Annex 9.3. Activity data (forest/land cover classes) improvement

The method to improve activity (forest cover/land cover data) in sub-national East Kalimantan is the same method that used by KLHK to produce national land cover data. The term "working definition" of forest was used to produce land cover maps through visual interpretation of satellite images at a scale that minimum area for polygon delineation is 0.25 cm2 at 1: 50,000 of scale which equal to 6.25 ha. Forest degraded mainly caused by human activity, either by legal logging activities, or by illegal logging and shifting cultivation.

Activity data improvement will be applied only in secondary forest and shrubs. Secondary forest classified into three classes using the information from tree canopy cover data (Hansen, 2012): medium density, low density and very low density secondary forest. While shrubs classified into three classes: forest re-growth, shrubs and bush. These classes are produced from overlaying analysis of land cover data of KLHK and tree canopy cover data from Hansen. The detail of the primary and secondary forest classes are described as follows:

- High density forest (Primary Forest): crown cover > 80%
- Medium density secondary forest: crown cover 50% - 80%
- Low density secondary forest: crown cover 30% - 40%
- Very low density forest: <30%

While shrubs classes are described as follow:

- Forest re-growth: crown cover ≥50%
- Old shrubs: 30%-50%
- Young Shrubs: crown cover 10% – 30%
- Bush: ≤10%

Tree canopy cover percentage:

Crown Cover (cc) refers to tree canopy cover within the forest cover, i.e. within a pixel or uniform polygons.

From the overlaying analysis, approximate classes were mapped as follows:

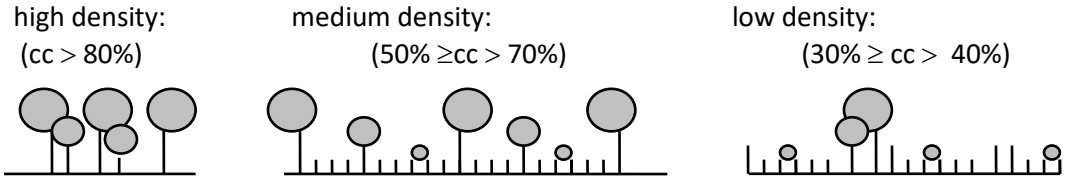

Figure 1 Canopy density and Crown cover percentage to estimate density of the Natural forest.

Table 1 Land cover classes, national level and sub-national improvement (East Kalimantan)

No	National Landcover Classes		Sub-National Landcover Classes	No
1	Hutan lahan kering primer	Primary dry land forest	High density dry land forest (Primary dry land forest)	1
2	Hutan lahan kering sekunder	Secondary dry land forest	Medium density secondary dry land forest	2
			Low density secondary dry land forest	3
			Very Low density secondary dry land forest	4
3	Hutan rawa primer	Primary swamp forest	High density swamp forest (Primary swamp forest)	5
4	Hutan rawa sekunder	Secondary swamp forest	Medium density secondary swamp forest	6
			Medium density secondary swamp forest	7
			Low density secondary swamp forest	8
5	Hutan mangrove primer	Primary mangrove forest	Primary mangrove forest	9
6	Hutan mangrove sekunder	Secondary mangrove forest	High density secondary mangrove forest	10
			Medium density secondary mangrove forest	11
			Low density secondary mangrove forest	12
7	Hutan tanaman	Forest plantation	Forest plantation	13
8	Perkebunan / Kebun	Crop plantation	Crop plantation	14
9	Semak belukar	Shrubs	Very old shrubs (Forest Re-growth)	15
			Old Shrubs	16
			Young shrubs	17
			Bush lands	18
10	Semak belukar rawa	Shrubs on swamp	Very old shrubs (Forest Re-growth) on Swampy	19
			Old Shrubs on Swampy	20
			Young shrubs on swampy	21
			Bush on swampy	22
11	Savanna / Padang rumput	Savana	Grassland/Savana	23
12	Pertanian lahan kering	Unirrigated agriculture	Unirrigated agriculture	24
13	Pertanian lahan kering campur semak / kebun campur	Mix unirrigated agriculture	Mix unirrigated agriculture	25
14	Sawah	Paddy field	Paddy field	26

15	Tambak	Aquaculture pond	Aquaculture pond	27
16	Permukiman / Lahan terbangun	Settlement	Settlement	28
17	Transmigrasi	Transmigration	Transmigration	29
18	Lahan terbuka	Open area	Open area	30
			Burnt scars	31
19	Pertambangan	Mining	Mining	32
20	Tubuh air	Water body	Water body	33
21	Rawa	Swamp	Swamp	34
22	Awan	Cloud	Cloud	35
23	Bandara / Pelabuhan	Airport/harbour	Airport/harbour	

The method is possible to be applied or scale up at provincial level and national level given the availability of dedicated human resources, finance and infrastructure. These improvements also could use for capacity building at Sub-National & National level. For the capacity building will conduct the training for Subnational & National on land cover analysis using reclassification analysis with ground check activities by the expert of the forestry remote sensing in the first year and monitor the result on

Carbon stock data for each improved land cover class is derived from the proportion of tree canopy cover using the following formula:

$$Ci = \frac{Average\ tree\ cover\ class\ i}{Total\ average\ tree\ cover}\ x\ C\ stock\ for\ national\ land\ cover\ class$$

Ci = Carbon stock of improved land cover class

There is a need to develop sample plots to measure the carbon stock in different level of degradation based on tree cover density of secondary forests and shrubs. The degradation level of the secondary forest can be categorized as lightly, heavily, and very heavily degraded and shrubs also into three categories as very old shrubs (forest regrowth), old shrubs and young shrubs. In these regards, the forest regrowth and old shrubs can be categorized as forestland but young shrubs and bush as non-forestland as it takes many years to regenerate naturally. With this categorization, we will be able to measure emission from degradation of the secondary forest. The country considers that adoption of this approach is possible in the next two years (2021) before the first verification, thus the recalculation of REL may be applied. The implication of this approach, the contribution of emission from deforestation and degradation to REL will change. The emission from fire causing degradation of forest will also change, as part of area of shrubs will be defined as forest (i.e. forest regrowth and old shrubs). As defined, most area affected by fire is shrub, thus the burnt of the very old (forest regrowth) and old shrubs will be included in the calculation of emission from the degradation and this will change the REL. In the preparation of the adoption of the approach, the government is preparing the establishment of new permanent sampling plots in different level of degradation of the secondary forest as well as training of technical staffs.