measures to be put in place*. These can include preparing activity-specific safeguards documents and / or obtaining environmental permits, or can include management processes such as identification of indigenous peoples, mainstreaming risk management into activity design, stakeholder engagement and / or training.
Management and mitigation of environmental and social risks is mostly mainstreamed into ERP activity implementation using Indonesian regulations and the guidelines and SOPs developed for the ERP program. This is because most of the activities are technical advisory. The safeguards management measures are presented in Section 3.2 below. Some safeguards documentation has been prepared during the during the reporting period, as presented in Section 3.2.
The records to demonstrate the screening, risk identification and process of selection of management measures in annual work plans are not always kept or reported to the Safeguards Working Party, but the safeguards management measures and outputs are recorded and reported.

According to the safeguards plans (ESMF, RPF, IPPF), most program activities do not need environmental and social documents prepared, consulted and disclosed. This is because most of the program activities are technical advisory (policies, planning, institutional strengthening, training, awareness raising) and the activities were designed to 1) enhance environmental and social outcomes and 2) integrate or mainstream the management of safeguards. The safeguards plans required environmental and social documents to be prepared, consulted and disclosed by implementing agencies when residual impacts could not be avoided.

Environmental and social risk instruments and permits

In the reporting period no physical works activities were undertaken by, or funded by, the implementing agencies and therefore no project-specific environmental and social management plans were prepared and no Indonesian environmental permits, UKL/UPL or SPPL were required. The ERP program provided technical advisory support to landowners, communities and businesses that were undertaking physical works (e.g. farming, forestry, small businesses). These activities did follow Indonesian regulations, such as ISPO certification which required small landholding farmers to apply for and comply with SPPL under local environmental permitting regulations.
The ESMF Environmental Codes of Practice have not been implemented regularly and consistently because they were not fit for purpose, or because they did not align with the ERP Activities that were in

the work plans. Instead, the implementing entities and Safeguards Working Group have utilized regulatory mechanisms and SOPs (see below for further information). From a general review of safeguards implementation in the reporting period, SOPs, approaches and technical advisory provided by implementing entities are consistent with relevant Environmental Codes of Practice, such as G. Community Timber Activities and H. Village Spatial Planning, but have gaps in the granular application of occupational health and safety and environmental risk management identification and management practices.

Indigenous Peoples' Plans

The IPPF required an Indigenous Peoples Plan (IPP) to be prepared for the entire Program. The IPP preparation has been ongoing since 2024. A precursor document, the Free, Prior, and Informed Consent (FPIC) guideline, was drafted in 2020, completed in November 2021 and then updated in 2024. A draft IPP has been publicly consulted and finalized in October 2025.

Resettlement Plans and Plans of Action

Regarding the RPF, during the reporting period there were no activities in the Program that required Resettlement Action Plans or Plans of Action to be prepared, consulted and disclosed.

Indonesian and East Kalimantan Systems and SOPs

Regulations, guidelines and SOP documentation were prepared and implemented under Indonesian regulations and the operational systems of implementing entities. These can be considered proxy tools that have some equivalence of management or mitigation plans, since they are prescriptive and instructive on environmental and social management, consultation and engagement, conflict management etc. They also mainstream risk management into government operations.

During the reporting period, regulations were prepared and / or implemented to mainstream safeguards, such as:

- Minister of Environment and Forestry Regulation No. 9 of 2021 on Social Forestry Management stipulates cultural heritage conservation and provisions for ecosystem services, forest protection and biodiversity.
- Governor's Regulation No 12 of 2021 stipulates HCV criteria and mandates palm oil companies to identify, manage and monitor HCV in their concession areas.
- Berau Regency Regulation No. 45 of 2019 concerning the Preparation of Village Spatial Plans which has principles of inclusive planning involving indigenous peoples, identifying risks early, community participation, environmental data gathering and spatial zoning that supports sustainable land use.

During the reporting period, several SOPs / procedures / modules / guidelines were prepared and implemented by the implementing entities and Safeguards Working Group. The approach has some equivalence with Environmental and Social Management Plans and / or Environmental Codes of Practice because they manage specific issues at the activity level. These SOPs etc. were considered appropriate tools and documents as they followed existing provincial and national laws, policies and regulations and they are familiar tools for staff because they are typically used by government entities. For example:

- East Kalimantan Forestry Agency SOP for Resolving Tenurial Conflicts in the Forestry Sector.
- SOPs for Forest and Land Fire Prevention and Management.

The efforts to engage with all stakeholders, including affected communities, indigenous people, governmental actors, companies, and NGOs, had been conducted inclusively. Overall, the quality of the stakeholders' engagement was good, considering that only one institution (UPTD KPH Damai) had not yet engaged with the stakeholders during the reporting period due to budget

constraints. Most of the institutions surveyed reported involving stakeholders in determining the locations of activities, identifying environmental and social risks, and in general public consultations. The stakeholders' engagement was not only program socialization. Almost half of the institutions surveyed shared that the inputs from the stakeholders changed the program slightly and significantly. One institution revealed that the program was cancelled after the stakeholders' engagement process. Even though the institutions surveyed claimed that they had carried out the stakeholders' engagement inclusively, some vulnerable groups, such as women groups, the Indigenous Law Communities (Masyarakat Hukum Adat / MHA) groups, and people with disabilities were not optimally engaged. For instance, most institutions did not report gender-differentiated data on participants in their reports. The stakeholders' engagement agenda lacked a clear legal mandate and SOPs to ensure optimal representation by potentially affected parties. The documentation procedure for engagement activities had been integrated into the Project Operational Manual as well as a participatory and inclusive engagement strategy is currently being developed.

Most institutions had monitoring and evaluation systems. They sent field officers to monitor and evaluate the program and report the progress to relevant units at the district and provincial levels. Some of them hired consultants to conduct field monitoring. The institutions coordinated to supervise the program's implementation. Based on the survey, the participants stated that they had coordination mechanisms, both horizontal (between OPD or work partners) and vertical (with leadership down to the regional heads), across and/or between units /institutions to ensure the implementation of environmental and social management of carbon emission reduction activities.

2.4 Confirm that the FGRM is functional, supported with evidence that the FGRM tracks and documents grievances, is responsive to concerns, complaints or grievances.

Before using the SP4N-LAPOR system, the backbone of FGRM implementation in supporting ER Program in East Kalimantan was *Layanan Aspirasi Etam*, a web-based online application where all entities in East Kalimantan might submit any complaints and comments or aspirations regarding the positive or negative excess of ER program during the implementation period. This web-based application officially became functional on November 29, 2019 following the issuance of East Kalimantan Governor decree No. 69/2019. Since then, the Communication and Information Services Agency (*Dinas Komunikasi dan Informatika*) compiled 45 reports sent to *Layanan Aspirasi Etam* in December 2020. These reports were then grouped into two categories, i.e., complaint and aspiration. Typically, the essence of aspiration was more neutral and tended to be positive while complaints should be related to something that was not proper or disliked. Of 45 reports, 57 percent were complaints while the rest are aspirations. All reports were recorded in the Aspirasi Etam's system. They complained about waste management, waste pollution, illegal logging, illegal mining, and city cleanliness. These complaints had been handled and resolved by the sectoral agency.

Regarding the agencies' responsiveness in responding to the complaint, the Communication and Informatics Agency informed that only four reports were currently under processing while other 38 reports were completely resolved in 2020. There were 19 complaints and aspirations related to the ER programs, and all of these cases had been resolved.

In parallel with *Layanan Aspirasi Etam,* East Kalimantan agencies, i.e., Forestry Agency, Crop Agency, and Environmental Agency, were still receiving complaints through the system already established long before *Layanan Aspirasi Etam* existed. East Kalimantan Forestry Services (*Dinas Kehutanan*) reported 15 cases of land tenure conflict in 2019 and decreased to only five cases up to December 2020. Two cases had reached a settlement while others were still in the process of being settled. Some of the cases might not be solved in a short period because of the complexity and involvement of many government agencies at different levels.

From 2021 to 2024, the Safeguards Working Group and the Directorate of Climate Change Mitigation (MPI) PPI actively worked to synchronize and integrate the FGRM with SP4N-LAPOR!, replacing the previous ASPIRASI ETAM system. This initiative to integrate complaints filing was guided by the National Public Service Complaint Handling System (SP4N) concept outlined in Presidential Regulation 76/2013 and Ministerial Regulation No. 24/2014. All complaints submitted via apps, Twitter/X, website, and WhatsApp were registered on the SP4N-LAPOR! website, each assigned a unique tracking code to help the public tracing the progress of their complaints.

The East Kalimantan Government prepared a SOP for the management of SP4N-LAPOR! in East Kalimantan Province (No 067/276/Diskominfo), formally issued on 3 January 2022. The SOP goal was to ensure that all complaints submitted via SP4N-LAPOR! would be responded and solved in a timely manner by the relevant OPDs within 30 days.

During the reporting period SP4N-LAPOR! system introduced a specific categorization for ERP-related grievances. The accuracy in using the ERP category remains a challenge. Many of the complainants did not use this category when submitted their complaints related to ERP (such as a request for more forest rangers) and many complaints using the category were not related (e.g. a complaint about Balikpapan Port).

The Communication and Information Agency of East Kalimantan province had filtered all complaints from 2021 to 2024 that were addressed to the OPDs involved in the ERP. The result shows that there was a total of 176 complaints addressed to the OPDs involved in the ERP. These complaints were filtered again whether they were related to the nine activities of the ERP or not. From a total of 176 complaints from 2021 to 2024, only 53 complaints were related to the nine ERP activities (See **Table 10 in the ESM report**). As of April 2024, all complaints had been responded to by related institutions. There were 32 complaints that were solved and 21 complaints were still being processed.

3. The objectives and expected outcomes in the Safeguards Plans have been achieved.

3.1 Assess the overall effectiveness of the management and mitigation measures set out in the Safeguards Plans.

Twelve relevant ER activities were subject to social and environmental due diligence (EK Retroactive Report). Most of the ER activities were capacity-building programs with minimum social and environmental risks. There were no records of negative social and environmental impacts. However, there were some risks in the medium- or long-term regarding suboptimal implementation of the

activities that might cause unintended impacts or potentially adverse implications on social and environmental aspects. The finding from the e-survey shows that six out of 19 institutions with ER activities had no mechanisms for management and mitigation measures, while the institutions that had management and mitigation mechanisms in place did not consistently and fully implement the mechanisms they had. For instance, some of them did not commence screening measures prior to implementing activities due to limited expertise, limited human resources, or time constraints.

The ER-P activities conducted during 2021-2024 can be broadly categorized into nine programs including: recognition of Customary Law Communities (MHA), Development of Village Spatial Planning Documents (RTRW Desa), Climate Village Program (Program Kampung Iklim/ProKlim), Establishment of Fire Prevention Farmer Groups (Kelompok Tani Peduli Api/KTPA) and Fire Prevention Communities (Masyarakat Peduli Api/MPA), Establishment of Community Partners of Forest Rangers (Masyarakat Mitra Polisi Kehutanan/ MMP), Licenses for Social Forestry, development and strengthening of Social Forestry Enterprises (Kelompok Usaha Perhutanan Sosial/KUPS), and facilitation of Indonesia Sustainable Palm Oil (ISPO).

Table A.1.5 below presents the summary of activities and mitigation measures demonstrates how effective the safeguards systems were functioning in identifying and managing risk.

Table A.1.5 Summary of activities and mitigation measures in identifying and managing risk.

Description of ERP Program Activities		Potential risks identified in ESMF and proposed mitigation measures	2021 – 2024 Reporting Period		
			ERP activity actions and outputs achieved during the reporting period	Safeguards mitigation applied during the reporting period and observations of limitations	Residual E&S issues identified during the reporting period
Recognition of customary law communities (Masyarakat Hukum Adat/MHA)	• Acceleration of the recognition of customary rights and control of land inside forest areas. • 214 MHAs were identified by EK DPMPD. • Through improved forest management, the MHA activity strengthens access to natural resources such as non-timber forest products (NTFPs), clean water, and fertile land. Communities can develop sustainable	*Risk:* Conflict with the Forest Management Unit (FMU). *Mitigation:* Identification of forestry conflicts based on circular letter Number: SE.1 / Menlhk-II / 2015 concerning Handling of Environmental and Forestry Cases Establishment of Committee for Customary Law Communities in the Regency Capacity building to engage with adat communities / MHA communities.	• Building partnerships between village and community empowerment agencies (DPMPD) at provincial and district levels and NGOs advocating customary rights. • Facilitating adat communities to apply for formal recognition. • Processing requests for formal recognition. • Five MHAs recognized through Head of District Decree (*SK Bupati*) in the reporting period. • 36 MHAs are in the process of applying for formal recognition. • Factors affecting the MHA recognition process include: (1) MHA communities have limited information on how to process its recognition; (2) Limited availability of technical facilitators who are experienced in the preparation of	• The preparation and implementation of SOP for the recognition of customary law communities, detailing identification, verification, and approval processes. • Policy is that MHA status will be granted only if the proposed land boundary is clear and clean. In case where tenurial conflicts occurs, SOP for tenurial conflict developed by the Forestry Agency is used. • Regional Legislative Council of East Kalimantan also acts as a mediator for conflict resolution. For example, the Legislative Council of East Kalimantan facilitated the mediation between farmers in Sebuntal Village and PT Mahakam Sumber Jaya. This Legislative Council invited both parties for hearing meetings and issued recommendations for conflict resolution. • DPMD of East Kalimantan in collaboration with NGOs such as PADI, HuMA, and Yayasan	Adat communities still report having limited information on how to process MHA recognition. This is an ongoing issue to be continuously addressed through awareness raising and engagement. On-going territorial conflicts which are not caused by ERP and could not be resolved during the reporting period. These conflicts are preventing some MHAs from being recognised and therefore cannot participate in this activity. (e.g. MHA Kampung Rinda face transmigration issues with migrants from Desa Pondang Baru that occurred in the 1980s).

Official Use Only

	livelihood strategies, such as ecotourism, agroforestry, or forest-based enterprises, which improve economic well-being while ensuring the long-term availability of resources. • MHA Recognition promotes the protection of forests and biodiversity by empowering communities to participate actively in conservation efforts. • Identification of Adat territories through participatory mapping (target 150 villages).	ethnographic data or in safeguarding the PPMHA process; (3) On-going territorial conflicts; (4) Not all districts have a PPMHA committee or a fully optimized PPMHA; (5) no regulation details the timeframe for PPMHA. • MHA recognition in East Kalimantan Province has been very slow. Further, it is important to note that MHA recognition is also a political process, in which technical capacity and resources have limited influence. This slow progress has disappointed Adat communities and discouraged several from continuing their applications.	Bioma actively assist MHA to prepare required documents, such as ethnographic data and village boundary data. DPMD and the NGOs also helped the MHA during the technical verification process. • DPMPD of East Kalimantan also conducted technical training on ethnographic data involving representatives from OPDs in West Kutai District, heads of villages, and the Head of Adat Kampung Institute of Kutai Barat on 15 February 2023. • DPMD of East Kalimantan has conducted trainings to strengthen the Committee of Recognition and Protection of MHA. Oct. 2023 50 government officials attended training on conducting technical verification in the field. • Ethnography Data Collection Training; Paralegal Training for the Customary Communities; and Refresher Training for Customary Organizations, April 2024. • Provision of technical verification of documents required for the MHA legal recognition conducted May - September 2024. 88 MHAs attended.

Development of village spatial planning documents (RTRW Desa)	RTRW Desa is a legal and technical foundation for managing and utilizing village spaces. This document is designed to optimize the use of natural resources, workforce, and infrastructure while prioritizing environmental sustainability, economic growth, and well-being of communities.	*Risk:* Village boundary conflicts. Mitigation: Clear guidelines and regulations for integrating REDD+ activities into village spatial planning. Strengthening the FGRM system.	• Support for spatial plan preparation. • 13 villages completed spatial planning documents during 2021 to 2024. • 15 villages are still in progress. • East Kalimantan Provincial Government Regulation No. 1 of 2023 on Provincial RTRW prepared. This regulation includes cultural heritage conservation as part of spatial planning the province. • Participatory process – socialization, FPIC, FGD, mapping, data processing and spatial analysis, public consultation on spatial plans, consultation with regional government. • The spatial plan consultation process involved NGOs such as Yayasan Bioma and Yayasan Bumi. During the reporting period, DPMPD and Yayasan Bioma assisted 12 villages to draft their village spatial planning documents using participatory mapping.	• Implementation of the East Kalimantan Provincial Forestry Agency SOP for tenurial conflict in forest areas (launched in 2020). • Implementation of new regulation. • Capacity building activities were conducted in partnership with NGOs or developing partners, such as Yayasan Bumi, BIOMA, Permakultur Lanskap Berkelanjutan Indonesia (Plan B), WWF and GIZ SCPOPP to strengthen the capacity of local and village governments in dealing with complex underlying issues of developing village spatial plan, including the building technical capacity on how to conduct and facilitate participatory mapping.	• No issues occurred as a result of the Activity but there are some **ongoing issues that affect ERP effectiveness** and will continue to be managed through capacity building, consultation, FPIC etc: • Overlapping claims between villages over village boundaries have long running conflicts that prevent plans from being completed, e.g., Long Isun disputes. • Example in Muara Siran, the community rejected the designation of land for palm oil plantations within the *RTRW Desa*, citing concerns about potential adverse impacts.

Official Use Only

- In terms of capacity of institutions to manage risk, lack of capacity from relevant agencies (e.g., DPMPD and FMU) to facilitate proper village spatial planning and participatory planning processes is an ongoing challenge in developing village spatial planning.
- Key risk - lack of awareness and lack of authority to deal with different (and often vested) interests in land use management and/or claims over land at the village level.
- Limited capacity in NGOs and implementing entities to resolve tenure conflicts (although many

					can be very long standing and deeply ingrained grievances).
Climate Village Program/ *ProKlim*	• Encouraging communities at the grassroot level to implement adaptation and mitigation measures (various, such as: waste management, planting mangroves, conserving water springs, producing biogas, solar panels). • Target is 20,000 villages nationally.	Risk: Village boundary conflicts. Mitigation: No specific requirements. Refer to general requirements.	• Directorate of Climate Change Regulation No. P.4/PPI/API/PPI.0/3/2021 issued. • Socialisation in over 150 villages. • 86 Prolim villages were established in the reporting period. (9, 2021; 27, 2022; 40, 2023; 10, 2024). • *Proklim* is voluntary and villages self-select. • Examples of Village activities include waste sorting, composting, aquaculture, drainage, irrigation.	MOEF published guidelines to provide a clear mechanism for proposing a new *ProKlim,* monitor, evaluate activities, and report on the program.	• No activity-based impacts or incidents were identified in the reporting period.
Fire Care Farmer Groups (*Kelompok Tani Peduli Api/KTPA*)	• KTPA is a government program for fire prevention and management that engages farmers in volunteer fire prevention groups. No forest fire	*Risk:* Changes in traditional culture and technology for land clearing. *Mitigation:* • Development of SOPs • Adoption and implementation of OHS general guidelines and	• Support for establishment and implementation. • During the reporting period, 98 KTPAs were established. • Process – identification of locations, social mapping, socialisation and awareness campaigns, group formation, training,	• SOP for forest and land fire control is stipulated through MoEF Regulation No P.12/PPI/SET/KUM.1/12/2020, which covered 47 detailed procedures including technical guidelines for joining in the regular joint forest patrols, technical guidelines for putting the 'hotspot' marks and socialize it to communities; technical	• New risks identified – health and safety of members when performing their duties –risk of exposure to fire and smoke due to lack of safety equipment. No incidents reported in the

Official Use Only

fighting is required. • Target is 150 companies working with 180 farmer groups.	establishing systems for emergency preparedness and response. • Provide support for alternatives to burning – compost as fertilizer • Technical guidelines for sustainable plantation management including intercropping • Facilitation for capacity building • Monitoring during implementation • Sufficient budgets required for fire equipment	equipment, M&E, reporting and coordination. • KTPA members received trainings to improve capabilities, skills, and readiness in the areas of fire prevention, firefighting, and post-fire management. • Communities are equipped with knowledge and tools to manage forests in ways that reduce fire risks while ensuring long-term productivity and ecological sustainability. • Hundreds of people trained in reporting period.	guidelines for regular coordination meeting, etc. • They cover the technical aspects of fire prevention by FMU and MPAs, as well as the standard conduct in interacting with communities (e.g., from community campaign and awareness raising, coordination with village, to emergency evacuation procedures). • Training programs for KTPA and MPA members to master the relevant SOPs and established lines of coordination in the event of forest and land fires. • Members of KTPA were registered under the national health insurance system such as BPJS Kesehatan and/or Kartu Indonesia Sehat to cover their health and safety issue. • Equipment shortages due to low budget limited fire prevention efforts from Plantation Agency. • Some palm oil companies provide assistance for equipment to extinguish fires on their plantations.	reporting period. • Complaints about limited firefighting equipment and fireproof suits, but no fire-related incidents occurred. • Uncontrolled burning due to lack of equipment and capacity and slow response times once incidents were reported (as per FGRM Records). • Some issues arose during consultation / engagement when MHA communities feel threatened by 'no fire' messages, when fire is part of traditional land management.

Fire Care Communities (*Masyarakat Peduli Api/MPA)*	• MPA is a government program similar to KTPA, aiming to empower local communities to actively engage in preventing and managing forest and land fires, raise awareness and knowledge within local communities about the importance of environmental protection focusing on preventing fires in fire-prone areas such as peatlands and agricultural boundaries, and enhance collaboration between communities and government authorities to	Loss of traditional culture and technology for land clearing leading to social change. *Mitigation:* • Development of SOPs • Provide support for alternatives to burning – compost as fertilizer • Technical guidelines for sustainable plantation management • Facilitation for capacity building • Monitoring during implementation Sufficient budgets required for fire equipment	• Support provided as per Fire Care Farmer Groups above. • 171 Fire Care Communities established in the reporting period. • Hundreds of people trained: 210 people, 2021; 150, 2022; 90, 2023; 300, 2024. • Fire prevention and small fire management training.	• SOP for forest and land fire control prepared through Ministry of Environment and Forestry Regulation No P.12/PPI/SET/KUM.1/12/2020, which covered 47 detailed procedures , including code of conduct for staff and communities' safety, technical guidelines for joining in the regular joint forest patrols, technical guidelines for putting the 'hotspot' marks and socialize it to communities; technical guidelines to provide first aid; technical guidelines for regular coordination meeting, etc. • They cover the technical aspects of fire prevention by FMU and MPAs, as well as the health, safety and standard conduct in interacting with communities (e.g., from community campaign and awareness raising, coordination with village, to emergency evacuation procedures). • Training programs for KTPA and MPA members to master the relevant SOPs and established lines of coordination in the event of forest and land fires.	• No fire-related incidents reported. • Some conflicts arose when MHA feel threatened by 'no fire' messages, when fire is part of traditional land management. • Health and safety risks to fire controllers because of limited / inadequate equipment. • Equipment shortages due to low budget limited fire prevention efforts. • There is a policy that prevents the Forestry Agency using Regional Budget / APBD for buying firefighting equipment for the communities, but can provide to KPH and KPHA and allow

	ensure the sustainability of forests and agricultural lands. No responsibilities for forest fire fighting. • Unlike KTPA, however, MPA works mainly in forest and peatland areas and is regulated under the Ministry of Environment and Forestry, whereas KTPA works in plantation/ agricultural areas under the Ministry of Agriculture.			• Members of MPA were registered under the national health insurance system such as BPJS Kesehatan and/or Kartu Indonesia Sehat to cover their health and safety issue.	communities to borrow.
Forest Ranger Community Partners (*Masyarakat Mitra Polisi Kehutanan*/MMP)	• The Forest Ranger Community Partners (MMP) is a community group around forests formed on the initiative of the community	No specific risks identified. No specific mitigation identified. Refer to general requirements.	Process – group formation either through community or government initiative, MMP registration, MMP approval (or rejection, support by government agencies. Ongoing program to socialise and support MMP establishment and implementation.	• SOP for forest and land fire control prepared and implemented to meet the requirements of Ministry of Environment and Forestry Regulation No P.12/PPI/SET/KUM.1/12/2020 which covered 47 detailed procedures , including code of conduct for staff and communities' safety, technical guidelines for	Health and safety risks to fire controllers because of limited/ inadequate equipment.

and/or the central or regional agencies responsible for forest protection. The purpose of MMP is to ensure forest preservation and to protect the state's rights over forests and forest resources through regular forest patrol activities.

- This program fosters collaboration between local communities and forest rangers to enhance the effectiveness of forest conservation efforts, prevent illegal activities such as illegal logging, deforestation,

Total number of MMP established in reporting period: 106.

joining in the regular joint forest patrols, technical guidelines for putting the 'hotspot' marks and socialize it to communities; technical guidelines to provide first aid; technical guidelines for regular coordination meeting, etc.

- Community-based socialization and consultation programs have also been launched to foster public involvement in conservation efforts and to educate local communities on the importance of forest protection.
- Trained to avoid illegal logging operations to avoid conflicts.
- Trained to patrol in partnership with government officials, not by themselves, to avoid conflict.
- Capacity building for Forest Ranger Partnerships with Community of Balikpapan Implementation Unit, July 2023, Sept and Nov 2024.

	and forest fires as regulated under the Minister of Environment and Forestry Regulation No. P.56/Menhut-II/2014 on MPP Guidelines.				
Social Forestry Licensing	Social Forestry is a sustainable forest management system implemented in state or customary forests by local communities or MHAs. It aims to improve prosperity, environmental balance, and social-cultural development through the establishment of Village Forests, People's Plantations, Community Forests,	• Soil and water contamination from pesticide use and poor waste management • Health issues from pesticide use and poor waste management • Conflict from communities not having the ability or awareness to participate. • Impacts on Adat community and forest dependent communities from lack of recognition,	• Support for establishment. • Minister of Environment and Forestry Regulation Number 9 of 2021 regarding the Management of Social Forestry. This stipulates protection of cultural heritage. • Decree of the Minister of Environment and Forestry of the Republic of Indonesia Number SK.6628/MENLHK-PKTL/KUH/PLA.2/10/2021 regarding the Development Map of Forest Area Recognition in East Kalimantan Province up to 2020. • Technical guidance provided: participatory development of management plans with local communities;	East Kalimantan Forestry Agency developed a Standard Operating Procedure (SOP) for Resolving Tenurial Conflicts in the Forestry Sector. A risk associated with Social Forestry is the lack of capacity of community groups to manage the forests after getting approval. Often, Social Forestry management plans cannot be implemented due to lack of human resources and funding. This issue has become a focus to address for development partners, the KPH, and the Social Forestry Acceleration Task Force of the East Kalimantan Forestry Department. The preparation of the Social Forestry Management Plan and Annual Plan is facilitated by forestry	The Forestry Agency identified an overlapping area of dispute during the establishment of a social forestry licence in Desa Semuntai (with Desa Lombok) and implemented tenure conflict SOP and appointed mediator. Despite the safeguards implemented, there is a residual risk that adat communities may not have equal access to benefits from

	People's Forests, Customary Forests, and Forest Partnerships. Targets for the ERP: • 50 villages • 341 licenses • 70 business plans	awareness and participation • Impacts on women and vulnerable from lack of awareness and participation *Mitigation:* • Use of screening, management plans and environmental licenses • Using approaches that avoid restricting access to land/forests and avoiding involuntary resettlement. • Strengthening FGRM systems and implementation • Transparency of process and licenses • Regulation enforcement • Development of biodiversity	training of enterprises (governance, management, administration); increasing the value of products and services; entrepreneurship development. • Compared to a baseline in 2016 of 38 Social Forestry units and 58,217 ha. • As of 2024, 112 villages received social forestry licence. • In 2024 ERP activities focussed on post-licensing strengthening of social forestry groups. Training, equipment, inputs and facilitation governance, management plan implementation, improved production, etc.	extension officers and partners from development organizations. The East Kalimantan Provincial Government involved independent extension workers and collaborates with NGOs and development partners, such as Yayasan Bumi and GIZ, to support the implementation of Social Forestry program. The East Kalimantan Forestry Agency also established the social forestry acceleration working group.	social forestry programmes. Ea st Kalimantan Provincial Government has limited capacity to accelerate social forestry program due to lack of facilitators to assist *adat* and local communities. Most *adat* and local communities eligible for establishing KUPS program are in remote regions that are difficult and costly to access, a problem that is compounded by East Kalimantan Province's limited budget for KUPS socialization. Some social forestry areas are far from the village where members live, meaning it is difficult to reach and manage.

		management framework			
Social Forestry Enterprises	Social Forestry Enterprise (KUPS) is an entity holding a Social Forestry permit that implements community-based forestry activities. KUPS is a component of the Social Forestry Group (*Kelompok Perhutanan Sosial*) that facilitates the development of enterprises under Social Forestry. The majority of activities carried out under the Forestry Economy and Ecosystem Services in the Management Plan (Ek-JERP) framework focuses on providing	Contamination of soil and water health risks associated with the use of pesticides and as result of poor waste management practices. Mitigation: Support the existing GoI systems by providing a screening mechanism, code of practices and guidance on environmental licensing for establishing social forestry activities.	Support for establishment and implementation. Minister of Environment and Forestry Regulation No. 9 of 2021 on Social Forestry Management includes provisions concerning forest protection and biodiversity and cultural heritage protection. The East Kalimantan Governance in collaboration with NGOs and development partner, such as Yayasan Bumi, and GIZ, provides technical assistance and socialization to establish KUPS, business development training, enterprise strengthening and purchase of equipment/tools/seedlings . By 2024, East Kalimantan had established 207 KUPS that cover various areas of business, such as weaving (selling clothes, woven fabrics, etc.), ecotourism (trekking, nature tourism, sunrise trips, photography, camping), honey production, coffee farming, rattan crafts, palm sugar production, shrimp	A risk associated with Social Forestry is the lack of capacity of community groups to manage the forests after getting approval. Often, Social Forestry management plans cannot be implemented due to lack of human resources and funding. This issue has become a focus to address for development partners, the KPH, and the Social Forestry Acceleration Task Force of the East Kalimantan Forestry Department. Furthermore, the East Kalimantan Provincial Government has limited capacity to accelerate social forestry program due to lack of facilitators to assist adat and local communities. Most adat and local communities eligible for establishing KUPS program are in remote regions that are difficult and costly to access, a problem that is compounded by East Kalimantan Province's limited budget for KUPS socialization.	The formation of KUPS can inadvertently marginalize vulnerable groups, such as women, indigenous peoples, and economically disadvantaged communities. For example, in Sembuan Village, Kutai Barat District, a dispute arose after the issuance of a village forest permit. A particular clan claimed they had managed the area designated as the Village Forest for generations and disputed LPHD's authority over it. Some enterprises / community activities may result in forest degradation outcomes based on limited capacity for scoping and planning. For example, in Semurut Village,

Official Use Only

technical guidance and support to communities engaged in Social Forestry initiatives.

farming, Haruan fish farming, pine resin harvesting, and more.

community members disputed the Community Plantation Forest (HTR) license issued to KUPS. The community members argued that the forest proposed as HTR was a natural primary forest, not a secondary forest with logging history as claimed by the KUPS. The dispute is being managed through the tenurial conflict SOP. Marketing difficulties were reported. Forestry agencies help by offering training to diversify and by providing office/shop to sell products and access to exhibitions. The locations of social forestry far away from villages meaning it is difficult to access and manage.

Indonesia Sustainable Palm Oil	The East Kalimantan Estate Crop Service will provide technical assistance to oil palm smallholders to improve their capacity for complying with sustainability principles. The program will help smallholders meet the principles of the Indonesian Sustainable Palm Oil (ISPO) standard. Module capacity building on sustainable estate crop development (particularly for sustainable palm oil) for smallholder estate crops will be developed by district	No specific risks. No specific mitigation. Refer to general requirements.	East Kalimantan Estate Crops Agency collaborated with development partners to facilitate certification. Increased the number and strengthening the capacity of Plantation Business Assessors. Provided funding for plantation assessment process as the main requirement to obtain ISPO certification. Estate Crops Agency collaborated with the National Land Agency and the provincial Forestry Agency to ensure the legal status of cultivated lands, giving legal certainty to corporations and farmers. 57 new certifications in the reporting period, 14 of which were given to cooperatives. Governor's Regulation No 12 of 2021 stipulates HCV criteria and mandates palm oil companies to identify, manage and monitor HCV in their concession areas. The regulation also grants the East Kalimantan Province authority to monitor the efforts of palm oil companies in preserving cultural heritage. All ISPO-certified companies must	The East Kalimantan Estate Crops Agency organized coordination meeting with palm oil companies to minimize tenurial conflict. They are actively involved in conflict resolution processes as a mediator. In 2023, the Plantation Agency solved 13 conflicts through consensus. They have also trained mediators to facilitate the mediation process between companies and communities. The Estate Crops Agency of East Kalimantan also conducted regular workshops to accelerate the implementation of ISPO. For example, the workshop on 18 July 2024 which convened the Estate Crops Agencies from every district in the province, PT Agri Mandiri Lestari Jakarta, PT Mutu Agung Lestari, GIZ, the Communication Forum for Sustainable Plantations, palm oil companies, smallholders, farmers communities, and cooperatives. The Estate Crops Agency of East Kalimantan actively conducted monitoring and evaluation of ISPO implementation involving professional agencies as third parties to conduct the ISPO audit processes. For example,	Some tenurial conflicts involved companies with ISPO certification occurred between 2021-2023, e.g. PT Teladan Primar Agro Lestari and plasma (transmigration) farmers in Kutai Kartanegara. Traditional land tenure is not recognized under ISPO certification, preventing smallholders from getting certified. In addition, many smallholders were located within the nationally designated forest area (*kawasan hutan*), including in conservation and protected areas. Even when smallholders possess proof of legal tenure, disputes might arise due to permit overlaps and conflicts with

	services through focus group discussions and consultations. Training and field facilitation to smallholders will be provided, with academics and NGO representatives as resource persons and facilitators. The district estate crop services monitor and evaluate the implementation of ISPO by smallholders.		report their efforts in conserving HCV areas, including cultural heritage and traditional knowledge, to the East Kalimantan Government (Yayasan Konservasi Alam Nusantara, 2024).	the Estate Crops Agency of East Kalimantan involved PT TSI to audit Bumi Subur Cooperation in Kerta Bumi Village. Another example is the audit of PT Multi Jayantara Abadi in 2021 by TUV Rheinland, a professional certification agency.	government spatial plans. However, there have been cases where companies with ISPO certification restricted access for local communities to enter the forest. For example, Mongabay in 2021 reported that PT Subur Abadi Wana Agung was involved in a tenurial conflict with Adat Dayak Modang Long Wai in Long Bentuq Village, East Kutai Regency. Adat communities could not access the forest since the company planted oil palm trees in areas they claimed as their adat land. There is a risk where ISPO cannot guarantee that companies would not restrict access to adat communities. Limited technical capacity of

				smallholders (to prepare and fulfil certification requirements) and inadequate financing to engage in certification programs.
Other	High Conservation Value Area Mapping	NA	The Estate Crops Agency of the East Kalimantan Province has crafted a detailed Indicative Map of Areas with High Conservation Value (HCV) spanning 456,827 hectares. This comprehensive map was endorsed by East Kalimantan Governor Decree No. 525/K.244/2022 following a rigorous validation process in collaboration with the respective district governments. The identified HCV areas were subject to a validation process at the management unit to ensure that each HCV criterion was met, including HCV 5 related to social and economic aspects of communities, and HCV 6 related to community culture, to ensure no restrictions on community access and control that previously	

	existed during the implementation of HCV management.	

3.2 Are the arrangements for quality assurance, monitoring, and supervision effective at identifying and correcting shortcomings in cases when ER Program activities are not implemented in accordance with the Safeguards Plans?

The SIS-REDD+ Indonesia was developed for quality assurance to ensure proper safeguards implementations (http://ditjenppi.menlhk.go.id/sisredd/). If ER program activities were not implemented according to the safeguards plans, the public and stakeholders could submit their feedback and grievances through the Aspirasi Etam website. That was the ideal purpose of the SIS-REDD+, yet the system did not work well due to human resources and budget constraints.

The quality assurance, monitoring, and supervision in the beginning of ERP implementation (2019-2020)_ were carried out with budget constraints. The COVID-19 pandemic had led to some budget tightening in East Kalimantan and affected the effectiveness of quality assurance, monitoring and supervision processes.

The EK government could demonstrate better arrangements for quality assurance, monitoring, and supervision from 2021 to 2024. The ESM report shows that the EK government monitored the progress of Safeguards implementation, identified the gaps, and conducted corrective actions needed. The detail of potential risks, mitigation measures, and gaps can be found in the Table 5 of ESM report. One good practice that can be used as an example is the corrective action form MHA recognition activity. Tenurial conflicts were the biggest challenge of MHA recognition. One of the requirements was village boundary data and some village boundaries were overlapping one and another. Understanding this risk, the EK Forestry Agency developed SOP for tenurial conflict. Using this procedure, the officials in the field could follow the procedures to deal with conflicts between communities. Moreover, the forestry agency also collaborated with experts from local NGOs such as PADI, HuMA, and Yayasan Bioma to assist Adat Communities to prepare ethnography data and village boundaries to minimise conflicts.

3.3 Describe the supervision and oversight arrangements to ensure that the Safeguards Plans and, if any, subsequent environmental and social documents prepared during Program implementation are implemented. Are these supervision and oversight arrangements effective (e.g., provide a meaningful feedback mechanism to implementing entities to allow for corrective actions)?

The supervision and oversight arrangements to ensure the implementation of the Safeguards Plans were coordinated by the Safeguards Working Group. During program implementation, the Safeguards Working Group was supported by the Sub National PMU Secretariat, which consisted of managers, staff, and experts. The PMU Secretariat assisted the Working Group in carrying out its duties, both administratively and technically. From the administrative side, managers, staff, and related experts managed documents related to safeguards. These administrative activities included preparing meeting materials, documenting activities (minutes and photos), managing documents collected from parties for reporting materials, and others. From the technical side, experts provided technical advice to the working group to carry out its roles and responsibilities, especially in the process of screening, implementation, monitoring and evaluation, and reporting of safeguards.

Safeguards implementation was conducted by the implementing entities, including the government, development partners, the private sector, village governments, and FMUs. The implementing entities

carried out safeguards management and reported to the Working Group. The Working Group monitored the safeguards management and was evaluated by the Provincial Technical Committee (PTC). The Working Group prepared an annual report on the implementation of safeguards, submitted the report to the PTC, and informed the Ministry of Environment and Forestry and the World Bank.

Overall, the supervision of program and safeguards plan implementation was conducted by the Secretary of East Kalimantan Province (SEKDA) at the province level and the Director General of Climate Change (DGCC) of the Ministry of Environment and Forestry (MoEF) at the national level. The supervision conducted by the SEKDA was effective in providing targets and guidelines for the improvement of program and safeguards plan implementation at the province and district levels. For example, the SEKDA issued a letter with number 500.4/17503 /EK on 23 October 2024 to inform the progress of ERP implementation. This information was sent to the World Bank Operational manager and forwarded to implementing agencies in East Kalimantan to be followed up.

For the FGRM supervision, the Communication and Informatics Agency played a key role to ensure that each implementing agency responded to all complaints submitted through SP4N-LAPOR. The Communication and Informatics Agency contacted implementing agencies that had not responded to the complaints on a daily basis. This supervision and oversight arrangements were effective to ensure that all complaints submitted to SP4N-LAPOR got responses from relevant agencies.

4 Program activities present emerging environmental and social risks and impacts not identified or anticipated in the Safeguard Plans prepared prior to ERPA signature.

4.1 Does the scope of potential risks and impacts identified during the SESA process continue to be relevant to ER Program activities?

Analysis of Social and Environmental Risks of Different Governmental and Non-Governmental Program Activities for Reducing Emission in East Kalimantan

The scope of potential risks and impacts identified during the SESA process is still relevant to ER Program activities. However, some potential risks and impacts had emerged due to the COVID-19 pandemic, the issuance of Omnibus Law, and the Nusantara Capital City (Ibu Kota Negara Baru, IKN) policy. The COVID-19 pandemic occurred during the assessment period and impacted budget allocation for ER program activities. It led to diverting some government funding away from the ER program and led to unintended social and environmental risks caused by poor implementation of program activities. Only six out of 24 institutions surveyed reported that the existing budget mechanisms ensured that the budget for medium-term environmental and social management (two to three years) would be sufficient. Moreover, the government decided to impose large-scale social restrictions. This restriction caused unintended social risks such as inadequate consultation, lack of representation, and low participation rate due to technical limitations to joining virtual events or meetings.

The Omnibus Law was criticized by environmental and social activists, NGOs, think tanks, and scholars because it led to potential social and environmental risks and impacts. Many articles in the Omnibus Law were counterproductive to ER program activities. The following needs to be considered further:

1. The food estate agenda might utilize forest areas and trigger deforestation.
2. The weakening of the environmental impact assessment process (AMDAL) to ease the business permit process was counterproductive to safeguards arrangements to protect remaining forest areas.
3. The removal of the government's obligation to maintain a minimum of 30 percent forest area based on watersheds and/or islands threatened the efforts to protect the remaining forest areas.
4. The limitation of public participation in the Amdal process reduced transparency and excluded the public from the Amdal process.
5. The elimination of opportunity for the public to challenge the Amdal permit was counterproductive to the FGDM mechanisms.
6. The 90 years of cultivation rights (HGU) for corporations had potential risks for the customary law recognition since the indigenous people had to wait 90 years if they wanted to claim their land back.
7. The lack of sanctions for corporations grabbing customary land (administrative sanctions only) was counterproductive as it the law enforcement efforts to prevent land grabbing activities.
8. The authority of the central government to revoke the regional regulations (Perda) had potential social risks for the indigenous people as many customary lands are recognized by Perda.

When the SESA document was drafted (2019), the IKN was being planned and the capital city bill was being drafted. There were no social and environmental risks that could be assessed in detail. However, some potential risks were observed during the assessment period. Tenurial conflict was one of the most apparent risks observed. Speculation and enormous increases in land prices were inevitable in East Kalimantan. This situation caused overlapping land claims in the IKN area which might trigger tenurial conflicts. Extensive deforestation was another potential risk discovered. Even though the government claims to begin the development of IKN with reforestation and rehabilitation, the development of a capital city in East Kalimantan Province attracted investors to have properties and bought land there. This mega project to move the capital city to East Kalimantan and massive development threatened biodiversity. The IKN also caused negative social impacts. AMAN reveals that 20,000 indigenous people were at risk of being victims or expelled from their land due to massive development in East Kalimantan. The IPPF document prepared had not captured the impacts of IKN on indigenous people in East Kalimantan Province. Therefore, further assessment is needed at a later stage.

4.2 During implementation, have any ER Program activities led to risks or impacts that were not previously identified in those Safeguard Plans prepared prior to ERPA signature? If so, what are the proposed actions to manage such risks and impacts that were not anticipated previously?

Dissatisfaction with the conflict mediation process resulted in losing access to several stakeholders. Dissatisfaction with spatial planning outcomes led to conflict risks over village boundaries. Overlapping land claims over the conservation areas made enforcement challenging to commence. Enforcement might lead to loss of access to key local stakeholders. Each FMU had identified potential conflicts and carried out conflict resolution according to the characteristics of the conflict. For example, the East Kalimantan Forestry Agency identified a potential conflict between Semuntai Village and Lombok Village due to the issuance of social forestry permit for Semuntai Village which claimed some areas of Desa Lombok. The Forestry Agency was aware with this potential conflict and ready to mediate both parties using the SOP they had developed. They waited the formal report from

both parties or FMU to begin the mediation process. SOPs had been owned by each sectoral agency to resolve conflicts. In addition, the settlement of tenure issues was carried out based on MoEF regulation No. P.84/Menlhk-Setjen/2015 and the mediation process was carried out based on the Regulation of the Director General of Social Forestry and Environmental Partnership No. .4/PSKL/SET/PSL.1/4/2016.

Unidentified risks occurred in the implementation of fire care farmer group and fire care community were the lack of equipment such as fire fighter suits (PPE), fireman helmets, or safety shoes. There was no record showing any accident, yet the community felt the danger while doing their tasks as members of the fire care farmer group or fire care community. The Plantation Agency was aware of this issue and allocated more budget to support the purchase of the equipment, even though it could not afford to provide the equipment for all groups.

Another unidentified risk was the complaint from the Adat Communities who were against the idea of a "no fire" policy. Nugal, or traditional practice to clear a land using slash and burn method, was part of some Adat Communities' culture and tradition. Preventing it without any further consideration could erase their identity and tradition. For example, Nugal was part of Suku Dayak Benuaq lived in Kutai Kartanegara. To mitigate this complaint, the EK government evaluated the no fire policy and implemented it more flexibly if it was related to the Adat Communities practices.

For the social forestry enterprises (KUPS) an unidentified risk occurred. Some of the social forestry locations were far from the village. It caused several problems such as inefficiency in managing the land, and difficulties in accessing what they needed from the forest and distributing the crops. The Forestry Agency was aware of this issue and considered location that was reachable for further.

Improving land governance was a proposed action to manage those risks and impacts. Several capacity building programs had been started to improve the capacity of relevant stakeholders in land governance. Details of the capacity building programs can be found in section 3.1 and Table A.1.4 of Annex 1.

5. Corrective actions and improvements needed to enhance the effectiveness of the Safeguards Plans.

5.1 Provide a self-assessment of the overall implementation of the Safeguards Plans

The self-assessment of the overall implementation of the safeguards plan in this section is based on the results of environmental and social management surveys, as part of the due diligence for the EK Retroactive Report (observation period of July 2019 to December 2020), and the ESM report. Based on the evaluation of the safeguards implementation arrangements, capacity of the Safeguards Working Group and implementing entities, availability of budgets and resources, effectiveness of stakeholder engagement and the FGRM, there are some gaps and limitations in the safeguards systems that can be strengthened.

1. **E&S risk screening and monitoring:** Risk screening and monitoring effectiveness is reportedly undertaken through internal government procedures and sectoral SOPs, however the process remains fragmented and not documented systematically. In most of the programs such as Fire Care Community (MPA), Fire Concerned Farmer Group (KTPA), and Social Forestry, the risk

mitigation measures were embedded within technical guidelines and participatory mechanisms. However, the lack of systematic documentation limits traceability and accountability. Furthermore, although an E&S risk working group is mandated to oversee and manage the alignment of risk mitigation measures implemented by each of the eight sub-national technical unit organization (OPD) as implementing agencies aligned with the ESMF and to consolidate these inputs into the reporting system, ESMF-aligned monitoring indicators have not yet been fully integrated into key reporting platforms, such as the Measurement, Monitoring and Reporting (MMR) system, managed by Environmental Services Agency.). There is a reporting and documentation gap resulting from the absence of clear guidance in both the POM and SOP regarding the required reporting components. Standardized reporting parameters and procedures are needed to ensure consistent data are collected and documented from implementing OPDs.

2. **Institutional capacity and governance:** Institutional arrangements for the E& S system implementation are formally in place, with working groups and focal points assigned. However, coordination remains largely ad hoc, and implementation continues to rely heavily on local experts. Varying capacity across OPDs and interpretations of safeguard requirements have limited the full institutionalization of safeguards monitoring and reporting. Going forward, clear SOPs need to be developed to guide the technical reporting of program activities—covering safeguards, fund disbursement, and benefit utilization - by OPDs to the working group via the MMR system. At the sub-national level, the capacity of provincial entities can be strengthened through targeted training, particularly in program management and safeguard integration.

3. **Environmental and social impacts and mitigation measures**: No major environmental or social impacts were observed or reported during the 2021-2024 period that could be directly attributed to EK-JERP activities. Assessment of available information with additional sources—including document reviews, community and stakeholder interviews, focus group discussions, analysis of FGRM records, and comparisons of reported activities with independent sources—to assess the adequacy of risk identification, the effectiveness of mitigation measures, and to determine whether any major impacts had occurred. Going forward, the use of localized SOPs to guide implementation, especially for high-risk activities needs to be fully embedded and tracked through the E&S system.

4. **Stakeholder Engagement Consultation and Socialization:** Stakeholder engagement has been continuous and undertaken by many different agencies as part of their institutional responsibilities to implement ERP activities. The stakeholder engagement and consultation were conducted in various formats include public consultation, technical meetings, and community outreach involving civil society organization, and beneficiaries including Indigenous Peoples (IPs), Adat communities, and local communities (IPLCs). In the context of the Program, FPIC refers to the right of forest-dependent IPLCs to be fully and meaningfully informed about proposed Program activities. FPIC has been carried out for the program level and implementation of specific ERP activities to secure broad support from IPLCs. The consultation process for the advance payment distribution was conducted by an intermediary agency in parallel with BSP socialization and village-level proposal facilitation. While the process was generally thorough, additional time should be allocated to strengthen community understanding and allow for more meaningful deliberation. Procedural steps were followed by the stakeholder and consultation, including culturally appropriate approaches with IPLC were conducted. This process was done irrespective of whether an area was known to be inhabited by IPLC. This provided an extra layer of protection,

ensuring that Indigenous communities were consulted appropriately. Despite these efforts, implementation should be more comprehensive and consistently applied. Moving forward, IPP FPIC guidelines will be systematically implemented across all OPDs and BSP implementing agencies to enhance consistency and effectiveness.

5. **Feedback Grievance Redress Mechanism (FGRM):** FGRM structures are formally in place primarily through SP4N-LAPOR! (the national public service complaint mechanism) and secondary mechanisms managed by sub-national technical unit organization (OPDs). There are diverse and complex typology of grievances which are being processed by different OPDs, affecting processing time. While most grievances are being followed up and resolved, the feedback analysis and learning loop is still limited. Several grievance cases have been addressed through local mediation or coordination, indicating that basic responsiveness mechanisms are in place and generally aligned with key FGRM principles such as accessibility, responsiveness, and timely initial response. Strengthening consolidation of grievances, particularly once logged to OPDs channels, would improve overall GRM and feedback learning. Improvement can be made to facilitate inclusiveness of FGRM to indigenous communities, particularly in remote areas.

5.2 List any corrective actions and areas for improvements. Take care to distinguish between: (i) corrective actions to ensure compliance with the Safeguards Plans; and (ii) improvements needed in response to unanticipated risks and impacts

1) Corrective Actions to ensure compliance with Safeguards Plans including timeline

Table A.1.6 List of Corrective Actions and Improvements

Gaps/Issues	Actions	Responsible Entity	Timeline
1. Capacity			
- Prepare and implement a capacity building plan to address weaknesses and limitations, including hiring consultants, staff, training and equipment etc. Include the following:	- Provide safeguards specialists in each implementing entity responsible for implementing Safeguards Plans, regulations and SOPs, record keeping, data analysis and coordinating safeguards activities with the Safeguards Working Group.	Safeguards Working Group, Forestry Agency, Forestry Management Unit (KPH), Social Forestry Working Group, DPMD, Plantation Agency, Development Partners, and NGOs.	Develop the capacity building plan within one month and implement it thereafter.
	- Update SOPs to include the screening and assessment of environmental and social risks in accordance with Safeguards Plans and provide guidance on suitable safeguards management measures for ERP and BSP activities.		
	- Update SOPs and work plans to provide additional resources and procedures to address residual risks, gaps and limitations identified in Table 5.		
	- Provide adequate budgets and training to safeguards focal points.		
Alignment of in-country systems and Safeguards Plans.	-Undertake a gap analysis of safeguards measures in regulations, policies, guidelines and SOPs and identify opportunities for greater alignment/harmonisation with Safeguards Plans and vice versa.	Safeguards Working Party, East Kalimantan Environmental Agency, Forestry Agency,	Prepare the gap analysis within three months and implement thereafter.

The ERP Agreement requires Safeguards Plans to be functioning and effective. Regulations, policies, guidelines and tools are being used by implementing entities, due to institutional preferences and legal requirements, but they are not always fully aligned with the Safeguards Plans.	-Focus on priority areas: risk screening and management, mitigation measures and tools, and safeguards performance indicators for ERP technical advisory activities and BSP activities.		
Safeguards Plans should be consistent with national and provincial regulations and institutional SOPs and vice versa.	-Share the gap analysis and plan to update documentation with the World Bank.		
	-Update SOPs and Safeguards Plans as necessary to align the systems to ensure compliance with World Bank operational policies, ERP safeguards requirements and in-country systems.		
2. Monitoring, Evaluation and Reporting			
Integrating Safeguards Data Management: The Safeguards Data Management system in the ER Program requires consistent record keeping and data collection protocols for implementing entities, centralization, transparency, and accessibility improvements.	- Develop an integrated system of Safeguards Data Management in an integrated database.	The Ministry of Environment and Forestry, Communication and Information Agency, Forestry Agency, East Kalimantan Economic Bureau, Bappeda, Safeguards Working Group, Social Forestry Working Group, Forestry Management Unit (KPHs), and Development Partners.	Integrated data management system and SOPs prepared within three months

	- Agree on a set of up to 10 indicators to demonstrate the effective functioning of safeguards systems, based on indicators from the SIS System and ESMF.		
	- Develop SOPs for record keeping, data analysis, impact monitoring and reporting of safeguards indicators, including roles and responsibilities.		
	- Provide budget to Safeguards Working Party and safeguards focal points in implementing entities		
	- Conducting training on the SOPs, including management, verification, and reporting of safeguards data.		
	- Develop and implement data-based monitoring and evaluation SOPs to support ERP safeguards effectiveness.		
	- Develop standardised reporting template.		
Continue integrating FGRM (Feedback Grievance Redress Mechanism) to the ER Program: SP4N-LAPOR! requires better integration with the ER Program through enhanced administrative capacity. Improve response times and time taken to close out grievances.	- Conducting regular socialization and training programs on SP4N-LAPOR! to all administrators at the provincial, district, and village levels.	Ministry of Environment and Forestry, Ministry of Communication and Digital Affairs, East Kalimantan Environmental Agency, Forestry Agency, Forestry Management Unit (KPHs), Bappeda, District Government, Social Forestry Working Group.	In the next three months
	- Developing integration guidelines of FGRM in ER Program activities.		Socialization and training to be regular and ongoing.
	- Establish effective mechanisms for timely complaint monitoring and handling, and resolution. Include feedback loops back into operational SOPs and mitigation measures to avoid future issues.		

	- Assign additional administrators and safeguards personnel responsible for managing the complaints processes and dispute resolution to meet processing timelines and to reduce environmental and social harm.		
3. Stakeholder Engagement			
Improving the capacity and participation of relevant stakeholders in the implementation of ER Program: Key stakeholders such as MHA, MPA, MMP, KTPA, KUPS, and Village Spatial Planning management, require ongoing capacity building.	- Continue conducting regular training related to ERP activity implementation, such as forest fire prevention, business planning, sustainable forest management, and village spatial planning.	DPMD, Forestry Agency, Forestry Management Unit, Plantation Agency, Social Forestry Working Group, Village Government, Development Partners, and private CSR.	Ongoing
	- Encouraging direct assistance from the government, KPHs, development partners, and NGOs.		
	- Facilitating partnerships with the private sector/other institutions to support production infrastructure and funding.		
Strengthening multiparty coordination through the Social Forestry Working Group Social Forestry relevant OPDs, development partners, academics, and NGO.	Organize regular multi-party coordination meetings and workshops, involving relevant Social Forestry Organizational Program Divisions (OPDs), development partners, academics, and NGOs.	Forestry Agency, Forestry Management Unit (KPH), Social Forestry Working Group, DPMD, Plantation Agency, Development Partners, and NGOs.	Hold the first coordination meeting within two months, and maintain regular meetings throughout the program period.
4. Funding			

Gaps in resources allocation for the above remedial actions (e.g. capacity building, monitoring, reporting, documentation, stakeholder engagement).	Estimate the funds (amount: in USD) to be needed for the remedial actions including capacity building, monitoring, reporting, documentation, integration of the Feedback and Grievance Redress Mechanism (FGRM), and stakeholder engagement, and allocate the funds accordingly.	The Ministry of Environment and Forestry, Communication and Information Agency, Forestry Agency, East Kalimantan Economic Bureau, Bappeda, Safeguards Working Group, Social Forestry Working Group, Forestry Management Unit (KPHs), and Development Partners	Ensure the timely availability of funding throughout the program period

1) Improvement to unanticipated risks and impacts:

   a. **Unanticipated risks and impacts per activity**

      The improvement needed (per activity) in response to unanticipated risks and impacts can be found in Table 5 in the 2025 Environmental and Social Management Report.

   b. **How to manage unanticipated risks of Omnibus Law?** (refer to section 4.1 above)

   c. **How to manage unanticipated risks of IKN?** (refer to section 4.1. above)

ANNEX 2: INFORMATION ON THE IMPLEMENTATION OF THE BENEFIT-SHARING PLAN

I. Requirements of FCPF on Benefit Sharing Plans

The Indonesian BSP was first published in November 2021. Between the advance draft and final BSP[99] (2020-2021), consultations were mostly conducted between the provincial government of East Kalimantan and the central government on the issue of responsibility costs from result-based payments. Consultations occurred through online meetings due to the COVID-19 pandemic. Exchanges were conducted between Director General of Climate Change Control (Echelon 1) from MoEF and the Governor of East Kalimantan to agree on the proportion of responsibility costs between national and sub-national levels. Consultations with communities on ER Program including BSP were conducted through FPIC process covering 99 villages. The policy on Benefit Sharing Mechanism (BSM) within the Province of East Kalimantan was issued in 2021 through Governor Regulation No.33/2021. The regulation outlines a) type of benefits, eligibility, and beneficiaries, b) proportion and allocation, c) the use of benefits, d) monitoring and evaluation, e) FGRM, and f) finance.

Three main allocations of benefits are agreed[100] as follows: a) Responsibility Allocation to incentivize governments in governing the ER Program (25 percent); b) Performance Allocation to incentivize beneficiaries in reducing emissions (65 percent); and c) Reward Allocation to incentivize communities who have demonstrated continued protection of forests (10 percent). Based on the Ministry of Environment and Forestry Letter No. S.187/MENLHK/PPI/PPI.3/5/2021 to the Government of East Kalimantan, the agreed proportions of benefits for operational costs are as follows (Table A2.1):

> **"Central Government (MoEF and Indonesian Environment Fund - IEF/BPDLH) will receive 13.91 percent, whereas sub-National Government will receive 11.09 percent."**

Table A2.1. Agreed Proportions of Operational/Responsibility Cost between Central and Sub-national Government level

Beneficiary	IDR	%	IDR	%	IDR	Total
Central Government (13,91%)	**Operational Cost**		**Incentive**		214,214,000,000	13.91%
- MoEF/KLHK	32,340,000,000	2.10 %	98,714,000,000	6.41 %	131,054,000,000	8.51%
- IEF/BPDLH	83,160,000,000	5.40 %	0	0.00	83,160,000,000	5.40%
Sub National Government (11,09%)	**Operational Cost**		**Incentive**		170,786,000,000	11.09%
- Province and 7 Districts and 1 City	84,700,000,000	5.50 %	86,086,000,000	5.59 %	170,786,000,000	11.09%
Total Responsibility Cost					**385,000,000,000**	**25%**
Total ER Payment					**1,540,000,000,000**	**100%**

The other consultations regarding payment arrangements were undertaken between IEF/BPDLH, MoEF, and the provincial government of East Kalimantan. This includes arrangements from IEF/BPDLH to beneficiaries (see Final BSP document, Section 4 – Benefit Distribution).

[99] Indonesia - East Kalimantan Project for Emissions Reductions Results : Benefit Sharing Plan (worldbank.org)

[100] Discussed in October 2018, agreed in Mission in December 2018. The Responsibility Allocation came up in the April 2019 Stakeholder Consultation (SC) which agreed to replace the operational cost (in ERPD) in May 2019 SC.

The main modifications and updates in the approved version include the following:

- FPIC
- BSP Timeline
- Fund Disbursements (at national level, MoEF will use an intermediary agency for funds disbursement, whereas for the adat community and village government, the funds will be disbursed by the local intermediary agency with acknowledgment by the provincial government).
- Institutional arrangement

- FPIC:

The consultation process on the Benefits Sharing Plan was done in phases involving multistakeholder groups, with the goal of achieving broad-based consultations to share information on the draft and final BSP, and to secure consent for target villages to participate in benefits sharing. The first phase was socialisation. The participants attending the first phase came from diverse backgrounds, including village residents, village heads, traditional leaders, women's groups (PKK), youth groups (Karang Taruna), village representatives, community empowerment institutions, religious leaders, farmer groups, neighborhood administrators, village forest management institutions, tourism awareness groups, healthcare representatives, village security officers (Babinsa), and community police (Babinkamtibmas), village facilitators, and representatives from local companies. The socialisation was conducted in six districts per city and a sample of 99 villages between July and November 2020. It covered one city (Balikpapan) and five districts (Kutai Barat, Kutai Timur, Berau, Paser and Penajam Paser Utara). All consultation processes followed COVID-19 health protocols. For two districts, Kutai Kartanegara and Mahakam Ulu, consultations could not be done due to COVID-19 pandemic conditions in those areas. Virtual meetings could not be held due to limited internet connection and mobile/computer device for the meeting. Due to the limited budget of the FCPF Readiness Fund for the consultation process and additional time constraints, consultations in the districts of Kutai Kartanegara and Mahakam Ulu were allocated to be funded by development partners. GIZ Pro-peat supported consultations in Kutai Kartanegara District in 2021, whereas WWF Indonesia supported consultations in Mahakam Ulu in 2022.

The second phase was broad consultations leading to community support for: i) participation in the jurisdictional emission reduction program under the ER program scheme, and ii) submission of proposal to access benefits. Phase two was carried out in face-to-face meetings in every district. These activities involved representatives from MoEF, the East Kalimantan Provincial Government, district/city governments, and representatives from villages/*kelurahan*, including village heads, village councils, traditional leaders, and community leaders. From 2020-2023, 155 villages across eight districts/municipalities (Paser, Penajam Paser Utara, Balikpapan, Kutai Kartanegara, Berau, Kutai Timur, Kutai Barat, and Mahakam Ulu) participated in the consultation process involving a total of 5,096 participants (3,347 male and 1,749 female), and an attendance rate of 85%. For the second phase, 483 participants attended (413 male and 70 female).

Finally, villages and community groups targeted to participate in the Benefits Sharing Plan Consultation meetings consented to these activities through village- and district-level meetings wherein they agreed to the development of actions plans aligned to ER Program activities, and submission of budgets for allocation of their portions of allocated funds. These agreements were documented through a signed minutes (*berita acara*) between stakeholders at the village level and submitted to the East Kalimantan Provincial Government. This process was implemented by a combination of Government staff and facilitators recruited by an implementing agency (LEMTARA).
Following this consultation processes, villages and/or communities are able to submit proposals to access benefits. Both the *berita acara* and proposals signify community consent to participate.

- Timeline BSP:

The advance payment, which was received in late 2022, took more than two years to be completely disbursed. As of December 2024, 82.68 percent of the allocated benefits (or 77 percent of the total advance payment) had been distributed to national and subnational governments, and local communities. While the first payment request was submitted by the sub national level in the 2023 fiscal year, the payment

request at the national level and village government and community level were only made in the consequent year (fiscal year 2024), as the 2023 fiscal year was primarily allocated to procuring intermediary agencies.

It is expected that the total time to implement the BSP is approximately 3 years, depending on when the payment is received by the IEF. This includes a preparation phase, where agencies prepare workplans, contracts, and implementations systems, followed by two sequential years of implementation (it is expected that at least two years will be required, based on the funding amounts and absorptive capacity of beneficiaries).

- Fund Disbursement :

During the reporting period (2023–2024), the Benefit Sharing Plan (BSP) implementation progressed significantly across national, subnational, and community levels. From the advance payment of USD 20.9 million received in late 2022, a total of approximately 82.68% had been distributed to beneficiaries by December 2024, equivalent to US$ 16.137 million out of the total US$ 19.518 million allocation. The fund distribution process follows the following procedure:

1. Payment requests from KLHK (for national-level) and the East Kalimantan Provincial Government, according to the beneficiaries at each level.
2. The establishment of payment recommendations from the steering committee and the technical team. Then, IEF proceeded with the establishment of a fund payment order, made by the Director Executive.
3. Establishment of a Payment Agreement between IEF and Benefit Managers, serving as the basis for fund disbursement to the beneficiary.
4. Instructions for fund disbursement from IEF as the payment recipient entity to the beneficiary and/or Benefit Manager.

At the national level, the Ministry of Environment and Forestry (MoEF) and its technical units received allocations to support REDD+ operationalization, policy development, and institutional strengthening. At the subnational level, the East Kalimantan Provincial Government and seven districts plus one municipality absorbed their allocations through the APBD mechanism, albeit with some delays due to alignment with local budget cycles. At the community level, distribution covered 360 out of 441 villages and 59 out of 150 communities, facilitated through intermediary agencies and the APBDes system. The selection of the intermediary agencies as eligible agencies for funding disbursement took place in 2021. Nine NGOs were awarded as eligible intermediary agencies.[101]

From the total advance payment of 20,900,000 USD received in 2022, a total of 16,137,916.88 USD (77% of the advance payment) was disbursed to beneficiaries through the Benefit Manager at the national, subnational, and community levels from 2023 to 2024.

The 2023 disbursement process focused on the distribution of funds for subnational governments, as the modalities for fund management were already in place using the APBD mechanism. The disbursement commenced from March 2023 to September 2023. The variety of disbursement periods was due to the time required by the Benefit Manager (and beneficiaries) to prepare the required documents and adjustments in the Annual Working Plan. In general, for the fund disbursement process at the subnational level, there were no major challenges encountered by the Program Entity.

In 2024, disbursement commenced for beneficiaries and Benefit Managers at the national and communities levels. As mandated in the BSP, Benefit Managers for the national and community level

[101] Based on Announcement of Executive Director BPDLH No.PENG-1/BPDLH/BPDLH.3/2022, the following nine agencies have been awarded as intermediatory agencies for REDD+ Fund Disbursement: a) Kehati Foundation, b) Penabulu Foundation, c) Samdhana Institute, d) Kemitraan, e) KKI Warsi, f) Huma Indonesia, g) Gemawan, h) Satunama Foundation, i) Sulawesi Community Foundation.

are Intermediary Agencies, specifically non-governmental agencies appointed by beneficiaries. To ensure a prudent process for fund distribution to ultimate beneficiaries, a series of setup for the funds flow arrangement was organized in 2023. This include but not limited to: the selection process for Intermediary Agencies, proposal development, and due diligence, as well as contract development between Intermediary Agencies with the beneficiary (KLHK at the national level, and East Kalimantan Government at the subnational level), and ultimately ER Payment Contract between Intermediary Agencies and IEF. The setup for distribution at the national and subnational levels began in mid-2023, and the first payment to Intermediary Agencies commenced in Q1 2024.

Figure A2.1. Fund Disbursement and ER Contract

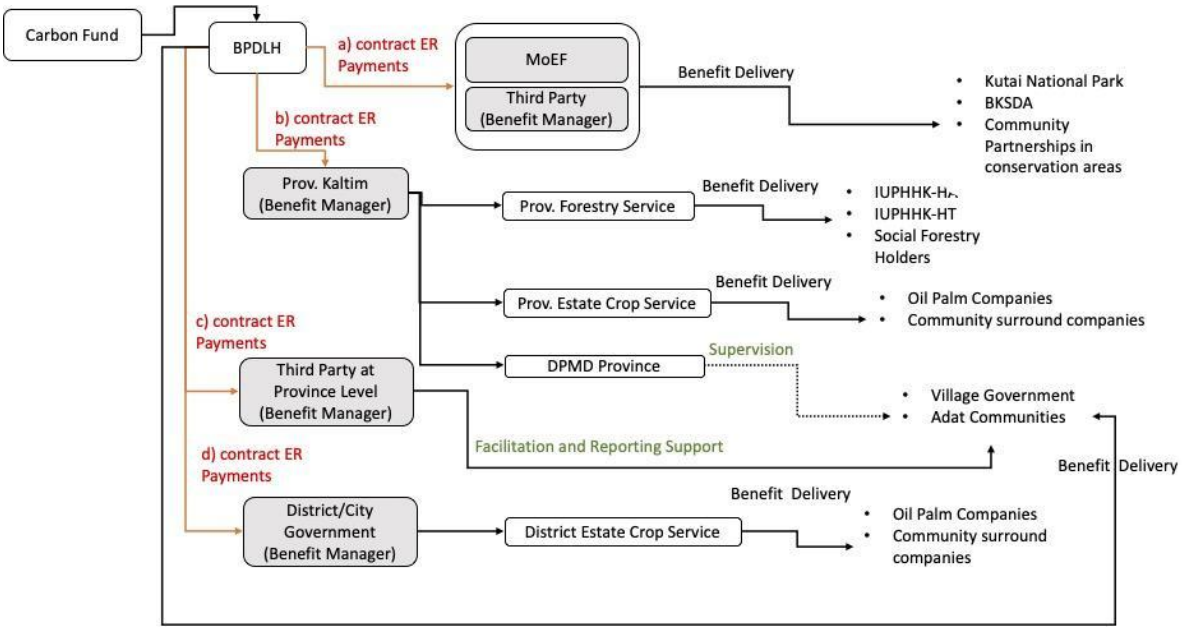
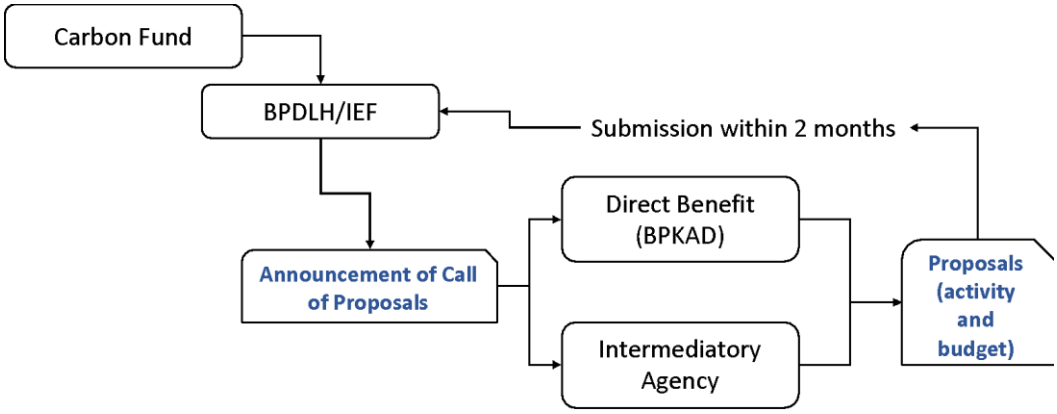
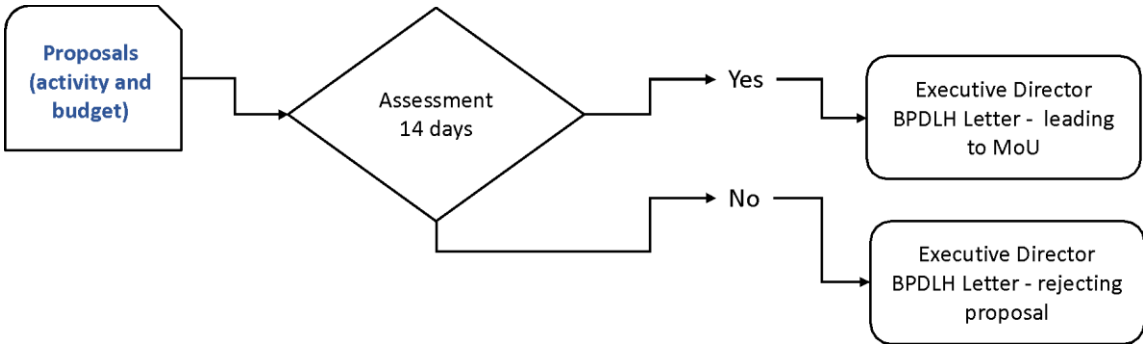


Figure A2.2. Timeline Proposals from BKAD and Intermediatory Agency to IEF/BPDLH

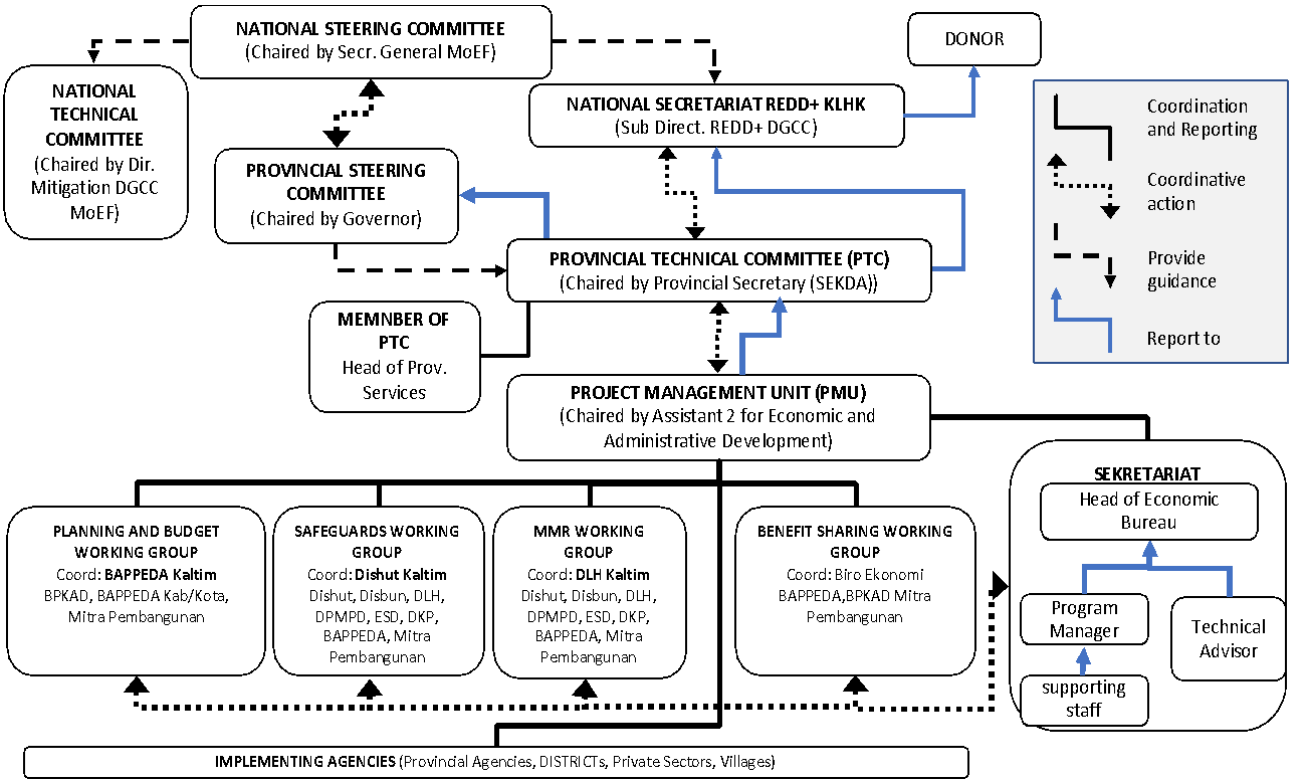




- Institutional Arrangements

  The governance of FCPF-CF benefit fund distribution involves three parties: the beneficiary and/or Benefit Manager, the Steering Committee and Technical Team (National and Provincial), and the IEF as the payment recipient entity. At the national level, it was agreed that a National Steering Committee (NSC) is chaired by the Secretary-General of MoEF, whereas at the provincial level, the Provincial Steering Committee (PSC) is chaired by the Governor. The NSC is supported by the National Technical Committee (NTC), chaired by the Director of Mitigation DGCC from the MoEF. On the other hand, the Provincial Technical Committee (PTC) is supported by members from the Provincial Services. A Project Management Unit (PMU) is established to manage oversight of the ER program at the provincial level. The PMU is supported by four working groups, namely a) Planning and Budget working group chaired by Bappeda Kaltim, b) Safeguards working group chaired by Dishut Kaltim, c) MMR Working Group chaired by DLH Kaltim, and d) Benefit Sharing Working Group chaired by Economic Bureau of Provincial East Kalimantan (Figure A2.3). The institutional arrangement for ER Program has been issued through Governor Decree No. 522/K.8/2022. The Provincial PMU was launched in April 2022. The program manager and technical advisors are recruited soon after the confirmation of delivery of ER Payments to the IEF/BPDLH is received by the Provincial Government. There is a risk of delay for recruitments if the ER Payment has not been received by the Provincial Government. In order to mitigate the risk, the role of PMU is supported by appointed staff from Bureau Economic Affairs under the Secretariat Government Office.

Figure A2.3. Institutional Arrangements for ER Program



II. Monitoring and Reporting Requirements

1. Benefit Sharing Plan Readiness

1.1 Confirm that the BSP has been completed and endorsed by all relevant parties. Are there any aspects of the BSP which remain unclear or require further review of endorsement by beneficiaries or other stakeholders? Has the BSP been made publicly available?

The First BSP document has been completed and endorsed by the Secretary of Provincial Government of East Kalimantan, Executive Director of BPDLH/IEF, and Directorate General of Climate Change - MoEF. This document was publicly disclosed and disseminated throughout the Province along with the outreach conducted for the program.

Based on lessons learned from the advance payment benefit sharing distribution, it was agreed the BSP would undergo adjustments and revisions before the final ER payment will be made. The revised BSP underwent a comprehensive government-led revision process, as well as public consultation process from July to September 2025 to improve inclusion, particularly for adat communities, and to clarify eligibility, enhance cost-effectiveness, and strengthen the environmental and social safeguard systems.

The process began with technical meetings between the Provincial Management Unit and local NGOs and CSOs in late May to prepare the consultation format and materials. Following a public disclosure of the revised BSP on July 16, 2025, a provincial workshop was then held on August 7, 2025, bringing together representatives from government agencies, civil society, and Adat community representatives. This workshop presented the rationale for revising the BSP, lessons learned from previous implementations, and key proposed changes. The main topics were eligibility criteria, fund allocation mechanisms, the role of intermediary agencies (LEMTARA), the working group for BSP concerning community and Adat groups, and community engagement strategies.

Four district-level consultations took place on August 26th and 28th, 2025, covering all seven districts in East Kalimantan. These consultations were attended by more than 800 people, including adat leaders, village heads, women's groups, youth representatives, and local NGOs. Discussions were structured to ensure inclusive participation and allow different stakeholder groups to express their views openly. At the same time, national and provincial government agencies were consulted on institutional roles, implementation responsibilities, and operational mechanisms related to the revised BSP, including fund channeling, grievance redress, and monitoring systems.

The process was concluded with a Provincial Workshop on September 18, 2025, inviting more than 200 participants. The feedback was all collected, the BSP was revised accordingly and posted on the project's MMR portal. This final event presented the outline of revised BSP, explained how stakeholder inputs were addressed, and provided an opportunity for any remaining questions or feedback.

The BSP is publicly available on the Directorate General of Climate Change Control's website: (http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/mitigasi/fcpf/Benefit_Sharing_Plan_.pdf) and Bank website (https://documents.worldbank.org/en/publication/documents-reports/documentdetail/606071637039648180/indonesia-east-kalimantan-project-for-emissions-reductions-results-benefit-sharing-plan).

1.2 In cases where capacity building initiatives have been included as part of the BSP, confirm whether the Program Entity has completed the required capacity building measures to ensure system effectiveness. What other measures are still outstanding?

Once the first ER Payment is delivered, capacity building for the participating village and *adat* community started. The intermediary agency is responsible to provide capacity building for the village and community. A Quick Training Need Assessment (TNA) was undertaken during the FPIC consultations. Some inputs that are relevant and important themes for villages and the *adat* community capacity building are as follows:

- Village Financial Management and Budgetary Plan
- Village Emission Reduction Activity Report
- Sustainable community livelihoods
- Participatory Village Land Use Plan
- Participatory Adat Community Area
- Village Forest Management Plan
- Village Forest Monitoring

As mandated by the BSP, further with the development of Payment Agreement, the Intermediary Agency (IA) arranged the Implementation Agreement with the beneficiaries at the village government and community level and conducted capacity building for the development of ER Proposal by the ultimate beneficiaries. The IA continues to support village fund distribution by providing capacity building, proposal development assistance, supervision, mentoring, and reporting functions for the ultimate beneficiaries at the community level.

With these achievements, it can be confirmed that most of the required capacity-building measures have been effectively implemented, particularly in the areas of environmental risk management, community engagement, and institutional strengthening for Indigenous Peoples (Masyarakat Hukum Adat/MHA). Nevertheless, challenges remain due to the varying levels of understanding among implementing entities regarding their specific roles in the implementation of safeguard plans. At present, the safeguard system of the Emission Reduction (ER) Program largely relies on existing national mechanisms, except for areas directly managed by the Safeguards Working Group, the Secretariat, and FGRM focal points. Therefore, capacity-building measures that still require reinforcement include enhancing cross-agency technical understanding of ER Program–specific safeguard instruments, strengthening thematic training on a continuous basis, and

expanding field-based mentoring to ensure consistent application of the ESMF across all levels of implementation.

1.3 Where relevant, confirm whether any agreed changes to the benefit sharing arrangement identified during the previous reporting period have been completed.

The Indonesian BSP was first published in November 2021. An advance payment of US$ 20.9 million was made in November 2022 to test the benefits-sharing mechanism. There were no revisions made to the Benefit Sharing Plan (BSP) during the implementation period of BSP Version 1.5. However, starting in February 2025, several adjustments were initiated based on the evaluation of BSP V1.5. These adjustments include revisions to the eligibility criteria for beneficiaries, the allocation of benefits, fund distribution mechanisms, BSP institutional arrangements, key implementation steps, and the overall structure of the document. Some of these changes remain dynamic and are subject to further refinement until the conclusion of the public consultation period in September 2025.

2. Institutional Arrangements

2.1 Confirm that the agreed institutional arrangements under the BSP are in place and that implementing entities are appropriately resourced to carry out their respective responsibilities.

The institutional arrangement for the ER Program, including BSP, has been set up and issued under Governor Decree No.522/K.28/2022. The arrangement has been discussed and consulted with relevant stakeholders in East Kalimantan and the central government (MoEF). Government staff have been appointed. Technical advisors and a program manager are recruited soon after the ER Payment is received. The institutional arrangement is ready and in place to implement the ER program. .

The National Steering Committee (NSC) meeting is conducted annually and chaired by the Secretary General of MoEF. The members of NSC are Echelon 1 from MoEF, Governor and Secretary of the provincial government of East Kalimantan, and Echelon 1 from BPDLH/IEF. The Echelon 1 from MoEF are the DG Climate Change, DG SFM, and DG Nature Conservation. The Echelon from BPDLH/IEF is the Director of Fund Disbursement. The NSC members can be added when necessary based on the result of the NSC meeting.

The Provincial Steering Committee (PSC) meeting is conducted every six months and chaired directly by the Governor of East Kalimantan. The members of the PSC are Echelon 2 from the MoEF (Ditjen PPI, Ditjen KSDA, Ditjen PHPL) and Echelon 1 and 2 from the provincial government of East Kalimantan (Provincial Secretary, Forestry Service, Environment Service, Development Planning Service, Mining Service, Estate Crop Service, Village and Community Service, and Economics Beaureu of Governor Office).

The Provincial Technical Committee (PTC) meeting is conducted every six months and chaired by the Provincial Secretary of East Kalimantan. The members of the PTC include the heads of the Provincial Services/Agencies (Forestry Service, Environment Service, Development Planning Service, Mining Service, Estate Crop Service, Village and Community Service, and Economics Beaureu of Governor Office) and district services (Estate Crops Service, and Village and Community Service).

Day to day operation of the ER Program is implemented by the Project Management Unit (PMU). The PMU is chaired by Assistant 2 for Economic and Administrative Development of Governor Office. The PMU is supported by Four Working groups, namely a) Planning and Budget Working Group coordinated by the Development Planning Service (Bappeda), b) Safeguard Working Group coordinated by the Forestry Service (Dishut), c) MMR Working Group coordinated by the Environment Service (DLH), and d)Benefit sharing Working Group coordinated by the Economic Beaureu of Governor Office (Biro Ekonomi).

The IEF/BPDLH as Fund Agency has adopted international standards for fund management and distribution. The financial management of BLU-BPDLH/IEF has been assessed by Pricewaterhouse Cooper (PwC). The process for distributing benefits to beneficiaries is outlined in the Final BSP Document (section 4.2.1). The IEF/BPDLH was launched in October 2019, the acting President Director was appointed in December 2019, and the personnel (i.e., staff and directors) have been operational since October 2020. The BLU-BPDLH/IEF President Director and personnel have been selected through the procurement (bidding) process and authorized by the Minister of Finance Decree as the responsible entity. The disbursement of funds for FCPF Carbon Fund is under the authority of the Director of Fund Distribution BPDLH. The selection of intermediary agencies to channel the funds to village and *adat* communities has taken place (see section 1 above).

2.2 Confirm that any regulatory or administrative approvals required for implementing the BSP have been obtained.

This is confirmed. The formal approval is in the form of regulations issued by the provincial government under Governor Regulation No.33/2021. The regulation outlines a) type of benefits, eligibility, and beneficiaries, b) proportion and allocation, c) the use of benefits, d) monitoring and evaluation, e) FGRM, and f) finance.

2.3 Assess whether all BSP stakeholders (beneficiaries and administrators) clearly understand their obligations, roles, and responsibilities associated with the BSP. This assessment could be based on, for example, findings and feedback received during field implementation support missions, during interviews with beneficiaries, issues raised through public consultation meetings, beneficiary monitoring, or grievance mechanisms.

The Benefit Sharing Plan (BSP) for East Kalimantan has been developed over a decade through multiple consultations and regulatory milestones aimed at ensuring transparent, inclusive, and effective distribution of Emission Reduction (ER) payments under the FCPF ER Program. The information about BSP is one of the materials disseminated to the stakeholders during the FPIC consultations both at the sub-national and village level. During the FPIC process, inputs and feedback were collected and responded accordingly before being integrated into the revised BSP document.

In April and May 2019, stakeholder workshops refined the BSP outline, eligibility criteria, and allocation parameters. The term Operational Cost was changed to Responsibility Allocation to better reflect its purpose of supporting both administrative needs and positive policy initiatives. Private sector and government stakeholders confirmed transfer mechanisms, although benefit-sharing proportions remained under discussion. In July 2019, an extensive stakeholder consultations process aligned with FPIC principles was conducted in East Kalimantan to explain the ER Program, safeguards, grievance mechanisms, and benefit-sharing arrangements to communities. The BSP was approved and published in 2021.

.

The monitoring process is carried out by the government agency in charge of the beneficiary area based on the plans and implementation. Monitoring is conducted jointly between DPMPD and the selected intermediary agency for the village and *adat* community. The government agency and intermediary agency will report to the PMU Sub-National and the East Kalimantan MMR Portal and then report to the National PMU and SRN. The report on the use of funds is a subject for the Indonesia Supreme Audit Institution (BPK) and will be made accessible to the public.

2.4 Confirm that a system is in place for recording the distribution of benefits and associated obligations to eligible beneficiaries. For example, are payment information systems, payment tracking and monitoring systems, bank accounts, accounting and financial control mechanisms, and payment modalities in place and functional?

The financial management arrangements and financial control mechanism of the ER program are guided under Presidential Regulation No. 77/2018 on Environmental Fund Management and Financial Service Authority (OJK) Regulation No. 27/2015 on Bank Business Activities in the Form of Custody with Management (Trust). As regulated in both regulations and mandated by the BSP, the IEF as a Public Service Agency (BLU) that serves as payment recipient entity of the ER program needs to follow procedures for an efficient and effective environmental fund management. Furthermore, financial management arrangements and financial control mechanisms used are in accordance with the IEF Regulation, specifically the Policy and Technical Guidelines for Accounting for Environmental Fund Programs through the Trustee Mechanism in the IEF.

Generally, as a BLU that manages the ER payment, the IEF has a specific chart of accounts for different expenditures for environmental fund management. In the case of fund disbursement for ER payment, the chart of accounts used in the state budget is '525151' defined as Environmental Program Fund Management Expenditure. In this case, the disbursement of benefits from the IEF to the Benefit Managers and beneficiary are accounted as Environmental Program Fund Management Expenditure in the State Budget. The accounting method applied is the cash-based accounting method, where financial transactions related to receipts and disbursements are recorded based on cash disbursement by the IEF to the Intermediary Agencies/Benefit Managers.

Specifically for the FCPF program, as a World Bank funded program, there are three additional reports that support the process of recording the distribution of benefits, namely: Interim Financial Report (IFR), Designated Account Activity Statement, and Benefit Distribution per Recipient that will be further explained below.

- Interim Financial Report: Interim Financial Report (IFR-1) / Project Fund Source and Utilization Report explains the source of funds for the project being implemented, whether from the Government (APBN), World Bank grants, or other grants/loans. The Project Fund Source and Utilization Report also explains the category and amount of fund utilization in the current quarter and its accumulation. This report allows for the determination of the percentage of project fund utilization based on planned and actual fund utilization.
- Designated Account Activity Statement (DAAS): DAAS is the information to report summarizing transactions in a specific, designated bank account - in this case, the trustee account for the receipt of funds from the World Bank and disbursement to beneficiaries.
- Benefit Distribution per Recipient: Status of Benefit Distribution is the information on the disbursement of funds to respective Benefit Managers and its utilization according to different allocation (Responsibility, Performance, and Reward) as mandated in the Benefit Sharing Plan.

Recording the Distribution of Benefits, Tracking Payments, and Audit Mechanism

Benefit Managers and BPDLH enter into an ER Payment Agreement, which includes the responsibility of developing reports on the utilization of funds and finance. The reporting period varies depending on the mechanism used for each beneficiary. For example, subnational governments are required to report per semester following the regulation in APBD, while Intermediary Agencies are required to report quarterly on the benefit distribution and utilization from end beneficiaries. The financial report consists of information for benefits used according to the three allocations. Respective Benefit Managers are required to conduct internal audits and validation processes, as there are audit mechanisms in APBD and APBDes. Once authorized by the head of respective Benefit Managers, the reports are then submitted to the IEF for the development of IFR, DAAS, and Status of Benefit Distribution and submitted to BPK to be used for audit purposes by BPK and reporting to the World Bank and KLH.

In general, according to the IEF Regulation No. 7/2024, the process for financial reporting encompasses several process to ensure a prudent and sufficient check and balance mechanism:

1. The IEF (i.e Project Management Unit in the IEF) compiled and assessed the financial report from each Benefit Manager, for the development of the financial report;
2. The financial report is prepared by the PMU and then given to Directorate for Finance, General, and Information System in the IEF for review and validation of the accounting and journal of transaction;
3. After being reviewed and approved by the Directorate for Finance, General, and Information System, the Directorate will provide a cover letter for the Internal Audit in the IEF for review request of financial report;
4. After being reviewed, the results of the review in the form of a statement h which will later be attached to the financial report
5. The reviewed financial report by the IEF is uploaded to the BPK for further audit report on the financial report

2.5 Confirm that agreed accountability mechanisms are in place and functional (e.g., stakeholder participation arrangements; agreed public information disclosure procedures; independent third party monitoring and or performance audit mechanisms; dispute resolution and grievance redress mechanisms.)

Stakeholder participation arrangements: The FCPF methodological framework requires that the benefit-sharing arrangements are designed in a consultative, transparent, and participatory manner and reflects inputs by relevant stakeholders. To ensure achievement of these principles and consistent with the ESMF and IPP and given the nature, scope and scale of the Program and the BSP, stakeholder engagement and consultation can be broad-based and inclusive, including district governments, representatives of Indigenous Peoples and Local Communities (IPLCs), community leaders (including Adat leaders), and relevant NGOs. To support this process, the following stakeholder engagement actions will be (or have been) undertaken for this BSP:

a. *Effective Community Outreach and community engagement strategy*, to ensure i) that beneficiaries of performance and rewards allocations are informed of their eligibility and the process to follow to either agree to access and allocate funds, volume of funds and the process to access them; ii) that village government officials are informed of their roles in channelling funds; iii) community members participation in the allocation of their funds to local development projects (i.e. village planning); iv) provision of effective channels for feedback and questions, including the option to decline to participate in the BSP if desired; and v) tailored messages and outreach options for marginalized and *adat* communities in particular, such as translation into local languages.
b. *Consultations on BSP design and BSP implementation*. Given the Program's nature, scope and scale and the challenges these represent, consultations are not required at village level but rather broad participatory processes with different stakeholders, including government agencies, IPLCs representatives, particularly adat representatives and community leaders and NGOs. Implementation of the BSP will follow principles of Free, Prior and Informed Consultation and Consent (FPIC) as the BSP is rolled out, and before funds reach communities to implement activities.
c. *Participation and Consent.* Based on consultations leading to consent, beneficiary groups will be given the opportunity to consent by agreeing or declining to receive funds or participate in activities in the areas where they live. This approach will be applied uniformly across all recipient villages and community groups, as the widespread presence of adat communities and IPLCs requires a standardized process. The 'consent' mechanism will apply to receipt and allocation of the funds and will be integrated into the workplans and budgets submitted by participants. Consent forms may be submitted alongside budget submissions, to limit document review processes. For community groups, the submission of a grant workplan by an eligible group will be considered a signal of consent, and additional written forms will not be required.
d. *Feedback and grievance redress*. A feedback and grievance redress mechanisms will always be available to stakeholders.

Public information disclosure:

In order to provide information to the public related to BSP implementation, the Government of East Kalimantan has provided a web portal under MMR system. The detail procedures on public information disclosure for MMR web portal will be put under Provincial Government Policy. The issuance of that policy is scheduled by first quarter 2023.

Independent third-party monitoring and performance audit: The Government has developed the accountability mechanism for BSP implementation under Governor Regulation No.33/2021 and Governor Decree No.522/2022 including responsible party for decisions, funds flow, and reporting as follows:

a) At the Provincial level the Governor of East Kalimantan Province through the Provincial Secretary (Sekda Provinsi Kaltim). In implementing the BSP, the Provincial Economic Bureau as the coordinator of the Provincial Benefit Sharing Working Group, will support Sekda.
b) At the District level each relevant Bupati of the District through their District Secretary (Sekda Kab/Kota). In implementing the BSP, the District Economic Bureau will support Sekda.
c) At the village and *adat* community level the selected intermediary agency will be responsible for monitoring funds flow and supporting and facilitating reports.
d) At the National level (MoEEF) the selected intermediary agency will be responsible for monitoring funds flow and supporting and facilitating reports.
e) The audit mechanism will be referred to the Government Audit systems. The report on the use of funds is subject to audit by the Indonesia Supreme Audit Institution (BPK), and all BPK audit reports are accessible by the public.

As the distribution of fund and accountability mechanism at the subnational level follows the APBD procedures, the financial report is also audited by the BPK in East Kalimantan Province (Local Representative of BPK) therefore the entity at the subnational level underwent several audit processes. Additionally, for fund management at the Intermediary Agency, the Intermediary Agency employs a KPA (Public Accounting Firm) to audit the financial report, to ensure a sufficient accountability mechanism by the Benefit Manager.

The World Bank, as a Trustee to the FCPF, reserves the right to request and/or commission a separate monitoring in the form of Third-Party Monitoring (TPM) at a regular or ad hoc basis, including after closure of the ERPA. A TPM is conducted to monitor and report on whether the BSP is implemented in accordance with its terms and relevant safeguard plans. The TPM (firms or individual) should be an independent entity, not be affiliated with the implementation of Emission Reduction Programs and should have adequate knowledge of World Bank Safeguards. The Terms of Reference (ToR) of the TPM, which includes general scope, timing, and budget will be consulted between the Government of Indonesia, the World Bank and the Facility Management Team (FMT) of the FCPF. The findings of the TPM will be reported to these entities.

Dispute resolution and grievance redress mechanisms: To ensure transparency, accountability, and inclusive participation, a Feedback and Grievance Redress Mechanism (FGRM) has been designed explicitly for the Emission Reduction (ER) Program, including the implementation of the Benefit Sharing Plan (BSP). The FGRM serves as a vital safeguard instrument to address concerns, complaints, or suggestions from stakeholders, including Indigenous Peoples and Local Communities (IPLCs), who may be affected by the program's implementation. The design of the FGRM adopts a dual-channel approach, integrating both web-based (SPAN-LAPOR!) and manual mechanisms (postal mail, in-person visits, or direct consultations). This dual system ensures flexibility and accessibility, particularly for stakeholders in remote or underserved areas.

2.6 Confirm that the Feedback and Grievance Redress Mechanisms (FGRM) is functional to record and address feedback and grievances related to the implementation of the BSP. Confirm the number and types of grievance received and submitted to the FGRM and how and whether they were addressed.

The FGRM is functional and accessible to communities within the target areas through various available grievance channels. The system operates in accordance with the provisions set out in the Environmental and Social Management Framework (ESMF) and is supported by both national and provincial regulations, including existing grievance mechanisms implemented at the provincial, district/municipal, village, and program levels. The FGRM is designed to collect, record, manage, and resolve public grievances, particularly those related to environmental and social issues arising during program implementation. The system aims to ensure transparency, accountability, and responsiveness, while providing space for communities to submit feedback and complaints.

During the reporting period of 2021–2024, two main mechanisms were utilized for submitting grievances related to the Emission Reduction (ER) Program, namely:

- **SP4N-LAPOR!,** a national government-managed system established to receive and follow up on public complaints in a transparent, accountable, and integrated manner;
- **Existing mechanisms implemented** by agencies at the provincial, district/municipal, and village levels, which rely on established grievance-handling procedures and are closer to the communities.

During the reporting period, SP4N-LAPOR! system introduced a specific categorization for ERP-related grievances. The accuracy in using the ERP category remains a challenge. Many of the complainants did not use this category when submitting their complaints related to ERP (such as a request for more forest rangers) and many complaints using the category were not related (e.g., a complaint about Balikpapan Port). The Communication and Information Agency of East Kalimantan province had filtered all complaints from 2021 to 2024 that were addressed to the OPDs involved in the ERP. The result shows that there were a total of 176 complaints addressed to the OPDs involved in the ERP. These complaints were filtered again whether they were related to the nine activities of the ERP or not. From a total of 176 complaints from 2021 to 2024, only 53 complaints were related to the nine ERP activities.

Year	Total Complaint Addressed to OPD	Total Complaints Related to ERP	Being Processed	Solved	Remarks
2021	10	0			Complaints submitted through SP4N LAPOR in 2021 were mostly related with mining issues, such as illegal mining and coal mining. Those complaints were not related with 9 ERP activities.
2022	77	0			None of complaints in 2022 were related to 9 activities of ERP.

2023	66	38	20	18	38 complaints were related to several ERP activities such as: ● forest fires (MPA/KTPA): 23 complaints ● illegal logging (MMP): 9 complaints ● tenurial conflicts (Social Forestry): 2 complaints ● palm oil plantation (ISPO): 4 complaints
2024	23	15	1	14	● Illegal logging (MMP): 12 complaints ● Forest fires (MPA/KTPA): 3 complaints
Total	176	53	21	32	

Additionally, local and adat communities could file complaints through various channels, including website, apps, or social media. However, recognizing the challenges faced by remote communities, alternative and conventional channels were also established, including mail, face-to-face meeting with agency officials at provincial, district, or village levels, SMS, and direct visit to local government agency offices. Local communities could visit or send a letter. Data on the number of complaints / grievances lodged through these systems and how many have been actioned and closed has been difficult to collate for reporting purposes, but the implementing entities have provided examples of how grievances have been managed:

- A complaint about illegal logging happened in Sei Baruk Lestari Forest areas. The SP4N-LAPOR forwarded the complaint to KPHP Berau Utara who then followed up the complaint by conducting forest encroachment prevention and putting up a banner to warn illegal loggers to stop their actions. There is a mechanism where the complainants can track the progress of their complaint and check what has been done by the responsible OPD. Hence, the management of feedback and grievances using SP4N-LAPOR becomes more transparent;
- In another case, an encroachment complaint was reported by local communities during MMP (Community Partners of Forest Rangers) patrols in the Production Forest area of KPHP Kendilo. The MMP relayed the case to UPTD KPHP Kendilo, which appointed a protection working group to investigate the encroachment location. Despite conducting a series of patrols within the forest area, the team did not find evidence of encroachment activities. When there was no evidence and no follow up from the complainant, the case was be closed within 10 days.

Overall, the implementation of the FGRM under the Emission Reduction Program has demonstrated solid performance and effectiveness in responding to various types of grievances at the provincial, district/municipal, and village levels. Integration with SP4N-LAPOR!, the national complaint-handling system, ensures that all grievances are registered, traceable, and monitored in a transparent manner. In addition, the presence of SOPs issued by implementing agencies at the local level further strengthens grievance-handling procedures according to each institution's mandate. Accessibility has also been enhanced through multiple channels, including digital platforms (applications, websites, social media, and SMS) as well as conventional means (letters, face-to-face meetings, and direct visits), thus enabling both local communities and indigenous peoples, including those in remote areas, to voice their concerns effectively. Practical cases such as those involving illegal logging, tenurial conflicts, and environmental pollution caused by companies illustrate that grievances are not only recorded but also followed up with concrete actions. These actions have included investigations, preventive measures, mediation processes,

and the imposition of administrative sanctions in accordance with prevailing regulations. Taken together, these mechanisms demonstrate that the FGRM effectively upholds transparency, accountability, and responsiveness in grievance management. Therefore, it can be confirmed that the FGRM under the Emission Reduction Program has been implemented properly, is consistent with the provisions of the ESMF and national regulations, and functions as intended.

2.7 Confirm that adequate human and financial resources have been allocated or maintained for implementing the BSP.

This is confirmed. IEF/BPDLH as the fund manager has been set up and issued under the Ministry of Finance's Decree PMK No.799/2019. The organizational structure has been established and staff have been recruited. The fund disbursement system has been regulated under BPDLH/IEF Executive Director's Regulation No. 7/2020. The process of selection for the intermediary agency was undertaken in 2021. At the sub-national level, human resources from governments have been appointed (under Governor Decree No. 522/K.28/2022 on the PMU FCPF Carbon Fund). Once the provincial government receives confirmation of the delivery of ER Payments, recruitment for the program manager and technical advisors, including supporting staff, will be conducted. There is a risk of delay for recruitments if the ER Payment has not been received by the Provincial Government. In order to mitigate the risk, the role of PMU is supported by appointed staff from Bureau Economic Affairs under Secretariat Government Office.

3. Status of Benefit Distribution

3.1 Summarize the distribution of all monetary and non-monetary benefits during the reporting period.

At the national level, distributed benefits from the advance payment totalled US$ 1,323,663.41, channeled to the Ministry of Environment and Forestry (MoEF) and its technical units through allocations to support REDD+ operationalization, policy development, and institutional strengthening. The directorates and technical units include Directorate General of Climate Change (Directorate of Climate Change Mitigation, Directorate of Green-house Gases Inventory and Monitoring Reporting and Verification, Directorate of Sectoral and Regional Resource Mobilization, and Vertical Office of DGCC in Kalimantan); Directorate General of Natural Resource Conservation and Ecosystems (Directorate General of Natural Resource Conservation and Ecosystems, Kutai National Park, and Kalimantan Natural Resource Conservation Centre); and Directorate General of Forestry and Environmental Planning (Directorate of Forest Resources Inventory and Monitoring).

At the sub-national level, the beneficiaries include the East Kalimantan Provincial Government, one municipal government (Balikpapan), and seven district governments: Mahakam Ulu, Paser, Penajam Paser Utara, Kutai Barat, Kutai Kartanegara, Kutai Timur, and Berau. Additionally, within East Kalimantan province, there are a total of 103 Forest Management Units (FMUs) that also receive FCPF funds. All of these beneficiaries at the subnational level are formally recognized in the Letter of Governor of East Kalimantan No. 500.4.3/0644/EK regarding Payment Request for FCPF - CF RBP ER Program dated 24 January 2023, that includes the Proposal and consolidated Annual Work Plans of East Kalimantan Local Government Agencies. The distributing benefits to the subnational level totaled US$ 7,206,062.94, albeit with some delays due to alignment with local budget cycles.

At the village level, the beneficiaries are the village governments from the eight municipalities/districts. This category of beneficiaries also includes "urban village" governments, which, in the context of regional hierarchy, are considered the same as "village" governments, but urban villages are located in the

administrative areas of urban regions. There are a total of 441 village governments and 25 urban village governments as beneficiaries. All of these beneficiaries at the village level are formally recognized in the letter from the East Kalimantan Province Government Secretary No. 500.4/15008/EK.

At the community level, distribution covered 360 out of 441 villages and 59 out of 150 community groups (including Climate Village Programs, Forest Farmer Groups, Forest Protection Groups, Social Forestry Business Groups, Fire-awareness Farmer Groups, Village Forest Management Institutions, and Customary Law Communities).

3.2 Indicate in a table format the number and type of beneficiaries who received benefits during the reporting period (examples of tables to be used and expanded upon below).

Total monetary benefits distributed per beneficiary							
Category	**Subcategory**	**Amount allocated**		**Amount distributed**		**Balance** [1] [2]	
		(US$)	**%** [3] [4]	**(US$)**	**%**	**(US$)**	**%**
Government	National	2.943.980,33	15,08%	1.323.663,41	6,78%	1.620.316,92	8,30%
	Regional	4.672.600,00	23,94%	4.511.349,73	23,11%	161.250,27	0,83%
	Municipal	2.791.031,00	14,30%	2.694.713,21	13,81%	96.317,79	0,49%
Private Sector		0	0,00%	0,00	0,00%	0,00	0,00%
CSOs		607.184,30	3,11%	139.729,49	0,72%	467.454,81	2,39%
IPs		111.500,48	0,57%	31.857,28	0,16%	79.643,20	0,41%
Local Communities		7.434.983,12	38,09%	6.527.616,44	33,44%	1.140.561,97	5,84%
Other (please specify)		956.887,90	4,90%	908.987,32	4,66%	47.900,58	0,25%
TOTAL		**19.518.167,13**	**100,00%**	**16.137.916,88**	**82,68%**	**3.613.445,54**	**18,51%**

3.3 Do beneficiaries receive adequate implementation support to assist in the management and use of benefits distributed to them?

During the advance payment benefit channeling, the intermediary agencies facilitated the community groups and villages to access and use benefits. From this process, 360 out of 441 villages and 59 out of 150 communities have received benefits. However, proposal development experienced delays, which were attributed to limited human resources for facilitation by the Intermediary Agency. To mitigate this for the next ER payment process, the engagement of local CSOs will be enhanced to streamline the process for proposal development assistance to ultimate beneficiaries. In the current revision to the BSP, this issue will be addressed with the option for partnership between the Intermediary Agency and local CSOs in East

Kalimantan. This aims to facilitate a smoother process for facilitation, as local CSOs have more familiarity and understanding of the local context of the beneficiaries. As illustrated in the BSP revision document (currently in the process of public consultation), the partnership between the Intermediary Agency and local CSOs should be done ideally 6 months after the contract between Intermediary Agency and the IEF is signed.

3.4 Describe and assess the effectiveness of the mechanisms for ensuring transparency and accountability during the implementation of the BSP, such as participatory monitoring by beneficiaries.

A rigorous monitoring and evaluation process ensures that benefit distribution adheres to principles of fairness and transparency, as reflected in key program management and monitoring achievements. Program monitoring and evaluation are conducted at both national and subnational levels. The implementation of digital monitoring platforms such as SRN PPI and SIGNSMART enhances the accountability of benefit distribution and enables real-time tracking, thereby improving transparency and credibility in the implementation of the Benefit Sharing Plan (BSP). Additionally, East Kalimantan Province has also developed a public MRV Portal, https://mrv.kaltimprov.go.id/, which operates via a website system. The MMR Portal is also part of the fund tracking mechanism, particularly for Monitoring and Evaluation processes.

3.5 Assess whether Benefit Sharing distributions continue to be relevant to core objectives and legitimacy of the ER Program objectives (e.g., benefit sharing is considered equitable and effective; seeks active participation of recipients; is respectful of customary land rights; enjoys broad community support of Indigenous People; benefit distributions incentivize adoption of emission reduction measures, among others).

The BSP is expected to improve the material well-being of people living in and around forested areas, while supporting improved forest management and helping to address the drivers of deforestation and forest degradation. It follows the FCPF Carbon Fund Methodological Framework (2020) and is aligned with and supports the ER Program. The general principles of the BSP are transparency, effectiveness, inclusiveness, and respect for customary rights to lands and territories. These principles are consistent with the safeguards system which applies to this BSP. The distribution of funds under the BSP (i.e., delivery of monetary and non-monetary benefits) will be subject to environmental and social safeguards requirements as stipulated in the ERP's Environmental and Social Management Framework (ESMF), Indigenous Peoples Planning Framework (IPPF), the Indigenous Peoples Plan (IPP), Resettlement Planning Framework (RPF), Process Framework (PF) and FGRM. The BSP should be read in conjunction with these environmental and social safeguard instruments.

3.6 Describe the mechanisms that are in place to verify how benefits are used and whether those payments provide sufficient incentive or compensation to participate in program activities to change land use or reduce carbon emissions. To what extent are distribution mechanisms viewed as credible and trusted by beneficiaries?

Verification is carried out through a series of structured stages, involving various stakeholders, including the Ministry of Environment and Forestry, as well as intermediary agencies such as Penabulu and Kemitraan. Through this comprehensive verification mechanism at both the national and sub-national levels, the effectiveness of benefit utilization and incentives for community participation in the ER program can be more accurately ensured. The periodic and transparent verification process allows for the identification of issues and obstacles that may arise during the program's implementation, while also providing an opportunity for beneficiaries to make necessary adjustments or improvements. Therefore, verification not

only serves as a tool to ensure the alignment of activities with the planned objectives but also acts as an instrument to strengthen accountability and transparency in the program's management.

At the national level, verification is conducted by the Monitoring and Evaluation (Monev) Team from the MPI Directorate, which regularly monitors the progress of program implementation every three months. This verification process includes administrative checks, analysis of supporting evidence, evaluation of program progress, and identification of challenges faced by beneficiaries. The results of this verification serve as a basis for assessing beneficiary compliance with program requirements and evaluating the effectiveness of the incentives provided to enhance their participation.

Meanwhile, at the sub-national level, verification is conducted through the Monitoring, Measurement, and Reporting (MMR) system, which functions as an integrated reporting instrument in the management of action-based programs at the local level. This process begins with socialization and technical guidance to ensure stakeholders understand the procedures for data input and the use of the MMR portal. Every activity undertaken is reported transparently and well-documented, ensuring that the benefits received are used in accordance with the established objectives.

3.7 Do beneficiaries understand their continued obligations once benefit distribution has taken place? Is there any evidence that there is a mismatch of expectations among beneficiaries regarding the nature and value of benefits accruing to them? What mechanisms are in place to manage such risks?

the mechanism for benefit distribution encompasses several processes including proposal development from the beneficiaries, recommendation for payment, and development of ER payment agreement between beneficiaries/Benefit Manager and IEF. Furthermore, since the benefit distribution is assisted by Intermediary Agencies, the due diligence process for the Intermediary Agency is an important process for benefit distribution. Furthermore, the distribution of funds to the Intermediary Agency is carried out in tranches; therefore, periodic reports on the use of funds are necessary for the subsequent period of fund distribution.

Generally, the benefit distribution process includes: i) an agreement between the beneficiary and appointed intermediary agency; b) document submission for benefit distribution (including proposal/annual workplan, recommendation for fund distribution from the NSC and NTC, and statement of responsibility for the distribution and utilization of fund); c) payment request to IEF; d) transfer of fund from IEF to Intermediary Agency in tranches and from Intermediary Agency to beneficiaries according to the proposal/workplan; e) fund utilization reporting from the beneficiary.

Fund distribution at the subnational level utilizes the Local Government Budget (APBD) for the benefit disbursement process to ultimate beneficiaries (local government agencies). The APBD already has a robust mechanism in place, from fund withdrawal to reporting, and therefore the required documents for each Local Government Agency follow APBD procedures.

At the community level, funds are distributed through the Subnational Intermediary Agency. In general, the mechanism for fund distribution follows the same procedures as the one at the national level. However, since the proposal for community action is a bottom-up approach, there is an additional review process for proposal assessment on a negative list of activities.

4. Implementation of the Environmental and Social Management Measures for the BSP

4.1 Assess to what extent the measures for managing the environmental and social aspects of BSP activities have been implemented. Refer to applicable sections in the Safeguards Plans where relevant.

A rigorous monitoring and evaluation process ensures that benefit distribution adheres to principles of fairness and transparency, as reflected in key program management and monitoring achievements. In this regard, the Directorate of MPI has submitted several essential documents, including, ESMF Report 2021-2023, IPP Report 2021-2024, FPIC Guidelines, SHP Data for ERMR-1, which has been adjusted according to the revised Provincial Spatial Plan (RTRW) of East Kalimantan. Additionally, program monitoring and evaluation are conducted at both national and subnational levels. The Directorate of MSDPPI has also completed the Revision of the Benefit Sharing Plan (BSP) to ensure compliance and the effective implementation of the benefit-sharing scheme.

Since benefit-sharing involves making decisions about access to and distribution of financial or non-financial incentives derived from the Program's activities on lands that are customarily owned, managed, or used by Indigenous Peoples and Local Communities (IPLCs), it is essential to ensure robust stakeholder engagement and consultations. Safeguards measures for this BSP includes two main processes: Stakeholder engagement and consultations leading to consent activities and participatory planning to support workplan development, ineligible activities, budgets, both to address social and environmental risks.

5. Recommendations for BSP Improvement or Modifications.

5.1 Based on experience during the current reporting period as well as feedback from recipients, identify any specific recommendations for modifying the procedural or substantive content of the BSP, if necessary. Substantive changes may include modifications to eligible beneficiaries; rationale or justification for benefits sharing; form or modality of benefit distribution; structure of dedicated funds established to distribute benefits; obligations of recipient among others.

Based on lessons learned from the advance payment benefit sharing distribution, it was agreed the BSP would undergo adjustments and revisions before the final ER payment will be made. A number of refinements have been made to certain aspects of the BSP document, including the fund channeling mechanism, eligibility criteria of beneficiaries, positive list of the fund use, and the role of civil society organizations, among others. The revised BSP underwent a comprehensive government-led revision process from mid-2024 to September 2025 to improve inclusion, particularly for adat communities, and to clarify eligibility, enhance cost-effectiveness, and strengthen the environmental and social safeguard systems.

5.2 Are there procedural or administrative obstacles to timely distribution of benefits (e.g., adequacy of financial channels, ability to use funds)? Are benefits distributed in a timely manner?

Delays in benefits distribution: The beneficiaries submitted an Emission Reduction (ER) Proposal from the East Kalimantan Provincial Government to the Ministry of Environment and Forestry via the Governor's Letter No. 500.4.3/0644/EK, dated 24 January 2023, concerning the Payment Request for the FCPF–CF RBP ER Program. The proposal was reviewed by the Technical Team, resulting in a payment recommendation issued in February 2023 through Letter S.134/SETJEN/ROCAN/REN.0/2/2023 regarding the Incentive Payment Request for the Emission Reduction Program under the Result-Based Payment (RBP) scheme for FCPF Kaltim. Following this, IEF arranged ER Payment contracts with each Benefit Manager representing the respective municipality, district, or province. These contracts were finalized in February 2023.

At the national level, the Intermediary Agency (Lemtara) acts as the Benefit Manager, marking a unique arrangement in which a non-governmental entity manages funds on behalf of Ministry of Environment and Forestry working units. Implementation challenges emerged due to delayed budget utilization by ultimate beneficiaries. This delay stemmed from the time required to establish the distribution mechanism, which only began in 2023—one year after the World Bank disbursed the funds. The appointed Intermediary Agency must also prepare the proposal and Annual Work Plan (AWP) in coordination with the beneficiaries, further extending the timeline. However, with the distribution mechanism now in place, future payments are expected to proceed more efficiently through an accelerated proposal and AWP development process.

Misalignment with budgeting cycle: Besides the delay in the disbursement process, there was also a delay in the context of when the FCPF-CF fund could be legally recorded as regional expenditure. This delay occurred due to the need to comply with the local government budget (APBD) mechanism's schedule. As stated in section 3.1, there is a challenge in aligning with the annual budgeting cycle, as the Indonesian government received the FCPF fund in late 2022. By that time, the APBD for 2023 had already been legalized, so the additional revenue for the region could not be directly included and had to wait for the next budgeting cycle, namely the Revised Local Government Budget (APBD-P). Only after the FCPF-CF fund is incorporated into the Revised Local Government Budget can it be utilized and recorded as spending by the beneficiaries. Both provincial and municipal/district governments incorporate the FCPF-CF fund into the Revised Local Government Budget based on their regional policies and timelines. The delayed receipt of Advance Payment from the World Bank to the Government of Indonesia in late 2022, complex administrative processes and changes in financial policies slowed down the disbursement, allocation in the Local Budget, and utilization of funds to beneficiaries. The impact of the delay here includes the Budget Surplus (SiLPA), especially in East Kalimantan Government. While some district governments have achieved significant progress for fund utilization in the short amount of time, some others faced bureaucratic challenges for fund absorption due to the delay and short amount of time for fund absorption.

5.3 Is there evidence of other emerging risks that may affect the sustainability or effectiveness of the BSP?

The evaluation of the Benefit Sharing Plan (BSP) implementation has identified several key lessons that can serve as a basis for improving the program's effectiveness and sustainability. A notable risk to continuity is the limited capacity and resources of government institutions to uphold safeguard mechanisms and sustain program outcomes. The allocation of responsibilities to national and subnational government entities is designed to reinforce their role in supporting Emission Reduction (ER) policies, thereby strengthening institutional ownership, mitigating reversal risks, and contributing to the program's sustainability beyond the current funding cycle.

5.4 Provide a suggested timeline and an outline of administrative arrangements to introduce any recommended changes.

It is expected that the total time to implement the BSP is approximately 3 years, depending on when the payment is received by the IEF. This includes a preparation phase, where agencies prepare workplans, contracts, and implementations systems, followed by two sequential years of implementation (it is expected that at least two years will be required, based on the funding amounts and absorptive capacity of beneficiaries). This timeline estimate includes the following considerations, and builds on the experience of the advance payment:

- Contracting of intermediary agencies and set-up of staff, including training on safeguards instruments is expected to take 4-6 months.
- Funds channelling aligns with government budget cycles, which typically begin in April of the preceding year, but can be adjusted mid-cycle. If village allocations are only available mid-cycle for

a 6-month implementation period, fund amounts will need to be reduced to reflect absorptive capacity and spread over up to 2 years.

- Funds channelling to villages and community groups involves prior community engagement and proposal development activities, which are predicted to take 3-6 months. Therefore, Intermediary agencies should ideally begin work by the first quarter of the prior year.
- Funds disbursed at the beginning of the year will be allocated to annual budgets, and then executed over the course of the year, until December.
- In some villages with larger allocations where absorptive capacity is a barrier to rapid spending within one year, funds may be spread over two consecutive budget cycles irrespective of when the first tranche is ready.
- Reports on funds use must be submitted within 6 months of the end of each annual budget cycle within which funds are utilised.

ANNEX 3: INFORMATION ON THE GENERATION AND/OR ENHANCEMENT OF PRIORITY NON-CARBON BENEFITS

Priority Non-Carbon benefits

1. *List the **identified set of priority Non-Carbon benefits** and provide necessary details on activities for generation and enhancement of these Non-Carbon benefits. (See questions in sections 2 and 3 below for examples of details on potential specific non-carbon benefits identified)*

Priority Non-Carbon Benefit	● Details on activities for generation and enhancement ○ Approach (as defined in ERPD, including relevant indicators)	Number of Beneficiaries
Improved access to forest resources for local communities, leading to improved livelihoods	From 1 July 2019 to 31 December 2020, 19 entities representing local communities in East Kalimantan received new social forestry licenses from the MoEF. By adding up these new licenses, the area of the social forestry program in East Kalimantan increased by 53,141 hectares in 1.5 years. Up to 31 December 2020, the accumulation of social forestry in East Kalimantan reached 193,846.75 hectares. These new licenses are distributed in nine forest management units (FMUs), i.e., Berau Barat, Kelinjau, Meratus, Santan, Sub DAS Belayan, Mook Manor Bulatn, Damai, Delta Mahakam and Telake). As the social forestry program is mandatory for each FMU to promote in their working area, it is foreseen that new licenses will be growing in coming years. FMUs facilitating the acquisition of social forestry licenses for local communities that live inside or adjacent to forested areas is a priority for all FMUs in East Kalimantan to fulfill the East Kalimantan annual target of as much as 32,000 hectares (Click for the information). The social forestry licenses is expected to allow forest-dependent communities developing sustainable livelihoods based on Non-Forest Timber Products (NFTPs) and other forest ecosystem services. Activities for promoting social forestry to local communities often involve a civil society organization (CSO) or "*mitra pembangunan*" (development partner) such as *Kawal Borneo* Community Foundation (KBCF), Yayasan BUMI, etc. These two CSOs work hand in hand with the FMU to obtain social forestry permits for local communities. Consultations, workshops, and facilitations to meet the requirements of social forestry permits were conducted. The facilitations include development of village development plans, village boundaries, and village land use plan, and village forest working plan. KBCF is recently working with Damai FMU in West Kubar district to facilitate two villages, i.e., Penarung and Muara Begai, in order to receive the permits (Click for the information). Meanwhile, during the reporting period, *Yayasan BUMI* has successfully assisted local communities of five villages (*Genting Tanah, Muhuran, Sebelimbingan, Teluk Muda, and Tuana Tuah*) in Middle Mahakam Basin) to receive the Village Forest licenses.	Households living inside the Forest Management Unit below the poverty line affected by improved access to forest resources are as follows: FMU Berau Barat = 753 households FMU Kelinjau = 1,550 households FMU Meratus = 2,324 households FMU Santan = 3,630 households FMU Balayan = 1,334 households FMU Mook Manor Bulatn = 687 households FMU Damai = 1,419 households FMU Delta Mahakam = 2,059 households FMU Telake = 931 households Total households affected = **14,867** households Source: Integrated Data on Households below Poverty Line by National Team for Poverty Allevation (TNP2K) Secretariat of Vice President of Republic Indonesia (2012 – 2019).
	According to the 2020 Annual Performance Report of East Kalimantan Forestry Services (*Laporan Kinerja Instansi Pemerintah - Dinas Kehutanan*), the production of non-timber forest products (NTFPs) increased significantly from 99.73 tonnes in 2018 to 864.9 tonnes in 2020. Among these reported NTFPs are corn (20 tonnes), bee's honey (0.075 tonnes), bark (9 tonnes), and rubber (835.82 tonnes).	

	Increased income of participating communities Communities are often involved in various activities organized by the FMU (KPH) as participants of technical training or participants in dissemination programs on specific themes such as social forestry or land and forest fire prevention. In 2020, there were 6,630 people involved in 27 activities organized by six FMUs. At the end of the activities, each participant received an allowance of IDR 100,000 ≅ US$7. Although it is a small amount of money, it means a lot for rural village people. This allowance is expected to be additional income for local people.	Participants = 6,630 in six FMUs The allowance of IDR 100,000 per participant as transportation payment for participating in the KPH's activities is based on the existing government regulation (Governor Decree No 027/K.543/2020 on Standard Price and Fee for Government Activities)
	Increased food security The Forest Management Unit of Kendilo in Paser District has successfully managed their cooperation with local communities to grow corn in their unproductive forest area through agroforestry. The program was initiated in 2018 and continues up to now. The program has contributed as much as 1,725,000 IDR to the PNBP (http://phpl.menlhk.go.id/tabular) from 21 tonnes of corn production from forest areas between July 2019 and December 2020.	FMU Kendilo = 1,315 households under the poverty line.
Protection of Biodiversity	There was a reduced decline in habitat for key species, such as HCV forests and primary forests. The driver of deforestation in East Kalimantan is primarily the expansion of oil palm plantations in non-state forest areas ("Areal Penggunaan Lain/APL" or "land for other purposes"). Deforestation is a major threat to habitat loss, especially Orangutan (OU), as a key species in this region. Orangutan habitat mostly occupies forests in the north side of Mahakam river i.e., Berau, East Kutai, West Kutai, and Kutai Kartanegara region. Unfortunately, some of this OU habitat is already occupied by forestry licenses and oil palm plantations. The government's roles and actions are pivotal to ensure the habitat of OU is not further depleted. The East Kutai district government is currently working together with the UNDP Kalimantan Forest project to save the remaining forests in APL. The East Kutai District head (Bupati) issued a formal letter addressing the obligation of oil palm companies to preserve 10 percent of their working areas as HCV areas. In early 2020, those companies were urged to submit this HCV location and other necessary information. HCV area collection data inside oil palm plantations continued to all districts in East Kalimantan led by the Crop Agency (Dinas Perkebunan Kaltim) in 2020. The results are compilation data and a map of 93,037 hectares of remaining forests in oil palm companies. Managing this HCV area will lead to the protection of key species' habitats in this region. Berau district has issued the committed areas of 83,876 hectares as HCV protection within the Bupati's Decree on the HCV indicative map No 287, 2020. Additionally, three Essential Ecosystem Areas (KEE) in East Kalimantan are promoted to be further managed and protected, i.e., Danau Mesangat and Kenohan Suwi KEE in Muara Ancalong sub-district, East Kutai district (13,570 hectares) meant for conserving the habitat of Crocodylus siamensis (Siamese crocodile) and Tomistoma schlegelii (The false gharial). Wehea-Kelay KEE is the habitat of Orangutan located in Berau and East Kutai district (532,143 hectares). Karst Sangkulirang-Mangkalihat KEE, also in East Kutai and Berau, protect the unique karst landscape (1,867,676 hectares).	

	Reduced decline in populations of key species According to the Directorate General of Natural Resources and Ecosystem Conservation (*Ditjen KSDAE*), Ministry of Environment, and Forestry Decree Number 180/IV-KKH/2015, the priority of endangered species in East Kalimantan are Orangutan, Bekantan, Owa, and Rhino that was recently discovered in West Kutai District. Orangutan habitat in East Kalimantan is vast but potentially reduced by land-based development activities by the government, private sector, or communities. The Conservation Agency on East Kalimantan Natural Resources (*BKSDA Kaltim*) has the responsibility to protect the population of key species in six conservation sites (four natural reserves (*cagar alam*), one wildlife sanctuary (*suaka margasatwa*), and one Natural Park (*taman wisata alam*)). Many activities have been reported in 2020 aim to reduce these species' declination. One of the important roles of BKSDA Kaltim is handling wildlife and human conflict. Through a call center 0821-1333-8181, there were 60 reported cases of wildlife entering farmer crops or oil palm plantations in 2020. Most of the cases involved OU, Sun Bear, and Crocodile. Once the call center receives information from the public regarding wildlife issues, BKSDA responds by sending a wildlife rescue team to save and protect wildlife from further unlawful actions. Returning captive wildlife to its habitat is key to maintaining a wildlife population balance. In 2019, BKSDA Kaltim reported that the Bekantan population in Teluk Adang natural reserve increased by 192.7 percent from the baseline survey in 2013. However, the Orangutan population, especially in Sungai Lesan protection forest in Berau district, decreased by 63.9 percent from the baseline survey in 2013.	
Reduced conflict over land	Records of settlement achieved Fifteen cases of land tenure conflict in 2019 have been reported by the East Kalimantan Forestry Services (*Dinas Kehutanan*). Two cases have reached a settlement while others are still in the process of being settled. The conflict between the people of *Sungai Payang* village in Kutai Kartanegara district and PT IHM company was facilitated by the *Meratus* Forest Management Unit (*KPHP Meratus*). This conflict has ended with points of agreement, i.e., normalization of the river environment and the corporate social responsibility program. The other settled conflict is between *Santan* FMU (*KPHP Santan*) and a small group of farmers (*Bapak Mogi*) who raised a claim on the social forestry area of *Santan* FMU.	Sungai Payang Village = 296 households living inside FMU Meratus FMU Santan = 2,324 households living inside the FMU

	Reduced number of conflicts reported In 2019, the East Kalimantan Forestry Services (*Dinas Kehutanan*) reported 15 cases of land tenure conflict. There were six reported conflict cases between a forestry license holder and local communities. Meanwhile, one case occurred between a mining company and the community. Six cases of conflict involved forest management units (government institutions) and communities in 2019. Another conflict over land was reported between forestry license holders and oil palm companies (one case) and between forestry license holders versus a mining company (one case). All 15 conflicts occurred in forest areas covering more than 60 percent of East Kalimantan jurisdiction. In 2020, the number of land tenure conflicts decreased to only five cases that were reported to the East Kalimantan Forestry Services (Dinas Kehutanan). Four of them are conflicts between forestry license holders and local communities, while the other conflict is between a mining company and the community.	

Other Non-Carbon benefits and additional information as linked to Monitoring and Evaluation Framework

2. *If applicable linked to **any other (non-priority identified) Non-Carbon benefits**, or if not already covered above linked to Priority Non-Carbon benefits, provide the following additional details:*

Livelihood enhancement and sustainability

2.1. Is your CF program testing ways to sustain and enhance livelihoods (e.g. one of your program objective/s is explicitly targeted at livelihoods; your approach to non-carbon benefits explicitly incorporates livelihoods)?

Yes, it is. The CF program in East Kalimantan clearly addressed Sustainable Alternatives Livelihoods for Communities as one of the CF programs. It is expected that CF activities will provide livelihood opportunities within sensitive areas (areas vulnerable to conflict), including peat areas, mangroves, and conservation areas. Promoting social forestry programs within the State Forest Area to the communities is expected to improve local communities' access to forested areas. Furthermore, it will contribute to improved land governance and community livelihoods. The program achieved the following:

- From 1 July 2019 to 31 December 2020, 19 entities of local communities in East Kalimantan received new social forestry licenses from MoEF covering an area of 53,141 hectares.
- Ninety-nine villages committed to participate in the ER program.
- Plantation 100 hectares of oil palm for a community group in Samarinda supported by the East Kalimantan Estate Crop Agency in 2020.
- Plantation 225 hectares of Pepper for a community group in Samarinda and West Kutai districts supported by the East Kalimantan Estate Crop Agency in 2020.
- Plantation 180 hectares of cocoa for community group in Samarinda and East Kutai district supported by East Kalimantan Estate Crop Agency in 2020.
- Plantation 135 hectares of rubber tree for a community group in Samarinda supported by the East Kalimantan Estate Crop Agency in 2020.
- Plantation 260 hectares of coconut trees for a community group in Samarinda, East Kutai, and Paser districts supported by the East Kalimantan Estate Crop Agency in 2020.
- Replanting 160 hectares of Pepper plantation for a community group in Samarinda supported by the East Kalimantan Estate Crop Agency in 2020.
- Replanting 50 hectares of Cocoa tree plantation for a community group in Samarinda supported by the East Kalimantan Estate Crop Agency in 2020.

- Replanting 200 hectares of rubber tree plantation for a community group in West Kutai district supported by the East Kalimantan Estate Crop Agency in 2020.
- Plantation 40 hectares of Agarwood trees (Pohon Gaharu) in *Nehes Liah Bing* village, East Kutai supported by the PT Gunung Gajah Abadi (forestry company).
- Establishment of a demonstration plot for sustainable agriculture and crab culture in five villages in Mahakam Delta supported by Yayasan BUMI and Planete Urgence.
- Seven villages adjacent to four nature reserves (*Teluk Adang, Teluk Apar, Padang Luway,* and *Muara Kaman Sedulang*) are currently involved in a conservation partnership scheme in 2020. The area under this scheme is 50 hectares.
- Six villages adjacent to Kutai National Park are currently involved in a conservation partnership scheme in 2020.
- Twenty thousand sugar palm trees (Aren) were planted in Kutai National Park for purposes of supporting the livelihoods of communities of Kandolo village inside the park.

Biodiversity

2.2. Is your CF program testing ways to conserve biodiversity (e.g., one of your program objective/s is explicitly targeted at biodiversity conservation; your approach to non-carbon benefits explicitly incorporates biodiversity conservation)?

Yes, it is. Components of the ER Program, as mentioned in ERPD, are explicitly targeted biodiversity conservation, particularly in preserving remaining forests (HCV areas) in plantation areas. The target is to respond to deforestation, which leads to biodiversity loss, mainly due to forest conversion to the plantation. In this case, target locations are specific to APL. East Kalimantan Regional Crop Agency (Dinas Perkebunan Kaltim) has successfully identified 93,037 hectares of HCV areas in existing oil palm plantations. This new data append East Kalimantan's biodiversity conservation sites as mentioned in the 2019 East Kalimantan Biodiversity Profile.

Biodiversity conservation in the East Kalimantan ER program is expected to be implemented in all areas (forest and APL).

Protected/conserved areas

2.3. What amount (in ha) of protected or conserved areas are included in your CF program area? Has this amount increased or decreased in the last year? If so, by how much?

East Kalimantan Spatial Planning (RTRWP Kaltim) 2016-2036 has allocated 1,844,969 hectares of protection forests (*hutan lindung*) and 438,390 hectares of conservation forests (*hutan konservasi*). However, following the CF program, the East Kalimantan government and the Ministry of Environment and Forestry commit to protecting as many remaining forests as possible in this region, including the APL areas. APL is an area designated to support non-forestry activities which include oil palm plantation. According to the East Kalimantan Crop Agency data, as much as 93,037 hectares of remaining forests in oil palm companies have been reported as HCV areas in 2020. The oil palm companies are committed to protecting these HCV areas.

On the other hand, the Conservation Agency on East Kalimantan Natural Resources (BKSDA Kaltim) and Regional Environment Office of East Kalimantan (DLH Kaltim) are concerned with managing and protecting Essential Ecosystem Areas (KEE). In 2020, BKSDA Kaltim successfully conducted stakeholder meetings to initiate the management of *Danau Mesangat and Kenohan Suwi* in Muara Ancalong sub-district, East Kutai district, as a KEE area. *Danau Mesangat and Kenohan Suwi* cover approximately 13,570 hectares of wetlands known as the habitat of *Crocodylus siamensis* (Siamese crocodile) and *Tomistoma schlegelii* (The false gharial). The local NGO Yayasan ULIN is also working in this area to conserve this unique habitat.

Another KEE named Wehea-Kelay is the habitat of Orangutan located at the cross border between Berau anda East Kutai district. The KEE covers an area of 532,143 hectares. BKSDA Kaltim and DLH Kaltim are currently working together to protect and manage this landscape.

The geological-based landscape (*Karst Sangkulirang-Mangkalihat*) in East Kutai and Berau is also another KEE in East Kalimantan. The area is even larger than *Wehea-Kelay* or *Danau Mesangat and Kenohan Suwi*, covering approximately 1,867,676 hectares of land. However, only 307,337 hectares of this karst area are already designated as protected areas according to East Kalimantan Spatial Planning 2016-2036. DLH Kaltim is a leading agency for managing this landscape and has been continuously working in this area since 2011. Last year, the DLH spending budget for KEE Wehea-Kelay and Karst Sangkulirang-Mangkalihat was IDR 180 million Rupiah, or nearly US$13,000.

Adding up three KEEs and HCV areas in the oil palm plantation to the existing protection forests and conservation forests data, currently East Kalimantan protects and conserves approximately 3,229,446 hectares of forests.

Re/afforestation and restoration

2.4. *Total forest area re/afforested or restored through the program*

East Kalimantan is the province that contributes to national timber production by harvesting the natural forest. Therefore each year this province receives a special allocation budget from the central government for forest rehabilitation activities (*Dana Reboisasi*). In 2020, East Kalimantan Forestry Services (*Laporan Kinerja Instansi Pemerintah - Dinas Kehutanan*) reported that 38,738 hectares of critical land and forest had been rehabilitated. One of the mandatory tasks and responsibilities of the Forest Management Unit is conducting forest and land rehabilitation.Meanwhile, Kutai National Park reported that 7,759 hectares of open area inside the park were rehabilitated in 2020. The number increased significantly compared to 2019 which only saw an increase of 1,342 hectares.

Finance and Private Sector partnerships

2.5. Update on CF program budget (as originally presented in ERPD), with updated detail on secured (i.e. fully committed) finance, in US$

2.5.1. Detail the amount of finance received (including ER payments) in support of development and delivery of your CF program. Figures should only include secured finance (i.e. fully committed): ex ante (unconfirmed) finance or in-kind contributions should not be included:

Table A3.1. Detailed financing received for CF program

Amount (US$)	**Source** (e.g., FCPF, FIP, name of government department)	**Date committed** (MM/YY)	**Public or private finance?**	**ERP, grant, loan, equity, or other?**
$ 1,335,307	Provincial Government	02/20	Public	Other (APDB 2021)
$ 6,976	GGGI	02/20	Public	Grant
$ 23,928	GIZ – LEOPALD	02/20	Public	Grant
$ 13,045	GIZ – SCPOPP	02/20	Public	Grant
$17,440	GIZ – Propeat	02/20	Public	Grant
$80.015	YKAN	02/20	Public	Grant

2.5.2. Not including ER payments from the FCPF Carbon Fund, what is the value of REDD+ ER payments that your CF projects have received, and that your country has received overall?

Table A3.2. Total value of REDD+ ER payments received to date

	Total REDD+ ER payments received to date ($US)
Carbon Fund project/s (i.e. ER payments from sources other than the Carbon Fund)	$ 0.-
All other national REDD+ projects	$ 0.-

2.5.3. How many formal partnerships have been established between your CF program and private sector entities? Formal partnerships are defined as:

- *The partnership is based on a written MoU (or equivalent), and/or*
- *The partnership involves tangible financial exchange/s, and/or*

The partnership involves tangible non-financial exchange/s (e.g., in-kind contributions)

Since the beginning of the program, the private sector has played an important role in the discussion of program design and emission reduction targets, and the benefit-sharing plan.

Private Company such as oil palm company has to look after their concessions from fires. In order avoid forest fires, the Company has established partnerships with communities living surround the concession. Public awareness on fires was conducted. Fire extinguishers such as portable fire pumps, shovels, and fire axe were distributed to communities.

Up to 2022, 57 out of 99 community-based fire management (KTPA or Kelompok Tani Peduli Api) has been supported by oil palm companies in East Kalimantan[102][103]. Total 50 oil palm companies have been involved in both financial and non-financial exchange to support villages in avoiding fires. The villages that have maintained successfully zero fires in their lands receive awards from private companies. These partnerships were put into Memorandum of Understanding between private companies and KTPAs. For example, in Paser district, four KTPAs received fifty million rupiahs (IDR 50 million) per village from the private company. These funds were donated from oil palm company (PT Muaratoyu Subur Lestari) as awards for villages that are successfully to keep their lands from fires in previous year. In Kutai Timur District, six KTPAs received fifty million rupiahs as awards from PT. Subur Abadi Wana Agung and PT. Etam Bersama Lestari (Oil Palm Company)[104]. The KTPAs not only receive the funds, but also firefighting tools (fire extinguishers).

Table A3.3. Formal partnerships established with private sector entities

	Established in the last year (Jul-Jun)	Total to date
Number of private sector partnerships involving financial exchange	47	50
Number of private sector partnerships involving non-financial exchange	47	50

3. Other Non-Carbon benefits and additional information

Policy development

[102] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Other/50_KTPA__Bermitra_Dengan_Perusahaan_Perkebunan.pdf

[103] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Other/DISBUN_KEGIATAN_KARLABUN_KTPA.pdf

[104] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Other/DISBUN_KEGIATAN_KARLABUN_KTPA.pdf

3.1. Is your CF program involved in the development, reform, and/or implementation of policies to help institutions/people/systems/sectors? Please provide information on the approach and any other relevant or related indicators/results.

Yes, East Kalimantan CF program is involved in developing policies and is expected to be implemented on a regional scale at the provincial and district/city levels. In November 2019, the Governor of East Kalimantan issued a provincial regulation on a public participation mechanism called "Layanan Aspirasi Etam" (*Peraturan Gubernur Nomor 69 Tahun 2019*). The regulation aims to provide an official channel for all development stakeholders in East Kalimantan to send feedback and grievances related to the performance of public services offered by regional offices (*perangkat daera*h). It is an online-based application which can be accessed through https://aspirasietam.kaltimprov.go.id/. The CF program in East Kalimantan has set *Layanan Aspirasi Etam* as one of its backbones, especially for safeguards monitoring activities. This regulation was initiated by the Provincial Communication and Information Services Agency (*Dinas Komunikasi dan Informatika*).

Following the issuance of the East Kalimantan Regulation on Sustainability of Plantation Program (Perda Kaltim No. 7/2018), the Governor of East Kalimantan is currently processing another regulation that guides the plantation stakeholder, especially plantation companies and communities, to manage and protect their remaining forests or HCV areas. This new governor regulation was initiated in 2019 and is currently in its final stage. In the last two years, at least six focus group discussions (FGD) were established to review and collect input from many stakeholders in East Kalimantan. The FGD process is often supported by development partners (*mitra pembangunan*) as part of their contribution to East Kalimantan development.

Responding to the issuance of *Perda Kaltim No. 7/2018*, the Head of Berau district (*Bupati Berau*) issued a district regulation (*Perda Berau No. 52/2019*) that established a multi-stakeholder (communication) forum for a sustainable plantation in Berau district. The main task of this forum is to provide Bupati Berau with advice and recommendations regarding plantation development issues in Berau, especially related to dispute and conflict resolution. Furthermore, *Bupati Berau* has also issued the designation of indicative maps for HCV in Berau for 83,000 hectares through Bupati's decree No 287/2020.

Related to the Law of Job Creation known as UU CK (Law No. 11/2020 concerning Job Creation), it is still being contested at the Constitutional Court. It has impacts on environmental and forestry regulations. Since the Law is still being reviewed, there is no assessment and analysis related to the Omnibus law in this report.

Capacity building

3.2 Is your CF program involved in training, education, or provision of capacity building opportunities to increase the capacity of institutions/people/systems? Please provide information on the approach and any other relevant or related indicators/results.

Yes, it is. Sub-components of the ER program in East Kalimantan are clearly targeted to strengthen the capacity of government agencies, especially in the area of licensing and forest management, strengthening village development and spatial planning, strengthening the capacity of provincial and district governments to supervise and monitor the implementation of sustainable Estate Crops, implementation of HCV policies, and strengthening communities in terms of livelihoods generation and collaborative management of forests and land.

In the case of a forest management unit or KPH, capacity building is a necessity. Many aspects of KPH as an entity responsible for managing the forests need to be strengthened. The existence of KPHs in East Kalimantan began roughly five years ago. Some KPHs were sless than two years ago. As a site management body, KPHs have a wide range of duties in managing forests i.e., forest planning and blocking, forest utilization, forest protection, forest rehabilitation, community development, conflict resolution, supervision of license holders, and other programs for supporting national policies on forestry. Professional personnel

of KPHs are required to ensure that all duties are properly carried out. Due to the personnel of KPH having varied backgrounds and experience, advanced training and education are needed. The training subjects may focus on aspects such as GIS and mapping training, drone training, MRV training, business planning training, ecotourism, and forest fire prevention.

Community and forestry company/oil palm plantation company areas are also part of ER entities that should be strengthened. In technical aspects related to forest operation and plantation, these companies may have been very experienced. Therefore, advanced training is required mainly for specific subjects such as HCV management, social forestry, and non-forest products development. Meanwhile, communities are an important subject of ER programs that are expected to improve at the end of this program. Nearly 37 percent of 841 villages (not including *kelurahan*) in East Kalimantan are underdeveloped. Therefore, specific training is essential for communities, especially related to livelihood improvement or income generation. Most of KPH and conservation forest management in East Kalimantan are aware of this situation and are already conducting many trainings and disseminating information to enhance community knowledge and skills.

Other

3.3. Is your CF program involved in generation or enhancement of any non-carbon benefits not already covered in this annex? Please provide information on the approach and any other relevant or related indicators/results.

No, there is no generation or enhancement of new non-carbon benefits.

ANNEX 4: CARBON ACCOUNTING – ADDENDUM TO THE ERPD

Technical Correction

Indonesia notified the FMT on the intention to apply technical corrections to the reference level for the ER-Program before the signing of the ERPA.

Summary of Technical Correction

Technical correction is applied to the following areas as defined in paragraph 3 of the Guideline on the application of the Methodological Framework Number 2 – Technical corrections. The summary of the corrections are the following:

1. Activity data. The technical corrections for the activity data include
    - Adjustment of the boundary of East Kalimantan Province as the provincial boundary of the 2019 ERPD does not match with the provincial spatial plan. This adjustment results in a change in the total project area from 12,746,546 ha to 12,734,691 ha.
    - Refinement of method for estimation of burnt area. The 2019 ERPD used MRI (2013) method which depend solely on hotspot data, while the current method combine the hotspot data with the Landsat image (quick look original with composite band 645) and fire control activity that is able to delineate the burnt area and supervised by other data (ground check).
    - Change of stratification approach for the estimation of deforestation and degradation area using Sample Based Estimation (SBE) from post stratification to stratification following the procedure of Olofsson (2014)[105], and adoption of the filtering method to avoid double counting of deforestation and degradation in recovered areas following the gross deforestation and forest degradation definition (gross). The change of the method from post stratification to stratification is to follow the proposed method of Olofson (2014) in which the sample is defined before the SBE analysis.

    Rationale for proposing technical correction on Activity Data :
    - East Kalimantan province shares border with adjacent provinces (North, Central and South Kalimantan). In particular segment, the boundary line is not clear. Ministry of Home Affair is appointed by regulation to facilitate synchronization of the border between two provinces or more (click this link to read news from local newspaper about boundary synchronizing meeting between East and Central Kalimantan in 2021). Therefore, it is normal if provincial administrative boundary slightly changed. The change of provincial boundary often is put then in the revision of regional spatial planning for every 5 years. In order to increase the accuracy of calculating jurisdictional emission reduction in East Kalimantan, it is highly necessary to use the latest East Kalimantan boundary line from East Kalimantan Regional Development Planning Agency (*Bappeda Kaltim*).
    - We used the update data of burnt area produced by MoEF in order to use the reference data of higher accuracy and/or precision. As mentioned above, the new burnt area map is produced and taken from using hotspot data and is verified using Landsat imageries.
    - Land cover classification map that is primary source to calculate deforestation and degradation needs adjustment as part of uncertainty analysis reported in this ERMR. This is part of improvement of the statistical design used in the emission calculation.

[105] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

Comparison of the area of sample-based estimation of the original 2019 ERPD and the Technical Correction is given in Table A4.1 and that of burnt area is provided in Tables A4.2 and A4.3.

Table A4.1. Comparison of area of Sample Based Estimation between 2019 ERPD and Technical Correction

LC Change Classification	Map Area (Ha)	Adjusted Area (Ha)	SE for the Adjusted Area (Ha)	CI (95%)	U (%)
	Technical Correction[106]				
Deforestation	631,440	717,740	99,687.01	195,386.53	27.22
Forest Degradation	103,448	140,974	61,236.19	120,022.93	85.14
Forest gain	0				
Stable Forest	6,509,063	7,525,408	195,722.67	383,616.44	5.10
Stable Non-Forest	5,490,741	4,360,569	193,622.34	379,499.79	8.70
Total	12,734,692	12,734,692			
	Original ERPD				
Deforestation	701,685	1,140,536	131,451.88	257,646	22.59
Degradation	93,979	276,780	72,953.51	142,989	51.66
Forest gain	372,712	-	-	-	-
Stable Forest	6,525,057	6,058,260	171,176.77	335,506	5.54
Stable Non-Forest	5,151,246	5,369,103	167,066.93	327,451	6.10
Total	12,844,679	12,844,679			

Table A4.2. Comparison burnt area of stable forest between 2019 ERPD and Technical Correction

Year	Land Use Code	Burnt Area-2019 ERPD(ha)	Burnt Area-Technical Correction (ha)
2007	2002	6,260	280
	20041	210	
	20051	154	
2008	2002	3,875	135
	20041	141	
	20051	-	
2009	2002	19,908	671
	20041	405	4
	20051	696	126
2010	2002	4,706	222
	20041	19	
	20051	469	21
2011	2002	7,996	435
	20041	167	13
	20051	159	63
2012	2002	11,716	1,216

[106] See sheet 'UncertaintyAD' on file fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx)

Year	Land Use Code	Burnt Area-2019 ERPD(ha)	Burnt Area-Technical Correction (ha)
	20041	56	12
	20051	194	30
2013	2002	7,731	695
	20041	120	
	20051	387	2
2014	2002	20,127	1,578
	20041	326	4
	20051	1,405	
2015	2002	17,738	0.04
	20041	316	0.01
	20051	912	
2016	2002	2,923	1,179
	20041	105	395
	20051	257	116

Table A4.3. Comparison burnt area of peat between 2019 ERPD and Technical Correction

Year	Burnt peat 2019 ERPD (ha)	Burnt peat Technical Correction (ha)
2013	370	323
2014	-	-
2015	51	395
2016	23	674

2. Emission Factors. The technical corrections for the EF include the

- Replacement of emission factors of dryland forest by using data from permanent sampling plots of the National Forest Inventory (NFI) located in East Kalimantan Province rather than the smaller sample specifically collected for FCPF in 2018-2019.
- Replacing the allometric equation from Basuki *et al.* (2009) to Manuri et al. (2017); and
- Establishment of new FCPF plots in mangrove forest for increasing number of samples.

Rationale for proposing technical correction on Emission factor:

- Permanent Sample Plot Data established in 2018-2019 was designed following Indonesia Standard using small sample plot of 0.04 ha. Regarding the high variability of East Kalimantan forests, bigger sample plots are preferred. Therefore, in this ERMR, we decided to use only NFI plots with bigger size that is 1 ha for accuracy improvement.
- Recent published article by Manuri (2017) is used as reference for allometric equation to calculate biomass and is more relevant for East Kalimantan rather than previous referenced article by Basuki et al. (2009)
- Additional mangrove plots that recently established also increase the accuracy and at the same time reduced uncertainty of the emission calculation.

Allometric equations used for swamp and mangrove forest remains the same. The changes of the EFs compared to original values in ERPD are presented in Table A4.4.

Table A4.4 Comparison of EF (living biomass) between the 2019 ERPD and Technical Correction

Land Cover Types	2019 ERPD			Technical Correction		
	n	C Stock (t/ha)	U (%)	n	C stock (t/ha)	U (%)
Primary dryland forest[1]	55	281.3	37.5	79	167.3	40.0
Secondary dryland forest[1]	68	147.3	33.3	408	122.1	39.5
Secondary dryland forest (burnt area)				50	120.5	39.8
Primary peat swamp forest[2]	18	344.2	38.9	18	343.9	38.3
Secondary peat swamp forest[2]	42	233.5	41.3	42	237.3	40.9
Dry shrub[3]	7	29.9	41.0	25	28.8	44.9
Wet shrub[3]	6	26.7	41.0	12	32.4	52.8
Primary mangrove forest	37	160.8	36.4	80	168.2	29.8
Secondary mangrove forest	23	128.6	34.0	54	118.1	30.9

[1] Higher uncertainty after technical correction for the dryland forest due to higher uncertainty of the allometric equation of Manuri et al. (2017) compare to Basuki et al. (2009) for dryland forest

[2] Slight decrease in living biomass for primary and secondary swamp forest due to the decrease in root : shoot ratio of the mangrove forest following the assumption that the ratio of the swamp forest is the same as that of the mangrove forest.

[3] Data on shrubs are taken from the National Forest Inventory located in East Kalimantan. Previous data are all from outside East Kalimantan, thus they are excluded.

Start Date of the Crediting Period

The ER Program Start Date is 1 July 2019. The rationale of date selection is to incorporate with the starting date of the production of annual land cover maps produced by Ministry of Environment and Forestry (MoEF). It is also related to the mosaics Landsat images prepared by Indonesian Space Agency (LAPAN) as primary sources of land cover interpretation that is started in July at year N-1 up to June at year N for land cover map year of N. For ER monitoring purpose, the emission is calculated using the LAPAN's land cover maps as it mentioned in ERPD. Therefore, it is essential to start the ER program following that cycle date.

The date is also in line with FCPF Methodological Framework. It is not earlier than the date the first ER Program Measure(s) (including any Sub- Project(s)) begins generating ERs, i.e. first implementation. The date is also not earlier than January 1st 2016. The date of 1 July 2019 is justified with objective evidence by the MoEF as mentioned in the previous paragraph. The period date of ER monitoring report from 1 July 2019 to 31 December 2020 is independently assessed by a Validation Verification Body during Validation. The ER monitoring report is also not in fall within the Reference Period (1 July 2005 – 30 June 2016).

Social and Environmental Safeguards Due Diligence is conducted to assess the extent to which the relevant safeguard measures under the ER Program are aligned with the Environmental and Social Management Framework (ESMF). Due Diligence focuses on assessing system capacity for the management of environmental and social aspects in all program activities implemented during the period 1 July 2019 to 31 December 2020. Over this period, implementation of all the program components had commenced, with a total of 47 relevant ER activities that are the subject of this due diligence. An eSurvey and in-depth interviews were conducted with 24 institutions, covering government agencies and non-government organizations. Specific aspects of due diligence focused on the presence or absence of a system for screening and assessing risks for activities carried out under the ER Program, provision of resources for monitoring/supervision, technical support, coordination, and capacity development, and the availability and operation of Feedback and Mechanisms Complaints Handling (FGRM). Overall, the results showed adequate institutional capacity for identifying and managing environmental and social risks, although some gaps and areas for strengthening remain. The assessment of system capacity identified a number of areas where environmental and social risks management could be improved. Particular attention needs to be given to the social risks

associated with improving land governance conducted in areas under existing and potential conflicts and/or disputes or areas with overlapping boundaries and/or claims, between customary and common/formal laws and processes, and in areas with competing claims especially with concession areas. The full report can be seen at . https://mrv.kaltimprov.go.id/storage/guest/SAFEGUARDS/FCPF_EK_Retroactive_FINAL REPORT_GOI.docx.

7. CARBON POOLS, SOURCES AND SINKS

Table 7.1 illustrates the REDD+ activities (adopted by 1/CP.16, paragraph 70) selected by the ER-Program and the associated emission sources and sinks.

7.1 Description of Sources and Sinks Selected

Table 7.1 Sources and Sinks Selected

Sources/Sinks	Included?	Justification / Explanation
Emissions from deforestation	Yes	Emissions from deforestation are identified as GHG emissions from the IPCC Land Use Change category of forest land to non-forest land, plus emissions from peat decomposition, peat fire, and mangrove soils that are linked to deforestation. Deforestation in this context is defined as a conversion of natural forest to other land uses (non-natural forest; see section 8.2). In the period 2006 to 2016 deforestation contributed 80% of total emissions in East Kalimantan. Conversion to agriculture, particularly to oil palm plantations, was the major cause of the deforestation, while conversion to monoculture timber plantations also contributed significantly. It is worthy to note that considering the lengthy reference period, i.e. 10 years, there is a chance for a deforested area to regrow into young secondary forest in 10 years or even earlier. To ensure this regrowth does not count twice as deforestation when it is deforested again during monitoring period, deforestation only identified in areas where it was consistently forest until the first year of monitoring.
Emissions from forest degradation	Yes	Emissions from forest degradation Forest degradation in the national FREL is defined as a change of a primary forest class to a secondary forest class. Primary forest classes include primary dryland, primary mangrove and primary swamp forests. However, this definition of forest degradation excludes losses of carbon in the secondary forest classes due to further disturbance. Identifying the degree of forest degradation within secondary forests is not a simple task, especially not on a routine basis with the currently used medium-resolution satellite imagery (Landsat); and at present, Indonesia has no capacity and data available to assess different levels of degradation within secondary forests. However, it is possible to estimate the loss of carbon due to fire within the secondary forest classes. Thus, included emissions from forest degradation comprise the following:

Sources/Sinks	Included?	Justification / Explanation
		Emissions due to the degradation of primary forest into secondary forest. This includes emissions due to the associated loss of tree cover; as well as emissions due to peat decomposition, where the change from primary to secondary forest occurs on swamp forest. Emissions due to fire within areas that are classified as secondary forest at the beginning and at the end of the measurement period (stable secondary forest). Emissions due to fire in secondary forests that have changed to a non-forest class (including shrubs) at the end of the measurement period, are reported under deforestation. Limiting consideration of fire to stable secondary forest avoids double-counting the emissions from fire with emissions from deforestation.
Emissions and removals from conservation of carbon stocks	No	The national REDD+ framework does not define activities for the conservation of carbon stocks.
Emissions and removals from sustainable management of forest	No	This activity is not included due to limited data and information.
Removals from enhancement of carbon stocks	No	The national FREL does not account for removals from the enhancement of carbon stocks. Also, there is limited data and information, especially on relevant emission factors. Inclusion of this activity would not be in line with the national REDD+ framework and would result in a higher uncertainty level.

7.2 Description of Carbon Pools and greenhouse gases selected

The following Table 7.2. explains which pools were recorded in the FREL for each activity.

Table 7.2 Carbon Pools

Carbon Pools	Selected?	Justification / Explanation
Above Ground Biomass (AGB)	Yes	According to Indonesia's FREL document, emissions from AGB accounted for around 70% of total emissions from biomass, making AGB the largest pool of emissions. Moreover, many studies for estimating above-ground tree biomass in Indonesia are available, enabling Tier 2 or Tier 3 approaches. AGB data are widely available and can be estimated from forest inventory or sample plot data.
Below Ground Biomass (BGB)	Yes	Based on research conducted at sites in Sumatra and Kalimantan, this pool accounts for an average of 13.6% of total biomass (MoEF, 2016). This pool is estimated using shoot-root ratios, following IPCC (2014).
Dead Wood	No	Based on research conducted at sites in Sumatra and Kalimantan by Manuri et al. (2011), Dharmawan et al. (2013), Khrisnawati et al. (2014) and Manuri et al. (2014) and compiled in Table Annex 3.2 of 2016 Indonesia FREL (https://redd.unfccc.int/files/frel_submission_by__indonesia_final.pdf), the dead wood or necromass pool is accounted for an average of 14.5% of total biomass emissions. In spite of being significant, the carbon pool of the dead wood is excluded due to lack of sampling data. The study of the Dead wood biomass measurement is limited and is only conducted by researcher at the universities or research institution. On the other hand, Indonesia's national forest inventory (NFI) does not include measurement of carbon pool other than above ground biomass. Therefore, in this case of ER program for East Kalimantan it does not consider the inclusion of the dead wood during the ER monitoring period up to 2024.
Litter	No	Emissions from litter are excluded as per Indonesia's FREL document. It was estimated that emissions from litter accounted for only 1% of total emissions from biomass, and the pool is therefore considered insignificant.
Soil Carbon	Yes for organic Soils No for mineral soils	The ERP accounts for losses of carbon from organic soils (peat and mangrove soils) due to decomposition (gradual loss following deforestation or forest degradation) and fire. Emissions from soil carbon in other mineral soils is excluded, since they are not significant.

Table 7.3 Type of Gases

Greenhouse gases	Selected?	Justification / Explanation
CO_2	Yes	The ER Program shall always account for CO_2 emissions and removals
CH_4	No/Yes	Excluded for peat drainage due to insufficient data in estimating methane emissions and included for peat and forest fire following the IPCC (2014)
N_2O	Yes	Included only for forest fire following the IPCC (2014)

8. REFERENCE LEVEL

8.1 Reference Period

Following the Criteria 11 of the FCPF Methodological Framework (2016), the end-date for the Reference Period should be the most recent date prior to two years before the TAP starts the independent assessment of the draft ER Program Document (i.e. 2018-2 years = 2016) and for which forest-cover data is available to enable IPCC Approach 3; and the start date of the Reference Period is about 10 years before the end-date. Considering this criterion, the reference period selected for the ERPD is from 2006-2007 to 2015-2016. This period is chosen to cover a 10-year period from 1 July 2006 to 30 June 2016, reflecting the 10-year period between the forest cover map developed for 2006 and the forest cover map developed for 2016. To ensure consistency with the national framework, the land use/cover data for the development of the FREL for the ER Program are the same as the data used in the development of the national FREL supplied by the Ministry of Environment and Forestry, i.e. data of years 2006, 2009, 2011, 2012, 2013, 2014, 2015 and 2016.

8.2 Forest definition used in the construction of the Reference Level

In accordance with UNFCCC decision 12/CP.17, forest in Indonesia is defined as a land area of more than 6.25 ha with trees higher than 5 meters at maturity and a canopy cover of more than 30 percent. This is a formal definition of forest that mostly based on forest ecology. For the construction of the national FREL for REDD+, Indonesia used a different definition that considers limitations of methods and data used in generating the Indonesia forest data. A "working definition" of forest was used to produce land-cover maps through visual interpretation of satellite images at a scale where the minimum area for polygon delineation is 0.25 cm^2 at 1: 50,000 of scale which represents 6.25 ha. This definition is in accordance with the Indonesian National Standard (SNI) 8033:2014 on "Method for calculating forest cover change based on results of visual interpretation of optical satellite remote sensing image" (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI_8033_2014.pdf). Other definitions of forest submitted to international organizations by Indonesia can be accessed from http://ditjenppi.menlhk.go.id/kcpi/dokumen/national_frel_final%20revisi_10des.pdf.

The SNI defined forest based on satellite data features including colour, texture and brightness. Forests were classified into 7 classes based on forest types and degradation or succession level, while non-forests were classified into 15 classes with one class being cloud (Table 8.1). The first six forest classes are natural forests, and the seventh class is plantation forest. These 23 land cover classes are based on physiognomy and biophysical appearance that is captured by remote sensing (Landsat at 30 meter spatial resolution). However, the object identification is purely based on the appearance in the imagery. Manual-visual classification through an on-screen digitizing technique based on key elements of image/photo-interpretation was applied as a classification method. Several ancillary data sets (including concession boundaries of logging and plantation, forest area boundaries) were utilized during the process of delineation, to integrate additional information valuable for classification. The process for analyzing satellite data to monitor the land/forest cover change is described in detail in Margono et al. (2016) and can be accessed from the following link https://nfms.menlhk.go.id/ and https://jurnal.ugm.ac.id/ijg/article/view/12496/9041. References for technical assessment related to the carbon accounting can be seen in Annex 8.2. The data/information/methodology was posted in http://puspijak.org/index.php/front/content/erpd (official website of Research and Development Center for Social Economy, Policy and Climate Change, Ministry of Environment and Forestry).

For the construction of the national FREL, Indonesia only included natural forest in its forest definition; plantation forest is treated as non-forest land for purposes of the FREL, and the ERPD follows the same convention for consistency.

The submitted national FREL has successfully undergone technical assessment by the UNFCCC. In the construction of the FREL for the ER Program, the same definition has been adopted, which excludes plantation forests. The use of this definition is in line with the spirit of REDD+ activities as defined in paragraph 2e in the Appendix 1 of Decision 1/CP.16 that REDD activities should not be used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests.

Table 8.1 Characterization of natural forests in Indonesia used in national land cover mapping.

No	Land cover type	Code	Description
	Forests		
1	Primary dry land forest	2001	Natural tropical forests growing on non-wet habitat including lowland, upland, and montane forests with no signs of logging activities. The forest includes heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest, which shows no, or little, influence from human activities such as logging.
2	Secondary dry land forest / logged forest	2002	Natural tropical forests growing on non-wet habitat including lowland, upland, and montane forests that exhibit signs of logging activities indicated by patterns and signs of logging (appearance roads and patches of logged-over area). The forest includes heath forest and forest on ultramafic and lime-stone, as well as coniferous, deciduous and mist or cloud forest.
3	Primary swamp forest	2005 biics2020test	Natural tropical forests growing on wet habitat in swamp form, including, brackish swamp, marshes, sago and peat swamp, which shows no, or little, influence from human activities such as logging.
4	Secondary swamp forest / logged forest	20051	Natural tropical forests growing on wet habitat in swamp form, including brackish swamp, marshes, sago and peat swamp that exhibit signs of logging activities indicated by patterns and signs of logging (appearance roads and logged-over patches).
5	Primary mangrove forest	2004	Wetland forests in coastal areas such as plains that are still influenced by the tides, muddy and brackish water and dominated by species of mangrove including Nipa (Nipafrutescens), which shows no, or little, influence from human activities such as logging.
6	Secondary mangrove forest / logged forest	20041	Wetland forests in coastal areas such as plains that are still influenced by the tides, muddy and brackish water and dominated by species of mangrove and Nipa (Nipa frutescens), and exhibit signs of logging activities, indicated by patterns and signs of logging activities.
7	Plantation forest	2006	The appearance of the structural composition of the forest vegetation in large areas, dominated by homogeneous trees species, and planted for specific purposes. Planted forests include areas of reforestation, industrial plantation forest and community plantation forest.
	Non-Forests		
8	Dry shrub	2007	Highly degraded logged over areas on non-wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs.

No	Land cover type	Code	Description
9	Wet shrub	20071	Highly degraded logged over areas on wet habitat that are ongoing process of succession but not yet reach stable forest ecosystem, having natural scattered trees or shrubs.
10	Savanna and Grasses	3000	Areas with grasses and scattered natural trees and shrubs. This is typical of natural ecosystem and appearance on Sulawesi Tenggara, Nusa Tenggara Timur, and south part of Papua island. This type of cover could be on wet or non-wet habitat.
11	Pure dry agriculture	20091	All land covers associated with agriculture activities on dry/non-wet land, such as tegalan (moor), mixed garden and ladang (agriculture fields).
12	Mixed dry agriculture	20092	All land covers associated with agriculture activities on dry/non-wet land that is mixed with shrubs, thickets, and log over forest. This cover type often results of shifting cultivation and its rotation, including on karts.
13	Estate crop	2010	Estate areas that has been planted, mostly with perennials crops or other agriculture trees commodities.
14	Paddy field	20093	Agriculture areas on wet habitat, especially for paddy, that typically exhibit dyke patterns (pola pematang). This cover type includes rainfed, seasonal paddy field, and irrigated paddy fields.
15	Transmigration areas	20122	Kind of unique settlement areas that exhibit association of houses and agroforestry and/or garden at surrounding.
16	Fish pond/aquaculture	20094	Areas exhibit aquaculture activities including fish ponds, shrimp ponds or salt ponds.
17	Bare ground	2014	Bare grounds and areas with no vegetation cover yet, including open exposure areas, craters, sandbanks, sediments, and areas post fire that has not yet exhibit regrowth.
18	Mining areas	20141	Mining areas exhibit open mining activities such as open-pit mining including tailing ground.
19	Settlement areas	2012	Settlement areas including rural, urban, industrial and other settlements with typical appearance.
20	Port and harbor	20121	Sighting of port and harbor that big enough to independently delineated as independent object.
21	Open water	5001	Sighting of open water including ocean, rivers, lakes, and ponds.
22	Open swamps	50011	Sighting of open swamp with few vegetation.
23	Clouds and no-data		Sighting of clouds and clouds shadow with size more than 4 cm^2 at 100.000 scales display.

8.3 Average annual historical emissions over the Reference Period

Description of method used for calculating the average annual historical emissions over the Reference Period

The following is a high-level overview of the steps taken to calculate the average annual historical emissions over the Reference Period. These steps are discussed in more detail in the following sections.

- Activity Data, the estimated areas of deforestation and degradation, are generated from a sample-based approach called as Sample Based Estimation (SBE) following the procedure of Olofsson (2014), with stratification using land cover maps. In the previous assessment (ERPD), the study area were stratified after selection of the sample called post-stratification.
- Emission Factors come from forest inventory data and biomass equations (for forest land and shrubs) and from published literature (for other non-forest land, fire and soil), with IPCC default assumptions for converting biomass to carbon.
- Activity Data and Emission Factors are combined to estimate emissions from different activities.
- Historical Emissions will be calculated and reported for the following components:
    - Emissions from changes in biomass associated with deforestation (change from forest to non-forest cover class) and forest degradation (change from primary to secondary forest cover class).
    - Emissions from organic soil associated with deforestation of swamp and mangrove forest (change from forest to non-forest cover class)
    - Emissions from forest fires in stable secondary forest and peat lands (emissions from fires in primary forest are captured in the land cover mapping described above)

All Emissions are only counted from land which was in a forested class at the start of the Reference Period in 2006. Removals are not counted, only Emissions are counted.

The method used for the calculation of average annual historical emissions follows the method that is consistent with the IPCC Guidelines for National Greenhouse Gas Inventories. Historical emissions over the reference period is calculated as combination of the Activity Data (AD) and Emission Factor (EF) from different sources. According to the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, AD is defined as a data on the magnitude of human activity resulting in GHG emissions or removals taking place during a given period of time, such as area of deforestation, and area of forest degradation. AD is primarily taken from the analysis of land cover maps in certain periods, and also from the fire hot spots data sets.

EF is defined as the average emission rate of a given GHG for a given source, relative to units of activity. EF in this emission calculation comes from site specific forest inventory data in East Kalimantan, and from the literature published internationally.

Annual GHG emissions or removals over the reference period in the Accounting Area ($RL_{i,t}$) are estimated as the sum of annual change in total living biomass, dead organic matter and Soil Organic Carbon and the non-CO_2 GHG emissions (L_{fire}).

$$GHG_{i,t} = \Delta C_B + \Delta C_{SOC} + L_{fire}$$

Changes in carbon stocks in the AGB and BGB pools

$$\Delta C_B = \sum_{j,i} \left(AGB_{Before,j} x(1 + R_j) - AGB_{After,i} x(1 + R_i)\right) x\ CF\ x \frac{44}{12} \times A(j,i) \qquad \textbf{Equation 1}$$

Where:

$A(j,i)$	*Area converted/transited from old land-use category j to new land use category i during the period, in hectare per year.*
$AGB_{Before,j}$	*Aboveground biomass of land-use category j before conversion/transition, in tonne of dry matter per ha. This was obtained through terrestrial inventory and defined at the time of RL establishment.*
Rj	*ratio of below-ground biomass to above-ground biomass for land-use category j, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$. See column F on sheet 'EF_EKJERP' on file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_erm*

	r1_MC_26Juli2022c.xlsx, according to 2006 IPCC GL, TABLE 4.4, Volume 4, Chapter 4. This is the case for land-use category j1 and land-use category j2.
$AGB_{After,i}$	*Aboveground biomass of land-use category i after conversion/transition, in tonnes dry matter per ha. This was obtained through terrestrial inventory and defined at the time of RL establishment.*
R_i	*ratio of below-ground biomass to above-ground biomass for land-use category i, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$ See column F on sheet 'EF_EKJERP' on file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx, according to 2006 IPCC GL, TABLE 4.4, Volume 4, Chapter 4. This is the case for land-use category j1 and land-use category j2.*
CF	*Carbon fraction of dry matter in tC per ton dry matter. The value used is 0.47 is the default for tropical forest as per IPCC AFOLU guidelines 2006, table 4.3.*
$44/12$	*Conversion of C to CO_2*

Changes in Soil Organic Carbon

$$\Delta C_{SOC} = \frac{\sum_{j,i} \left(\left(SOC_{Before,j} - SOC_{After,i} \right) \times \frac{44}{12} \times A(j,i) \right)}{D}$$ ***Equation 2***

Where:

$A(j,i)$	*area undergoing conversion from old to new land-use category, ha.. This is the same as parameter $A(j,i)$ above.*
$SOC_{Before,j}$	*the reference carbon stock, tonnes C ha-1 for land-use category j. This was obtained through terrestrial inventory and defined at the time of RL establishment. See sheet 'EF_EKJERP' on file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx*
$SOC_{After,i}$	*the carbon stock, tonnes C ha-1 for land-use category i This was obtained through terrestrial inventory and defined at the time of RL establishment. See sheet 'EF_EKJERP' on file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx*
D	*time period of the transition from land-use category j to land use category i, yr. The Tier 1 default is 20 years.*
$44/12$	*Conversion of C to CO_2*

Emissions for biomass consumed by fire

Emission factors EF_f for biomass consumed by fire can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$L_{fire} = A(i) * EF_f$ (Equation 5)

$EF_f = M_B * C_f * G_{ef} * 10^{-3}$ (Equation 6)

$L_{fire} = A * M_B * C_f * G_{ef} * 10^{-3}$ (Equation 7)

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO_2, CH_4, N_2O

A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline,

Chapter 2-page 2.48)[107]. The default value of the IPCC combustion factor, C_f, is 0.36

G_{ef} = emission factor, g kg^{-1} dry matter burnt (1580 for CO2, 6.8 for CH4 and 0.20 for N2O, Table 2.5 of 2006 IPCC Guideline, Chapter 2- Page 2.47)[108]

The M_B for the peat is 353 tons dry matter per hectare following IPCC default (Table 2.6 of the Chapter 2 in page 2.40, 2013 Supplement to the 2006 IPCC)[109]. The M_B depends on depth of peat and bulk density of the peat. Based on measurement in Central Kalimantan, the M_B is about 505 tons dry matter per hectare with assumption that the average depth of peat burn is 0.33 m and bulk density 0.153 t/m^3 (MRI 2013). However, we adopt the IPCC default as the default considering the data was based on measurement from multiple locations that may represent better general condition. The C_f is taken from the IPCC default value (Tables 2.6 of 2006 IPCC Vol. 4 Chapter 2)[110]. The G_{EF} for CO_2 is 1,703 g/kg dry matter burnt (Christian et al. (2013) in Table 2.7 of the Chapter 2 of the 2013 Supplement to the 2006 IPCC, page 2.41)[111] and for CH_4 is 21 g/kg dry matter burnt. *Detail data can be see on See sheet 'EF_EKJERP' on file* *https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx*

Activity data and emission factors used for calculating the average annual historical emissions over the Reference Period

Activity data

There are several kinds of activity data used in the historical emissions calculation;

- Activity Data from land cover mapping; for emissions calculation due to deforestation (forest to non-forest) and forest degradation (primary forest to secondary forest). The 23 land cover classification was built based on visual on-screen digitizing interpretation of Landsat mosaic data of East Kalimantan for periods 2006, 2009, 2011, 2012, 2013, 2014, 2015, and 2016. The activity data were shown in land cover change matrix transition to describe their emission. Land cover change can describe deforestation, forest degradation, forest and non-forest stable as well as forest gain. This information was combined with Reference Data to conduct a sample based estimation (SBE) analysis (see updated Annex 12.1 ERPD)
- Activity data from satellite-based fire mapping or hot spot analysis, for emission calculation due to fire on stable secondary forest. These data are spatially explicit, derived from Modis mapping of fire activity (described below).

[107] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[108] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[109] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

[110] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[111] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

Deforestation

a. Deforestation from forest categories to non-forest categories

Parameter:	Land cover change from forest to non-forest
Description:	Area of land cover change between 2006-2009, 2009-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, and 2015-2016. Land cover in each year is interpreted in the period July y-1 to June y. The land use transition matrices between these periods are generated to estimate the change of area from forest categories to non-forest categories.
Data unit:	hectare
Source of data and description of measurement/calculation methods and procedures applied:	Activity data used in the monitoring period came from Ministry of Environment and Forestry national land cover data (NFMS). The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail in MS Excel file named: https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/Calculation of Uncertainty of AD_2006_2016.xlsx It is available online at https://nfms.menlhk.go.id/ , which is coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of geospatial portal under the one map policy. Further details on the method for land cover mapping conducted by MoEF , including the method for remote sensing data processing and analysis including type of sensors and the details of the images used can be found here https://jurnal.ugm.ac.id/ijg/article/view/12496/9041
Value applied	Area in hectares:

Forest to non-forest	**2006-2009**	**2009-2011**	**2011-2012**	**2012-2013**	**2013-2014**
Primary dryland forest	2,012.93	0.00	3,957.15	54.86	137.00
Secondary dryland forest	205,787.29	63,766.55	107,896.89	72,611.23	36,109.56
Primary mangrove forest	119.47	28.83	82.76	132.39	0.00

	Primary swamp forest	53.15	0.00	460.40	0.00	0.00	137,10
	Secondary mangrove forest	5,370.30	421.10	806.14	1,925.92	391.97	4.414,81
	Secondary swamp forest	1,343.54	1,414.02	343.68	7,034.43	1,467.52	4.142,51
	Total	**214,686.67**	**65,630.50**	**113,547.03**	**81,758.83**	**38,106.06**	**69.751,89**

Please note that the land cover transition area presented here is so called *adjusted area* since it was adjusted according to the level of uncertainty in land cover change classification process. Further details about adjusting the land cover change are can be found in the next chapter related to uncertainties.

Detail calculation on sheet AR_ER_DEF_XXYY at row 39-46 column U, on excel file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx *XXYY indicates the year the started and ended land cover change.*

QA/QC procedures applied	SNI 8033-2014 - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf) and Tosiani, et.al (2020) Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI ISI EBOOK.pdf).
Uncertainty associated with this parameter:	Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and that of land cover changes. The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014), substituting a post stratified estimator of variance (Olofsson 2019, pers. com.). The uncertainty of the land cover change (deforestation) for the period of July 2005- June 2016 are 27,22% .
Any comment:	

b. Peat decomposition

Parameter:	Peat decomposition In peatland forest, that has been deforested, peat decomposition will continue to release emissions, leading to future inherited emissions. Following resolution CFM/19/2019/1, the CFPs and Indonesia agreed to remove the calculation for emissions associated with projected future deforestation in peat forest and apply the estimate of the most recent data not later than 2018 and the CFPs agreed to provide a one-time waiver to Indicator 13.1. The agreement has been documented and traceable through this following link https://www.forestcarbonpartnership.org/system/files/documents/Resolution%20CFM_19_1_Endorsement%20of%20Indoneisa%20ER%20Program%20FINAL.pdf

<table>
<tr><td>Description:</td><td>Area of land cover changes between July 2017-June 2018. The land use transition matrices between these periods are generated to estimate the change of areas from forest categories to non-forest categories that occurred in the peatland for the estimation of emissions from peat decomposition from the deforested areas. The use of July 2017 – June 2018 period, which is different than the reference period of other carbon pools (2006-2016) for peatland deforestation is part of an agreement with CFPs considering the Indicator 13.1 of the Methodological Framework. Indonesia is not eligible for applying an upward adjustment to its reference level, while Indonesia has peatland in which such indicator is not possible to be applied for countries that have peatland forest. For reference level using period between July 2017-June 2018.</td></tr>
<tr><td>Data unit:</td><td>Hectare</td></tr>
<tr><td>Source of data and description of measurement/calculation methods and procedures applied:</td><td>Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS).
The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail in MS Excel file named:
https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/Calculation of Uncertainty of AD_2006_2016.xlsx

It is available online at https://nfms.menlhk.go.id/ , which is coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of geospatial portal under the one map policy.
The peat area map is provided by the Ministry of Agriculture (2011), through national survey of peatland, updated by the MoEF.
The description of methods for data derived from remote sensing images including type of sensors and the details of the images used can be found here https://jurnal.ugm.ac.id/ijg/article/view/12496/9041</td></tr>
<tr><td>Value applied</td><td>
<table>
<tr><th>Land Cover Change</th><th>Area (ha)</th></tr>
<tr><td>2002-20092</td><td>2.79</td></tr>
<tr><td>20041-2010</td><td>0.17</td></tr>
<tr><td>20041-5001</td><td>2.00</td></tr>
<tr><td>20041-20071</td><td>33.95</td></tr>
<tr><td>20051-2010</td><td>1,168.34</td></tr>
<tr><td>20051-2014</td><td>6.78</td></tr>
</table>
</td></tr>
</table>

20051-20071	330.14
20051-20141	35.53
20041-2004	1,354.35
2002-20041	34.46
2002-2002	95.99
2002-2004	34.38
20041-20041	4,381.94
20051-20051	42,014.30
2005-2005	6,634.44
2005-20071	35.46
2010-2010	1,260.11
2014-2014	524.70
2014-20071	312.25
20071-20051	279.68
20071-20071	496.84
Total	59,038.59

Note: The first column shows land cover change using cover class codes

.

QA/QC procedures applied	SNI 8033-2014 - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries and Tosiani, et.al (2020)[112] Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change.
Uncertainty associated with this parameter:	Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and that of land cover changes. The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[113], substituting a post-stratified estimator of variance (Olofsson 2019, pers. com.)[114].

Land Cover Change	U (%)
2002-20092	29,00
20041-2010	29,00
20041-5001	29,00
20041-20071	29,00
20051-2010	29,00
20051-2014	29,00
20051-20071	29,00
20051-20141	29,00
20041-2004	29,00

[112] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

[113] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[114] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_Indonesia_AD_Estimation_2019.pdf

	2002-20041	11,23	
	2002-2002	11,23	
	2002-2004	11,23	
	20041-20041	11,23	
	20051-20051	11,23	
	2005-2005	11,23	
	2005-20071	13,25	
	2010-2010	13,25	
	2014-2014	13,25	
	2014-20071	13,25	
	20071-20051	13,25	
	20071-20071	13,25	
Any comment:	Deforestation and subsequent land cover changes for peat lands. Tracking change over time is necessary to estimate the future inherited emissions because emissions are related to future land cover.		

c. Deforestation: Mangrove forest to pond/aquaculture

Parameter:	Deforestation: Mangrove forest to pond/aquaculture
Description:	Area of land cover changes between 2006-2009, 2009-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, and 2015-2016. Land cover in each year is interpreted in the period July y-1 to June y. The land use transition matrices between these periods are generated to estimate the change of areas from mangrove forests to aquaculture/fishpond for the estimation of emission from the loss of soil carbon
Data unit:	Hectare
Source of data and description of measurement/calculation methods and procedures applied:	Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS). The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail in MS Excel file named: https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/Calculation of Uncertainty of AD_2006_2016.xlsx

<table>
<tr><td></td><td>It is available online at https://nfms.menlhk.go.id/, which is coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of geospatial portal under the one map policy.
The description of methods for data derived from remote sensing images including type of sensors and the details of the images used is can be found https://jurnal.ugm.ac.id/ijg/article/view/12496/9041</td></tr>
<tr><td>Value applied</td><td>Area in hectares
<table>
<tr><th>Land cover change</th><th>2006-2009</th><th>2009-2011</th><th>2011-2012</th><th>2012-2013</th><th>2013-2014</th><th>2014-2015</th><th>2015-2016</th></tr>
<tr><td>Primary mangrove forest to pond</td><td>15,07</td><td>0,00</td><td>9,64</td><td>0,00</td><td>0,00</td><td>0,00</td><td>12,50</td></tr>
<tr><td>Secondary mangrove forest to pond</td><td>915,17</td><td>59,85</td><td>447,89</td><td>774,04</td><td>0,00</td><td>1.881,86</td><td>684,62</td></tr>
<tr><td>Total</td><td>930,24</td><td>59,85</td><td>457,53</td><td>774,04</td><td>0,00</td><td>1.881,86</td><td>697,12</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures applied</td><td>SNI 8033-2014 - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries; and
Tosiani, et.al (2020)[115] Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change,</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and that of land cover changes.

The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[116], substituting a post-stratified estimator of variance (Olofsson 2019, pers. com.)[117].

Uncertainty mangrove forest to pond: 27,22%</td></tr>
<tr><td>Any comment:</td><td>Deforestation and subsequent land cover changes for peat lands. Tracking change over time is necessary to estimate the future inherited emissions because emissions are related to future land cover.</td></tr>
</table>

Forest Degradation

a. Forest degradation – from primary forest to secondary forest

Parameter:	*Forest degradation - – from primary forest to secondary forest*
Description:	*Area of degradation, change of primary forest into secondary forests between* 2006-2009, 2009-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, and 2015-2016.

[115] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP_AKURASI_ISI_EBOOK.pdf

[116] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[117] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_Indonesia_AD_Estimation_2019.pdf

<table>
<tr><td></td><td>Land cover in each year is interpreted in the period July y-1 to June y., that occurred in all forested land. The land use transition matrices between these periods are generated to estimate the change of area from Primary forests to Secondary Forests</td></tr>
<tr><td>Data unit:</td><td>hectare</td></tr>
<tr><td>Source of data and description of measurement/calculation methods and procedures applied:</td><td>Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS).
The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7 with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes.

It is available online at https://nfms.menlhk.go.id/ , which coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of the geospatial portal under the one map policy.
The description of methods for data derived from remote sensing images including type of sensors and the details of the images used is can be found https://jurnal.ugm.ac.id/ijg/article/view/12496/9041

The result of this assessment is presented in detail in MS Excel file named:
https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/Calculation of Uncertainty of AD_2006_2016.xlsx</td></tr>
<tr><td>Value applied</td><td>Area in hectare
<table>
<tr><th>Land cover change</th><th>2006-2009</th><th>2009-2011</th><th>2011-2012</th><th>2012-2013</th></tr>
<tr><td>Primary dryland forest to secondary forest</td><td>38.974,77</td><td>8.865,41</td><td>2.778,51</td><td>19,56</td></tr>
<tr><td>Primary mangrove forest to secondary forest</td><td>748,66</td><td>0,00</td><td>0,00</td><td>4,33</td></tr>
<tr><td>Primary swamp forest to secondary forest</td><td>0,00</td><td>0,00</td><td>0,00</td><td>1.041,45</td></tr>
<tr><td>Total</td><td>39.723,43</td><td>8.865,41</td><td>2.778,51</td><td>1.065,34</td></tr>
</table>
<table>
<tr><th>Land cover change</th><th>2013-2014</th><th>2014-2015</th><th>2015-2016</th></tr>
</table></td></tr>
</table>

	Primary dryland forest to secondary forest	8.392,13	64.828,04	14.191,58
	Primary mangrove forest to secondary forest	0,00	43,94	9,49
	Primary swamp forest to secondary forest	113,14	966,42	0,00
	Total	8.505,27	65.838,40	14.201,06

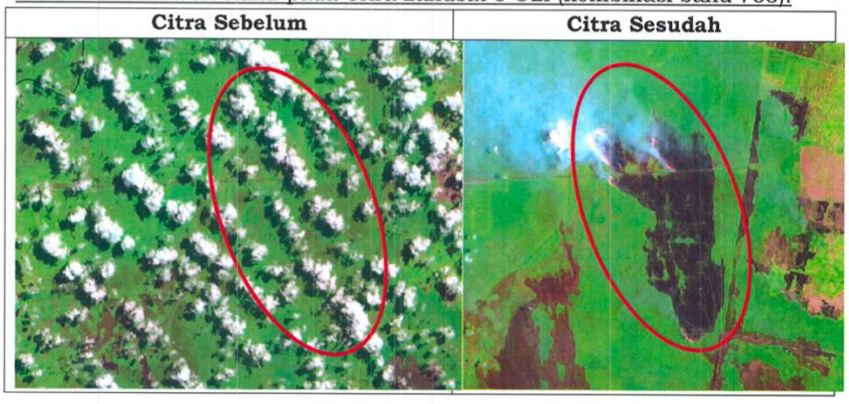
Detail calculation on sheet AR_ER_DEG_XXYY at row 39-41 column I, on excel file https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx *XXYY indicates the year the started and ended land cover change.*

QA/QC procedures applied	SNI 8033-2014 – Methods for Forest Cover Change Interpretation from Optical Satellite Imageries; and Tosiani, et.al (2020)[118] Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change,
Uncertainty associated with this parameter:	Uncertainty : 85,14%
Any comment:	

b. Forest degradation – secondary forest affected by fires

Parameter:	*Forest degradation – Forest degradation – secondary forest affected by fires*
Description:	*Area of secondary forest affected by fires in 2006-2009, 2009-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, and 2015-2016. that identified using burnt scare area (NFMS – https://nfms.menlhk.go.id),* which coupled with webGIS at geoportal.menlhk.go.id for display and viewing.
Data unit:	*hectare*
Source of data and description of measurement/calculation methods and procedures applied:	Activity data uses used in the monitoring period came from MoEF Ministry of Environment and Forestry national land cover data (NFMS). The land cover map has been developed by MoEF for the period of 1990 to 2021. Principally, a mosaic of Landsat imageries were prepared to cover the whole area by the Indonesian Space Agency (LAPAN). The MoEF then perform visual interpretation to the image to develop the land cover map consists of 23 land cover types as listed in the SNI No 8033 Year 2014. The land cover map series then further analyzed by the East Kalimantan MMR Technical Team to define the carbon emission as described in this report. The analysis conducted by the East Kalimantan MMR Technical Team includes accuracy assessment of the land cover change status to define overall uncertainty for each land cover change status. This process was performed by generating stratified random samples within the area of land cover changes then analyzed to confirm whether or not the land cover changes stated in the map is correct. The analyst used Higher-resolution imageries (e.g. SPOT-6/7

[118] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SOP AKURASI_ISI_EBOOK.pdf

	with 1.5 m ground resolution or Sentinel-2 with 10 m ground resolution) to conclude the real status of the land cover changes. The result of this assessment is presented in detail In MS Excel file named: https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/Calculation of Uncertainty of AD_2006_2016.xlsx It is available online at https://nfms.menlhk.go.id/ which coupled with webGIS at geoportal.menlhk.go.id for display and viewing. The two websites are part of the geospatial portal under the one map policy. The description of methods for data derived from remote sensing images including type of sensors and the details of the images used is can be found https://jurnal.ugm.ac.id/ijg/article/view/12496/9041 The geospatial data used for estimating the fire on secondary forest are produced by the DGCC especially the Forest Fire Mitigation and Control Directorate under the DGCC of MoEF. The technical procedures are given in the DGCC Regulations No P.11/PPI/PKHL/KUM/1/12/2018 (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Perdirjen_P.11_Pedoman_Teknis_Penaksiran_Luas_Karhutla.pdf) Data Source (before and after fire events): 1. Optical medium-resolution satellite imagery data (Landsat, Sentinel) 2. Hotspot indication from NOAA-AVHRR, SNPP-VIIRS, ATSR, Terra/Aqua MODIS, Himawari and other potential satellite missions Technical Procedures: 1. Geometric and Radiometric Corrections 2. Visual Interpretation and Delineation of Fire-Affected Forest Areas 2.1. Remote Sensing Image Fusion (as necessary) 2.2. Image Sharpening 2.3. Spatial Filtering 2.4. Geometric and Metadata Format Preparation 2.5. Compiling optical data with hotspot data 2.6. Delineation of Fire Affected Forest The fire-affected forest is detected by comparing the previous and current optical satellite imageries by looking at the color of the area. Dark brownish of black dominated areas meant that those particular area were burnt. Contoh ciri area terbakar pada Citra Landsat 8 OLI (kombinasi band 753): 

<table>
<tr><td>Value applied</td><td>This data is the three secondary forest classes (Dry land forest, swamp forest and mangrove forest).
<table>
<tr><th>Land cover</th><th>2006-2007</th><th>2007-2008</th><th>2008-2009</th><th>2009-2010</th><th>2010-2011</th><th>2011-2012</th></tr>
<tr><td>Secondar dryland forest</td><td>379,35</td><td>280,39</td><td>135,32</td><td>670,94</td><td>222,17</td><td>434,68</td></tr>
<tr><td>Secondary mangrove forest</td><td>110,46</td><td>0,00</td><td>0,00</td><td>3,93</td><td>0,00</td><td>12,96</td></tr>
<tr><td>Secondary swamp forest</td><td>401,75</td><td>0,00</td><td>0,00</td><td>126,38</td><td>21,22</td><td>63,30</td></tr>
</table>
<table>
<tr><th>Land cover</th><th>2012-2013</th><th>2013-2014</th><th>2014-2015</th><th>2015-2016</th><th>2016-2017</th></tr>
<tr><td>Secondar dryland forest</td><td>1.216,04</td><td>695,31</td><td>1.577,89</td><td>0,04</td><td>828,03</td></tr>
<tr><td>Secondary mangrove forest</td><td>11,83</td><td>0,00</td><td>4,19</td><td>0,01</td><td>407,89</td></tr>
<tr><td>Secondary swamp forest</td><td>30,00</td><td>1,95</td><td>0,00</td><td>0,00</td><td>115,51</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures applied</td><td>SNI 8033-2014 - Methods for Forest Cover Change Interpretation from Optical Satellite Imageries, Tosiani, et.al (2020) Standard Operating Procedure (SOP): Calculation of Accuracy and Uncertainty of Land Cover Change, and DGCC regulation number P.11/PPI/PKHL/KUM.112/2018 on Technical Guidelines for the Assessment of Forest and Land Fire Areas[119].</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Two main sources of uncertainties are from image processing and interpretation of land cover types from the image (depend on quality of satellite images, method of land cover map generation process; uncertainty of land cover) and from land cover changes (uncertainty of land cover changes).
The estimation of uncertainty follows a modified method presented by Olofsson et al. (2014)[120], substituting a post-stratified estimator of variance (Olofsson 2019)[121].

Uncertainty: 5,10%</td></tr>
<tr><td>Any comment:</td><td>Forest degradation. This is to estimate the loss of above ground biomass of the stable secondary forest due to fire.</td></tr>
</table>

[119] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Perdirjen_P.11_Pedoman_Teknis_Penaksiran_Luas_Karhutla.pdf

[120] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_et_al_2014_Good_practices_estimating_area_assessing_accuracy_land_change.pdf

[121] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Olofsson_Indonesia_AD_Estimation_2019.pdf

Activity Data for peat burn areas in deforested forest after 2006

The estimation of peat burn area follows the same method as the estimation of Activity Data for additional forest degradation in secondary forest from fire. However, in the third step the overlay of burned areas was done with the land cover and peat land map (produced by MoA) to identify the type of land cover being affected by the fire. The method for estimating burnt area has been improved from the previous method from MRI (2013) by combining the hotspot data with the Landsat image (quick look original with composite band 645) and fire control activity that is able to delineate the burnt area and supervised by other data (e.g. fire control activity and ground check). The technical guidance for the estimation of burnt area is regulated under the Regulation of Director General of Climate Change Number P11/2018. Comparison of the two methods in estimating peat burnt area can be seen in Rossita et al. (2019). The MRI tends to be overestimated.

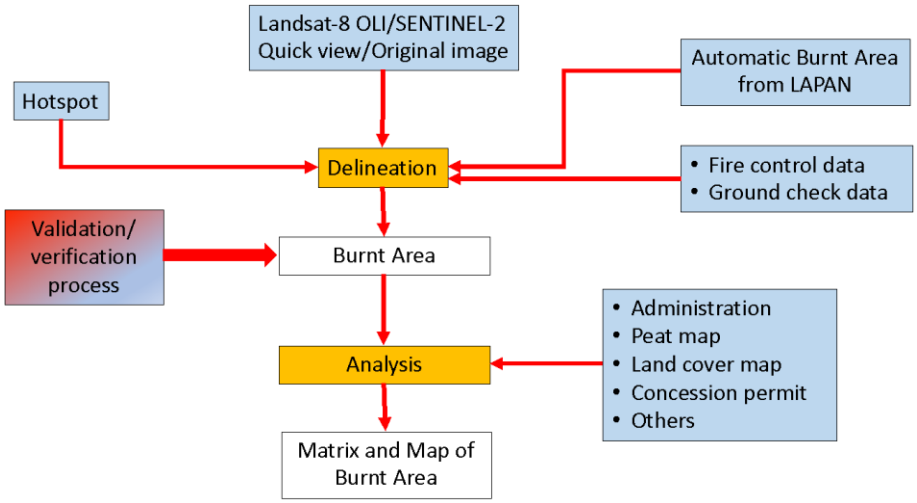


Figure 8.1 Method for estimating burnt area from hotspot data (MoEF, 2021)

Description of the parameter including the time period covered (e.g. forest-cover change between 2006-2016 or transitions between forest categories X and Y between 2006-2016):	Area of peat deforested after 2006 affected by fires in the period 2006-2016. Burnt area estimated from Hotspot data, derived from NASA FIRMS (https://earthdata.nasa.gov/firms)
Explanation for which sources or sinks the parameter is used (e.g. deforestation or forest degradation):	Deforestation. This is to estimate the emission from the loss of peat due to fire in non-forested land that was deforested after 2006.
Data unit (e.g. ha/yr):	Ha

Value for the parameter:	<table><tr><td>Year</td><td>Burnt peat (ha)</td></tr><tr><td>2013</td><td>322.79</td></tr><tr><td>2014</td><td>-</td></tr><tr><td>2015</td><td>395.05</td></tr><tr><td>2016</td><td>674.14</td></tr></table> Detail data can be see on sheet 'PeatDefFire' on file *fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx* . https://mrv.kaltimprov.go.id/storage/guest/ERMR1/CarbonAccounting/fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx
Source of data (e.g. official statistics) or description of the method for developing the data, including (pre-) processing methods for data derived from remote sensing images (including the type of sensors and the details of the images used):	Hotspot data, derived from NASA FIRMS (https://earthdata.nasa.gov/firms). Method for estimating the burnt area follows the method described in the Regulation of Director General of Climate Change Number P11/2018.
Spatial level (local, regional, national or international):	Regional (Province)
Discussion of key uncertainties for this parameter:	Key uncertainty comes from the processing of Hotspot data and selection of confidence level of the Hotspot data for this analysis, which is >80%
Estimation of accuracy, precision, and/or confidence level, as applicable and an explanation of assumptions/methodology in the estimation	Uncertainty level 13.25%. This is combined uncertainties of accuracy estimates of land cover classification estimated using Olofsson (2014, 2019) for stable non forest (8.7%) and that of sample burnt area (10%).

Emission Factors

Emission Factors from deforestation and degradation from change in land use/land cover class

ESTIMATES OF C/HA FOR FOREST CLASSES

The main sources of data used to derive emission factors for six forest types is from Permanent Sample Plots (PSP) established in East Kalimantan. Technical correction for the emission factors was conducted for the dryland forest and mangrove forest through the increase number of sample and change of allometric

equations. For the dryland forest, the sample are taken from PSPs of the National Forest Inventory (NFI), while for swamp and mangrove forest, they are from PSPs established in 2016-2019 under FCPF Readiness program (the ones established in 2019 are additional plots for increasing number of samples of mangrove only as part of technical correction). Sample from the PSPs in the dryland forest developed under the FCPF Readiness program are not used in the estimation of the EF since the design of the FCPF plots are not the same as that of NFI. The number of PSPs of the NFI in East Kalimantan are much larger than that of the FCPF, while for the other two forest types the number of NFI plots are very limited.

The establishment of the Permanent Sampling Plot (PSP) for carbon measurement in East Kalimantan under the FCPF Readiness program follows stratified random sampling in which the locations are selected based on Ministry of Environment and Forestry land cover map. The method used for data collection is based on Indonesian National Standard (SNI) 7724:2011 regarding forest carbon accounting. The size of each plot is 20mx20m, and within the plot there are 3 nested plots with the size of 10mx10m, 5mx5m and 2mx2m (Figure 8.4). For aboveground carbon measurement, we collected vegetation data from seedlings (diameter < 2cm), saplings (diameter 2 cm to < 10cm), poles (DBH 10cm to < 20 cm) and trees (DBH ≥ 20cm). Seedlings data was collected in 2x2m sub plot, saplings in 5x5m sub plot, poles in 10x10m sub plot and trees in 20x20m sub plot. Species name and diameter of each individual found within the plots were recorded. The wood density for each sample tree is taken from species wood density database develop by ICRAF (http://db.worldagroforestry.org/wd). Summary of the sample trees is presented in Table 8.8.

A. Number of Permanent Sampling Plots (PSPs)			
Land cover types	**Number of PSP**	**Data summary**	**Location**
Primary swamp forest	18	Max D: 109.6 #genus: 20	Muara Siran; Genting Tanah
Secondary swamp forest / logged forest	42	Max D: 109 #genus: 23	Muara Siran; Penyinggahan Melak; Genting Tanah; Sebelimbingan
Primary mangrove forest	37+43	Max D: 76.8 #genus: 5	Delta Mahakam; BTNK
Secondary mangrove forest / logged forest	23+11	Max D: 89.2 #genus: 7	Delta Mahakam; CA Teluk Adang; PT. Inhutani I Batu Ampar; BTNK
Total A	**243**		
B. Number of NFI's Permanent Sampling Plots in the dryland forests and shrubs along with maximum D and number of species observed			
Land cover types	**Number of PSP**	**Data summary**	**Location**
Primary dry land forest	79	Max D: ? #genus: ?	Distributed throughout the province systematically in grids
Secondary dry land forest/logged forest	408	Max D: ? #genus: ?	Distributed throughout the province systematically in grids
Dry shrubs	7	Max D: ?	Scattered
Wet shrubs	6	Max D: ?	Scattered
Total B	**500**		
Total A+ B	**743**		

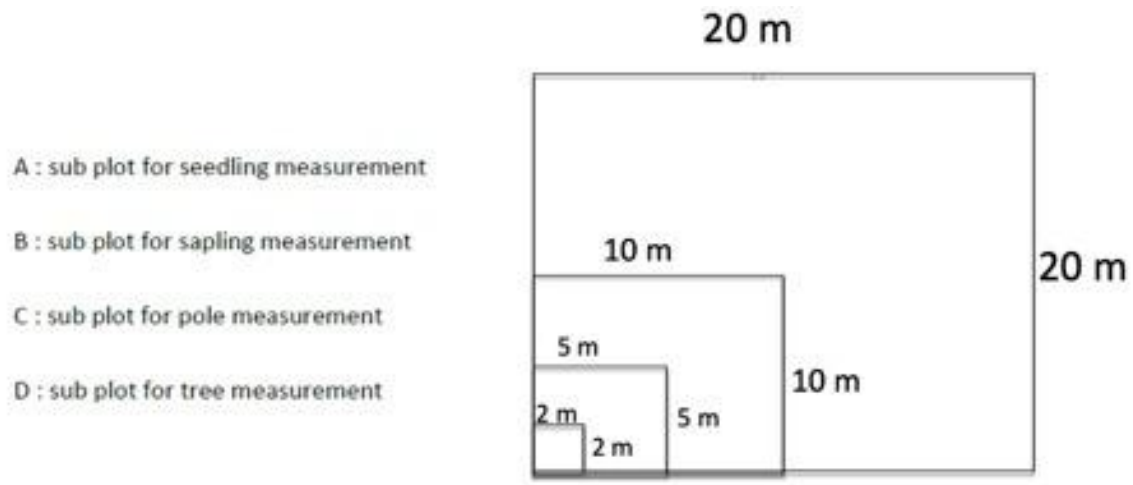


Figure 8.2 The design of permanent sample plot (PSP) in East Kalimantan

The NFI plots was primarily designed for conducting forest resource assessment at national scale initiated in 1989. The establishment of the NFI was supported by the Food and Agriculture Organization of the United Nations (FAO) and the World Bank. Sample plots are distributed systematically on 20x20 km, 10x10 km and 5x5 km grids across the country. Each cluster consists of a permanent sample plot (PSP) with a size of 100x100m surrounded by 8 temporary sample plots (TSP). Individual trees within the 1-ha PSP were measured within 16 recording units (RU) as numbered 25x25m sub-plots. Biomass estimation only includes PSP data. Since the main purpose of NFI was to monitor forest resources, data to generate timber volume or stocks were strongly required. These includes species name (local name), tree diameter at breast height or above buttress, tree height and bole height and buttress height. The quality of the trees was also recorded for both stem and crown quality. All trees measured in PSP according to the size class:

- Sub plot circle with radius = 5 m for measuring dbh between 5 cm – 19.9 cm
- All trees inside the recording unit with dbh > 20 cm are measured

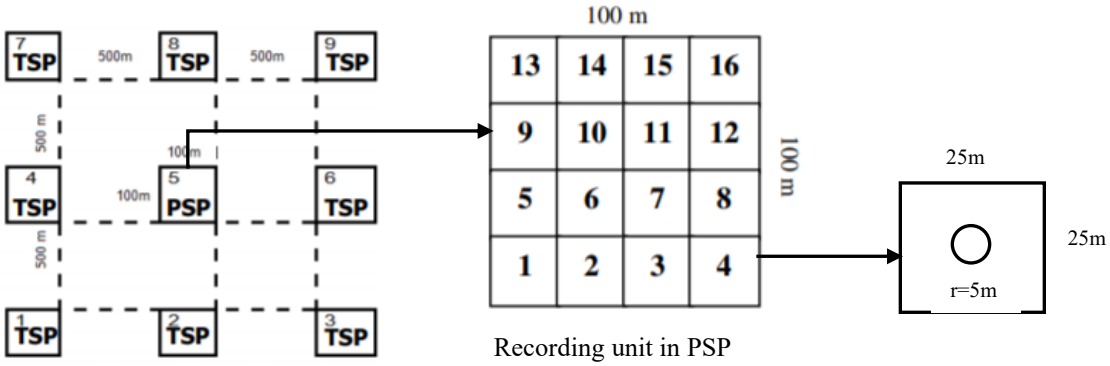


Figure 8.3. The design of permanent sample plots

East Kalimantan has published, peer reviewed biomass equations for the three forest types (Basuki 2009 for dry forest; Manuri 2014 for peat swamp forest; and Komiyama 2005 for mangrove forest). In order to decide whether or not to use the local equations, we considered several factors including the sample domain and forest type where the sample was collected; the sample size; and the maximum diameter included in the sample. Based on the assessment of the allometric equations considering those aspects, it was found that the use of Basuki et al. (2009) equation for estimating the biomass of dryland forest tend to be bias (Manuri et al., 2016). The estimates of biomass using Basuki et al. equation are overestimated for small trees and underestimated for large trees. Improved allometric equations should use large sample with large diameter

range.

The Chave equation clearly has the largest sample size, but this sample is an aggregate from all tropical regions of the globe and all forest types and may not well reflect the specific sample population of East Kalimantan. The three local biomass equations are much more specifically targeted to the specific populations of interest for East Kalimantan. The local equations also included higher diameter trees in the sample compared to Chave. This last factor is very important because extrapolation of a biomass equation beyond the range of its data can quickly lead to biased results. In general the Chave equation yielded higher estimates of the local equations; the difference was small within the range of D of the Chave data (up to about D=160), but Chave departed (increased) quite dramatically for higher diameters.

Specific allometric equations for Indonesia lowland (dryland) forests have been developed (Manuri etal, 2017) using 1300 sample representing large range of diameter and all major islands in Indonesia and Malaysia (Figure 8.6). These samples include the samples from Indonesia used in Chave etal, 2014 equations development, totalling of more than 30% of the samples. Manuri et al. (2017) provides various option of equation selection for accommodating available forest inventory data. Tree diameter and species name are the most common data collected during field inventory in Indonesia. Thus using the equation with diameter (D) and wood density (G) variables is recommended. In addition, Manuri et al. (2017) also found that region variable (East, Center and West) explains the variation of the AGB and Kalimantan situated in West Region.

This information is summarized in the table below:

	Equation source					
Attribute	Chave 2005	Basuki 2009	Manuri 2014	Komiyama 2005	Manuri et al. 2016	Manuri et al. 2017
Sample Domain	Global, pan-tropical	East Kalimantan	Sumatra and West Kalimantan	Indonesia	Kalimantan	Indonesia
Forest type	pan tropical	low dipterocarp	peat swamp	Mangrove	Low dipterocarp	Low dipterocarp
Sample size (trees)	2,410	122	148	104	108	1300
Max D(cm)	156	200	167	55	172	172

Based on this analysis we believe that the local equations are more suited for application in the ERPD and so have used these to generate estimates of AGB for calculating Emission Factors. The estimation of the carbon stock of the above ground biomass of the six forest-types uses local allometric models, i.e.

- Dryland forest (Manuri et al., 2017)
  $AGB = 0.167 \times DBH^{2.56} \times WD^{0.889}$ (Equation 2)

- Swamp forest (Manuri et al., 2014)
  $AGB = 0.242 \times DBH^{2.473} \times WD^{0.736}$ (Equation 3)

- Mangrove forest (Komiyama et al., 2005)
  $AGB = 0.251 \times WD \times DBH^{2.46}$ (Equation 4)

To convert AGB (t/ha) to C (t/ha) for each forest types, carbon fraction of 0.47 is used as suggested by the IPCC 2006 (C = 0.47 * AGB).

The below ground biomass (BGB) for dry forest is estimated using root-shoot ratio from the IPCC GPG LULUCF (Table 3A.1.8. page 3.168). The value of the ratio is 0.24 for dry forest. For mangrove forest the value is 0.36 based on measurement reported in Komiyama et al., 2005 for mangrove forest in Indonesia. For swamp forest is assumed to be the same as that of mangrove forest in Indonesia.

ESTIMATES OF C/HA FOR NON-FOREST CLASSES

The data source for the carbon stock of non-forest lands is derived from mainly Indonesian literatures (Annex 8.3.). The below ground biomass (BGB) of non-forest classes is also estimated using root-shoot ratio based on IPCC default values (IPCC GPG GL for LULUCF page 3.168 table 3A.1.8). The values of the ratio vary between land cover types, i.e. 0.32 for forest plantation and estate crops), 0.48 for dry and wet shrubs, mix dryland agriculture and transmigration area, and 1.58 for savanna/grassland, pure dryland agriculture, rice paddy, bare ground and settlement.

a. Carbon Stock for Deforestation and Forest Degradation

Parameter:	Carbon stock used for the estimation of emission from deforestation and degradation
Description:	Emission Factor for deforestation and forest degradation, i.e. living biomass (AGB+BGB) of the six forest classes, primary and secondary dryland forests; primary and secondary swamp forests; primary and secondary mangrove forests; and 17 type of non-forest lands (Plantation forest; Dry shrub; Wet shrub; Savanna and Grasses; Dry agriculture; Mixed dry agriculture; Estate crop' Paddy field' Transmigration areas; Bareland; Settlement; Others (pond, mining, port, open water, open swamp, ponds)
Data unit:	ton /hectare
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	The primary data source for the carbon stock of natural forests is derived from the measurement of AGB from the Permanent Sampling Plots in of National Forest Inventory (NFI) in East Kalimantan (see sheet 'TC_AGB' on file TC_AGB lokal_Uncertainty_23Jul2022 The estimation of AGB used local allometric equations (Manuri et al , 2017[122] for dryland forest; Manuri et al., 2014[123] for swamp forests; Komiyama et al., 2005[124] for mangrove.The valu of the root shoot ratio can be seen on sheet 'TC_Uncertainty' on file TC_AGB local_Uncertainty_23Jul2022 The estimation of the carbon stock of the above ground biomass of the six forest-types uses local allometric models, i.e. ● Dryland forest (Manuri et al., 2017) AGB = 0.167 x $DBH^{2.56}$ x $WD^{0.889}$ ● Swamp forest (Manuri et al., 2014) AGB = 0.242 x $DBH^{2.473}$ x $WD^{0.736}$ ● Mangrove forest (Komiyama et al., 2005) AGB = 0.251 x WD x $DBH^{2.46}$

[122] https://link.springer.com/article/10.1007/s13595-017-0618-1

[123] https://www.sciencedirect.com/science/article/abs/pii/S0378112714005209

[124] https://www.cambridge.org/core/journals/journal-of-tropical-ecology/article/abs/common-allometric-equations-for-estimating-the-tree-weight-of-mangroves/6067C26CECE5B0EF18A319B8DB89B771

The data source for the carbon stock of non-forest lands is derived from mainly Indonesian literatures (see sheet 'AGB_Other Studies 'on file TC_AGB local_Uncertainty_23Jul2022

The carbon stock data used are total of above ground (AGB) and below ground biomass (BGB). Calculation for BGB = AGB * Root shoot ratio. The value of the ratio is 0.24 for primary forest. For mangrove and swamp forest the value is 0.36 based on measurement from Komiyama et al., 2005 for mangrove. The values of the ratio vary between land cover types, i.e. 0.32 for forest plantation and estate crops), 0.48 for dry and wet shrubs, mix dryland agriculture and transmigration area, and 1.58 for savanna/grassland, pure dryland agriculture, rice paddy, bare ground and settlement[125].

Spatial level: regional (province)

Value applied:

Forest lands

Land cover	Code	AGB (t/ha)	AGB+BGB (t/ha)
Primary Dryland Forest	2001	287.08	355.98
Secondary dryland forest	2002	209.44	259.70
Swamp primary forest	2005	538.56	731.60
Swamp secondary forest	20051	365.30	496.24
Mangrove primary forest	2004	263.38	357.78
Mangrove secondary forest	20041	181.83	247.01

Non-forest lands

Land cover	Code	AGB (t /ha)	AGB+BGB (t/ha)
Plantation forest	2006	133.11	175.71
Dry shrub	2007	41.36	61.21
Wet shrub	20071	46.53	68.86
Savanna and Grasses	3000	5.96	15.37
Pure dry agriculture	20091	15.96	41.17
Mixed dry agriculture	20092	47.89	70.88
Estate crop	2010	105.75	139.59
Paddy field	20093	9.36	24.15
Transmigration areas	20122	21.28	31.49
Bare ground	2014	5.32	13.72
Settlement	2012	8.51	21.96
Port and harbour	20121	0.00	0.00
Open water	5001	0.00	0.00
Open swamps	50011	0.00	0.00
Mining areas	20141	0.00	0.00
Fish pond/aquaculture	20094	0.00	0.00

[125] *https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf*

<table>
<tr><td></td><td>After the AGB successfully calculated, the BGB was estimated by multiplying the AGB with the Root:Shoot Ratio, then multiplying the result with the carbon fraction to estimate the carbon content (C /Ha).</td></tr>
<tr><td>QA/QC procedures applied</td><td>Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018[126])</td></tr>
<tr><td>Uncertainty associated with this parameter:</td><td>Key uncertainty comes from (1) sampling error (between 13 to 31%), (2) allometric model (27%-31%), (3) biomass conversion factor to carbon (5.3% Table 4.3 of the 2006 IPCC) and (5) root: shoot ratio (based on the IPCC GPG for LULUCF. And measurement, i.e. between 9% & 32%; See Annex 12.1 ERPD for details).

The uncertainty of above ground biomass (AGB) for each land cover type was determined through standard statistical measures combining the mean and the 95% confidence interval. For a complete work regarding the uncertainty of the estimates of AGB, please consult the following file TC_AGB local_Uncertainty_23Jul2022 .

For the case of Deforestation, it was too complex to perform all calculations involving all 23 land cover types with 6 forest types and 17 non-forest types. Therefore, a weighting approach was applied to estimate the AGB while error propagation approach was applied to estimate uncertainty values of those non-forest classes. In the end, there were only 6 values for AGB along with uncertainty and standard error for 6 classes of forest.

For forests
<table>
<tr><th>Land cover</th><th>Code</th><th>Uncertainty (%)</th></tr>
<tr><td>Primary Dryland Forest</td><td>2001</td><td>9.27</td></tr>
<tr><td>Secondary dryland forest</td><td>2002</td><td>5.24</td></tr>
<tr><td>Swamp primary forest</td><td>2005</td><td>22.11</td></tr>
<tr><td>Swamp secondary forest</td><td>20051</td><td>29.87</td></tr>
<tr><td>Mangrove primary forest</td><td>2004</td><td>14.61</td></tr>
<tr><td>Mangrove secondary forest</td><td>20041</td><td>18.45</td></tr>
</table>
For non-forests
<table>
<tr><th>Land cover</th><th>Code</th><th>Uncertainty (%)</th></tr>
<tr><td>Plantation forest</td><td>2006</td><td>14.57</td></tr>
<tr><td>Dry shrub</td><td>2007</td><td>31.79</td></tr>
<tr><td>Wet shrub</td><td>20071</td><td>42.19</td></tr>
<tr><td>Savanna and Grasses</td><td>3000</td><td>31.79</td></tr>
<tr><td>Pure dry agriculture</td><td>20091</td><td>14.57</td></tr>
<tr><td>Mixed dry agriculture</td><td>20092</td><td>31.79</td></tr>
<tr><td>Estate crop</td><td>2010</td><td>15.86</td></tr>
<tr><td>Paddy field</td><td>20093</td><td>14.57</td></tr>
<tr><td>Transmigration areas</td><td>20122</td><td>31.79</td></tr>
</table></td></tr>
</table>

[126] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

	Bare ground	2014	14.57	
	Settlement	2012	14.57	
	Port and harbor	20121	0.00	
	Open water	5001	0.00	
	Open swamps	50011	0.00	
	Mining areas	20141	0.00	
	Fish pond/aquaculture	20094	0.00	
Any comment:				

b. Fire in Secondary Forest

Parameter:	Emission factors used for the estimation of emission from Fire in Secondary Forest
Description:	*Emission Factor for biomass fire*
Data unit:	*t CO_2e/ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	*See chapter 2.2.2.* Spatial level: regional (province) with data provided nationally by MoEF. Combustion factor value = 0.36 is derived from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 (Agriculture, Forestry and Other Land Use), Chapter 2: Generic Methodologies Applicable to Multiple Land-Use Categories, Table 2.6 (sees page 2.48 on the document: 'Mean' for 'All primary tropical forests'). For the following Gas emission factors, CO_2 = 1,580 g/kg d.m. burnt, CH_4 = 6.8 g/kg d.m. burnt, and N_2O = 0,2 g/kg d.m. burnt, is derive from from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 (Agriculture, Forestry and Other Land Use), Chapter 2: Generic Methodologies Applicable to Multiple Land-Use Categories, Table 2.5 (sees page 2.47on the document: Table 2.5 under the category of 'Tropical forest'). The link for the document is provided as follows: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf In addition, the link to refer the Global Warming Potential values that used for developing Indonesia's 2nd FRL submitted in January 2022 as well as for calculating emission from fire in East Kalimantan emission reduction program (ERP) by FCPF-CF is as follows: https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials

Instead of using the latest Fifth Assessment Report (AR5) for GWP values, the calculation of East Kalimantan emission used Second Assessment Report (SAR). It aimed to make consistent with the GWP values that was used previously for calculating Indonesia Forest Reference Level (FRL) submitted to UNFCC in early 2022.

In Indonesia's 2nd FRL document (https://redd.unfccc.int/files/2nd_frl_indonesia_final_submit.pdf), SAR GWP values for 100 years' time horizon are listed in Table 8 (see on page 20), exactly on column table 6 and 7 for CH_4 and N_2O respectively.

According to Trottier (2015), 100-year GWPs being the most widely adopted in GHG inventories. In addition, Trottier (2015) also mentioned that applying the AR5 GWP values with feedback will cause only a small increase in stated emissions for most organizations. Therefore, for Indonesia's FRL and East Kalimantan ERP, GWP values from SAR is still relevant to be used. The link to download Trottier (2015) document is as follows:

https://ecometrica.com/assets/Understanding-the-Changes-to-GWPs.pdf

Value applied:

Parameter	Value	Unit
Combustion Factor	0.36	Unitless
EF CO_2	1580	(g/kg DM)
EF CH_4	6.8	(g/kg DM))
EF N_2O	0.2	(g/kg DM)
Pooled EF	756.24	(g/kg DM)

Species	**Chemical formula**	**Lifetime (years)**	**Global Warming Potential (Time horizon) from Second Assessment Report (SAR)**		
			20 years	**100 years**	**500 years**
Carbon dioxide	CO_2	Variable	1	**1**	1
Methane	CH_4	12±3	56	**21**	6.5
Nitrous oxide	N_2O	120	280	**310**	170
				Selected	

QA/QC procedures applied

Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)

Uncertainty associated with this parameter:

Parameter	Uncertainty	Unit

	Combustion Factor	16.67	%
	EF CO_2	8.29	%
	EF CH_4	27.94	%
	EF N_2O	35.00	%
	Pooled EF	256.60	%
Any comment:	Key of uncertainty is error in estimating the amount of biomass available for burning, combustion factor and EFs of three gases (CO_2, CH_4 and N_2O).		

c. Peat Fire

Parameter:	Emission Factor for deforested peat fire
Description:	*Emission Factor for peat fire*
Data unit:	*t CO_2e/ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	*See chapter 2.2.2 .* Spatial level: regional (province)
Value applied:	756.24 t CO_2e/ha. The value is estimated from the summation of the result of the multiplication of MB, C_f, and G_{ef} for CO_2 and CH_4
QA/QC procedures applied	*Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)*[127]
Uncertainty associated with this parameter:	Key of uncertainty is error in estimating the amount of biomass available for burning, combustion factor and EFs of three gases (CO_2, and CH_4). Uncertainty level is 66.5% (Pooled uncertainty based on confidence interval EF of Tables 2.6 and 2.7 of the 2013 Supplement to the 2006 IPCC Guidelines, $U_{Polled} = \sqrt{(U_{CO2}^2+U_{EF-CH4}^2)}$
Any comment:	

d. Emission Factors from soil

d.1. Emission Factors from Peat Soils

The emissions from peat decomposition do not continue indefinitely, as they cease when the peat has completely decomposed or reached the water table. For the purpose of the ER Program, the time frame ends in 2024 by which time the peat will not be completely decomposed and should not thus affect the calculation. On average, the rate of loss of peat due to decomposition after drainage is about 5.6 cm per

[127] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

year in secondary forest (Maswar and Agus, 2015)[128]. After a period of 5 years of drainage in acacia and oil palm plantations, the rates appear to stabilize at around 5 cm per year (Hooijer et al, 2012)[129]. With an average peat depth of more than 2 m, it will thus take about 40 years to decompose the peat. By reference to the existing data on peat depth in Sumatra and Kalimantan, it appears that peat depth of deforested areas in Indonesia is generally more than 2 m (Ritung et al. 2011)[130] in MoEF (2016)[131]. A refinement of the peat depth map particularly in deforested areas is required for the development of the Reference Level beyond 2024.

Parameter:	Emission Factor for peat decomposition
Description:	Peat emissions happen slowly over time once land is cleared for a number of years depending on the depth of the peat soil. The emissions from peat decomposition do not continue indefinitely, as they cease when the peat has completely decomposed or reached the water table.
Data unit:	*t CO_2e/ha*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	*See chapter 2.2.2* Spatial level: national
Value applied:	

Land cover	**Code**	**EF (t CO_2/ha/yr)**
Primary dryland forest	2001	0
Primary mangrove forest	2004	0
Primary swamp forest	2005	0
Secondary dryland forest	2002	19
Secondary mangrove forest	20041	19
Secondary swap forest	20051	19
Plantation forest	2006	73
Estate crop	2010	40
Pure dry agriculture	20091	51
Mixed dry agriculture	20092	51
Dry shrub	2007	19
Wet shrub	20071	19
Savanna and Grasses	3000	35
Paddy Field	20093	35
Open swamp	50011	0

[128] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/4_Maswar_Agus_2015_Peat_Carbon_Stock_and_Subsidence_Rate_at_Different_Landuse_Types.pdf

[129] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/3_Hooijer_2012_Subsidence_and_carbon_loss_in_drained_tropical_peatlands.pdf

[130] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/2_Ritung_2011_Indonesian_Peat_Land_Map_Scale_1_250000.pdf

[131] MoEF, 2016, National Forest Reference Emission Level for Deforestation and Forest Degradation. https://redd.unfccc.int/files/frel_submission_by__indonesia_final.pdf (*page 29*)

Fish pond/aquaculture	20094	0
Transmigration areas	20122	51
Settlement areas	2012	35
Port and harbor	20121	0
Mining areas	20141	51
Bare ground	2014	51
Open water	5001	0
Clouds and no-data		Nd

QA/QC procedures applied

Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)[132]

Uncertainty associated with this parameter:

Key uncertainty comes from sampling error (number of sampling, timing of sampling, length of the time between sampling taken to processing in laboratory).

The uncertainty is taken from the 2013 supplement for 2006 IPCC Guideline (IPCC, 2014)[133]

Land cover	Code	Uncertainty (%)
Primary dryland forest	2001	0.0
Primary mangrove forest	2004	0.0
Primary swamp forest	2005	0.0
Secondary dryland forest	2002	84.2
Secondary mangrove forest	20041	84.2
Secondary swap forest	20051	84.2
Plantation forest	2006	20.5
Estate crop	2010	55.0
Pure dry agriculture	20091	86.3
Mixed dry agriculture	20092	86.3
Dry shrub	2007	84.2
Wet shrub	20071	84.2
Savanna and Grasses	3000	108.6
Paddy Field	20093	108.6
Open swamp	50011	0.0
Fish pond/aquaculture	20094	0.0
Transmigration areas	20122	86.3
Settlement areas	2012	108.6
Port and harbor	20121	0.0
Mining areas	20141	86.3
Bare ground	2014	86.3
Open water	5001	0

[132] http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

[133] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

		Clouds and no-data		Nd	
Any comment:					

d,2. Emission Factors from Mangrove Soils

Parameter:	Emission Factor for mangrove soil and shrimp pond
Description:	Calculation of emissions from mangrove soil in the ER program is considered only for mangrove forest converted to aquaculture. Emissions released are calculated as potential emissions assuming that emissions from organic soil removed from the floor of the aquaculture system are emitted once at the time of the conversion.
Data unit:	*Ton CO_2e /hectare*
Source of data or description of the method for developing the data including the spatial level of the data (local, regional, national, international):	Data on the soil carbon of mangrove and abandoned pond is taken from Kauffman et al. (2017)[134] based on measurement from the 20 locations in East Kalimantan. The procedure for the sampling is described in Kauffman et al. (2016)[135] Data can see at sheet 'Mangrove Soils 'on file TC_AGB local_Uncertainty_23Jul2022. Spatial level: province
Value applied:	902.91 tCO_{2e}/ha (mangrove) 487.31 tCO_{2e}/ha (abandoned shrimp pond) EF = 415.6 tCO_{2e}/ha Uncertainty = 33.4%.
QA/QC procedures applied	*Guidelines for Quality Assurance and Control (QA/QC) of Indonesia's Greenhouse Gases Inventory (DGCC MoEF, 2018)*[136]
Uncertainty associated with this parameter:	Key uncertainty comes from sampling error
Any comment:	

8.4 Estimated Reference Emission Level

ER Program Reference level

Crediting Period year *t*	**Average annual historical emissions from deforestation over the Reference Period (tCO_{2-e}/yr)**	**If applicable, average annual historical emissions from forest degradation over the Reference**	**If applicable, average annual historical removals by sinks over the Reference**	**Adjustment, if applicable (tCO_{2-e}/yr)**	**Reference level (tCO_{2-e}/yr)**

134 https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1482

135 https://link.springer.com/article/10.1007/s11273-015-9453-z

136 http://ditjenppi.menlhk.go.id/reddplus/images/adminppi/dokumen/Pedoman_QA_QC_FULL_ISBN.pdf

		Period (tCO_{2}-e/yr)	Period (tCO_{2}-e/yr)		
2019	23,949,437.32	3,520,419.08			27,469,856.40
2020	23,949,437.32	3,520,419.08			27,469,856.40
2021	23,949,437.32	3,520,419.08			27,469,856.40
2022	23,949,437.32	3,520,419.08			27,469,856.40
2023	23,949,437.32	3,520,419.08			27,469,856.40
2024	23,949,437.32	3,520,419.08			27,469,856.40

Calculation of the annual historical emissions over the Reference Period

The reference level is calculated using: [average of deforestation (living biomass, mangrove soil, and fires on peat) in the reference year (2006-2016) added with peat decomposition of the deforested area in 2017-2018[, then added with [average of forest degradation (living biomass, fires in stable forest) in the reference year (2006-2016) added to peat decomposition in degraded areas in 2017-2018].

	Emission (tCO_2e/year)		Emission (tCO_2e/year)
Deforestation	23.949.437,32	Average Living biomass	23.058.668,41
		Average Soil Mangrove	729.648,69
		Peat Decomposition 2017-2018	55.852,42
		Average Peat fire	105.267,80
Forest Degradation	3.520.419,08	Average Living biomass	2.391.882,73
		Peat Decomposition 2017-2018	987.517,06
		Average Fire in stable forest	141.019,29
Total	27.469.856,40		27.469.856,40

More detailed on the historical emission (reference level) is shown in the following table:

Period	Emission (tCO2)							
	Deforestation (living biomass)	Forest Degradation (living biomass)	Soil mangrove	Peat Fire (Deforestation)	Peat decomposition (Deforestation)	Peat decomposition (Forest degradation)	Fire in stable forest	Total
2006-2007	22,265,406.47	2,203,162.16	472,518.94	-			258,230.51	25,199,318.08
2007-2008	22,265,406.47	2,203,162.16	472,518.94	-			22,580.16	24,963,667.73
2008-2009	22,265,406.47	2,203,162.16	472,518.94	-			153,586.02	25,094,673.59
2009-2010	11,283,098.43	735,459.61	45,603.44	-			43,954.96	12,108,116.44
2010-2011	11,283,098.43	735,459.61	45,603.44	-			95,157.52	12,159,319.00
2011-2012	34,372,668.98	461,002.08	697,213.18	-			214,555.41	35,745,439.65
2012-2013	29,557,250.31	426,479.08	1,179,540.14	-			116,656.23	31,279,925.76
2013-2014	9,655,366.26	1,438,282.73	-	244,106.47			263,971.09	11,601,726.56
2014-2015	26,845,754.93	11,156,226.95	2,867,704.54	298,756.14			8.07	41,168,450.63
2015-2016	40,793,227.35	2,356,430.72	1,043,265.40	509,815.35			241,492.96	44,944,231.78
2017-2018					55,852.41	987,517.06		1,043,369.48
Average	**23,058,668.41**	**2,391,882.73**	**729,648.69**	**105,267.80**	**55,852.41**	**987,517.06**	**141,019.29**	**27,469,856.40**

8.5 Upward or downward adjustments to the average annual historical emissions over the reference period

Explanation and justification of proposed upward or downward adjustment to the average annual historical emissions over the Reference Period

As Indonesia does not meet the qualifications for an upward adjustment as outlined in the Methodological Framework, and the Methodological Framework does not otherwise consider the uniqueness of peat forests, the CFPs agreed to provide a one-time waiver to Indicator 13.1 of the Methodological Framework. In other words, Indonesia uses emission level of peat decomposition year 2018 as baseline historical emission and stays constant for years after 2018 (Figure 8.4). The Carbon Fund Participants and Indonesia note that this decision is specific to this ER-Program and does not imply precedent for any other program under the Carbon Fund or in Indonesia[137].

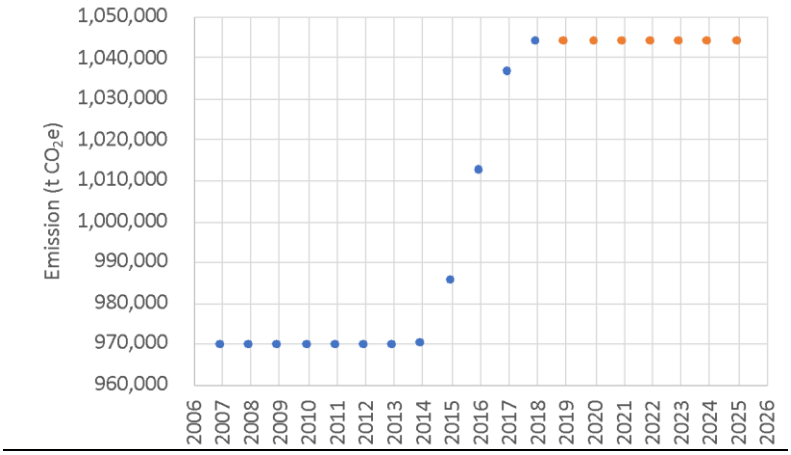


Figure 8.4 Projected emission from peat decomposition to 2025 taking into account the inherited emission

Quantification of the proposed upward or downward adjustment to the average annual historical emissions over the Reference Period

Intentionally left blank

8.6 Relation between the Reference Level, the development of a FREL/FRL for the UNFCCC and the country's existing or emerging greenhouse gas inventory

The RL for the ER Program was developed using the same approach as that used for the national FREL which Indonesia submitted to the UNFCCC in 2016 (http://unfccc.int/resource/docs/2016/tar/idn.pdf), with some enhancements, notably (1) application of sample based area estimation for Activity Data, (2) use of region-specific forest inventory data rather than national averages, and (3) use of locally derived biomass estimation equations rather than global equations. The National FREL is the result of a process involving a series of initial technical analyses followed by public multi-stakeholder consultation. The procedure follows

[137] Resolution CFM_19_1_Endorsement of Indoneisa ER Program FINAL.pdf (forestcarbonpartnership.org)

FCCC guidelines as detailed in the annex of FCCC/CP/2013/10/Add.1 The two REDD+ activities included in the national FREL were *Deforestation* and *Forest Degradation*, consistent with Decision 1/CP.16, paragraph 70 and covering national forest. The reference period used in the National FREL is 1990 to 2012 (22 years; MoEF, 2015). The use of this long reference period is to better capture the dynamic land policies in Indonesia[138].
The ERP's RL uses a reference period of 10 years (2006-2016) in order to conformity with the Carbon Funds Methodological Framework. The activity data used in the development of the reference level begin with the same data used in the National assessment but have been enhanced by application of the sample based approach (Olofsson) to improve accuracy in estimation of AD. The RL also includes activities which are not included in the national REL, namely the inclusion of below ground biomass and soil carbon for mangroves. The estimation of emission from peat soil is also consistent with the national GHG gas inventory and national FREL. This consistency would be enhanced by CFP agreement to allow a small upward adjustment to the historical emission level, to account for the unusual National Circumstance of inherited emissions from peat deforestation and degradation.

The emission factors (AGB) used for the estimation of historical emission do not use the national data as GHG Inventory and national FREL. This ERP used local data based on measurement in a number of permanent sampling plots of NFI and that of the FCPF. Thus, this ERP used higher tier of emission factor as suggested by the IPCC. In addition, the ERP's RL take into account the carbon stock after the conversion in the calculation of emission from deforestation. It is expected that the ER Program will generate lessons that will contribute to the next submission of the national FRL/FREL, e.g. the addition of REDD+ activities, or the improvement of activity data and emission factors.

Indonesia's GHG Inventory is managed by the Directorate for GHG Inventory and MRV, which also maintains the national registry system. The ER Program (through the local Environmental Agency) will report on the emission reductions generated by the implementation of the ER Program to the national registry system (see Section 9 for details). The implementation of the ER Program will also provide inputs to the development of the national GHG Inventory.

At present, the estimation of the GHG emission from deforestation and forest degradation in the National GHG Inventory is not consistent with the ones used in the ERPD. In term of method, the GHG Inventory used gain and loss approach while the ERPD used the stock difference approach. In term of sources, the GHG Inventory also does not include soil-carbon emission from mangrove conversion as in the ERPD. The emission factors used in the GHG Inventory are also not similar to the ones in the ERPP, particularly for the above ground biomass. As mentioned above, the ERPD used local data, higher tier while GHG Inventory and National FREL used national data. In addition, some of conversion factors are also not consistent. The GHG Inventory used the one conversion factor for all forest types and also one conversion factors for all non-forest covers. In the case of ERPD, the conversion factors differ between types of forest and non-forest. Most of sources of uncertainties of the AD and EF are included in the ERPD while in the National FREL and the National GHG Inventory only part of the uncertainty sources. The ERPD also used higher tier of method for estimating the uncertainty, i.e. Monte Carlo, while National GHG Inventory used Tier 1 (error propagation approach). The Directorate for GHG Inventory and MRV plans to change the method from Gain and Loss to Stock Difference methods and to apply best practices used in the ERPD for the development of GHG Inventory. These efforts are to increase the consistency between the ERPD and the National GHG Inventory.

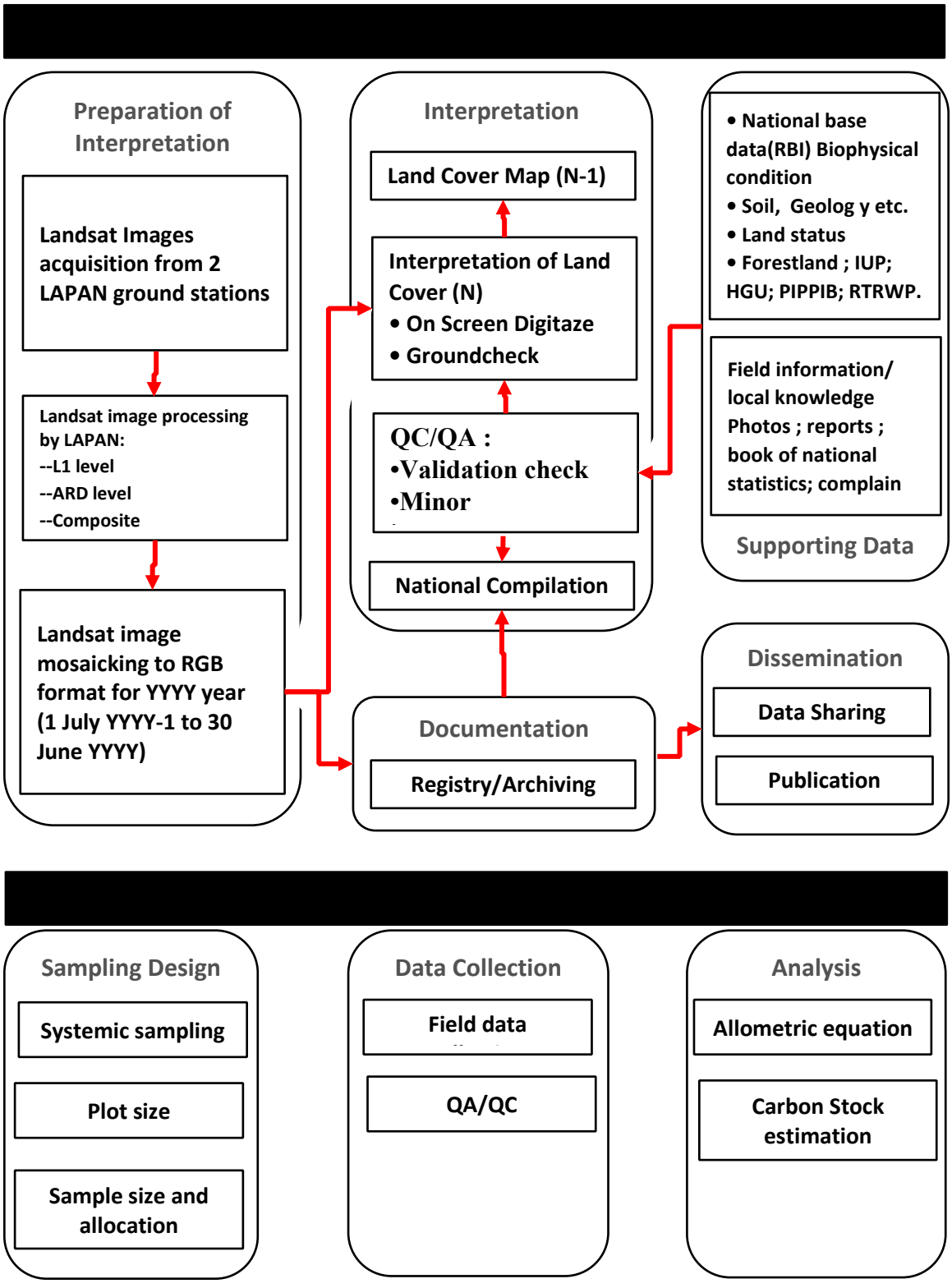
[138] MoEF, 2015, National Forest Reference Emission Level for REDD+ In the Context of Decision 1/CP.16 Paragraph 70, Directorate General of Climate Change. The Ministry of Environment and Forestry. Indonesia

9. APPROACH FOR MEASUREMENT, MONITORING AND REPORTING

The Ministry of Environment and Forestry regulation No.70/2017 includes guidance on MRV for REDD+. For example, the regulation states that measurement should take place at least twice a year (Article 10), that an independent verifier shall be used (Article 12), and that the system shall include a registry (Article 13). The ER Program's MRV design will conform to the regulation, and will involve an independent verifier in addition to verification by the Ministry of Environment and Forestry.

9.1 Measurement, monitoring and reporting approach for estimating emissions occurring under the ER Program within the Accounting Area

Line Diagram



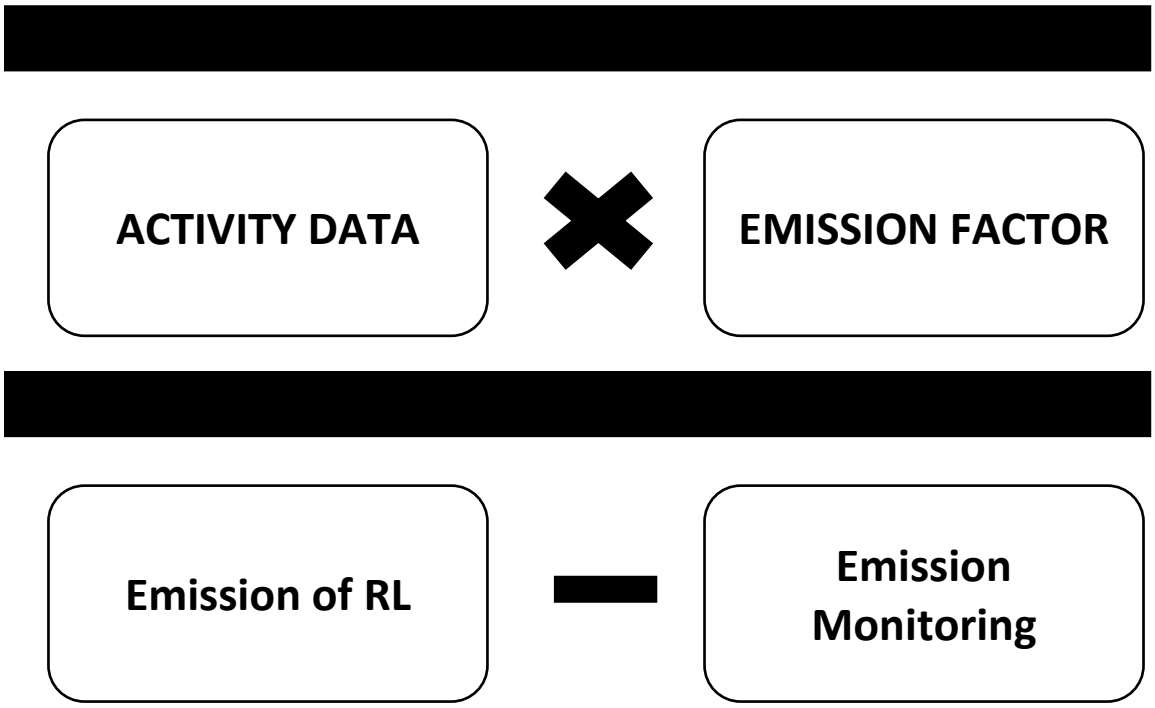


Figure 5. Flow chart for calculation of emissions from deforestation and forest degradation

Method for monitoring activity data and emission factors

The ER Program will apply methods for monitoring activity data and for estimating emission factors that are aligned with the approach used in developing Indonesia's FREL and that comply with established standards for the measurement of satellite imagery (LANDSAT) interpretation to estimate forest cover changes (SNI 8033:2014).[139] These standards have been defined in the annex of the Regulation of the Director General of Forest Planology Number P.1/VII- IPSDH/2015[140]. Technical guidelines for field observation and ground check procedure for land cover accuracy assessment can be seen in Annex 9.1. and Annex 9.2. of the 2019 ERPD, respectively.

Specifically:

1. Measurement of Activity Data for land cover change will continue to utilize the National Forest Monitoring System (NFMS) plus addition of the sample-based area estimation (i.e. Olofsson approach) to derive unbiased estimates of Activity Data when reporting during the ER program. This is the same process used for establishing the REL, with the addition of a stratified sampling approach and more sample locations in the future in order to ensure a minimum of 30 observations each for deforestation and degradation classes.
   Additionally the ER Program will collect Activity Data for fire areas using the same procedures utilized in developing the REL.

[139] Standar Nasional Indonesia (Indonesia National Standard) No. 8033 year 2014 regarding Method for Estimation of Forest Cover Changes based on Result of Visual Interpretation of Optical Remote Sensing Imagery. https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/SNI 8033 2014.pdf

[140] Perdirjen Planologi (2015).Pedoman pemantauan penutupan lahan (guidance for monitoring land cover change). https://sigap.menlhk.go.id/sigap-trial/files/pages/perdirjen-planologi-2015-pedoman-pemantauan-penutupan-lahan.pdf

2. Emission Factors for forest land classes will continue to be based on the forest inventory for East Kalimantan. There may be opportunity to increase sample sizes for the purpose of increasing precision. Methods and biomass calculations will be the same. Emission factors for non-forest land classes will continue to be based on published literature. Additional literature will be added to the data base as it becomes available and where appropriate estimates of C stock will be updated. IPCC conversion factors will remain the same.

Calculation

Emission reduction calculation

$$ER_{ERP,t} = RL_t - GHG_t \qquad \textit{Equation 1}$$

Where:

ER_{ERP}	=	*Emission Reductions under the ER Program in year t; $tCO_2e*year^{-1}$.*
RL_{RP}	=	*Gross emissions of the RL from deforestation and forest degradation over the Reference Period; $tCO_2e*year^{-1}$. This is sourced from Annex 4 to the ER Monitoring Report and equations are provided below.*
GHG_t	=	*Monitored gross emissions from deforestation and forest degradation at year t; $tCO_2e*year^{-1}$;*
t	=	*Number of years during the monitoring period; dimensionless.*

Reference Level (RL_t)
Following the TAP assessment of the ERPD, Indonesia notified the FMT on the intention to apply technical corrections to the reference level for the ER-Program before the signing of the ERPA. The corrected RL estimation may be found in Annex 4, yet a description of the equations is provided below.
Gross emissions of the RL from deforestation over the Reference Period (RL_{RP}) are estimated as the sum of annual change in total biomass carbon stocks (ΔC_{B_t}) during the reference period.

●CARBON STOCK AND EMISSION FACTOR

The estimation of the carbon stock of the above ground biomass of the six forest-types uses local allometric models, i.e.

- Dryland forest (Manuri et al., 2017)
  $AGB = 0.167 \times DBH^{2.56} \times WD^{0.889}$ (Equation 2)

- Swamp forest (Manuri et al., 2014)
  $AGB = 0.242 \times DBH^{2.473} \times WD^{0.736}$ (Equation 3)

- Mangrove forest (Komiyama et al., 2005)
  $AGB = 0.251 \times WD \times DBH^{2.46}$ (Equation 4)

where:
AGB= Above ground biomass
DBH= Diameter at chest height
WD= Weight density

To convert AGB (t/ha) to C (t/ha) for each forest types, carbon fraction of 0.47 is used as suggested by the IPCC 2006 (C = 0.47 * AGB).

The below ground biomass (BGB) for dry forest is estimated using root-shoot ratio from the IPCC GPG LULUCF (Table 3A.1.8. page 3.168). The value of the ratio is 0.24 for dry forest. For mangrove forest the value is 0.36 based on measurement reported in Komiyama et al., 2005 for mangrove forest in Indonesia. For swamp forest is assumed to be the same as that of mangrove forest in Indonesia.

The data source for the carbon stock of non-forest lands is derived from mainly Indonesian literatures (ER-PD Annex 8.3.). The below ground biomass (BGB) of non-forest classes is also estimated using root-shoot ratio based on IPCC default values (IPCC GPG GL for LULUCF page 3.168 table 3A.1.8). The values of the ratio vary between land cover types, i.e. 0.32 for forest plantation and estate crops), 0.48 for dry and wet shrubs, mix dryland agriculture and transmigration area, and 1.58 for savanna/grassland, pure dryland agriculture, rice paddy, bare ground and settlement.

Emission factors EF_f for biomass consumed by fire can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$$L_{fire} = A * EF_f \quad \text{(Equation 5)}$$

$$EF_f = M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 6)}$$

$$L_{fire} = A * M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 7)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO_2, CH_4, N_2O
A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Chapter 2-page 2.48).The default value of the IPCC combustion factor, C_f, is 0.36

G_{ef} = emission factor, g kg^{-1} dry matter burnt (1580 for CO_2, 6.8 for CH_4 and 0.20 for N_2O, Table 2.5 of 2006 IPCC Guideline, Chapter 2- Page 2.47)

Emission factors EF_f for the peat fires can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$$L_{fire} = A * EF_f \quad \text{(Equation 8)}$$

$$EF_f = M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 9)}$$

$$L_{fire} = A * M_B * C_f * G_{ef} * 10^{-3} \quad \text{(Equation 9)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO_2, CH_4, N_2O
A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Volume 4, Chapter 2-page 2.48)[141]

G_{ef} = mission factor, g kg^{-1} dry matter burnt (default values in Table 2.7, Chapter 2 of 2013 Supplement to 2006, page 2.41)[142]

[141] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[142] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

The M_B for the peat is 353 tons dry matter per hectare following IPCC default (Table 2.6 of the Chapter 2 in page 2.40, 2013 Supplement to the 2006 IPCC)[143]. The M_B depends on depth of peat and bulk density of the peat. Based on measurement in Central Kalimantan, the M_B is about 505 tons dry matter per hectare with assumption that the average depth of peat burn is 0.33 m and bulk density 0.153 t/m^3 (MRI 2013). However, we adopt the IPCC default as the default considering the data was based on measurement from multiple locations that may represent better general condition. The C_f is taken from the IPCC default value (Tables 2.6 of 2006 IPCC Vol. 4 Chapter 2)[144]. The G_{EF} for CO_2 is 1,703 g/kg dry matter burnt referring to Christian et al. (2013) in Table 2.7 of the Chapter 2 mentioned in the 2013 Supplement to the 2006 IPCC, page 2.41 and for CH_4 is 21 g/kg dry matter burnt.

Calculation of emission factor of mangrove soil, i.e. the difference between amount of carbon in the mangrove soil (C_M) and amount of carbon in soil on the floor of the aquaculture system (C_{AQ}). Data on the soil carbon of mangrove and abandoned pond is taken from Kauffman *et al.* (2017) based on measurement from the 20 locations in East Kalimantan. The procedure for the sampling is described in Kauffman et al. (2016). Based on measurement in 20 locations in East Kalimantan, the value of C_M is 902.91 tC/ha and the value of C_{AQ} is 487.31 tC/ha, thus the EF for conversion of mangrove soil to aquaculture system is 415.6 tC/ha (Kauffman, 2017[145]).

- **EMISSIONS FROM DEFORESTATION**

Emissions from deforestation include the following:

- Emissions associated with loss of living forest biomass
- Emissions associated with soil carbon

As described in the previous section, the carbon pools used to measure emissions from deforestation depend on the land type. For deforestation on mineral soils AGB and BGB are included. For deforestation on organic soils (peat forests and mangroves) soil carbon is also included. The methods for calculating emissions from deforestation are described below.

a. Deforestation emissions from living biomass

The method used for the calculation of average annual historical emissions follows the national method (MoEF, 2015)[146] that is consistent with the IPCC. Emissions from deforestation at a given period were calculated by aggregating CO_2 emissions resulting from newly identified deforested areas within that period.

The calculation of CO_2 emissions from deforested areas used the following equation:

$$GE_{ijk=} = A_{ijk} \times EF_{jk} \times (44/12) \qquad \text{(Equation 10)}$$

GE_{ijk} = CO_2 emissions from deforested area-i at forest change class-j to non-forest class-k, in tCO_2e

A_{ijk} = Deforested area-i in forest change class-j to non-forest class-k, in hectare (ha).

[143] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

[144] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[145] https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1482

[146] https://redd.unfccc.int/files/national_frel_for_redd__in_indonesia_2015.pdf

EF_j = Emission Factor which is calculated as the difference between carbon stock of forest class-j and carbon stock of non-forest class-k, in ton carbon per ha (tC ha-1). Emission factors for each forest and non-forest class are listed in sub-chapter 3.1.1 ER-PD/Annex 4 ER-MR.

(44/12) is conversion factor from tC to tCO_2e

Carbon stock of the lands after the conversion used in the calculation of the emission from the deforestation is the lifetime average carbon stock. It is assumed that land-cover types after deforestation will not change. This assumption is adopted since it is not practical to track the changes of land cover after deforestation, and it is unlikely that the natural forest that have been converted to non-forest lands will change back to natural forest. The deforestation of primary or secondary forest to non-forested was also counted only once that occur at one particular area. Identification of primary or secondary forest area in particular year is filtered using the primary or secondary forests of the previous years. Thus, the deforestation of primary and secondary forest to non-forested will be detected only in remaining primary or secondary forests of the previous years that have never been deforested before.

The emission from gross deforestation at period t (GEt), was estimated using equation below,

$$GE_t \sum_{i=1}^{N} \quad \sum_{j=1}^{P} \quad GE_{ijk} \qquad \text{(Equation 11)}$$

GE_t = total emission at period t from deforested area-I in forest class-j to non-forest class-k, expressed in tCO_2
N = number of deforested area units at period t (from t0 to t1), expressed without unit
P = number of forest classes which meet natural forest criterion.

Further, average emissions from deforestation from all periods were calculated as follows:

$$MGE_P = \frac{1}{T}\sum_{t=1}^{p} \quad GE_t \qquad \text{(Equation 12)}$$

MGEP = mean or average emissions from deforestation from all period P (expressed in tCO_2yr^{-1})
t = number of years in period P

The estimation of emission from deforestation from the loss of living biomass between two years (period) used the land use transition matrix.

The emissions from the change of a land use category to other land use category from the transition matrix used the equation 2 and their corresponding emission factors as defined in sub- chapter 3.1.1.

b. Deforestation emissions from soil carbon
b1. Emissions from Peat decomposition in deforested areas

Peat emissions happen slowly over time once land is cleared for a number of years depending on the depth of the peat soil. Thus the emissions in any given year is the sum of emissions from all peat lands disturbed over the previous years. These emissions from prior year deforestation are called 'inherited emissions' (e.g. Agus et al., 2011[147]). The reference level for peat emissions uses peat decomposition emissions that occurred in 2017-2018, and for the monitoring period uses peat decomposition emissions in the monitored year period.

The procedures of calculating peat decomposition from deforestation follow three steps as shown Figure 4. First is defining natural forest in 2006 over peat land, and then step 2 is generating land cover change from

[147] http://apps.worldagroforestry.org/sea/Publications/files/manual/MN0051-11.pdf

each interval year to define a transition area matrix for the associated year of interval. The third step is calculating total annual emissions by multiplying the transition matrix of both areas and associated emission factors.

Calculation of emissions from peat decomposition used the same basis as emissions from deforestation. This is due to the fact that once deforestation occurs in peat forest, there will be emissions from removal of the ABG at the time of conversion as describe above, and plus from peat decomposition subsequently. The formula for estimating the emission from peat decomposition is the following:

$$PDE_{ijt} = A_{ijt} \times EF_j \qquad \text{(Equation 13)}$$

PDE = CO_2 emission ($tCO_2yr\text{-}1$) from peat decomposition in peat forest area-i changed into land cover type-j within time period-t
A = area-i of peat forest changed into land cover type-j within time period-t
EF = the emission factor from peat decomposition of peat forest changed into land cover class-j (tcO_2 ha yr-1) [148]

Emission factor for peat decomposition of peat forest change using Paciornik and Rypdal (2006) and IPCC (2014). These emission factors are reported in 2013 Supplement Guideline to 2006 IPCC Guidelines for National GHG Inventory: Wetlands[149]. Most of the data reported in this guideline come from Indonesian sites.

b2. Emissions from Peat Fire in deforested areas

Emission factors EF_f for the peat fires can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following formula:

$$L_{fire} = A * EF_f \qquad \text{(Equation 14)}$$

$$EF_f = M_B * Cf * G_{ef} * 10^{-3} \qquad \text{(Equation 15)}$$

$$L_{fire} = A * M_B * Cf * G_{ef} * 10^{-3} \qquad \text{(Equation 16)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CO_2, CH_4, N_2O
A = burnt area, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

Cf = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Volume 4, Chapter 2-page 2.48)

G_{ef} = mission factor, g kg^{-1} dry matter burnt (default values in Table 2.7, Chapter 2 of 2013 Supplement to 2006 IPCC, page 2.41)

The M_B for the peat is 353 tons dry matter per hectare following IPCC default (Table 2.6 of the Chapter 2 in page 2.40, 2013 Supplement to the 2006 IPCC). The M_B depends on depth of peat and bulk density of the peat. Based on measurement in Central Kalimantan, the M_B is about 505 tons dry matter per hectare with

[148] Emission factor for an area of change is an average of the emission factors of the respective land cover before and after. This reflects the assumption that conversion of land cover on peatland between two time periods gradually affects the peat water table implying a gradual peat decomposition emission. For example, the emission factor of secondary forest is 19 tCO2 ha-1 y-1 and the emission factor of bare ground is 51 tCO2 ha-1 y-1, so that the average emission factor for an area changing from secondary forest to bare ground is 35 tCO2 ha-1 y-1.

[149] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/10_2013_Supplement_to_the_2006_IPCC_Guidelines_for_National_GHGI_Wetlands.pdf

assumption that the average depth of peat burn is 0.33 m and bulk density 0.153 t/m^3 (MRI 2013). However, we adopt the IPCC default as the default considering the data was based on measurement from multiple locations that may represent better general condition. The C_f is taken from the IPCC default value (Tables 2.6 of 2006 IPCC Vol. 4 Chapter 2)[150]. The G_{EF} for CO_2 is 1,703 g/kg dry matter burnt referring to Christian et al. (2013) in Table 2.7 of the Chapter 2 mentioned in the 2013 Supplement to the 2006 IPCC, page 2.41 and for CH_4 is 21 g/kg dry matter burnt.

Calculation of emissions from peat fire in the deforested area (L_{fire}) is calculated using the following formula (IPCC, 2014):

$$L_{fire} = A * EF_f = A * M_B * C_f * G_{ef} * 10^{-3} \qquad \text{(Equation 17)}$$

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CH_4, N_2O, etc.

A = area burnt, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}.

C_f = combustion factor, dimensionless (default values in Table 2.6 of the 2006 IPCC Guideline, Volume 4 Chapter 2-page 2.48)

G_{ef} = emission factor, g kg^{-1} dry matter burnt (default values in Table 2.5 of the 2006 IPCC Guideline, Volume 4 Chapter 2-page 2.47)

b3. Emissions from *Mangrove Soil in deforested areas*

When mangrove forests are converted to aquaculture, they normally are being cleared and the soil being removed or excavated, normally 1.5 to 2 meters deep. When the organic soils are excavated, they exposed to aerobic condition and being oxidized that emit CO_2. Considering that soil mangrove has very high organic content (Kauffman et al, 2017[151] and Murdiyarso et al, 2015[152]), conversion of mangroves will result in a significant amount of CO_2 emissions.

Calculation of emissions from mangrove soil in the ER program is considered only for conversion to aquaculture. Emissions released are calculated as potential emissions assuming that emissions from organic soil removed from the floor of the aquaculture system are emitted once at the time of the conversion. Thus, the calculation of the emissions from conversion of mangrove to aquaculture (E_{MS}) used the following formula:

$$\boldsymbol{E_{MS} = A_{MA} \times EF_{MA}} \qquad \text{(Equation 18)}$$

$\boldsymbol{A_{MA}}$ is area of mangrove converted to aquaculture, $\boldsymbol{EF_{MA}}$ is emission factor, i.e. the difference between amount of carbon in the mangrove soil (C_M) and amount of carbon in soil on the floor of the aquaculture system (C_{AQ}).

[150] https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/13_The_2006_IPCC_Guidelines_for_GHG_AFOLU_V4_Chapter_02_Ch2_Generic.pdf

[151] https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1482

[152] https://www.nature.com/articles/nclimate2734

Summary: Average Historical Emissions from Deforestation

Emissions from deforestation is calculated based on the emissions associated with loss of living forest biomass (AGB and BGB), and the emissions associated with soil carbon. The Emission from soil includes the emission from peat soil due to decomposition process, and fire events, and also the emission from mangroves soil due to mangrove conversion to aquaculture.

- **EMISSIONS FROM FOREST DEGRADATION**

The emission from degradation of natural forest include:

4. *Emissions due to the degradation of primary forest into secondary forest*
5. *Emissions due to further degradation of secondary forest caused by fire*
6. *Emissions from peat decomposition in secondary forests*

a. Emissions from forest degradation of primary forest to secondary forest

The assessment of changes of primary forest to secondary forest and the estimation of emissions from the removal of the living biomass (AGB and BGB) and decomposition of organic soils follows a similar procedure as that of the deforestation (Equations 2-4). The degradation of primary forest to secondary forest was also counted only once that occur at one particular area, similar to the procedure used in calculating the deforested area. Identification of secondary forest area in particular year is filtered using the primary forests of the previous years. Thus, the degradation of primary forest to secondary forest will be detected only in remaining primary forests of the previous years that have never been degraded before.

The estimation of emission from forest degradation from the loss of living biomass (change of primary to secondary forest) between two years (period) used the land use transition matrix in all forests (production and non-production forests).

The emissions from the change of primary to secondary used the equation 19. For example, the emission from 41,722.33 ha degraded area (Primary dryland forest to Secondary dryland forests; 2001-2002) occurred in the period 2006 and 2009 is calculated as follow:

$$E_{2001\text{-}2002} = A * (EF_{BC} - EF_{AC}) * 44/12 \quad \text{(Equation 19)}$$

$E_{2001\text{-}2002}$ = 41,722.33*(167.3-122.06)*44/12 = 6,922,432.35 ton CO_2 or about 2,307,477.45 tCO_2e per year.

b. Emissions due to further degradation of stable secondary forest caused by fire

Emission factors EF_f for biomass consumed by fire can be developed based on Eq. 2.27 in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (GL), Volume 4, using the following equation 14,15 and 16. Gas emission factor from dry matter burnt for CO_2, CH_4 and N_2O is 1701.33 g kg^{-1}, 21 g kg^{-1} and 0.20 g kg^{-1} respectively.

Fire in secondary forest will result in further degradation and in more emissions. Estimation of the stable forest area affected by fire is by delineating burnt area of the stable forest (forests that remained as secondary forest throughout the reference period) hotspot (see Annex 4 section 8.4.3). This is to avoid double counting of emissions in which the loss of biomass due to fire in the deforested forest is not included. The implication of this is that when the secondary forests affected by fire are deforested during the future ERP reporting period, we will have to use separate emission factors in the calculation of the emission from deforestation which take into account the loss of carbon due to fire that occurred in the reference period.

For example, the area of stable secondary forests affected by fire in 2007 was 280.39 ha which is all secondary dryland forest (2002). The total fire emission reached 46,787.70 ton CO_2e (using equation 6). A similar approach was taken for all other years to estimate the emissions from fire in stable secondary forest.

c. Emissions from peat decomposition in secondary forests

The loss of carbon from the decomposition of organic soil occurs in secondary forest (IPCC, 2014). These are considered to be inherited emissions because the disturbance (which changed the forest from primary to secondary) occurred prior to 2006. The estimation of the emission from peat decomposition uses equation 5.

Parameters to be monitored

During the ERPA term (2020-2024), activity data (AD) and emission factors (EF) will be monitored in the Accounting Area to measure emissions from deforestation and forest degradation. Monitoring will follow the procedures defined in the NFMS (national forest monitoring system) and in the East Kalimantan forest inventory. Parameters to be monitored include the same parameters used to develop the REL, specifically:

Activity Data

- Forest cover change resulting in deforestation or forest degradation for all land that was forested in 2016.
- Areas of burned forest land in stable secondary forest starting in 2016.

Emission Factors

Emission factors for live biomass by land cover classes (forested and non-forested)
Emission factors for peat and mangrove soils
Emission factors for fires

The following tables provide information on the monitored parameters.

9.1.1.1 DEFORESTATION AND DEGRADATION

Parameter:	**Area of forest cover change to estimate emissions from deforestation and degradation**
Description:	**Applicable to all transitions, including forest remaining forest (degradation, i.e. from primary to secondary forest) and forest to non-forest (Deforestation)**
Data unit:	**Ha/yr**
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	**Remote sensing data is processed by the National Forest Monitoring System (NFMS) named Simontana (*Sistem Monitoring Hutan Nasional*) (MoFor, 2014).** **It is available online at webGIS of MoEF https://nfms.menlhk.go.id/** for display and viewing. The websites are part of the geospatial portal under the one map policy (http://tanahair.indonesia.go.id/portal-web).The detailed explanation of the methods for monitoring the forest resource can be seen in Margono et al. (2016; https://jurnal.ugm.ac.id/ijg/article/view/12496/9041)

	Field observations to check the accuracy of the interpretation of land cover change are also conducted as part of the NFMS, with the involvement of ER Program Entities that include local communities.
Frequency of monitoring/recording:	*Annually*
Monitoring equipment:	**National Forest Monitoring System (NFMS)**
Quality Assurance/Quality Control procedures to be applied:	***Following the Standard Operating Procedure on QA/QC developed by the IPSDH (Inventory and Monitoring of Forest Resources) unit under the Directorate General of Forest Planology, Ministry of Environment and Forestry.***
Identification of sources of uncertainty for this parameter	**Uncertainty comes from the quality of satellite images used, land cover map generation process, and the number of ground truth points.**
Process for managing and reducing uncertainty associated with this parameter	- *Increase the number of ground checking* - *Provide additional training for the interpreters* - *Refine the selection of Landsat and other supported images (Hi-res)* - *Application of sample based estimation (Olofsson 2014) using a stratified random sample to estimate area of change, and to assess map accuracy.*
Any comment:	In the current NFMS, the system is still not capable of monitoring the different level of degradation of the natural forests. Level of degradation is only able to be divided into two categories, i.e. primary intact forest called primary forest, and degraded primary intact forest called secondary forest. There is no category for shrubs as well. In fact some shrubs have regrowth and will be back into forest again (called old shrubs). As the current NFM only recognize this as shrubs, this land considered as non-forest. Based on the study conducted in two districts of Kalimantan, i.e. Kutai Barat & Mahakam Ulu, the category of degradation of the natural forest and shrubs can be monitored using the current method. The result of accuracy assessment indicates that this improved method can be applied for East Kalimantan or even national (see Annex 9.3 of the 2019 ERPD). The national government may use the method for the improvement of the land cover data given availability of resources.

Parameter:	**Above ground biomass (AGB)**
Description:	**The above ground biomass is estimated based on the DBH (Diameter at Breast Height) and wood density that is measured from trees in the permanent sampling plots (PSP) using local allometric equations of Manuri et al. (2017), Manuri et al.**

	(2014) and Komiyama et al. (2005)
Data unit:	**Tonne of carbon per hectare**
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	**Field measurement from the permanent sampling plots (PSPs) of the Kalimantan Timur established for the FCPF (for swamp and mangrove forests) and from PSPs of the National Forest Inventory (for dryland forest). New permanent sampling plots for mangrove have been established in 2019, in total 120 PSPs. These data were used for the technical correction of RL. The locations of the PSPs in all forest types in East Kalimantan Province are provided in Annex A9.2.**
Frequency of monitoring/recording:	***During the ERPA monitoring and recording will be carried out at minimum in 2022 and 2024. In the ER Program, the new data from the PSP will be used to improve the accuracy. In the case the improvement is significant, the recalculation of the Reference Level will be performed.***
Monitoring equipment:	
Quality Assurance/Quality Control procedures to be applied:	**Following the standard methods that have been developed for the NFI (SNI 7724:2011)**
Identification of sources of uncertainty for this parameter	**Sources of uncertainty for this parameter are due to:** **1.** Limited number of permanent sampling plots **2.** Allometric equations **3.** Root:shoot ratio **4.** Biomass density **5.** Human error in measuring tree diameters
Process for managing and reducing uncertainty associated with this parameter	***Increasing number of PSP. The additional PSPs is planned to be established in the forest types will less number of plots, namely swamp and mangrove forest. With the plan to increase the categorization of forest based on level of degradation, the establishment of the new PSPs will also be allocated to this area.***
Any comment:	In the secondary forest affected by fire during the reference period, the AGB of the fire affected secondary forest will be adjusted to avoid double counting if this fire-affected secondary forest becomes deforested during the ER period. Following the IPCC default factor, the AGB of the fire-affected secondary forest will decrease by 36% of the initial biomass. Thus the AGB of the

	secondary forest affected by fire during the reference period will be only 64% of the non-affected secondary forest.

Emission Factors for peat decomposition and mangrove will continue to rely on the same published values used to calculate the RL. Above ground biomass of forest lands will be monitored as part of the NFI program in which the number of PSPs will be increased in East Kalimantan to reduce the uncertainties mentioned above, while for those of non-forest lands will not be monitored to maintain consistency with the EF used in the development of the Reference Level.

9.1.1.2 PEAT AND FOREST FIRES

Parameter:	**Area of stable secondary forest affected by fire each year**
Description:	**Stable Secondary forest (secondary forest in 2016 and in the measurement year) affected by fire is monitored based on hotspot data**
Data unit:	**Ha/yr**
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature),including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	**Hotspot data will be acquired from NASA FIRMS (https://nrt4.modaps.eosdis.nasa.gov/). The method for estimating the burnt area follows the method that combine the hotspot data with the Landsat image (quick look original with composite band 645) that is able to delineate the burnt area and supervised by other data (e.g. fire control activity and ground check).**
Frequency of monitoring/recording:	***Annually***
Monitoring equipment:	**National Forest Monitoring System (NFMS)**
Quality Assurance/Quality Control procedures to be applied:	**QA/QC are directed to ensure the consistency of the method and approach adopted for estimating burnt area with the one used in the RL development. Result of the estimation of burnt area will be verified by BAPLAN**
Identification of sources of uncertainty for this parameter	**Sources of uncertainty for this parameter are: (i) processing of Hotspot data; (ii) selection of confidence level of the Hotspot data for this analysis, which is >80%; and (iii) sample error**
Process for managing and reducing uncertainty associated with this parameter	***Developing SOP for the estimation of burnt area*** **using semi-automatic approach which combine the hotspot data with the Landsat image (quick look original with composite band 645) and supervised by other data (e.g. fire control activity and ground check) for minimizing bias.**

Any comment:	**The semi-automatic approach replaced the MRI (2013) method. Comparison of the two methods is available in Rossita et al. (2019).**

Emission Factors for peat and forest fire will not be changed in order to maintain consistency with the EF used in the development of RL (using the IPCC default values).

9.2 Organizational structure for measurement, monitoring and reporting

The ER Program has two sets of organizational structures for measurement, monitoring and reporting of emissions estimates as presented in Figure 9.1.

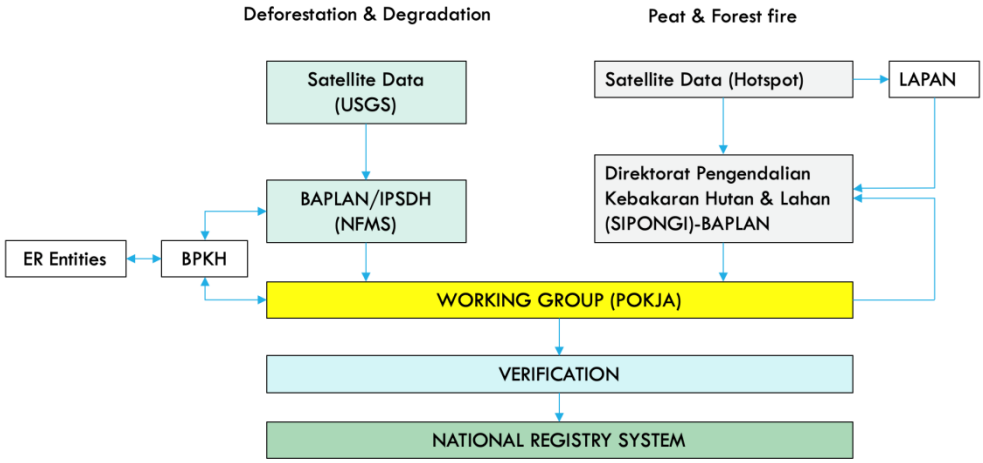


Figure 9.6 Organizational Structure for measurement, monitoring and reporting of the implementation of ER Program

The MMR system of the ER Program will be institutionally integrated with the national forest monitoring system (NFMS; Figure 9.2) as described in Regulation of Director General of Forest Planology Number P.1/VII- IPSDH/2015. The generation of national forest and land cover change data from satellite images is conducted by the Regional Office for the Management of Forest Area (BPKH) in East Kalimantan Province under the direction of the Directorate of Forest Resources Inventory and Monitoring (IPSDH), which is under the Directorate General of Forestry Planning and Environmental Arrangement (BAPLAN). The BPKH will receive satellite data from ISPDH. The satellite data are first acquired by LAPAN, which also does pre-processing of data up to mosaicking before sending the data to the respective institutions (including ISPDH). The visual interpretation is conducted by the BPKH using a standard methodology for land cover mapping (Margono *et al*, 2014, 2016). Results of the processing and ground check by BPKHs are sent back to ISPDH for validation by ISPDH including some necessary edge-matching as appropriate, as part of the QA/QC process. Finally, the accuracy of the interpretation is assessed by comparing the land cover maps to field data from the ground check using a contingency matrix (MoFor, 2012, Margono *et al.*, 2012). There are about 300 points for ground checking in East Kalimantan (MoEF, 2017), which are determined randomly by land cover classes. All the data from the BPKH will be consolidated to generate data on forest cover change.

The ER Program (through the Working Group) will analyze the data from the BPKH to estimate emissions from deforestation and degradation, peat decomposition, and loss of mangrove soil from the conversion of mangrove to aquaculture. Results of the estimation are then submitted to the Environmental Agency for internal verification. The Environmental Agency will then submit the results of the verified estimation to the national registry and verification system.

To facilitate the work of the Working Group, the Government of East Kalimantan has developed a web portal for the Sub-national MRV System for managing all the processed data from the national and also from local governments. The system can perform calculations of the emissions using the national data & sub-national data. The system is to be operated by the Provincial Environmental Office (DLH) as the East Kalimantan MRV Focal Point. Measurement (data input pages) and Verification (verification purpose pages) sections need a user account but the Reporting section is publicly available to show the Emission Factor (Faktor Emisi), Activity Data (Data Aktifitas) and Emission include Reference Emission Level (Tingkat Emisi Rujukan), Actual Emission after reference period (Emisi Aktual) and Performance of Emission Reduction (Kinerja Penurunan Emisi). This menu is available on the left as an expandable menu. The MRV web portal has been tested using national data and the calculation method is the same with the national FREL. This MRV web portal will

increase public participation of OPD to village communities or indigenous people to participate in monitoring the condition of forests and changes in the forest/land that occurs.

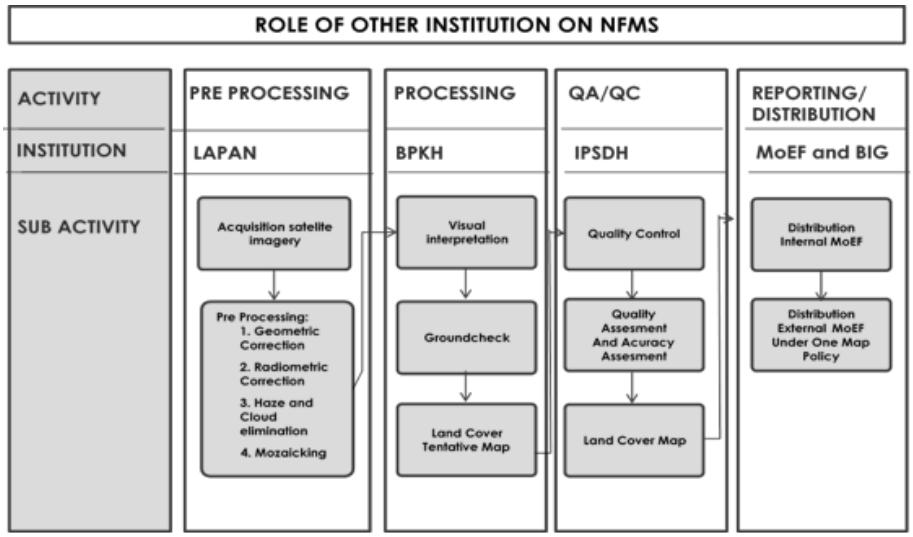


Figure 9.7 Related institutions on NFMS management (MoEF, 2017)

The process of the production of land cover maps will be on an annual basis as defined in the Regulation of the Director General of Forest Planology Number P.1/VII- IPSDH/2015. The timeline of the process is shown in Table 9.2. The collection of the LANDSAT images is conducted throughout the year by LAPAN and the pre-processing of the image is conducted as the data becomes available for producing the mosaic. The mosaic will be available by June to be distributed to IPSDH and to BPKH. BPKH under the supervision of IPSDH will do manual interpretation of the image during the period July-October, while land cover data from field visits (with defined coordinate) are collected in the period March-September. In October, all the results of the interpretation conducted by BPKH will be compiled to the national by IPSDH for QA/QC and accuracy assessment. By December the result of the interpretation is finalized and reported.

Table 20 Timeline of land cover change analysis under the current NFMS

No	Activity	Year (n-1)						Year (n)											
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
A	**LAPAN**																		
	Collecting Landsat Satelite Image																		
	Finalization of Mozaik (M)													M					
B	**IPSDH**																		
	Techncail evaluation																		
	Supervision																		
	Quality Control																		
	Data finalization (DF)																		DF
	Reporting ®																		R
C	**IPSDH/BPKH**																		
	Data distribution (DD)																		
	Interpretation																		
	Ground Checking																		
	National Compilation of results (NC)																NC		

As shown in Figure 9.2, the ER entities (village governments, community groups, concessions), will participate in monitoring deforestation (see section 4 for the entities in the accounting areas). The ER entities will be involved in conducting ground checking and in monitoring and reporting the occurrence of deforestation in the accounting area to the Working Group. The mobile application for this has been developed (Figure 9.4) which is connected to the MRV web-portal.

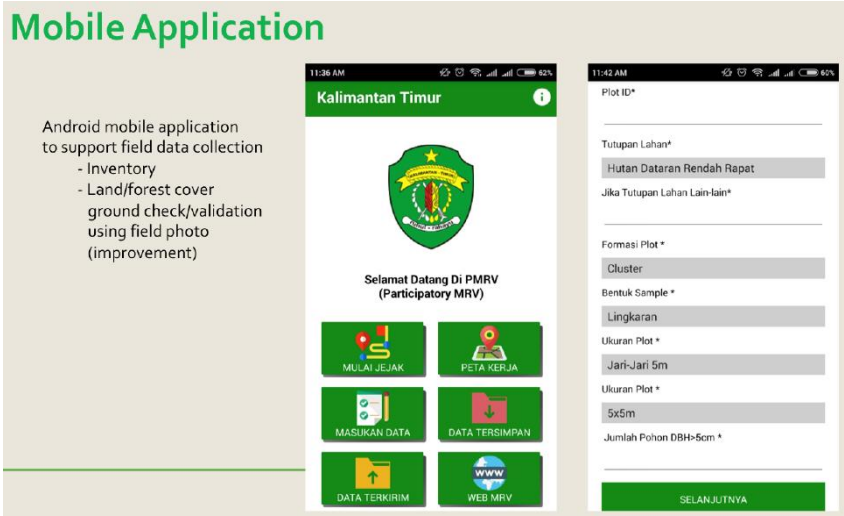


Figure 9.8 Mobile application for ER entities for supporting the MRV activities

Organizational Structure for measurement, monitoring and reporting of emissions from peat and forest fires

For MMR of peat and forest fire, as seen in Figure 8.1, estimation of peat burnt area will use data derived from hotspots sourced from NASA. The processing of the hotspot data is conducted by LAPAN for the Directorate for Forest and Land Fire Control, of the Ministry of Environment and Forestry. The ER Program (through the Working Group) will access and analyze the hotspot data to estimate burnt area and greenhouse gas emission. Results of the estimation are then submitted to BAPLAN for internal verification. The Environmental Agency will then submit the results of the verified estimation to the national registry and verification system.

9.3 Relation and consistency with the National Forest Monitoring System

As mentioned above, the ER Program will use the data generated by the NFMS, and the East Kalimantan forest inventory data will be integrated to the National Forest Inventory (NFI). The system provides continuous information on activity data and emission factors that can ensure the sustainability of activity data supply needed for estimating emission reductions from the implementation of the ER Program, thus ensuring consistency. The ER Program will continue to apply the sample based area estimation for ER purposes, and will consider whether this approach is also applicable to the NFMS for national reporting purposes.

In addition, the ER Program will also include ground checking activities, as mentioned above, to increase the number of points required for the accuracy assessment. At present, due to limited budget BPKH can only do ground check in a small number of observation points. Through the ER Program, it is planned for ER Entities, as shown in Figure 9.2. This implies an urgent need for capacity building and technical assistance for ER entities.

For the development of capacity of ER entities in the implementation of monitoring and evaluation activities, the ER program will implement a number of capacity building activities. The budget plan is 418,513 USD for the capacity building on monitoring and evaluation and 6,924,317 USD for measurement and reporting of the ER Program (Table 9.2).

Table 21 Cost for the implementation of capacity building for monitoring, evaluation, measurement and reporting activities

Year	Implementation of monitoring and evaluation for ER program implementation (USD)	Measurement and Reporting (USD)
2020	63,654	556,415
2021	62,060	593,774
2022	66,226	3,606,316
2023	70,673	676,187
2024	75,418	721,588
2025	80,482	770,037
Total	**418,513**	**6,924,317**

12 UNCERTAINTIES OF THE CALCULATION OF EMISSION REDUCTIONS

The process for addressing uncertainty related to the REL and the calculation of emission reductions follows a stepwise process. The process involves the identification of sources of uncertainty, the minimization of uncertainty where feasible and cost effective, and the quantification of the remaining uncertainty through application of Monte Carlo analysis. The ER Program uses the 2006 IPCC Guideline for estimating average annual GHG emissions in the reference period, i.e. multiplication of Activity Data with Emission Factors (AD x EF) as described in Section 8.3.1. Therefore, uncertainty in the emission estimates is linked to the uncertainties of the AD and EF inputs.

12.1 Identification of sources of uncertainty of AD

The activity data used to estimate the emissions of deforestation, forest degradation, peat decomposition, and mangrove soil came from the national land cover maps produced by MoEF. The land cover map consists of 23 land cover classes derived by remote sensing data analysis (Landsat at 30-meter spatial resolution). The object identification is purely based on the appearance on the images. Manual-visual classification through an on-screen digitizing technique based on key elements of image/photo-interpretation was applied as the interpretation/classification method. Several ancillary data sets (including concession boundaries of logging and plantation, forest area boundaries) were utilized during the process of delineation, to integrate additional information valuable for classification. The detailed explanation on the method for generating the activity data can be accessed from https://nfms.menlhk.go.id/ and https://jurnal.ugm.ac.id/ijg/article/view/12496/9041

Manual classification is time-consuming and labor intensive (Margono et al., 2012, Margono et al., 2014). It involves staff from district and provincial levels to manually interpret and digitize the satellite images, to exploit their local knowledge. Data validation was carried out by comparing the land cover maps with field data. Stratified random sampling is the selected approach to verify the classification map to the field reality. Compilation of several field visit data within a specific year interval was exercised for accuracy assessment. Comparison of results was performed on a table of accuracy (contingency matrix MoFor, 2012, Margono *et al.*, 2012).

Emissions from peat decomposition are estimated using the activity data derived from the peatland map, which is separated from land cover maps produced by MoEF. The development of the peatland map in Indonesia is closely related to soil mapping projects for agricultural development programs, conducted by the Ministry of Agriculture. Indonesia has developed a procedure for peatland mapping based on remote sensing at a scale of 1:50,000 (SNI 7925:2013). The map of Indonesia's peat land has been updated and released several times due to the dynamics of data availability. The latest Peatland Map version 2011 at a scale of 1:250,000 (national scale) is used for the emission estimation.

Based on the above practices, there are a number of main sources of uncertainty for the Activity Data used for estimating the emission from deforestation, degradation, peat decomposition, and mangrove soil. The AD for forest cover and forest cover changes used in the estimation of emissions from deforestation, degradation, peat decomposition and mangrove soils have at least three sources of uncertainty, namely quality of the satellite images, interpretation procedure, and sampling error that is related to the process of ground truthing.

Table 22 . Analysis of contribution to overall uncertainty

Sources of uncertainty	Analysis of contribution to overall uncertainty
Activity Data	

Sources of uncertainty	Analysis of contribution to overall uncertainty
Measurement	Annual land cover map produced by MOEF is the primary sources of activity data in this ER program. The map accuracy relies on the interpreter which vary in term of experience when the manual interpretation took place. This situation may lead to inconsistency during delineation of Landsat image to land cover class. As deforestation and forest degradation are identified using this map, therefore the accuracy of land cover map is pivotal and contribute significantly to overall ER uncertainty In order to maintain consistency of the delineation process, the Landsat interpreter must have equal capacity and basic understanding about the interpretation process. Through training program, the capacity of interpreter will be upgraded and refreshed. MOEF as institution that responsible to produce the map, provides Standard Operating Procedures (SOPs) and manuals to guide the interpreters to do the satellite image interpretation. Another unit in MOEF run the QC/QA process, to quantify the land cover map accuracy and fixed any inappropriate data. All this measure action will ensure the land cover map is accurate and suitable for further analysis including deforestation and forest degradation calculation.
Representative ness	As much as 150 points sampling were distributed for each land cover change (LCC) categories. There are 6 possible categories as a result of analysing two land cover maps (T_0 and T_1) that is area of deforestation, forest degradation, forest gain, stable primary forest, stable secondary forest and stable non forest. If all land cover change categories applicable, therefore there will be 900 sample points. Each sample point will be representing an area of 6.25 hectare, so that in total there will be 5,625 hectares of sampling area for assessing the accuracy of East Kalimantan land cover change. In relation to East Kalimantan jurisdictional area, the sampling intensity for all East Kalimantan area is about 0.04% but for deforestation alone, the sampling intensity is 0.15%. Using this guideline, the representatives is well addressed therefore the contribution to overall uncertainty is low.
Sampling	150 sample points is distributed using stratified simple random sampling for evaluating each land cover change. This is called probability sampling. This approach ensures that ER program follow robust sampling design in term of activity data preparation. Robust sampling design will increase the confidentiality of land cover change estimation. Probability sampling is expected to reduce uncertainty and therefore the contribution of sampling is essential.
Extrapolation	There is no extrapolation conducted to prepare activity data for this ER program. Deforestation is estimated per forest class, based on reference data. Therefore, this source of uncertainty is not applicable to our approach.
Approach 3	The source of uncertainty of Approach 3 in East Kalimantan ER program may come from massive cloud cover that persist in Landsat images as sources for land cover interpretation. However, as mentioned in the interpretation guideline (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/petunjuk-teknis-penafsiran-citra-satelit-resolusi-sedang.pdf) , on the area where cloud exists, the interpreter may use additional imageries such as mosaics of Landsat image from previous year or high resolution image (SPOT 6/7 if available) or downloading additional Landsat scene from http://landsat-catalog.lapan.go.id/
Emission Factor	
DBH measurement	DBH is variable of tree measured directly during field survey. DBH is proxy data for estimating biomass and carbon using allometric equation. Another variable is tree height. Compare to DBH, tree height is difficult to measure. Both variables are the very important and are contributor for any uncertainty in emission estimation. Plot delineation is also
H measurement	

Sources of uncertainty	Analysis of contribution to overall uncertainty
Plot delineation	important to ensure only tree inside sample plot that is measured. Technically, during sample plot establishment in the ground, the plot line boundary or delineation is open clear at least 1 meter wide. Flagging tape often puts along the plot line. The process to measure DBH, height and establishing plot delineation follow manual or guideline that already provide by IPSDH MOEF (https://mrv.kaltimprov.go.id/storage/guest/ERMR1/Guidance/Petunjuk Teknis Enumerasi TSP dan PSP.pdf). Field surveyor is expected one who has forestry background. The survey team is preferable lead by researcher or universities -forestry staff. Training is mandatory prior survey.
Wood density estimation	The complexity of forests structure and tree species composition in East Kalimantan make wood density important variable for estimating biomass. The inclusion of wood-density classes improved the performance of allometric equation for lowland tropical forests. Furthermore, diameter and wood density are essential variables in estimating AGB in highly diverse tropical ecosystems (Manuri et al., 2017). The source error of wood density is possibly due to limited data availability and variation among samples from the same species. Therefore it is necessary to encourage more research to add wood density database of tropical forests in East Kalimantan.
Biomass allometric model	Biomass allometric equation directly affects emission factor for each land cover classes. In this ER program, EF uncertainty is expected getting lower and lower. At this point, uncertainty of EF of primary and secondary dryland forest is 9.27% and 5.24%, respectively. This uncertainty is low. It is expected that other land cover classes will have EF uncertainty less than 10% as well. However, the sample tree data used to construct biomass allometric models is still relatively limited to trees of a certain size. Since biomass is calculated using allometric model of one or two measured variables, therefore the contribution of error is quite high to emission prediction. In order to control the error source from allometric equation, it is recommended to add more available field data to update the existing allometric model.
Sampling	Sampling error is the statistics representing error due to collecting data using sample (part of population) rather than all population element. Emission factor is generated from sample plots therefore sampling is also contributor of overall uncertainty of EF. This source of error is random and is considered to be high if sample do not represent all variation of population. By adding more sample plots and the plot is distributed following probability sampling, then the error is expected low.
Carbon Fraction	Carbon fraction uses the values listed in Table 4.3 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4: Agriculture, Forestry and Other Land Use https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf Carbon fraction default values is expressed as 0.47. In tropical and subtropical forest, the lowest value of carbon fraction is 0.43 while the highest one is 0.49. Deviation is quite small, therefore carbon fraction contribution to overall EF uncertainty is low.
Root to-shoot ratio)	Root shoot ratio using the IPCC GPG LULUCF Table 3A.1.8 - https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf Root to shoot ratio (R:S ratio) varies depending on the land cover type. From 23 land cover classes in Indonesia, the lowest R:S ratio is 0.24 while the highest one is 1.58 (savanna & grasses, pure dry agriculture, bare ground and Settlement). The deviation of lowest and highest value of R:S ratio is quite significantly different, therefore R:S ratio most likely have high contribute to overall uncertainty. Similar to carbon fraction, ER program management is encouraged to support any research on this topics at local scale.

Sources of uncertainty	Analysis of contribution to overall uncertainty
Representativeness	From regional point of view, 23 classes of land cover are suitable enough to accommodate all physical variation on the ground. Emission factor has been set to all these land cover class (forest and non-forest classes). It is expected emission uncertainty from deforestation and forest degradation would be lower. The potential error sources regarding to representativeness is the sample plot is not randomly distributed. With lack of access to reach all forest area, sample plot may distributed purposively following road or stream network. In this case, the error would be increased. Representativeness should be accommodated through robust sampling design using stratified random sampling.
Integration	
Model	The combination of AD & EF does not necessarily need to result in additional uncertainty. Usually, sources of both random and systematic error are the calculations conducted in spreadsheets. Common error is incomplete equation script during data processing. The MRV team of East Kalimantan has implemented an automated script to calculated emissions and uncertainty in spreadsheet as well as in GIS web-based platform. Thes efforts should greatly reduce the possibility of mistakes in the calculations. The outputs of the activity data and emissions spreadsheets were double checked by MRV team member through MRV working group meeting.
Integration	This source of error is linked to the lack of comparability between the transition classes of the Activity Data and those of the Emission Factors. Using Landsat image (spatial resolution 30 m), some of land cover classes may looks similar and therefore it is difficult to differentiate. On the other hand, there is physical feature that really unique as seen on Landsat (such as karst) but there is no class for this landscape. Meanwhile, we almost agree that forest structure and composition in karst area is unique and quite different compared to primary or secondary dryland forest.

Steps to minimize uncertainty

The minimization of error of interpretation that normally results in systematic error, as required by Indicator 8.1 of MF of the FCPF, is through the implementation of a consistent and comprehensive set of standard operating procedures (SOP), including a set of quality assessment and quality control processes, and that of sampling error is through increased sampling. The implementation of QA/QC procedure will be enhanced, through the consistent use of the SOPs for the interpretation and training procedures. The consistency checks will be conducted by interpreters that were not involved in the original classification. Following the provisions on verification provided in Chapter 3 – Volume 1 of the 2006 IPCC GL, QA/QC measures will be complemented with verification, i.e. through an accuracy assessment. The verification will be conducted by a third party, which will serve to confirm the acceptable quality of the estimates and will enable the correction of biases and respective uncertainties. The accuracy assessment is conducted using Olofsson *et al*. (2014) with stratified reference data. The assessment is not only to assess accuracy but to also calculate the sample based estimates of areas and to quantify the degree of uncertainty for analysis purposes. In applying Olofsson et al. (2014) for the estimation of the accuracy of land cover change and the calculation of the sample based estimates of areas, Indonesia used a reference data set of 880 observations.

Similar to activity data, the uncertainty in Emission Factors is reduced through strengthening the consistency in the use of SOP including through trainings, and through increasing the number of samples. Indonesia plans to increase the number of sample plots in different categories of secondary forest based on tree cover density of secondary forests and shrubs (Annex 9.3). The implementation of this effort will involve FMUs.

Activities to be implemented for reducing the uncertainty of the emission factors will include the following activities:

- Developing and improving the monitoring protocol;
- integrating the monitoring protocol into the curriculum of the national forest training center to produce skilled staff within FMUs in east Kalimantan. The training should be conducted periodically by inviting key related field staff from FMUs; and
- providing proper supporting tools/equipment to make the monitoring processes more efficient.

12.2 Quantification of Uncertainty in the Reference Level Setting

Table 23 . Quantification of Uncertainty in the Reference Level Setting

Parameter included in the model	**Parameter values**	**Range or standard deviations**		**Error sources quantified in the model (e.g. measurement error, model error, etc.)**	**Probability distribution function**	**Source of assumptions made**
		Lower	**Upper**			
Project Area	12,734,692 ha	Intentionally left blank	Intentionally left blank	Intentionally left blank	Intentionally left blank	ER program document
Length of reference period	10 years	Intentionally left blank	Intentionally left blank	Intentionally left blank	Intentionally left blank	ER program document
Carbon Fraction	0.47	0.43	0.49	Measurement error	Triangular (lower bound = 0.44, upper bound = 0.49, mode = 0.47)	IPCC 2006 - https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf
Ratio of molecular weights of CO_2 and C	44/12	44/12	45/12	Intentionally left blank	Intentionally left blank	The weight of carbon isotopes contains in molecules found in the atmosphere (i.e. CO_2), mainly 12C and 13C
Root shoot ratio	0.24 0.32 0.36 0.48 1.58	0.22 0.27 0.31 0.33 1.09	0.26 0.37 0.41 0.63 2.07	Measurement error	Intentionally left blank	2006 IPCC GPG LULUCF Table 3A.1.8 https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3

						/Anx_3A_1_Data_Tables.pdf See sheet 'EF_EKJERP' excel file fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx
AGB sample	See sheet 'EF_EKJERP' excel file fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx	Intentionally left blank	Intentionally left blank	Measurement error	Non-parametric bootstrapping	Intentionally left blank
Activity data	See sheet 'UncertaintyAD' excel file fcpf_ekjerp_ermr1_MC_26Juli2022c.xlsx	Intentionally left blank	Intentionally left blank	Measurement error	Non-parametric bootstrapping	Intentionally left blank

Quantification of the uncertainty of the estimate of the Reference level

		Deforestation	Forest degradation	Enhancement of carbon stocks
A	**Median**	23,910,110.75	3,499,907.39	0.00
B	**Upper bound 90% CI** (Percentile 0,95)	21,692,563.78	2,360,708.84	0.00
C	**Lower bound 90% CI** (Percentile 0,05)	26,214,647.70	4,732,375.53	0.00
D	**Half Width Confidence Interval at 90% ((B – C) / 2)**	2,261,041.96	1,185.833.35	0.00
E	**Relative margin (D / A)**	0.09	0.34	0.00
F	**Uncertainty discount**	9.46	33.88	0.00

Sensitivity analysis and identification of areas of improvement of MRV system

Sensitivity Test	Median	Lower bound (5th percentile)	Upper bound (95th percentile)	Half-width confidence interval at 90%	Relative Margin	Uncertainty (%)
All on	35,404,709.61	31,595,294.53	39,343,003.80	3,873,854.63	0.10	10.94
R:S Uncertainty	35,471,602.13	35,001,607.79	35,949,894.69	474,143.45	0.01	1.34
CF Uncertainty	35,463,547.88	34,959,756.78	35,968,679.38	504,461.30	0.01	1.42
Sampling uncertainty	35,479,001.24	33,736,204.15	37,220,024.41	1,741,910.13	0.05	4.91
Emission Factor uncertainty	35,447,106.81	33,535,207.34	37,352,701.23	1,908.746.94	0.05	5.38
Activity Data	35,476,198.51	32,158,638.15	38,852,025.32	3,346,693.58	0.09	9.43

The sensitivity analysis was done using Monte Carlo approach by removing one estimation parameter at a time, i.e.:

No	Parameter Used	Approach
1	All on	Using the uncertainty for Root shoot ratio, Carbon Fraction, Sampling uncertainty AGB, and Activity Data
2	R:S Uncertainty	Using the uncertainty for Root shoot ratio, and other uncertainty parameter near zero.
3	CF Uncertainty	Using the uncertainty for carbon fraction ratio, and other uncertainty parameter near zero
4	Sampling uncertainty	Using the uncertainty for AGB biomass sampling, and other uncertainty parameter near zero
5	Emission Factor uncertainty	Using the uncertainty for Root shoot ratio, carbon fraction, and AGB biomass sampling, but uncertainty for activity data near zero
6	Activity Data	Using the uncertainty for activity data (AD), and other parameter near zero