Malaysia's Submission on Reference Levels for REDD+ Results Based Payments under UNFCCC

Ministry of Natural Resources and Environment, Malaysia

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1.0 Background

Recalling Decision 12/CP.17, where parties are invited to submit information and rationale on the development of their forest reference emission levels and/or forest reference levels, including details of national circumstances and if adjusted include details on how the national circumstances were considered, in accordance with the guidelines contained in the annex to this decision. In addition, a step-wise approach to national forest reference emission level and/or forest reference level (FREL) development, which enables Parties to improve the forest reference emission level and/or forest reference level by incorporating better data, improved methodologies and, where appropriate, additional pools.

Malaysia welcomes the opportunity to submit a forest reference emission level for a technical assessment in the context of results-based payments for *reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries* (REDD+) under the United Nations Framework Convention on Climate Change (UNFCCC).

The submission of FRELs and/or forest reference levels (FRLs) and subsequent Technical Annexes with results are voluntary and exclusively for the purpose of obtaining and receiving payments for REDD+ action.

2.0 National Circumstances considered

2.1 Governance

The land administration structure in Malaysia demarcates the power to manage land to the State Authority as land is a State matter pursuant to the Federal Constitution of Malaysia. Land administration and land law practices is based on the Torrens system introduced by the British. Under the Torrens System, the Register is everything. Hence, the legal entity of a forest is through the State gazette. The National Forestry Act (NFA) allows State Authority may, by notification in the *Gazette,* declare any area as permanent reserved forest. Although land administration is at the state level, Article 76 Clauses (4) (Malaysia Federal Constitution, 2008) mentions that the federal government has the power to ensure uniformity of law and policy such as to make laws with respect to land tenure; registration of titles and deeds relating to land; transfer of land; mortgages; leases and charges in respect of land; and local government. The National Land Code, 1965 performs this role.

The NFA, defines the Permanent Reserved Forest (PRF) as any land constituted or deemed to have been constituted a permanent reserved forest under this Act. It also allows PRFs to be classified into any of the twelve (12) functional classes identified in the NFA to promote sustainable forest management taking into account the multiple roles/uses of forest (Annex 1). Out of the 12 functional classes, only the production forest will be subjected to harvest.

2.2 Forest Management

The management of all type of forests is enshrined in the National Forestry Policy 1978 (revised 1992) (NFP). This policy provided for greater uniformity in the implementation

of strategies for the achievement of forest conservation, management as well as social and educational needs. It represents an important legislation, which is unequivocal in maintaining that forest management must fulfil environmental, social and conservational needs besides meeting rational economic production goals. It provides guidelines and strong emphasis on the necessity for sound management, conservation, utilization, development and protection of the forests. This commitment is duly recognized and given specific attention by the National Forestry Act in its 1993 revision.

The key objective of the forest management in Malaysia has been to ensure the continuity of product flow while conserving complex ecosystems rich and varied in flora and fauna. The annual felling rates (coupe) are monitored as of 1996 through the Seventh Malaysian Development Plan. Malaysia is moving from managing forest for its commodity to managing forest for its natural resource.

Malaysia has implemented selective harvesting system, which is a technique providing openings in forest cover conducive to the natural regeneration of seedlings. Details of how Malaysia's selective forest management is shown in Annex 1. In addition, a set of principles, criteria and indicators as a yardstick to assess sustainable forest management started in 1994 based on the ITTO Criteria and Indicators for Sustainable Forest Management. There are nine principles, 47 criterion and 97 indicators and 307 verifiers under the Malaysian Criteria (MC&I) and indicators for forest management certification.

Malaysia started project based forest certification in 1997. Malaysian Timber Certification Council was established in October 1998 as an independent organisation to develop and operate the Malaysian Timber Certification Scheme (MTCS). The MTCS provides for independent assessment of forest management practices, to ensure the sustainable management of Malaysia's natural forest as well as to meet the demand for certified timber products. In addition, a peer reviewer is responsible to provide a second independent expert opinion on the level of compliance of the forest management unit by assessing the reports prepared by a certification body against the requirements of the standard.

The MC&I for forest management certification was implemented in 2005. As of August 2014, about 4.7 million ha of natural forest has been certified. There is plan to certify another 2.2 million ha in the next 2 years.

2.3 Greenhouse gas emissions from Land Use, Land Use Change and Forestry (LULUCF)

The Second National Communication to UNFCCC indicated that the LULUCF sector was a net sink for the reported years of 2000, 2005 and 2007. The total removal was about 240 million tonnes CO_{2e} and the emissions was 26 million tonnes CO_{2e}

3.0 Information on FRL

Based on our forest management goals, Malaysia proposes a national reference level for sustainable management of forest as result based payment for REDD+ activity. All PRFs are managed under sustainable forest management principles and remains forest in perpetuity and therefore considered in the construction of the FRL.

Tables 1 shows the total area of PRF logged from 1990-2010 while Table 2 shows the total growing stocks and the harvest. The growing stocks were derived from the National Forest Inventory and reported in the FAO- FRA reports accordingly. Other forested areas outside the forest reserves are not managed in a sustainable manner and are land banks for future development activities. Most of these areas have been logged long time ago. Forest management activities considered are as follows:

a. PRF where commercial harvest is undertaken
b. New areas subjected to sustainable forest management through the gazettement as PRF
c. Extended harvesting rotation cycle.
d. Designation of forest for conservation

Recalling decision 12/CP.17 where a step wise approach could be applied in the construction of FRL, only PRF where commercial harvest is undertaken has been considered. The other forest management activities will be included when addition information becomes available.

Table 1: Trends in total areas logged.

	1996-2000	2001-05	2006-10	2011-15
Approved 5 years coupe (ha)	1,382,000	1,364,350	1,334,700	1,274,165
Actual harvested area (ha)	1,185,581	1,548,412	1,323,682	630,636*

* Upto June 2014

Table 2: Growing stocks and harvest in PRF

	1990	2000	2005	2011
Growing stocks (million m^3)	2977	2721	2813	2648
Commercial harvest (million m^3)	19	12.3	11	9.2

Wild fires have reported in the FRA-FAO (2010) but these fires are limited to plantation forest and forested areas outside the PRF. Biomass burning and fuel wood gathering do not occur in the PRF and neither is peat draining or fertilizer application. Hence, emission is from the commercial harvest.

3.1 Activity data and Emission factors

The activity data and methods used for calculating the forest management reference levels are consistent with the Malaysia greenhouse gas inventory. For the Second National Communication, Malaysia used the Revised 1996 Guidelines for the reporting of the GHG inventory.

The activity data used are the total area of PRF based on the forest types and total commercial harvest extracted from PRF (Table 3). The total area of PRF was obtained from the Annual Reports of the Forest Departments and validated using Landsat images for 1990 and 2000 and SPOT 5 for 2010 (Annex 3). This is part of the National Forest Monitoring System where a biennial geospatial images are used to verify the changes in the PRF from 2010 onwards. Additionally, National Forest Inventory where ground assessment is conducted every 10 years once. NFI provides information on the state and trends of forest resources, their goods and services, and other related variables that support.

The land cover classification scheme used to verify the changes in the PRF was based on the International Geosphere Biosphere Programme. The land cover category provided by the programme was used as a guide to learn the class reparability of imagery. The first level was created using a knowledge based, which returned objects of suitable size and variation for the desired classes. These classes were: i) *bare ground*, including barren fields, very young plantations; ii) *built-up,* including residential, commercial and industrial areas; iii) *vegetation*, including agriculture, and natural vegetation and plantations. Training classes were created iteratively for each class, where the classification result of each iteration determined the refinement of training classes for the next iteration until a satisfactory classification was obtained.

Once satisfactory classification has been achieved for the first level, the vegetation class was further segmented, resulting in smaller "child" vegetation objects, more suitable for specific vegetation distinction. For the classification of objects on this sub-level, training areas were again iteratively created and refined for the following classes: *farmland, mangroves,* peat swamp, *natural forest, natural vegetation* and *plantation forest*. On the whole, the final classification was *mangrove,* peat swamp, *inland forest*, *plantation forest,* and *natural vegetation, built-up, bare ground* and *water.*

Table 3: Activity data and emission factor used in the reference level

Activity	Activity Data	Emission factor
Annual increase in carbon stocks due to biomass growth	Area of PRF obtained	Data on annual growth rate obtained from National Forest Inventory and recent publications For below ground biomass, root:shoot ratio was applied. Leaf litter data was obtain from published data.
Annual increase in carbon stocks due to biomass loss	Total commercial harvest	Data on commercial and allometric volume functions for total biomass loss

The emission factor used is annual growth rate, obtained from the Fourth National Forest Inventory, 2002 and published literatures. Allometric equation developed from data of National Forestry Inventories of 1972 and 1982 was used to determine the annual growth rates. The carbon fraction used is 0.5

The National Commodity Statistic Report provided the data for commercial harvest. The actual commercial harvest was validated against the allowed annual coupe.

3.2 Pools and gases considered

The IPCC 2006 Guidelines was used to calculate these removal by sinks and emissions. The forest reference level only considered CO_2 emissions. Non-CO_2 emissions are normally associated with the burning of tree residues or with wild fires, or draining of Peat Swamp Forest. None of these activities are common in the PFR. The carbon pools and greenhouse gas sources considered are shown in Tables 4 and 5.

Table 4: Changes in carbon pools included in the reference level

Above ground biomass	Below ground biomass	Litter	Deadwood	Soil Organic carbon
√	√	√	No	No

Table 5: Green house gas sources included in the reference level

Fertilization N_2O	Drainage of soils - N_2O	Liming CO_2	Biomass burning
Not occurring	Not occurring	Not occurring	Not occurring

3.3 Rotation cycle

The cutting limit is 45cm and 60cm diameter at breast height (DBH) for non dipterocarps and dipterocarps respectively to provide greater protection to the residual stand. The rotation cycle is between 25-30 years and States may elect to extend their rotations. For Peat swamp forest, the rotation cycle is between 45-55 years and cutting limits of more than 40 cm dbh. The mangrove forest undergoes a 30 years rotation. In addition, the maximum gross volume of harvest is 85 m^3/ha, as of 2004 onwards was set by the National Forestry Council.

3.4 Business as usual scenario

The business as usual scenario would be harvesting following the pre felling inventory data which is based on the total commercial logs available. With the implementation of sustainable forest management and forest certification, the maximum harvest is limited to 85m^3 and follows all the principles, criteria and indicators set in MC&I. Since 2005, the harvesting intensity has been below 85m^3.

4.0 Malaysia's Proposed Reference Level

4.1 Approach

Historical emission estimates are developed based on official statistics on the commercial harvest of logs from PRF. Fuel wood gathering does not occur in the PRF. Time series from 1990 -2011 was used to generate the reference level. The baseline is recalculated every 5 years, for period 2006-2010, historic emissions from 1990-2005.

The calculation is made by subtracting the biomass carbon loss from the biomass carbon increment for the reporting year. The biomass carbon loss is from the commercial harvest.

$$\Delta C_{FFLB} = \Delta C_{FFG} + \Delta C_{FFL} \qquad \text{(2006 IPCC Guidelines)}$$

Where:

ΔC_{FFLB} = annual change in carbon stocks in living biomass (includes above- and belowground biomass) in forest land remaining forest land, tonnes C yr^{-1}

ΔC_{FFG} = annual increase in carbon stocks due to biomass growth, tonnes C yr-1

ΔC_{FFL} = annual decrease in carbon stocks due to biomass loss, tonnes C yr^{-1}

4.2 Scope

The Sustainable Management of Forest reference levels presented in this submission were estimated taking into account the best available information on a number of key factor including:

(a) removals and emissions from forest management activities based on Malaysia's greenhouse gas inventory
(b) relevant historical data on forest management;
(c) National legislations and relevant policies

4.3 Scale

Only the managed forest where commercial harvest is undertaken as part of the management plan is considered, covering a total area of about 12 million ha of forest (Annex 3). The FRL considers national data, which includes Peninsular Malaysia, Sabah and Sarawak.

4.4 Assumptions

a) The construction of the forest reference level assumes existing domestic policies are maintained.
b) The harvesting continues to be subjected to a regulatory framework designed to maintain environmental values and the productive capacity of forests.
c) The annual coupe is based on the growing stocks, the net production areas for the period and net volume increment. Pre-felling inventory will determine the total amount of harvest and cannot exceed the $85m^3$/ha harvest.
d) The effects of extreme weather patterns will not affect the Production forest – floods will not affect the seedling regeneration nor forest fires.
e) No projection is made for the future and therefore future policy is not considered.

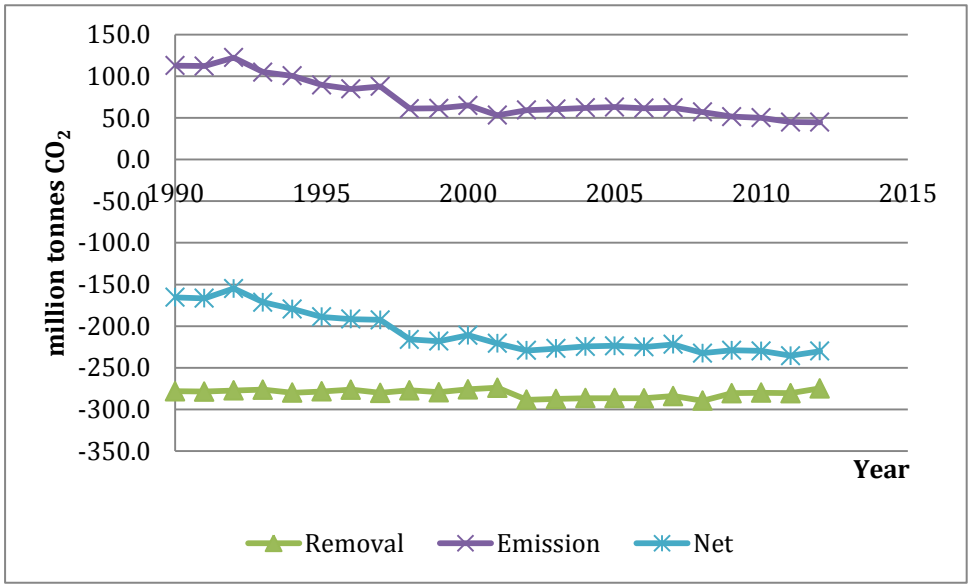
The proposed reference level for result based payments are as follows:

a. the average net removals from 1990-2005 will be used as reference level for period 2006-10 is -198.8 million tonnes CO_2/yr (Table 6).
b. The average net removals from 1990-2010 will be used as reference level for period 2011-15 is -205.7 million tonnes CO_2/yr (Table 6).
c. The trend in removal and emissions from 1990-2010 is shown in Figure 1.

Table 6: Malaysia's Proposed Forest Reference Level

2005-10	2011-15
-198.8 million tonnes CO_2	-205.7 million tonnes CO_2

Figure 1: Trends in removals and emissions from Sustainable Management of Forest



5.0 Transparent, complete, consistent and accurate, information including methodological information, description of data sets, approaches, methods in FRL construction

Transparent:

Published data was used for the construction of the FRL annual reports. Data has been provided to ensure that the same calculations can be used to develop same values. Summary is provided in Table 7 and details provided in Annex 3.

Table 7 Changes in PRF (million ha) from 1990-2012

	1990	2000	2005	2010	2012
Inland	10.91	11.13	11.81	11.66	11.42
PSF	1.04	0.78	0.66	0.5	0.51
Mangrove	0.47	0.44	0.45	0.43	0.43
Total	12.42	12.35	12.91	12.59	12.36

Source: www.nre.gov.my

The Protection Areas are not included in the construction of FRL.

Complete

Complete means the provision of information that allows for the reconstruction of forest reference emission levels and/or forest reference levels as in the footnote of 12/CP.17

Annex

For the construction of the forest reference level for results based payments only considered the carbon uptake and the commercial harvest. The other forest management activities have yet to be included.

The forest profile is shown below is based on the vegetation type (reference) is shown Below and the activity data covered the forest type accordingly.

The soil carbon, dead wood and harvest wood product are not considered in the current construction of forest reference level because no consistent national data over the period between 1990-2011 is available. However, data for selected forest type are available. Additionally, there is no land use change in the PRF and therefore it is also assumed that there are not significant changes in soil carbon. The 6th National Forest Inventory (2022 -24) may consider these parameters.

There are a number of publications on the carbon stocks in forest available. However for the construction of the forest reference level allometic equations by Brown (1997) was used. Brown et al (1989) first developed allometric equations for estimating total above-ground biomass following the National Forest Inventory 1972 and 1982 and further improved the equation. This allometric equation has been used to determine the annual growth rate in the forest is as follows:

$Y = 42.69 - 12.8 \times (D) + 1.242(D^2)$ – Brown 1997
(is based on the National Forest Inventory)

The 4th National Forest Inventory (2002) and other published data have been used. (Table 8). 10cm dbh was considered to reduce the error.

For below ground biomass, both Niiyama et al (2010) and Saner et al (2012) reported a root: shoot ratio from Malaysian forest as 0.18.

Saner et al (2012) reported that there were no significant difference in the dead wood in logged and unlogged forest and the leaf litter is 9.6 tonnes/ha/yr

The biomass expansion factor used was 1.3 (FRA, 2010)

Figure 1: Forest profile in Malaysia

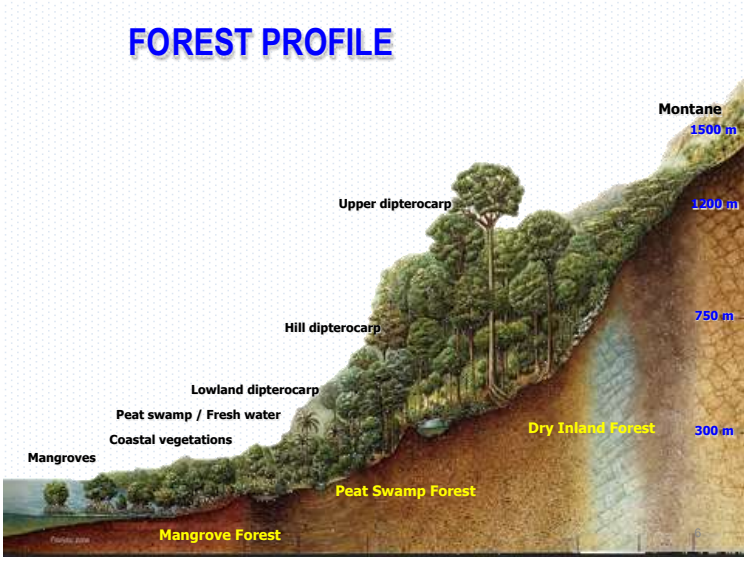


Table 8: Growth rates for forest types

Forest Type	Peninsular Malaysia (t dm/ha/yr)		Sarawak (t dm/ha/yr)		Sabah (tdm/ha/yr)	
Inland	11.685	NFI4	9.35	Morel et al (2011)	9.35	Morel et al (2011)
Peat swamp	10.4	NFI4	10.4	NFI4	6.3	Morel et al (2011)
Mangrove Ong et al (2002)	11.9					

Acknowledging that not all carbon pools have been accounted for, but all production forest has been included.

Consistent

Decision 12/CP.17 requires that the forest reference emission levels shall maintain consistency with anthropogenic forest related greenhouse gas emissions by sources and removals by sinks as contained in the country's national greenhouse gas inventory. This implied that the same methodologies and consistent data sets are used to estimate the removal and emissions from sustainable forest management activities in the construction of reference level and in the national greenhouse gas inventory.

Consistent activity data and emission factors have been used throughout the construction of FRL and is consistent with the activity data and emission factors in the national greenhouse gas inventory.

Accurate

The national forest inventory data has cv of 90% while the carbon stock assessment had an overall accuracy of 97%. Effort has been taken to ensure that the information is as accurate as possible. QC process was also undertaken.

The harvest will be checked and measured before leaving the forest for the purpose of records, calculation of royalty and cess and issuance of removal pass. The chain

The uncertainty remains in the following:

a. verification of area using geospatial images.
b. total area expressed in ha as some gazettement was done in the 1900s and the area measured were in different unit. A series of unit conversion have taken place.
c. The uncertainty in the leaf litter value as limited data is available.

The reference level construction considered the National Forestry Policy, The Climate Change Policy, the 10th Malaysian Development Plan and relevant State Policies.

Forest definition

The forest definition used in the development of the reference level is based on the national legislation and is consistent with the national greenhouse gas inventory. However, the definition used by FAO is not used as some agricultural land, like the state land and rubber plantations would be considered as forest but these areas are not managed in a sustainable manner neither subjected by the National Forestry Act. Rubber plantations are managed by the smallholders following the rubber management while the state land forest is land banks for future development.

The National Forest Act prescribes that only the land under this Act will remain as forest reserves and management in a sustainable manner.

6.0 Policy and Plan Considered

The following policies were considered in the construction of the FRL:

a. National Forestry Policy –
Revised National Forest Policy (1992) aims at a more comprehensive approach that addresses in greater depth the requirements for sustainable management, development, conservation and control of the resource to fulfil the needs of the people, industry and the protection of the environment.

b. National Policy on Climate Change
The main objectives of the National Policy on Climate Change include mainstreaming climate change through the wise management of resources and enhanced environmental conservation. The policy also aims to strengthen institutional and implementation capacity to better harmonise opportunities to reduce negative impacts on climate change.

c. National Biological Diversity Policy
The National Biodiversity Policy aims to conserve Malaysia's national biological diversity and to ensure that its components are used in a sustainable manner for the continued progress and socio-economic development of the nation. The policy is undergoing a review process currently.

d. Directives from the National Land Council
The maximun cutting limits and annual coupe are sets by the Council and reviewed periodically.

The 10th Malaysian Development Plan (2011-15)

The 10th Malaysian Development Plan outlines that in responding to global climate change, the Government will focus on adaptation strategies to ensure sustainable growth and mitigation strategies to reduce the emission of greenhouse gases. Two major initiatives were launched to ensure sustainable use of forests and their natural resources: the Central Forest Spine project covering 4.3 million hectares in Peninsular Malaysia and the Heart of Borneo project covering 6.0 million hectares in Sabah and Sarawak.

7.0 Capacity needs

7.1 Technical capacity is needed to develop the national soil organic carbon database.

7.2 Technology to enhance forest management and conservation- logging damage

8.0 References

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7. Saner P, Loh YY, Ong RC, Hector A (2012) Carbon Stocks and Fluxes in Tropical Lowland Dipterocarp Rainforests in Sabah, Malaysian Borneo. PLoS ONE 7(1): e29642. doi:10.1371/journal.pone.0029642
8. Malaysia's Second National Communication to UNFCCC, 2011

Annex 1

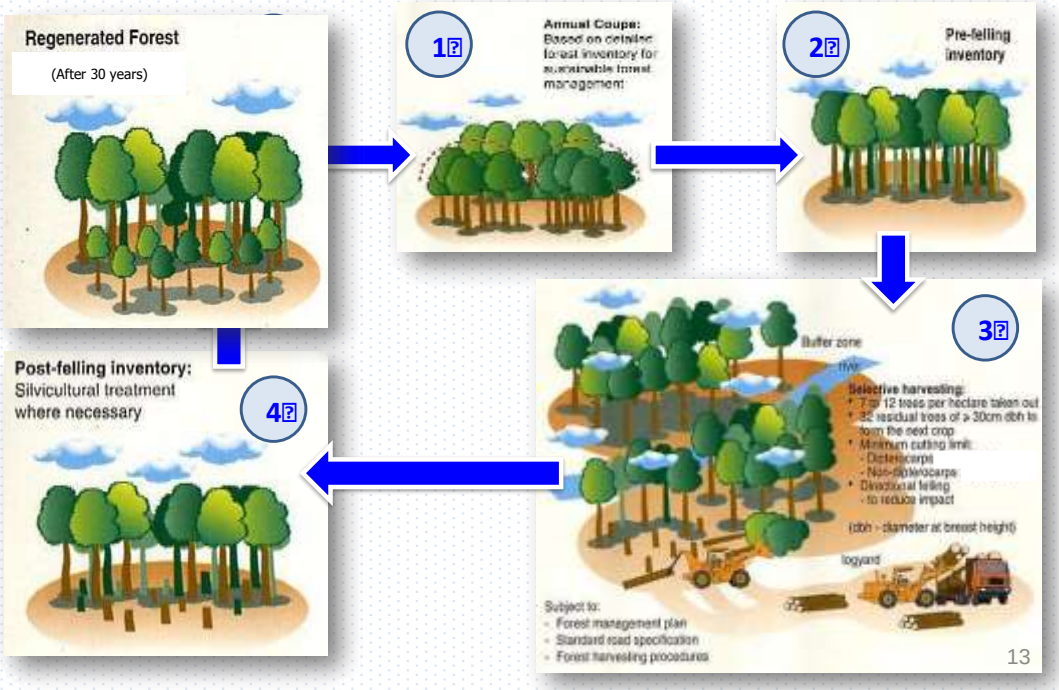
CLASSIFICATION OF PRFs INTO FUNCTIONAL CLASSES

Section 10, NFA 1984, allows PRFs to be classified into any of the following twelve (12) functional classes to promote sustainable forest management taking into account the multiple roles/uses of forest:

1. Timber Production Forest under sustained yield
2. Soil Protection Forest
3. Soil Reclamation Forest
4. Flood Control Forest
5. Water Catchment Forest
6. Forest Sanctuary for Wildlife
7. Virgin Jungle Reserves
8. Amenity Forest
9. Education Forest
10. Research Forest
11. Forest for Federal purposes
12. Forest State Parks

11

SELECTIVE MANAGEMENT SYSTEM



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Malaysian Timber Certification Scheme

MTCC was established in October 1998 as an independent organisation to develop and operate the Malaysian Timber Certification Scheme (MTCS). As a voluntary national scheme, the MTCS provides for independent assessment of forest management practices, to ensure the sustainable management of Malaysia's natural forest and forest plantations, as well as to meet the demand for certified timber products.

The MTCS has been endorsed by the Programme for the Endorsement of Forest Certification (PEFC) schemes, the largest forest certification programme, representing more than 200 million ha of certified forests worldwide. The MTCS is also the first tropical timber certification scheme in the Asia Pacific region to be endorsed by the PEFC.

MTCC started operating its timber certification programme known as the Malaysian Timber Certification Scheme (MTCS) in October 2001 which comprises two components as follows:

Forest Management Certification

This is a process of third party audit of the forest management practices of natural forest in a Forest Management Unit (FMU) or forest plantation in a Forest Plantation Management Unit (FPMU) to assess compliance with the requirements of a prescribed standard, leading to an award of a Certificate for Forest Management or Certificate for Forest Plantation Management under the MTCS.

The standard used for certification of natural forest is the Malaysian Criteria and Indicators for Forest Management Certification or in short MC&I (2002). The MC&I (2002) has undergone a review process and the revised standard, Malaysian Criteria and Indicators for Forest Management Certification (Natural Forest) or in short MC&I (Natural Forest) has come into force on 1 July 2012 and will become mandatory beginning 1 June 2013. All applications for forest management certification are receive and process by certification bodies (CBs).

Peer Review

Peer review is an integral part of the decision making process in forest management certification. A peer reviewer is responsible to provide a second independent expert opinion on the level of a compliance of the forest management unit by assessing the reports prepared by a certification body against the requirements of the standard.

Table 9: Total Permanent Reserved Forest for Malaysia

MALAYSIA				
Permanent Reserved Forest (million ha)				
Year	Inland/Hill	Peat Swamp	Mangrove	Total
1990	10.91	1.04	0.47	12.42
1991	10.94	1.05	0.47	12.46
1992	10.94	1.01	0.46	12.41
1993	10.92	0.99	0.45	12.36
1994	11.15	0.96	0.44	12.55
1995	11.11	0.94	0.44	12.49
1996	11.12	0.83	0.44	12.39
1997	11.27	0.86	0.44	12.57
1998	11.14	0.84	0.44	12.42
1999	11.19	0.88	0.44	12.51
2000	11.13	0.78	0.44	12.35
2001	11.12	0.69	0.44	12.25
2002	11.87	0.70	0.44	13.01
2003	11.83	0.70	0.43	12.96
2004	11.82	0.68	0.43	12.92
2005	11.82	0.65	0.44	12.91
2006	11.81	0.66	0.45	12.92
2007	11.70	0.67	0.44	12.81
2008	11.92	0.66	0.44	13.03
2009	11.69	0.49	0.43	12.61
2010	11.66	0.50	0.43	12.59
2011	11.52	0.50	0.55	12.57
2012	11.42	0.51	0.43	12.36

Source : Annual Report Forest Department Sabah
Annual Forest Department Sarawak
Annual Report Forest Department Peninsular Malaysia
Environmnetal Compendium Statistic, Department of Statistic, Malaysia

These figures have been adpated following varification through the gazzete order and geospatial images

Annex 4

Table 20: Total Commercial Harvest for Malaysia

Malaysia	
Year	Commercial harvest (million m^3)
1990	40.10
1991	39.86
1992	43.51
1993	37.27
1994	35.67
1995	31.84
1996	30.09
1997	31.17
1998	21.70
1999	21.83
2000	23.07
2001	18.92
2002	21.05
2003	21.53
2004	22.04
2005	22.36
2006	21.89
2007	22.05
2008	20.26
2009	18.31
2010	17.80
2011	16.08
2012	15.89

Source : MPIC -Statistics on Commodities
FDPM – Forestry Statistics Peninsular Malaysia

Annex 5

Table 21: Total removal by sinks and emissions from Sustainable management of forest

Year	Uptake (million ton CO_2)	Harvest (million ton CO_2)
1990	-278.2	112.8
1991	-278.7	112.1
1992	-277.3	122.4
1993	-276.2	104.8
1994	-279.8	100.3
1995	-278.5	89.5
1996	-276.3	84.6
1997	-280.1	87.6
1998	-277.0	61.0
1999	-279.4	61.4
2000	-275.9	64.9
2001	-273.9	53.2
2002	-288.5	59.2
2003	-287.4	60.5
2004	-286.4	62.0
2005	-286.5	62.9
2006	-286.6	61.6
2007	-284.0	62.0
2008	-289.5	57.0
2009	-280.4	51.5
2010	-279.9	50.1
2011	-277.3	45.0