KUMPULAN PENGURUSAN KAYU KAYAN TERENGGANU SDN BHD (KPKKT)

Management Plan
For The High Conservation Value Forests (HCVFs) Within Dungun Timber Complex (DTC), Terengganu, Malaysia (2018– 2027) (rev. #1)

By

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Bukit Besi, Malaysia
08 December, 2018
(revised on 07 Jan. 2020)

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Executive Summary

A High Conservation Value (HCV) area can be defined as a natural habitat that carries certain unique characteristics or delivers functions which, in their own right, could be regarded as having such outstanding value and significance, or of critical importance, that, the continued existence, management and protection of such natural habitat through to the fuure are warranted, or even critical and therefore fully justified. In this context, a HCV Forest (HCVF) therefore is simply an area of forest or an ecosystem where these special values, products and services are present, and worth to be appropriately and soundly managed and conserved in perpetuity in such a way that such values and functions are allowed to persist, continue, or even enhanced. For a forest concession as large as Dungun Timber Complex (DTC) which is currently under the management of Kumpulan Pengurusan Kayu Kayan Terengganu Sdn Bhd (KPKKT), and covers a total area of 106,697-ha of rich and biologically-diverse tropical rain forest (TRF) on a variety of landscapes; the presence of multitudes of HCV types in it is only to be expected and should come as no surprise. But for reasons of practicality and due to limited resources and capability at the disposal of KPKKT, only very few of these HCVFs could be specifically set aside and systematically protected and described in this Plan and managed as such.

Just like the earlier Plan which covered the five-year period 2013 – 2017, the present, revised HCVF Management Plan outlines the strategies, plan, and line of actions toward the effective management and protection of the identified HCVFs within DTC during a longer period of ten

years: 2018 – 2027. In essence, this document serves as a continuation to the first Plan. As responsible managers, KPKKT continue to demonstrate its competence and tenacity in managing DTC along with all the various categories of forest in it, *i.e*. based on the principle of sustainable forest management (SFM). Consequently this single-minded commitment paid off accordingly when DTC was successfully certified (for the first time) as a "well-managed forest" by the internationally-renown Forest Stewardship Council (FSC) in 2008 which was then followed up by two successive certifications during the audits conducted in 2012 nd 2018. As a matter of policy, KPKKT still, up till this day, maintains its deep interest and commitment with FSC and to get DTC to be certified as a well-managed forest by abiding with all FSC's Principles and Criteria (P& C) of Forest Stewardship. The latter actually comprises a total of 9 Principles and 56 Criteria which cover a broad range of issues pertaining to the effective and sound management, economic, technical, human resource, environmental, social etc. governance of the resource at hands. Of these, Principle No. 9 for instance implicitly implies the need to prepare a management plan for the managed HCVF network within DTC which would serve as a guide for the effective management and conservation of the said resources.

Covering a ten-year period of 2018 – 2027, this Plan was prepared following the general principles and guidelines as laid out by the Forestry Department of Peninsular Malaysia (FDPM) as well as those of the WWF-Malaysia "National Toolkit" for HCVF, *i.e*. within the bounds of KPKKT's existing limited resources, capacity, capability and expertise. In this edition of the HCVF Management Plan, some snapshots of the findings from field assessments and monitoring of the existing HCVFs within DTC conducted in collaboration with the Forest Research Institute of Malaysia (FRIM) and the Malaysian branch of the World Wildlife Fund

(WWF – Malaysia), as well as results from the series of discussions held with concerned stakeholders are incorporated.

Needless to say, as a living document, this HCVF Management Plan is subject to further refinement through continuous periodic reviews and updating as and when necessary and expedient by KPKKT in collaboration with concerned stakeholders. KPKKT does however acknowledge that the 106,697-ha DTC that it currently manages since more than 40 years now, surely contains innumerable HCVs that are, and should be identified, studied, documented and sustainably managed for the service of mankind in perpetuity. KPKKT's long-standing policy in this regard is to continue to further explore, study and understand the said forest resources, values and environment in a continuous effort to be adaptive and enhance the company's professionalism and credibility. In this context "Adaptive management" refers to a planned and systematic process for continuously improving the management practices on the resources, their biodiversity and environment by learning about the outcomes of such practices. Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project. As a matter of fact the concepts of SFM and the Malaysian Selective Management System (SMS) are in themselves adaptive and take into consideration the local site specific peculiarities as well as constraints in their planning and field implementation as called for by the Forest Stewardship Council (FSC)'s P&C for Forest Sewardship. Our HCVF areas are to be managed in tandem with the rest of the concession forest, as laid out, *albeit* in generic terms, in this HCVF Management Plan document. The existing two HCVF areas being described in this report are:

1. The Keruing sarawak (*Dipterocarpus sarawakensis*) HCVF plot in Compartment nos. 31 & 34 of Jerangau PRF, involving a total area of 61ha, and
2. The Community Water Catchment HCVF Area of Compartment no. 52 Jengai PRF, from where the nearby residents of Pasir Raja village draw their supply of freshwater from the forest. This HCVF covers a total area of 24 ha.

Other HCVF areas will be accordingly added to the existing list over time, as and when appropriate, so that the list could be expanded to cover as many as possible of the six categories of HCVFs as defined by FSC, and to eventually fulfil FSC's target to have at least 10% of the area of DTC set aside and declared as HCVF.

A typical view inside the tropical rain forest of Malaysia.

Acknowledgement

On behalf of Golden Pharos Berhad (GPB), the parent company of KPKKT, I am pleased to acknowledge and extend my heartful thanks and deep gratitude to the following parties and individuals for their invaluable contributions and inputs to this second HCVF Management Plan for Dungun Timber Complex (DTC) which covers a 10-year period 2018 – 2027.

- Terengganu State Forestry Department (TSFD)
- The management and staff of Kumpulan Pengurusan Kayu Kayan Terengganu Sdn Bhd (KPKKT)
- Forest Research Institute of Malaysia (FRIM)
- The World Wildlife Fund (WWF) Malaysia
- The Malaysian Nature Society (MNS)
- The various reviewers and stakeholders who had generously contributed their comments and ideas toward this document
- To all those who were involved either directly or indirectly in the project.

I am happy and proud to note that DTC had been successfully re-certified for the second time as a "well-managed forest" by the internationally-renown Forest Stewardship Council (FSC) following their re-certificartion audit in 2018. This only goes to show KPKKT's successful compliance and commitment to all of FSC's Principles and Criteria of Forest Stewardship since more than 40 years ago. Our policy has been one in which we are committed to the principle and practice of Sustainable Forest Management (SFM) as well as FSC P & C of Forest Stewardship, and a continued certification of our DTC under FSC's stringent standards had enabled us to uplift our professionalism and significantly improve our performance towards achieving this objective.

Chief Executive Officer
Golden Pharos Berhad January 7th 2020.

Abbreviations

CITES	Convention on International Trade of Endangered Species of Flora and Fauna
Compt., C	Compartment
DTC	Dungun Timber Complex
DTCP	Department of Town and Country Planning
EMP	Environmental Management Plan
FDPM	Forestry Department of Peninsular Malaysia (Headquarters)
FELDA	Federal Land Development Authority
FR	Forest Reserve
FRIM	Forest Research Institute of Malaysia
FSC	Forest Stewardship Council, Asociación Civil
GPB	Golden Pharos Berhad
HCV	High Conservation Value
HCVF	High Conservation Value Forest
IUCN	International Union for the Conservation of Nature
JaKOA	*Jabatan Kemajuan Orang Asli* (Orang Asli Development Department)
KPKKT	Kumpulan Pengurusan Kayu Kayan Terengganu Sdn Bhd (Terengganu Forest Management Group Pte Ltd)
LAC	Limit(s) of Acceptable Change
MC&I	Malaysian Criteria and Indicators and Standard of Perfomance (of Sustainable Forest Management)
MMD	Malaysian Meteorological Department
NTFP	Non-Timber Forest Produce
PERHILITAN	Department of Wildlife and National Parks
PESAMA	Pesama Timber Corporation Sdn Bhd
P&C	Principles and Criteria
PRF	Permanent Reserved Forest
RISDA	Rubber Industry Smallholders Development Authority
RTP	Restricted Timber Production (Area)
SFM	Sustainable Forest Management
SMS	Selective Management System
SOP	Standard Operating Procedure
SPAN	Suruhanjaya Perbekalan Air Negara (National Commission for Water Supplies)
STD	Standard
STPA	Sustainable Timber Production Area
TP	Timber Production (Area)
TRF	Tropical Rain Forest
TSFD/ JPNT	Terengganu State Forestry Department
UMT	Universiti Malaysia Terengganu
UPM	Universiti Putra Malaysia
WWF	World Wide Fund for Nature

Management Plan

For The High Conservation Value Forests (HCVF) Within Dungun Timber Complex (DTC), KPKKT, Terengganu, Malaysia for the Period 2018– 2022 (Rev.#1)

1.0 Introduction

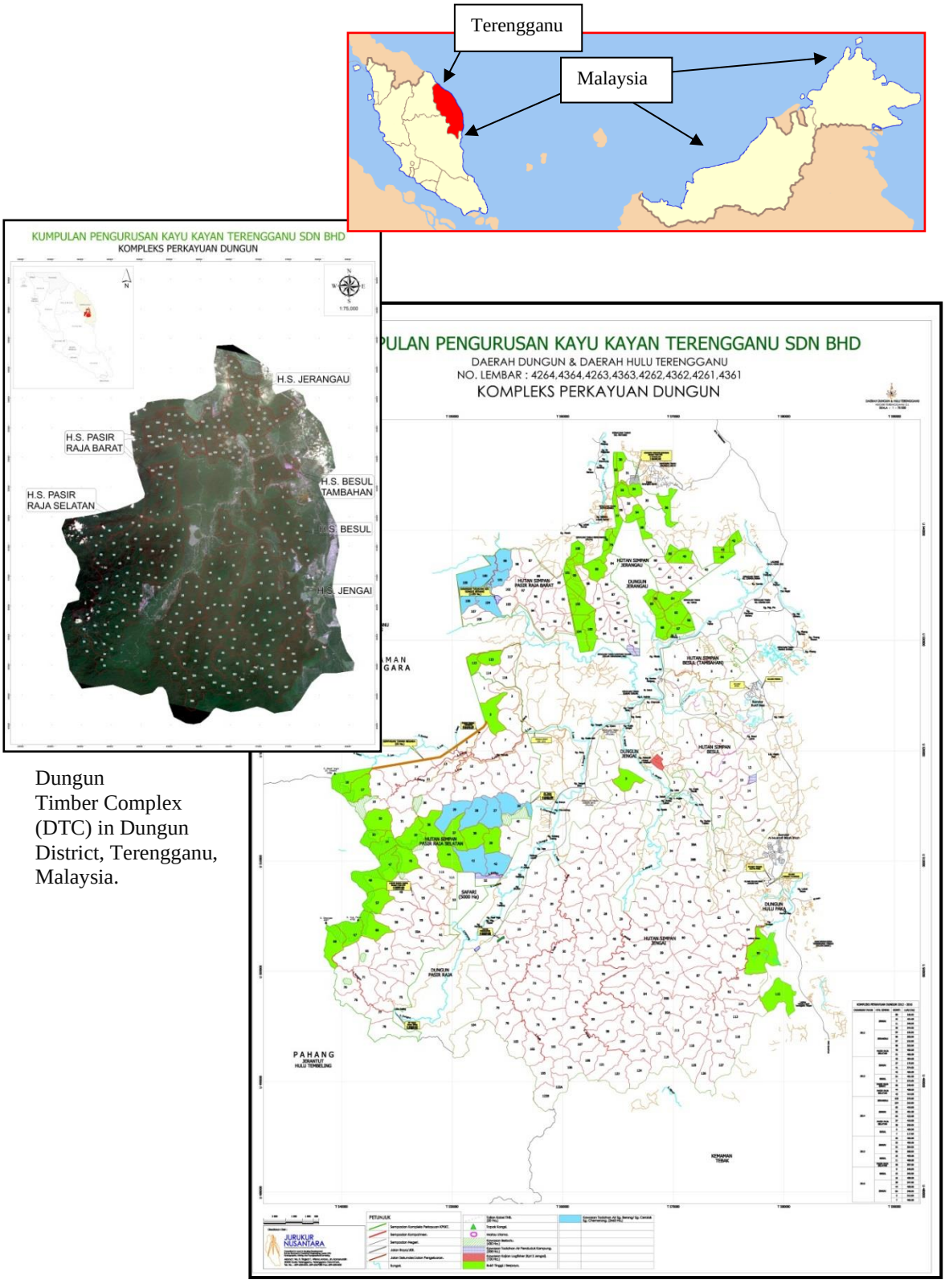
1.1 Physical, Biological and Social Environments

Located about 120km to southwest of the state capital of Kuala Terengganu (KT), in the State of Terengganu, Malaysia between latitude 3˚ 53" - 5˚ 51" North and longitudes 103˚ 30" - 102˚ 23" East (Fig. 1), and covering a total area of approx. 108,900ha (approx. 268,980acres), the forest concession Dungun Timber Complex (DTC) has been continuously managed by Kumpulan Pengurusan Kayu Kayan Terengganu Sdn Bhd (KPKKT) since 1983 from its base in Bukit Besi town which is in turn situated some 75km to the south of KT city, and about 32km to the west of Dungun town, in the Forest District of South Terengganu. The whole of DTC comprises the climatic climax natural moist Tropical Rain Forest (TRF) formations consisting of a series of **(1)** lowland mixed dipterocarp forests; **(2)** hill mixed dipterocarp forests; and **(3)** upper hill dipterocarp forests, and identified and distributed as follows:

1. Kapur forests on low hills, concentrated along the eastern fringes of DTC,
2. Meranti/ Keruing forests, on the western part of Jerangau PRF, southern part of Besul PRF and the western part of Jengai PRF
3. Meranti/ Seraya forests which cover large parts of Jengai PRF, the whole of Pasir Raja Selatan PRF and Pasir Raja Barat PRF.

Geologically, the whole region is underlain with a mixture of undifferentiated granitic rocks and shales, predominant with sandstones, mudstones and siltstones from the Carboniferous (most prevalent) and Permian ages as well as some minor pockets of gravel, sand, and clayey sandstone and siltstones. Soils of sedimentary origin which are frequently associated with the granite-derived soils are mainly found on the foothills. In terms of site degradation risk, some 60% of the Project Area lies on gentle to moderately steep (0^o - 20^o) topography, 30% on steep (21^o - 30^o), and 10% are on very or extremely steep (over 30^o) slopes. In terms of drainage, Sungai Dungun which originates in the eastern side of the Titiwangsa Main Range at the south-western border of Terengganu virtually cuts the bell-shaped concession into two halves, east and west (Fig. 2). On the eastern side are Besul Tambahan PRF, Besul PRF and Jengai PRF, whereas on the western half are Jerangau PRF, Pasir Raja West PRF and Pasir Raja South PRF. Each of these six PRFs constitutes its own catchment with a majority of the rivers in the individual catchment flow into Sungai Dungun before draining into the South China Sea at Dungun town.

Climate-wise, DTC forest area lies within the tropical monsoon climate belt which is characterised by high temperatures (24^o – 30^oC), high humidity (70% - 98%) and an average rainfall of more than 4,000mm per year. The wet monsoon season usually occurs from November to January during which period logging operations effectively halt. Rainfall in the Project Area is brought about by two monsoons: Northeast monsoon during October – February and Southwest monsoon during April – July, but peaks during the northeast monsoon, in November and December.



Dungun Timber Complex (DTC) in Dungun District, Terengganu, Malaysia.

Fig. 1.

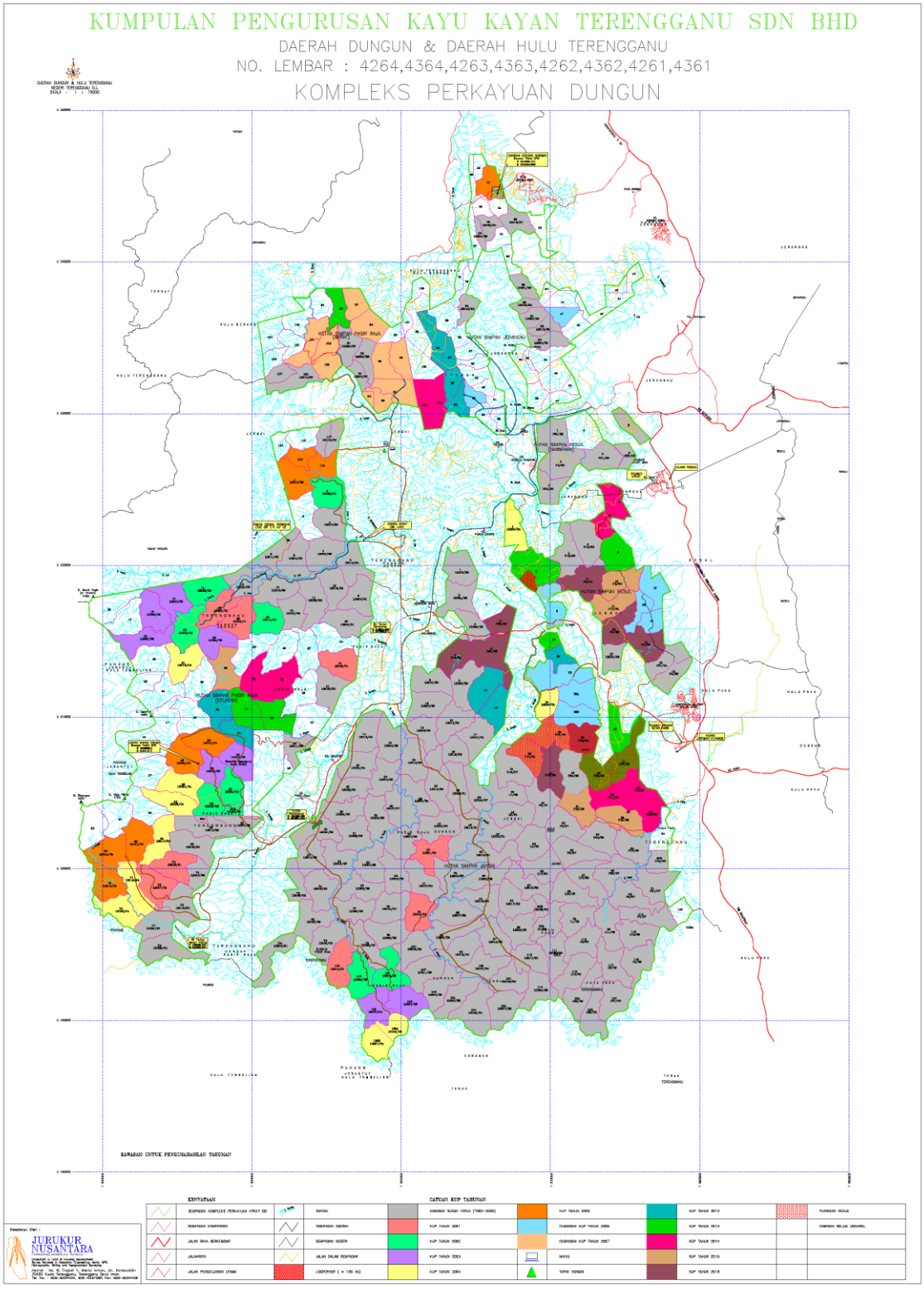


Fig. 2. Map of DTC (2018).

The general composition of the natural TRF in DTC is made up of the two main groups of tree species: the Dipterocarps and the non-Dipterocarps. Among the Dipterocarps, the following tree species were found: Meranti *(Shorea species, e.g.* incl. Meranti seraya (*Shorea curtisii),* Meranti sarang punai (S. *parvifolia),* Meranti rambai daun, Meranti langgung, Meranti tembaga (S. *leprosula),* and Damar hitam), Keruing *(Dipterocapus species),* Balau (Heavy hardwood *Shorea* species, *e.g.* Balau laut merah), Merawan (*Hopea spp.),* Mersawa (*Anisoptera spp.),* and Chengal (*Neobalanocarpus heimii).* Among the non- Dipterocarps, the following families and species dominate the tree flora: Kelat (*Syzygium species),* Medang *(Lauraceae),* Kempas *(Kompassia malaccensis),* Merbau (*Intsia palembanica),* Sepetir (*Sindora* spp.), Rengas (*Gluta* & *Melanochylla* species), Bitis, Machang (*Mangifera sp.),* Mengkulang (*Heritiera sp.),* Jelutong (*Dyera costulata),* Durian (*Durio s*pp.), Bintangor (*Callophylum inophyllum),* Kembang semangkuk (*Scaphium spp*.), Melunak (*Pentacme spp.),* and Mahang *(Macaranga spp.).*

2.0 The Practice of Sustainable Forest Management (SFM) by KPKKT at Dungun Timber Complex (DTC)

It is a fact that Dungun Timber Complex (DTC) represents a fine example and proof that the sustainable management and conservation of our tropical rain forest (TRF) is entirely possible and not a myth. In DTC, the natural TRF ecosystem and timber stands are managed following the dictates of the conservation-oriented Malaysian Selective Management System (SMS) which calls for rotation cycles of between 30 -40 years whereby only trees reaching certain

minimum diameter felling sizes are selectively cut and removed *albeit* under strict guidelines and supervision of the relevant authorities namely the Terengganu State Forest Department (TSFD). To affect this, forest compartments under management are systematically inventorised and, based on the data collected, a range of management options are caloculated and proposed, incorporating the combination of minimum diameter felling limit regimes for the two major timber groups of dipterocarps and non-dipterocarps. In this way an area-wide control through a meticulous manipulation of the timber stand was made possible and the forest manager's silvicultural objectives could be realised, whereby the selectively removed larger trees pave the way for smaller-sized potential crop trees (PCTs) to grow through time in the artificially created forest gaps and growing spaces thus created. Under the current SMS practices, a growing period of about 30 – 40 years is advocated for the PCTs within the residual stand to grow until they reach the next felling rotation and become ready for the next round of selective harvesting.

At current going KPKKT is already well into the second rotation of SMS which sees forest compartments which had been logged at the beginning of the first rotation during the early 1980s are now being primed for the second round of selective harvesting, much in keeping with the principle of sustainable forest management (SFM) and the environmental management and conservation standards as laid out by the relevant authorities, namely TSFD and the Department of Environment, Terengganu as well as global forest certification standards. In a nutshell, the KPKKT's short and long term objectives and strategies are one in which the sustainability of the natural resource and the protection of the natural environment reign supreme and can be summarised in the following points:

1. Strict adherence and implementation of the long term Forest Management Plan (FMP) and guidance of Terengganu State Forestry Department (TSFD).
2. Implementation of RIL (Reduced Impact Logging) practices with emphasis on protecting residual stands and the ecological and human environments as well as all high conservation value forests (HCVFs), through selective and directional feling.
3. Provision of necessary training and mentoring programmes to all staff and contractors.
4. Periodic, but continuous engagement with local stakeholders and forest-dependent communities.

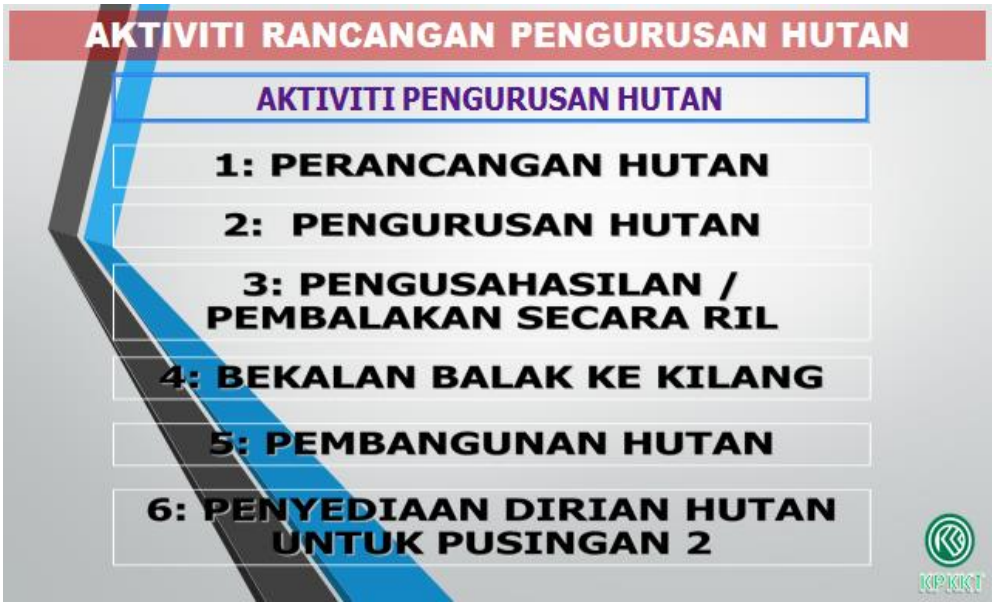
DTC forests are identified into several categories according to their functions based on their locations and characteristics as defined in NFA (National Forest Act) 1993 (**Table 1**). As can be seen from Table 1, only around 67% of the total area of DTC has been dedicated as "Sustainable (i.e. Selective) Timber Production" area whilst the rest are set aside for various protection and conservation purposes. The management of the STP area follows the general line of operations as summarised in **Fig. 3**.

Table 1.

Forest Functions in DTC in relation to the Functions Defined in the NFA1993.

Type of Forest Functional Classification/ Zonation		**% DTC Area**
Classification According to National Forestry Act 1993	**Forest Zonation in Dungun Timber Complex (DTC)**	
1. Sustainable Timber Production	Sustainable Timber Production (STP)	67%
2. Soil protection	Soil Protection (SP)	14%
	Soil Conservation (SC)	37%
3. Flood control	Flood Control Conservation (WFC)	-
4. Water catchment	Water Catchment Conservation (WCC)	37%
	Riparian Buffer Protection (WBP/ HCVF)	18%
5. Wildlife Sanctuary	Rare Ecosystem Protection (HCVF)	-
6. Virgin Jungle Reserve	Protected Area Buffer (HCVF)	1%
7. Amenity	e.g. Chemerong Waterfall	<1%
8. Research	e.g Compts. 51 & 54 of Jengai FR.	<1%
9. Education	e.g. Compartment 52 of Jengai FR.	<1%
10. Forest for federal purposes	-	-

Fig. 3. General Line of Operations in Sustainable Timber Producton Area in DTC.



3.0 The Conservation-Oriented Malaysian Selective Management System (SMS) and The High Conservation Value Forests (HCVFs) in DTC

As mentioned in Table 1, out of the total of 106,697 ha of DTC concession area, only 67% are dedicated as "Sustainable Timber Production Area (STPA)" through selective felling, whle the rest have been set aside for various conservation and protection purposes thereby setting up a balance in land use and wise and sustainable management of the natural resoruces. The non-STPA area include forest ecosystems which have been identified for soil protection, flood mitigation, riparian buffer protection, rare ecosystem protection, freshwater supply, amenity, research and development (R & D), education and virgin jungle reserves (VJRs). The latter category includes areas known as having high conservation value or "High Conservation Value Forests (HCVFs)". Going by its definition and for the case of DTC, a HCVF is an area of forest that possesses one or more high conservation values, i.e. a natural habitat that carries unique attributes or characteristics or delivers functions and services which, in their own right, could be treated as of such outstanding value and significance, or of critical importance, that, the continued existence, in a well-protected condition, of such area in perpetuity is warranted, and fully justified. In other words, an HCVF is simply an area of forest or an ecosystem where these special attributes are present, and worth to be managed and conserved accordingly in perpetuity with the view to preserve the said values, services and functions and, if possible enhance them.

For a forest concession as large as Dungun Timber Complex (DTC) which covers rich and biologically-diverse tropical rain forest (TRF) on a variety of landscapes; the presence of

multitudes of HCVF types in it is only to be expected and comes as no surprise. But for reasons of practicality and due to limited resources and capability at the disposal of KPKKT, only very few of these HCVFs could be set aside and described in this Plan and managed as such.

3.1 Selective Felling as a Form of Silvicultural Treatment for the Sustainable Timber Production Area (STPA).

The selective cutting and removal of trees in the working area is conducted judiciously with the view to protect the standing forest ecosystem and water resources by observing all the pertaining rules and regulations as specified under the logging license and established certification standards. The series of activities and standard operation procedures (S.O.P.s) form parts of the Malaysian Selective Management System (SMS) and can be summarised as follows:

3.1.1 Pre-Felling Operations

(i) Boundary Demarcation

Boundary demarcation involves surveying and marking on the ground the external boundary of the working area and buffer zones which must be completed well before the start of any field operations.

(ii) Pre-Felling Inventory

Data collected from the Pre-Felling Inventory are used to determine the set of minimum DBH cutting limits for dipterocarps and non-dipterocarp tree species as well as Chengal which is always accorded a higher minimum DBH cutting limits due to its high market value.

(iii) Tree Marking (TM)

TM operation is done on trees above the minimum DBH cutting limits which are marked in conformity with the reduced impact logging (RIL) protocols and chain-of-custody certification processes. Certain trees of special significance such as mother trees, fruit trees, nesting trees, protection trees and trees standing within the riparian buffer zones are however spared from logging and conserved for obvious reasons, regardless of their species and size.

(iv) Road and Bridge Construction and Maintenance

The designs and construction of of the road system follow the specifications in the Forestry Department guidelines, namely the Forest Road Specification, 2010. The specifications guide the construction of forest roads, skid trails, cross drains, side drains, culverts, sumps etc.

3.1.2 Selective Felling Operations

(i) Directional Felling of Trees and Bucking

Trees are felled into the prescribed felling direction while at all times observing all the precautionary and safety measures to the workers as well as the surrounding vegetation and ecosystem. No tree shall be felled into the buffer zones or into rivers, and no felling activity shall be carried out during rainy days or windy times. The instruction on felling direction also is to avoid hitting and injuring potential crop trees (PCTs) as well as mother trees, fruit trees and protection trees.

(ii) Timber Haulage and Transportation

The timber is subsequently pulled by a cable withdrawn from a bulldozer sitting on the skid trail. Timber harvesting, haulage and transportation are done by contractors under close supervision by staff of KPKKT.

3.1.3 Post-Felling Operation

(i) Area Inspection and Closing Report (CR)

Upon completion of logging in a forest compartment, a closing report is prepared, accounting for the number of trees felled, the number of trees marked to be felled but not felled, the volumes of timber wastages, damage inflicted on the residual trees and regeneration as well as the buffer zones, rivers and general ecosystem. Findings recorded on the CR are used as a basis for computing the penalty to be levied to KPKKT as the concession holder and manager of DTC.

(ii) Area Rehabilitation and Timber Stand Improvement (TSI)

Under normal circumstance, a post-felling inventory operation is conducted at 2 – 5 years after completion of logging, in order to assess the regeneration status of the residual stand and to help decide on the type of timber stand improvement (TSI) operations for the selectively-logged stands, e.g. the "open-area planting" (*Tanaman Kawasan Lapang* – TKL) by using fast-growing indigenous species.

3.2 HCVs and HCVFs for DTC

The High Conservation Value Forest (HCVF) concept constitutes Principle No. 9 of FSC's Standard. It focuses on the environmental, social and/ or cultural values that make a particular forest area unique and special, and of outstanding significance, hence must be protected and preserved in perpetuity. The idea is to soundly manage and conserve those forests in a manner that would enable the proper maintenance and effective enhancement of the identified High

Conservation Values (HCVs) in perpetuity. According to FSC, HCVFs are those forest ecosystems that possess one or more of the following attributes:

1. Forest areas containing globally, regionally or nationally significant:
    i. concentrations of biodiversity values (*e.g.*, endemism, endangered species, refugia); and/or
    ii. large landscape level forests, contained within, or containing the management unit, where viable populations of most (if not all) naturally occurring species exist in natural patterns of distribution and abundance.
2. Forest areas that are in or contain rare, threatened or endangered ecosystems.
3. Forest areas that provide basic services in critical situations (*e.g.*, watershed protection, erosion control).
4. Forest areas fundamental to meeting basic needs of local communities (*e.g.*, subsistence, health) and/or critical to local communities' traditional cultural identity identified in consultation and cooperation with such local communities.

By identifying and studying these key attributes and values, it would be possible to strategise wise and rational management approaches for these forests for the purpose of protecting the said services and values. FSC's **Principle 9** requires that management activities in HCVFs "maintain and enhance the attributes which define such forests". Specifically, Principle 9 contains four criteria as follows:

- **Criterion 9.1** requires an assessment to determine the presence of attributes consistent with HCVFs.
- **Criterion 9.2** guides certifiers on the consultative portion of the certification

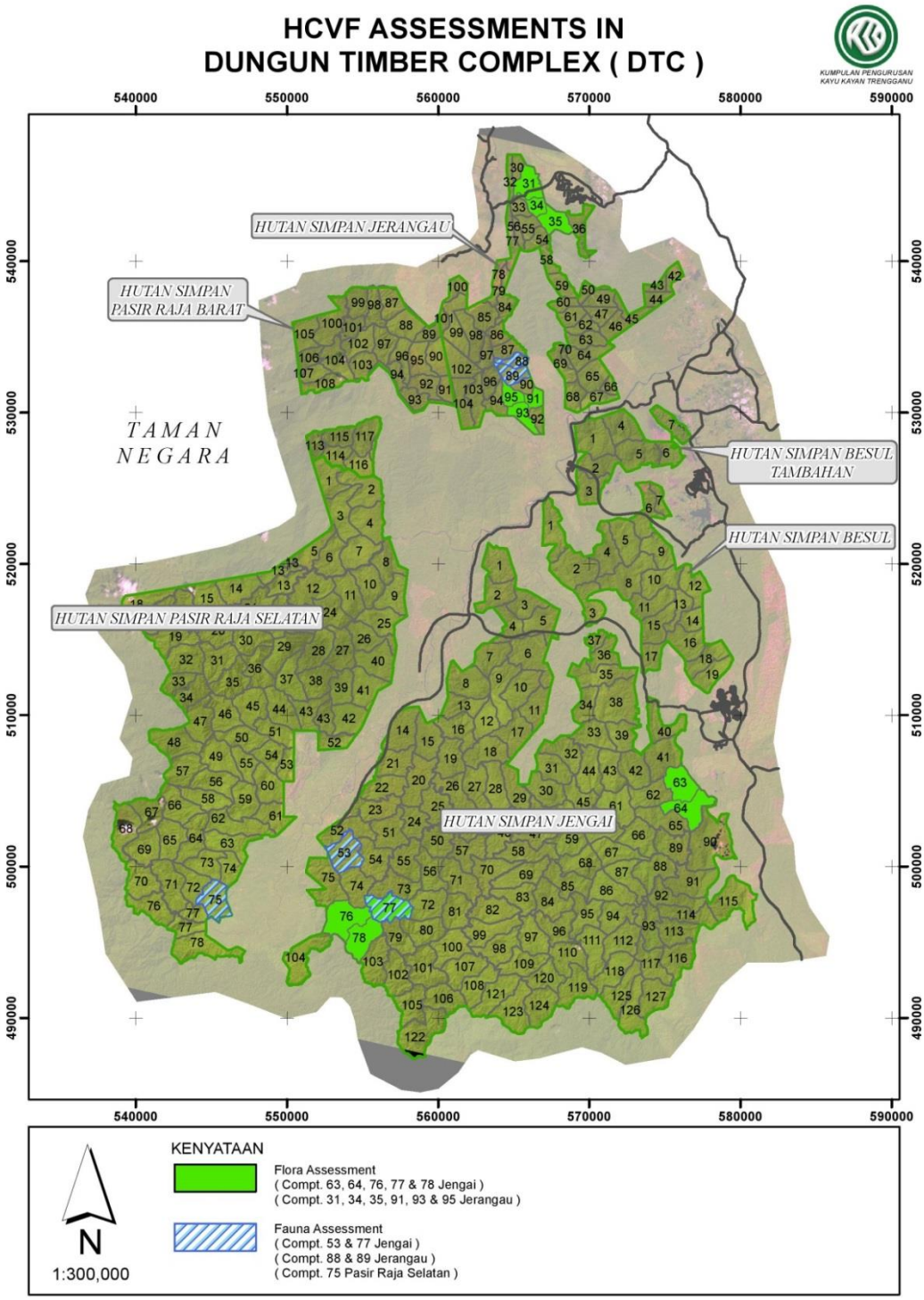
process.

- **Criterion 9.3** requires a precautionary level of management and activities that ensure the maintenance or enhancement of High Conservation Values.
- **Criterion 9.4** requires monitoring the effectiveness of the management and activities implemented.

Much of KPKKT's efforts in these areas thus far have been conducted in close collaboration with institutions such as WWF-Malaysia and the Forest Research Institute of Malaysia (FRIM). Several local institutions of higher learning such as UPM and UMT had also shown their interest to participate *albeit* on ocassional basis and in smaller scale. As part of its continuous management of DTC, assessments of the concession's flora and fauna resources have been conducted on a continuous basis, during Pre-Felling and other surveys. However, more focused and directed investigations were conducted on regular basis since 2009, *i.e*. in collaboration with FRIM and WWF-Malaysia. These biodiversity surveys assessed the High Conservation Value Forest (HCVF) areas in the PRFs of Jerangau, Pasir Raja, Jengai and Besul following the procedure recommended in **Fig. 3**. Based on the assessments and for reasons of practicality, resource availability, managerial expediency and the state of expertise at the disposal of KPKKT, the following two areas have been narrowed down into and preliminarily recommended to be set aside as HCVF areas for DTC (**Fig. 4**):

1) The rare Keruing sarawak (*Dipterocarpus sarawakensis*) stands in Jerangau PRF covering a total area of 61ha ;
2) The Water Catchment Forest of Compt. No. 52 of Jengai PRF, covering a total area of 24ha.

Fig. 4.


HCVF ASSESSMENTS IN
DUNGUN TIMBER COMPLEX (DTC)
KUMPULAN PENGURUSAN KAYU KAYAN TRENGGANU
HUTAN SIMPAN JERANGAU
HUTAN SIMPAN PASIR RAJA BARAT
TAMAN NEGARA
HUTAN SIMPAN BESUL TAMBAHAN
HUTAN SIMPAN BESUL
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(Compt. 31, 34, 35, 91, 93 & 95 Jerangau)
Fauna Assessment
(Compt. 53 & 77 Jengai)
(Compt. 88 & 89 Jerangau)
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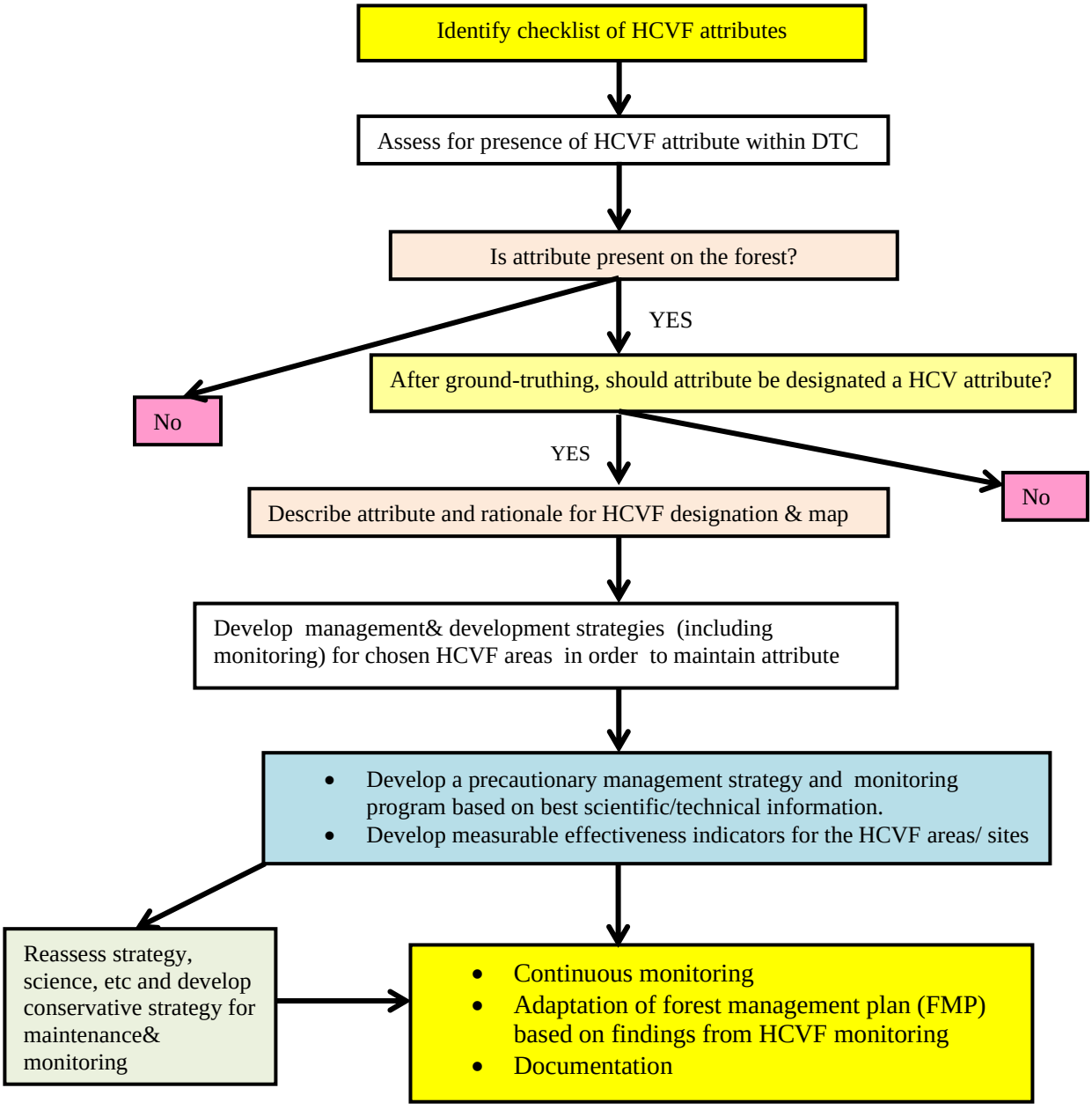
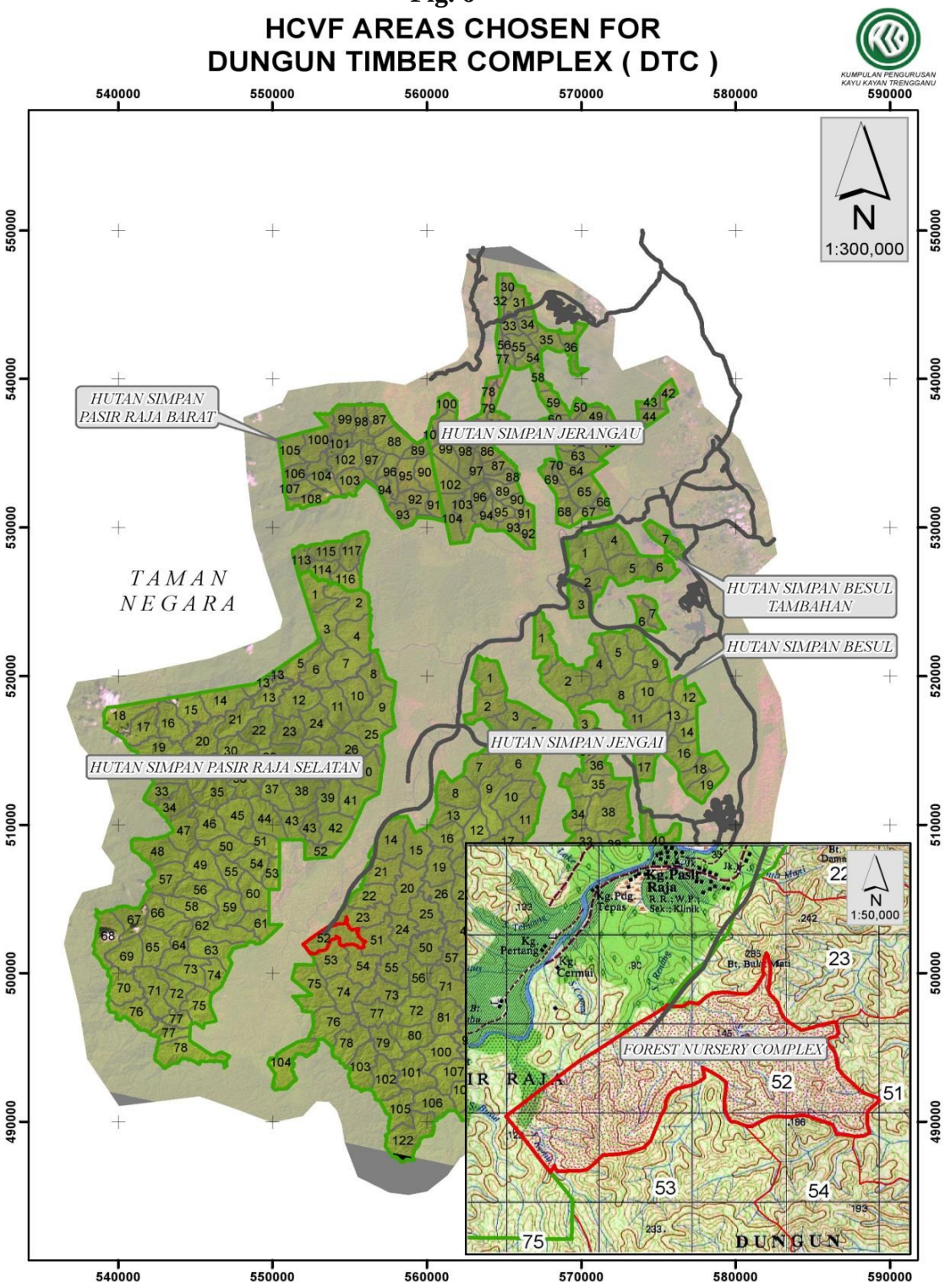
Fig. 5.
Flow Chart for Assessing and Establishing HCVF in DTC to Meet FSC's P9 Requirements



Note: Process revised/reviewed annually or periodically, whenever new information on attributes comes to light.

Fig. 6


HCVF AREAS CHOSEN FOR
DUNGUN TIMBER COMPLEX (DTC)
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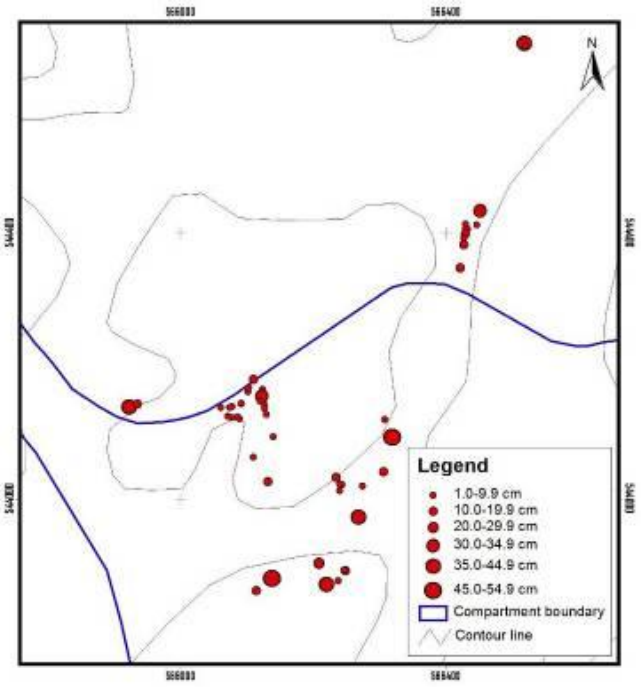


5(a) Keruing sarawak HCVF plot

5(b) Keruing Sarawak flowers

Figs 7(a) & (b): Keruing sarawak (*Dipterocarpus sarawakensis*) HCVF Plot at Comp. 31 & 34 Jerangau PRF. Source: Chua & Wong (2013).

Figure 8: Community Water Catchment HCVF at Compartment 52, Jengai PRF

Fig. 9
Community Water Catchment HCVF in Comp. 52, Jengai PRF Serving Pasir Raja Village.

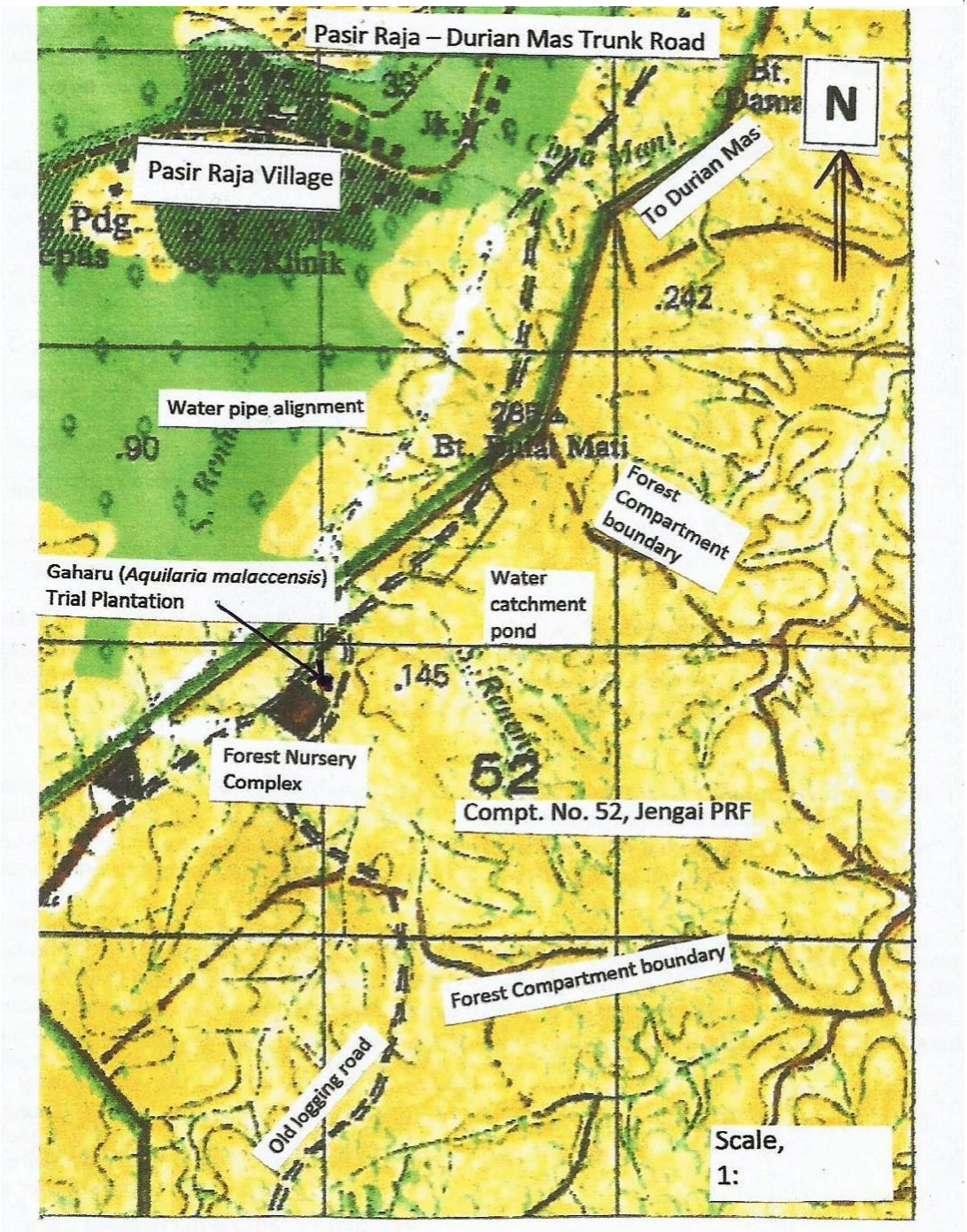


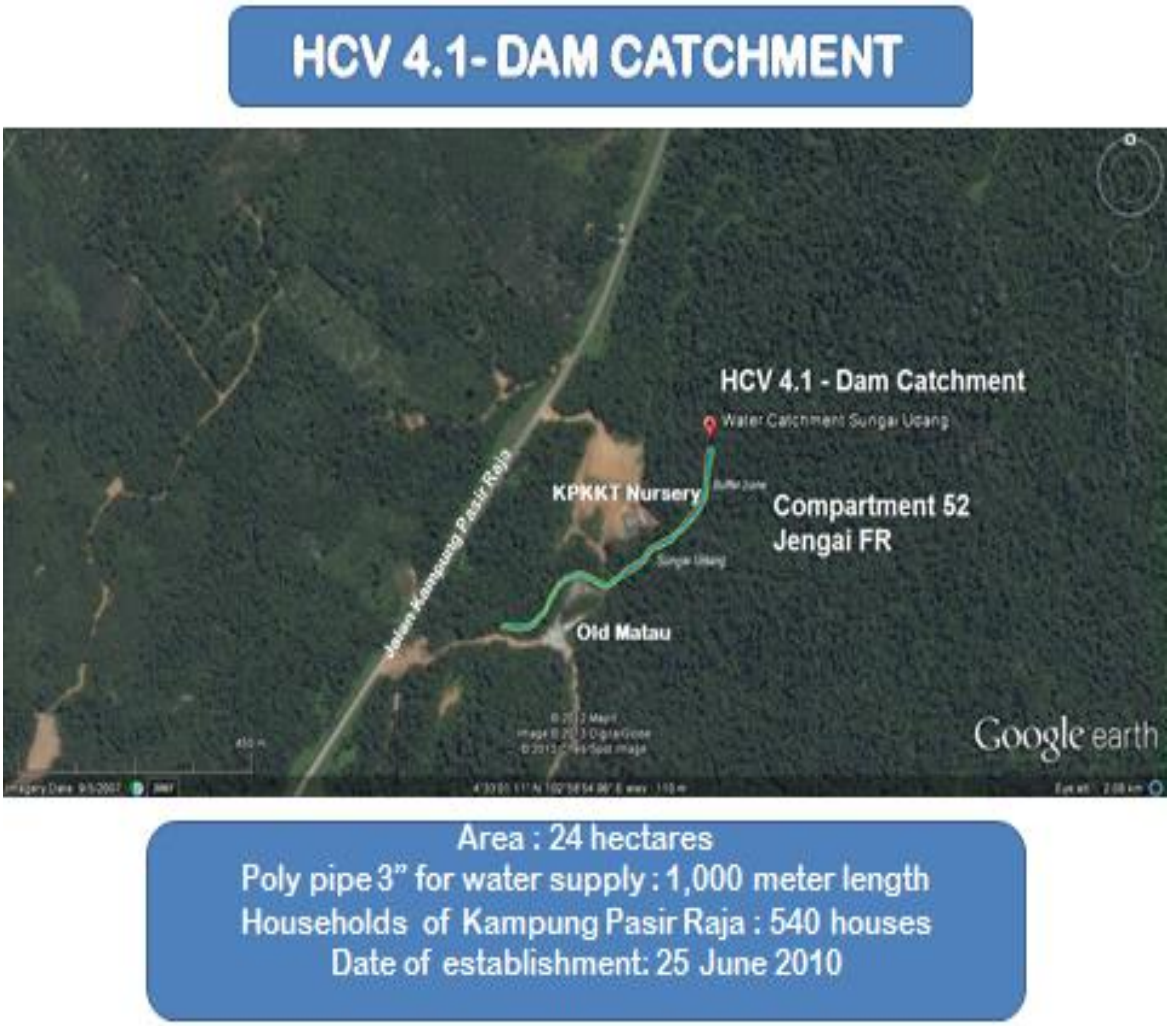
Fig. 10. The Community Water Catchment HCVF Project Installation

(a)

(b)

(c)

(d)


HCV 4.1- DAM CATCHMENT
HCV 4.1 - Dam Catchment
Water Catchment Sungai Udang
KPKKT Nursery
Compartment 52
Jengai FR
Jalan Kampung Pasir Raja
Old Matau
Google earth
Area : 24 hectares
Poly pipe 3" for water supply : 1,000 meter length
Households of Kampung Pasir Raja : 540 houses
Date of establishment: 25 June 2010

4.0 Assessement Procedures

The choice of the two above-mentioned sites as initial HCVFs for DTC was technically justified through a selection process which involved a series of field surveys conducted on the resource and stakeholder consultations, as well as based on information gathered from various other sources.

4.1 Flora Assessment

Surveys on flora were conducted in collaboration with FRIM during 2009 in four localities in Jerangau PRF (**Table 2**). Species were identified as far as possible to species level and appropriately compiled. A preliminary checklist of vascular plant species identified is provided in **Annex 2** to this report. It comprises a total of 32 species of Ferns, 5 species of Lycophytes, 58 species of Monocotyledons, 568 species of Dicotyledons and 3 species of Gymnosperm giving a total of 666 taxa.

4.2 Fauna Assessment

Camera-trapping was carried out for the wildlife component whereby camera traps were set up at selected strategic wildlife trails in Jerangau PRF to obtain visual records of large mammals and other wildlife. The camera traps were left to operate for 3 – 4 weeks after which they were retrieved from the field. **Table 3** below provides details of locations of the cameras. Wildlife surveys were also carried out at saltlicks.

Table 2: Flora collecting localities in Jerangau PRF

Locality	Compartment No.	GPS Coordinates & Elevation			Ecosystem & Forest Type
Buffer Zone	93, 95, 91	4º47.19'N	103º 04.66'E	31m	Riverine and slope in primary lowland dipterocarp forest.
Selectively - logged Stand	95	4º48.22'N	103º 04.39'E	157m	Selectively-logged lowland dipterocarp forest.
Buffer zone	31, 34	4º55.29'N	103º 05.86'E	33m	Swampy, primary lowland dipterocarp forest
Selectively-logged stand	35	4º55.03'N	103º 06.34'E	37m	Swampy, selectively-logged lowland dipterocarp forest.

Table 3: Camera trap locations deployed in DTC in 2009.

Camera Trap ID	PRF	Compartment No.	GPSCoordinates	
F2	Jerangau	89	RV566172	WMR531793
F5	Jerangau	89	RV565536	WMR531937
F4	Jerangau	88	RV565603	WMR533112
F1	Jerangau	88	RV565467	WMR533050
F9	Pasir Raja	75	WA546218	WMR496942
F7	Pasir Raja	75	WA546526	WMR497199
F6	Jengai	77	WA546226	WMR496920
F10	Jengai	53	RV555114	WMR500036

4.3 Social Assessment & Stakeholder Consultations

Social assessments were carried out to determine the nature of community use and degree of dependence on forest resources in DTC, particularly with regard to local communities living in villages in the vicinity of the forest concession. Data gathered by KPKKT in 2008, 2012, 2013, 2014 and 2018 was combined with earlier data collected by an NGO, Forest Voices in 2009. Key assessment activities included:

1) Forest dependence identification: Types of forest produce and services used and intensity of use.
2) Community interviews: Focus group meetings with stakeholders, community leaders, as well as forest workers.

3) Participant observations: Forest walks to important HCVF Areas.

- Data/ evidence collation and documentation: Extended interviews with identified stakeholders; identification of key themes and forest areas, preparation of maps and photographs.

4) Analysis and report writing.

Over the years Stakeholder Consultations, particularly with local communities and relevant government agencies had become a regular feature at KPKKT, where various issues of common interest, including biodiversity conservation and HCVF were deliberated and resolved.

4.4 Results and Discussion

4.4.1 Flora

The inventory exercise in Jerangau PRF recorded at least 666 taxa of vascular plants from 123 families and 331 genera (**Annex 2**). Among them, 568 were Dicots, 58 Monocots, 37 Ferns and Lycophytes, and three Gymnosperms. As shown in **Tables 4** and **5**, the highest number of species came from the family Euphorbiaceae with 50 species from 24 genera, followed by Dipterocarpaceae (46 taxa), Rubiaceae (37 taxa), Annonaceae (27 taxa) and Palmae (24 taxa). The flora inventory found 59 species that are either endemic to Terengganu or Peninsular Malaysia (**Annex 2**). **Table 6** lists some of the flora species found to be rare and unique to DTC which have special conservation interest.

Three endemic species *Scaphochlamys breviscapa (Zingiberaceae), Licuala fractilexa* (Palmae) and *Licuala bayana* (Palmae) are only found in Terengganu with *L. bayana* being only known from its

type locality, Jerangau PRF. **Table 7** shows the interesting endemic plants found in Jerangau during the flora survey.

Table 4: Ten most diverse vascular plant families in Jerangau PRF.

No	Family	Genera	No. of Taxa
1	Euphorbiaceae	24	50
2	Dipterocarpaceae	8	46
3	Rubiaceae	24	37
4	Annonaceae	14	27
5	Palmae	12	24
6	Guttiferae	5	24
7	Ebenaceae	1	22
8	Anacardiaceae	11	20
9	Lauraceae	7	19
10	Moraceae	4	18

Table 5: Six most diverse genera recorded in Jerangau PRF

No	Genera	Family	Taxa
1	*Shorea*	Dipterocarpaceae	24
2	*Diospyros*	Ebenaceae	22
3	*Garcinia*	Guttiferae	12
4	*Ficus*	Moraceae	10
5	*Dipterocarpus*	Dipterocaprceae	9
6	*Syzygium*	Myrtaceae	9

Table 6: List of Unique And Rare Flora Species Of Special Conservation Interest in DTC

No	Species	GPS Coordinates	Notes
1	*Scaphochlamys atroviridis*	4,478460 N, 103. 045930 E	Extremely rich in Jerangau PRF. Common in both primary and logged stands.
2	*Vatica havilandii*	4.551180N, 103.063339 E	A very rare species in Peninsular Malaysia and first time collected in fruit. It is also found in Borneo.
3	*Dipterocarpus sarawakensis*	4.554640 N, 103.051390 E	This species is only found in Sarawak and Terengganu. Measures are being taken to protect this species.
4	*Shorea collina*	4.478460 N, 103.045930 E	Possibly new species.
5	*Didymocarpus sp.*	4.478080 N, 103.045030 E	Possibly new species
6	*Barringtonia sp.*	4.478000 N, 103.045500 E	Possibly new species
7	*Neobalanocarpus heimii*	NA	Vulnerable (IUCN)

Table 7: Endemic Plants in Jerangau PRF (Combined lists of FRIM (2009) and WWF-Malaysia (1998))

No.	Species	Notes
1	Chengal – *Neobalanocarpus heimii*	Endemic to Peninsular Malaysia
2	Keruing Sarawak – *Dipterocarpus sarawakensis*	
3	Bunga Pakma – *Rafflesia spp*.	3 species endemic to Peninsular Malaysia
4	*Salacca flabellate* (Palmae)	Endemic to Terengganu
5	*Macaranga curtisii* (Euphorbiaceae)	Otherwise only endemic to the Main Range
6	*Macaranga punctatai* (Euphorbiaceae)	Otherwise only endemic to the Main Range
7	*Macaranga quadricornis* (Euphobiaceae)	The only record east of Gunung Benom
8	*Agrostistachys leptostachya* (Euphorbiaceae)	A giant shrub of Taman Negara area
9	*Lithocarpus erythrocarpus* (Fagaceae)	Otherwise only known from the Main Range
10	*Eria atrovinosa*	
11	*Licuala bayana*	
12	*Licuala fractiflexa* (Palmae)	
13	*Pinanga beccariana* (Palmae)	

4.4.2 Fauna

The KPKKT – WWF Malaysia survey of 2009/ 2010 detected the presence of fauna species which are either on the IUCN Red List, CITES or the Wildlife Protection Act 2010 as threatened and endangered. Out of these, 8 are listed by the Red List as Vulnerable (VU), 5 as Endangered (EN) and one as Critically Endangered (CR). Nine species are listed in Appendix I and II of CITES while 28 are listed either in Schedule 1 or Schedule 2 of the Malaysian Wildlife Protection Act 2010.As for the fish fauna among the common species caught and identified from the streams and rivers included the *Kelah, Sebarau, Baung, Lampam and Kelisa putih*. **Table 8** summarizes the threatened and endangered mammal species found in DTC which are listed on the Red List, CITES and the Wildlife Protection Act 2010 (as required by the *HCVF Toolkitfor Malaysia*). The Wildlife Plan for Peninsular Malaysia (DWNP, 1992) lists the Asian Elephant, Malayan Tiger, Sumatran Rhino, Malayan tapir and the Gaur (Seladang) as endangered in Malaysia. DTC contains all five species in its forests.

Table 8. IUCN, CITES and PERHILITAN Threatened and Endangered Fauna Species in DTC.

No	Fauna Species	Common Name	IUCN	CITES	PERHI=-LITAN	Data Source
1	*Arctictis binturong*	Binturong	VU	III	Jadual I	WWF-Malaysia 1998
2	*Bos gaurus*	Gaur	VU	I	Jadual I	WWF-Malaysia 2009, 1998
3	*Bucerotidae spp.*	Hornbills	VU/NT/LC			WWF-Malaysia 2009
4	*Callosciurus prevostii*	Prevost's Squirrel		II	Jadual I	WWF-Malaysia 1998
5		Deer			Jadual2	WWF-Malaysia 1998
6	*Dicerorhinus sumatrensis*	Sumatran Rhinocerous	CR	I	Jadual 1	WWF-Malaysia 1998
7	*Elephas maximus*	Asian Elephant	EN	I	Jadual 2	WWF-Malaysia 1998, 2009, JPSM 2006
8	*Helarctos malayanus*	Malayan Sun Bear	VU	I	Jadual I	WWF-Malaysia 1998
9	*Herpestes brachyurus*	Short-tailedf Mongoose			Jadual I	WWF-Malaysia 1998
10	*Hylabates lar*	White-handed Gibbon	EN	II	Jadual I	WWF-Malaysia 1998, 2009, JPSM 2006
11	*Macaca fascicularis*	Long-tailed Macaque		II	Jadual 2	WWF-Malaysia 1998
12	*Macaca nemestrina*	Pig-tailed Macaque		II	Jadual 2	WWF-Malaysia 1998
13	*Martes falvigula*	Yellow-throatd Marten		III	Jadual I	WWF-Malaysia 1998
14	*Nycteris javanica*	Javan Slit-faced Bat	VU			WWF-Malaysia 1998
15	*Nycticebus caucang*	Slow Loris	VU	I	Jadual I	WWF-Malaysia 1998
16	*Paguma larvata*	Masked Palm Civet		III	Jadual 2	WWF-Malaysia 1998
17	*Panther tigris jacksonii*	Malayan Tiger	EN	I	Jadual I	WWF-Malaysia 1998, JPSM 2006
18	*Panther pardus*	Leopard, Panther		I	Jadual I	WWF-Malaysia 1998
19	*Petaurista petaurista*	Red Giant Flying Squirrel			Jadual I	WWF-Malaysia 1998
20		Porcupine		III	Jadual 2	WWF-Malaysia 1998
21	*Prionailurus bengalensis*	Leopard Cat		I	Jadual I	WWF-Malaysia 1998
22	*Presbytis melalophos*	Banded Leaf Monkey	EN			JPSM 2006
23	*Ratufa affinis*	Cream-coloured Gaint Squirrel		II	Jadual I	WWF-Malaysia 1998
24	Ratufa bicolor	Black Giant Squirrel		II	Jadual I	WWF-Malaysia 1998
25	Cervus unicolor	Sambar Deer	VU		Jadual 2	WWF-Malaysia 1998
26	Sus scrofa	Wild Pig			Jadual 2	WWF-Malaysia 1998,JPSM 2006
27	*Tadarida johorensis*	Northern Free-tailed Bat	VU			WWF-Malaysia 1998
28	*Tapirus indicus*	Malayan Tapir	EN	I	Jadual I	WWF-Malaysia 1998, 2009, JPSM 2006
29	*Trachypithecus obscurus*	Dusky Leaf Monkey		II	Jadual 2	WWF-Malaysia 1998
30	*Tragulus javanicus*	Lesser Mousedeer		III	Jadual 2	WWF-Malaysia 1998
31	*Tupaia glis*	Malayan Treeshrew		II		WWF-Malaysia 1998
32	*Tupaia minor*	Lesser Treeshrew		II	Jadual 2	WWF-Malaysia 1998
33	*Viverra tangalunga*	Malayan Civet			Jadual 2	JPSM 2006.

Source: WWF-Malaysia 2009.

4.4.3 Other Conservation Areas In The State of Terengganu (HCVF Database)

In deliberating on the choice of HCVF areas for DTC, reference was also made on the availability and existence of other conservation areas within the State of Terengganu, and these are summarised in **Table 9 and Table 10**. They were also considered within the larger context of the Peninsular Malaysian situation (**Fig. 5**).

Table 9: Conservation Areas Within The State of Terengganu

No.	Conservation Area	Classi-fication	Habitat/ Forest Type	Area, ha
1	Bukit Bauk PRF	VJR	LDF: *Dacryodes breviracemosa, Pseuduvaria cerina*	27.9
2	Gunung Tebu PRF	VJR	LDF & HDF	50.0
3	Hulu Besut PRF	SRP	LDF	10.0
4	Hulu Terengganu	SRP	HDF	2.0
5	Jambu Bongkok PRF	VJR	THF	115.7
6	Jerangau PRF	VJR	LDF: *Dipterocarpus sarawakensis*	61.0
7	Pasir Raja PRF	SRP	HDF	0.8
8	Rasau Kertih PRF	VJR	LDF	32.0
9	Taman Negara	NP	MDF & MF*: Adinandra angulate, Agathis flavescens, Aquilaria rostrata, Ardisia biniflora, Ar. cardiophylla, Ar. retinervia, Bridelia whitmorei, Dacryodes multijuga, Eugenia clypeolata, E. cyrtophylloides, E. pseudoclaviflora, E. tahanensis, E. tekuensis, Garcinia clusiaefolia, Lindera montana, Polyosma robusta, Talauma peninsularis, Terminthodia viridiflora, Tristania fruticosa*	85,300.0
10	Ulu Cukai PRF,	VJR	LDF	40.8
11	Kemaman	n.a	*Ardisia tumida, Cleistanthus major, Eugenia rostadonis*	n.a
12	Ulu Brang-Tersat	n.a	Pseuduvaria nervosa	n.a
13	**SUB-TOTAL (Terengganu)**			**85,660.0**
14	**PENINSULAR MALAYSIA TOTAL**			**1,563,180.0.9**

Note: **VJR**= Virgin Jungle Reserve; **NP** = National Park; **SRP** = Species Reserve Plot; **LDF** = Lowland Dipterocarp Forest; **HDF** = Hill Dipterocarp Forest; **THF** = Tropical Heath Forest;**MDF** = Mixed Dipterocarp Forest; **MF** = Montane Forest; **n.a** = data not available.
Sources: **(1)**DWNP 1992: Wildlife Plan for Peninsular Malaysia.
(2) WWF-Malaysia (2009)

Table 10.

Areas That Had Been Identified By Terengganu State Forest Department (TSFD) As Potential Sites for the High Conservation Value Forests (HCVFs) for Terengganu
(Source: Terengganu State Forest Department, 2015)

Bil.	Kawasan HCVF	HSK	Daerah Hutan	Ciri-ciri Istimewa	Catitan dan Kesesuaian
(i)	Cengal Besar	Kompt. 5, Pasir Raja	Terengganu Selatan	Telah dikenali sebagai Pokok Cengal (*Neobalanocarpus heimii*) terbesar di dunia dan merupakan kawasan tarikan pelancongan di Negeri Terengganu.	Mengikut pengitirafan 'The Malaysian Book of Records' umur pokok dianggarkan pada 1,300 tahun dengan perepang dan ketinggian sebanyak 16.75 m dan 65 m masing-masing. **Sangat Sesuai.**
(ii)	Petak Keruing Sarawak	Kompt. 31, Jerangau	Terengganu Barat	Kawasan ini mengandungi spesis pokok Keruing Sarawak dan merupakan antara spesis endemik di Semenanjung Malaysia dan Sarawak.	'Spesis ini walaupun terdapat di Sarawak dan Brunei tetapi hanya dijumpai di HS Jerangau. **Sangat Sesuai**.
(iii)	Petak Pokok Sal	Kompt. 34, Jerangau	Terengganu Barat	Kawasan ini mempunyai spesis palma *Johannesteijsmannia altifrons*. Satu dari 4 spesis dari genus *Johannesteijsmannia* yang dijumpai di Semenanjung Malaysia, Selatan Thailand dan Sumatra.	*Johannesteijsmannia altifrons* adalah antara spesis *Johannesteijsmannia* yang terbanyak sekali dan boleh dijumpai Kedah, Perak, Pahang, Johor, Negeri Sembilan dan Terengganu. **Sesuai.**
(iv)	Pusat Pengumpulan Genetik Herba, Hutan Lipur Sekayu	Hulu Terengganu	Terengganu Barat	Kawasan ini mengandungi spesis pokok herba istimewa untuk kegunaan sebagai ubatan dan boleh digunakan untuk para penyelidik, pelajar dan agensi kerajaan yang lain.	Merupakan konservasi ex-situ dan tidak melibatkan lokasi dan habitat. **Kurang Sesuai.**
(v)	Pusat Pengumpulan Genetik Orkid Liar, Hutan Lipur Sekayu	Hulu Terengganu	Terengganu Barat	Kawasan ini merupakan tempat pengumpulan genetik orkid di Negeri Terengganu. Di sini juga ada satu spesis baru yang ditemui iaitu *Dendrobium Terengganuensis.*	Kurang Sesuai. Merupakan konservasi ex-situ dan tidak melibatkan lokasi dan habitat. **Kurang Sesuai.**

Sumber: http://trgforestry.terengganu.gov.my/ (laman web rasmi JPNT)

Note: See also Annex 3– TSFD Directive on Terengganu HCVF.

4.4.4 HCVs in DTC in The Context of FSC's Definitions

DTC plays a very crucial role in safeguarding the regional high biodiversity values as it shares the boundary with Taman Negara National Park in the western flank of Pasir Raja PRF (**HCV 1**). A total of four endangered dipterocarp species were identified during the survey on flora (**HCV 1.2**). This is in addition to a total of 35 new species recorded for Terengganu, 11 of which are endemic to Malaysia (**HCV 1.3**). DTC area is also rich in bird diversity with at least 176 near-threatened, threatened and endangered (IUCN Redlist) bird species recorded (**HCV 1.2**). A total of nineteen threatened and endangered (**HCV 1.2)** mammal species were also recorded with the iconic Malayan Tiger, Asian Elephant, Malayan Tapir, Dhole and White-handed gibbon listed as Endangered (IUCN Redlist). For a further enhancement in wildlife protection, stricter enforcement and anti-poaching measures constitutes the best management options to reduce threats to the HCV species. Critical temporal use of areas for birds were identified (**HCV 1.4).** The sustainable and conservation-oriented forest management as currently practiced by KPKKT are important to ensure that these areas continue to exist and are not degraded.

DTC area also plays an important role as part of a larger forest landscape (**HCV 2**) for the following reasons:

(1) it being part of the *Banjaran Taman Negara - Banjaran Timur* forest complex (see **Fig. 9**);

(2) its close proximity to Taman Negara National Park and,

(3) it shares boundary with Gunung Aais and Sg. Nipah PRFs in the south. One potentially threatened and endangered ecosystem is the Pandan Swamp in Jerangau PRF (**HCV 3).**

(4) DTC area is listed as an important water stress area in Peninsular with five catchments legally gazette as *Hutan Tadahan Air* (Water Catchment Forest) (**HCV 4) (see Fig. 10).**

(5) The social surveys when looking at all the communities living in the vicinity of DTC as a whole suggested that, more than 80% do not depend on the DTC forest for subsistence or to supplement their income. For families that do depend on the forest they rely on the forest for 3 main products namely non-timber forest produce (NTFP), medicinal plants and fish, with fish being the most critical resource of the three (**HCV 5**). The forest is also frequented by locals for bee's honey and freshwater fishes. In this context, the availability of HCVF5 and HCVF6 within DTC can be summarised as in **Table 11**.

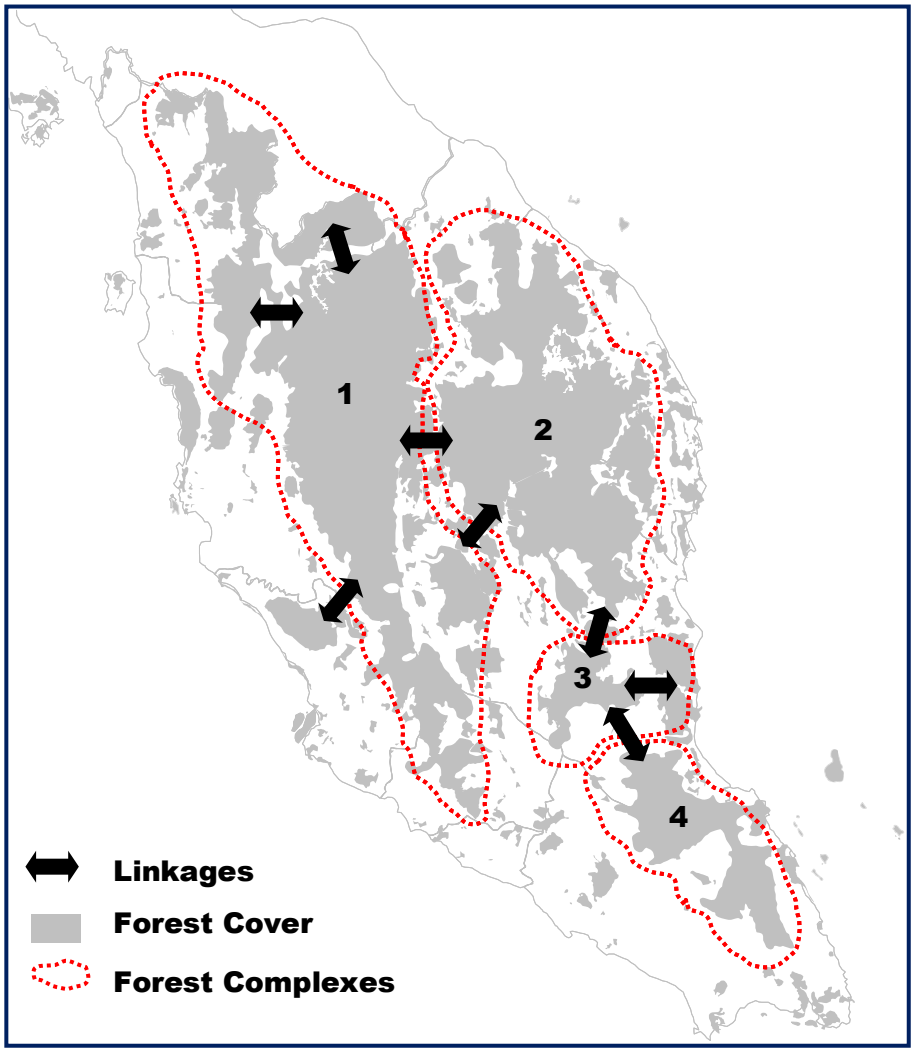
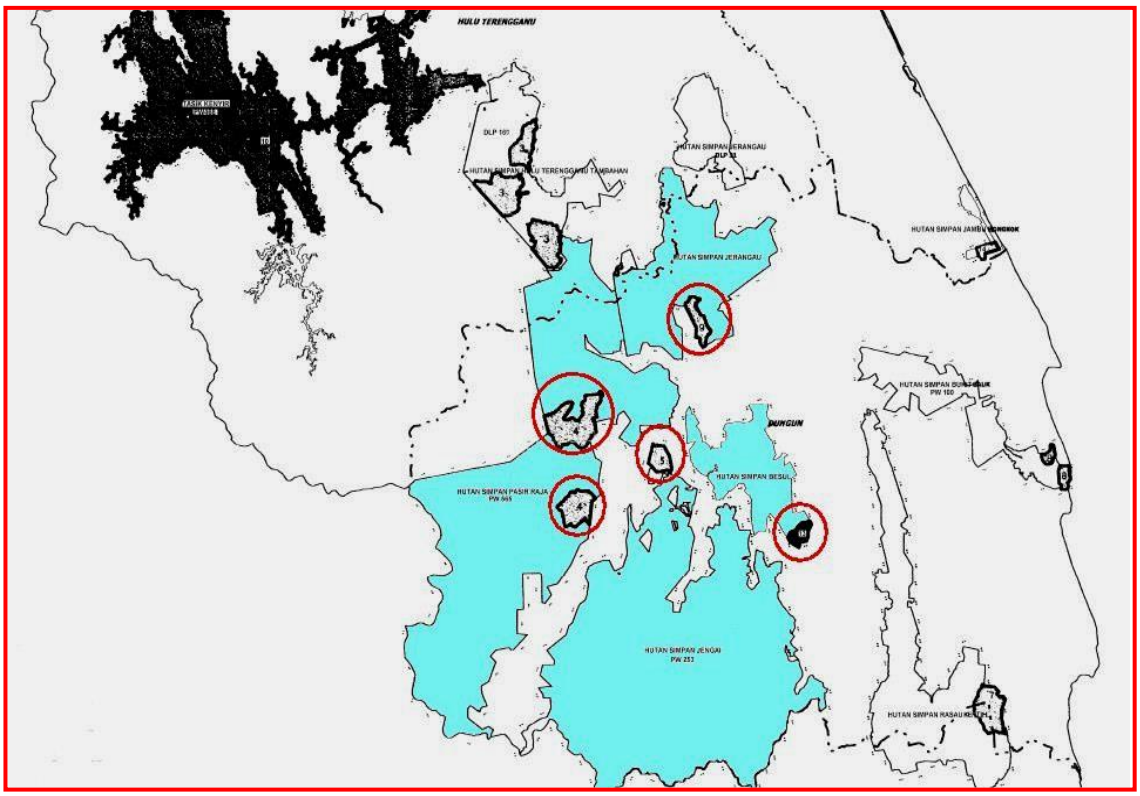


Figure 11. Forest Complexes and Linkages identified by the National Physical Plan (Source: DTCP, 2005)



Water Catchment Areas in Forest Reserves	Area (Ha)	Compartments
Pasir Raja (Hulu Terangganu) FR	2603.3	3, 4, 25, 26, 40
Pasir Raja (Dungun) FR		
Besul FR	325.3	18, 19
Jerangau FR	514.7	68, 69
Besul Tambahan FR	0	
Jengai FR	452.0	1

Figure 12: Map showing the location of the water catchment areas within DTC

Table 11: Potential HCV5 and HCV6 Areas Around DTC

No.	Location	HCV	HCV Indicators
1	Kampung Pasir Raja, Sungsi Dungun, Jeram Keling and surrounding watershed areas including tributaries such as Sungai Nua and Sungai Pelenggong	5,6	Fishing area, hunting ground, NTFP collection: petai, rattan, etc. Current large mammal presence, at least one salt lick, cultural sotries. Adjacent to Compt. Nos. 75, 77 and 78 of Pasir Raja PRF.
2	Kampung Pasir Raja/ Kampung Shukur, Sungai Loh, Sungai Pertang, Sungai Ceralak, Sungai Bangan, Sungai Lasir, Sungai Chemerung, Sungai Jengai, Sungai Perlis, Sungai Cheniah watershed areas.	5	Gaharu collection, mouse deer presence, fishing ground. Situated in between Compts. 91, 92 & 68 of Jerangau PRF and Comp. 1 of Besul PRF. Presence of important primary forest in this watershed, esp. Sg Perlis.
3	Kampong Minda, Bukit Kelik, Sungai Loh, Sungai Kelmin, Sungsi Jengai, Bukit Kelip, Bukit Lentur, adjacent to Sungai Ceniah. This area is adjacent to a FELDA oil palm estate.	5	Honey collection areas (Bukit Kandis & Bukit Melung). Adjacent to Compt Nos. 60, 61 & 61B of Pasir Raja PRF, and Compt Nos. 23 & 52 of Jengai PRF.
4	Road hillside in Pasir Raja PRF, 3 hills opposite trunk road before entering village.	5	Herbs collection area, community timber collection area for house repairs
5	Forested area(s) surrounding Kampung Basil.	5, 6	Traditionsl watershed area (Sungai Serentang), not yet gazetted for use by community. Included fresh water source for local community, also adjacent to ancient burial sites of Kubur Busuk.
6	Compt. 52 of Jengai PRF	5	Freshwater source for local community.

5.0 The HCVF Management Plan

5.1 Management Objectives

Among the objectives of this HCVF Management Plan are as follows:

(1) To establish a network of HCVFs in identified spots/areas within DTC and to manage and protect such HCVs/ HCVFs within the framework of sustainable forest management (SFM) of DTC as a whole, and in the wider contexts of HCVF management in Terengganu and Malaysia.

(2) To make sure that the management of KPKKT adheres to FSC's protocols on the identification, maintenance and long–term management, monitoring and protection of such HCVFs within DTC.

(3) To develop and refine in-house expertise within KPKKT/ GPB in the area of HCVF management through continuous training and skill upgrading of the relevant staff.

(4) To extend the concept and practice of HCVF management to as wide an audience as possible.

(5) Over the long term, to continue to keep the existing HCVFs and to expand it so as to achieve and fulfil FSC specification that at least 10 percent of the whole DTC be declared and set aside as HCVF/ conservation areas.

(6) To collaborate with relevant agencies, NGOs and other stakeholders on the management and research on HCVFs.

(7) To identify areas of research and management which have the potential to contribute to add value to the existing HCVF initiative.

5.2 General Line of Actions

In managing its present and future HCVFs KPKKT adopts the following general line of actions, which are subject to further modifications and refinements as and when necessary and expedient depending on the dictate of the particular situation and the resources at hands, as well as in the light of new findings. The following general line of actions are also in conformity with the results of consultations and deliberation made with WWF - Malaysia a summary of which is shown in **Annex 4** to this report.

(1) HCV and HCVF Screening Procedure

i) Fresh data and information on any new HCV or potential HCVF within DTC will be sourced through any of the following means:

- Pre- and Post-Felling Inventories and research plots established within DTC area.
- Communications with local communities: KETENGAH, FELDA, RISDA and villagers, etc.
- Personal encounters and experience of staff of KPKKT, PERHILITAN, TSFD/ JPNT, enforcement agencies, etc
- Expert advice from various organisations/ agencies/ NGOs: FRIM, MNS, WWF-Malaysia, academics, etc
- Published and unpublished reports.

ii) KPKKT will take initiative to archive the data and information on its dossiers of HCVs and HCVFs, and compare them with the national registry on HCVFs, if there is any.

iii) KPKKT (with the help of other agencies, (e.g. PERHILITAN, TSFD, etc) to despatch teams to conduct verification exercise on the ground (*i.e* ground truthing). Study teams to take photographs and samples and, if necessary set camera traps for continuous data collection

iv) KPKKT to hold Stakeholder Consultations on new HCV findings and plans for new HCVFs

v) KPKKT to liaise with TSFD, FDPM, PERHILITAN, UMT and FRIM etc. to verify and confirm the conservation status of any new HCVwithin DTC.

vi) TSFD to issue appropriate written instructions to KPKKT to take any of the following courses of action:

- Delineate and exclude the species and its habitat from any future logging or road construction or other violations
- Demarcate on the ground, appropriate size of area for conservation of the species/ habitat, mark the boundary and install signboard with appropriate information.
- Regularly identify potential threats to the HCV
- Formulate strategies for conservation and protection, alleviation of threats and possible non-consumptive utilisation of the species and habitats.
- Conduct detailed surveys on the resources therein and document the results

vii) KPKKT to earnestly abide and implement TSFD insructions on the ground

viii) KPKKT to conduct continuous monitoring and data collection on HCVF attributes and values.

(2) Management Guidelines

i) Identification of HCVF -

In line with FSC Indicator 6.4.2, KPKKT will analyse protected areas within the regional landscape, as well as KPKKT's own protected areas, to determine if existing ecosystems are adequately represented, either at local, regional or national level. Where ecosystems are not adequately represented, and opportunities exist for KPKKT to fill these gaps, KPKKT will contribute to the regional network of representative areas.

ii) Preparation of Maps showing details of -

- Topography, terrain, roads and access, rivers, human settlements, land use patterns
- Forest types and habitats
- Soil types and geology
- Physical and biological resources

iii) Determination of attributes to be used in considering HCVF type

iv) Development of time scheduling for Plan of Actions

v) Training and skill upgrading of staff and contractors in relevant fields

vi) Allocation of appropriate budget for commission of compliance activities

vii) Coordination and Staffing -

- KPKKT to establish a dedicated HCVF Team which will meet regularly, collate its findings and report to the management of KPKKT and GPB, *i.e*. internal coordination
- Coordination with external agencies: governmental and NGOs, as well as other stakeholders
- Documentation and packaging of information

viii) Stakeholder Consultation

ix) Protection (incl. identification of threats):

- Protection from encroachment and theft
- Protection from fire, landslides, floods, windthrows and other natural calamities
- Protection from diseases and pollution
- Protection from site modification
- Protection from intrusion by foreign materials and exotic species
- Area protection: regular patrol, inspection and maintenance of boundaries, closure of unused/ inactive roads and bridges, warning signboards.

x) R & D including breeding programme – scientific expeditions, *in situ* and *ex situ* conservations, rescue harvesting, permanent sample plots, nursery research, herbarium and taxidermy collections. Data will be collected on the following basic parameters:

- History of forest compartment
- Climate
- Forest management system
- Presence of wildlife
- Incidence of damage and injuries due to biological and non-biological elements, as well as environmental factors
- Phenological behaviours (incl. flushing, flowering, fruiting & seed dispersal, *etc*)
- Standing stock: Tree distribution, standing volume, basal area, *etc*
- Market value
- Target & keystone species
- Budgeting.

xi) Monitoring, Evaluation and Control (MEC) - To evaluate and review from time to time, the status of HCVF and the need to re-define direction

xii) Eco-tourism & Other Non-Destructive Pursuits.

xiii) Documentation and maps, dissemination, publication and publicity. KPKKT to package the latest information and knowledge on HCVF and present in relevant meetings/ seminars/ exhibitions, etc.

5.3 Immediate Management Recommendations on The Plan of Actions and Measures to Reduce and Mitigate The Impact Of Logging And Enhancing HCV Areas Within DTC

i) The second rotation selective logging activities within DTC needs to maintain high minimum diameter cutting limits for the harvested trees and should embrace the RIL/LIL methodology to minimise the impacts to the environmentally(biodiversity) sensitive areas.

ii) Ground cutting of the side/ slip roads to get excess to the timber trees will be totally avoided. The same also should apply to road cuttings along rivers or bridges across rivers.

iii) As far as possible KPKKT will try to make use of old first-rotation forest roads, and avoid from having to cut and open newroads. No forest road will be permitted or allowed on hilltops for they may harbour unique forest habitat types.

iv) All forest roads are to be constructed by strictly following the most recent FDPM specifications and guideline on forest roads (e.g. "*Spesifikasi Jalan Hutan 2010*", etc)

v) A strict adherence to river buffer area speficiation will be observed at all times. Increasing the flow of water and sedimention build-up in the rivers will be avoided at any cost, as it would have undesirable impact on the endemic riparian species.

vi) Environmentally sensitive (including HCV) areas within DTCwill be identified, reserved and protected from future logging activities. This can be in the form of river

reserves, catchment protection, areas reserved for biodiversity and enhancement of cultural value. And, over time, these HCVFs would eventually sum-up to ***no less than 10%*** of the total area of DTC.

vii) Biodiversity corridors for wildlife movement will be identified (*e.g* elephant and tapir trails) and created for all compartments that will be subjected to logging exercise (*i.e.* as part of the Environmental Management Plan (EMP) for the area concerned). There will be a need for wildlife management plan for the forest concession, which, among others, addresses hunting by local communities and specific research study on flagship wildlife species *e.g*. tiger, gibbon, hornbill, etc.

viii) Plant species rescue operation will be considered before and after logging operation. The target groups, amongst others would include the endemic and rare species, also herbal plants with ornamental and medicinal properties. A dedicated nursery has been established in C52 Jengai PRF to nurture these plants.

ix) Some species of the Dipterocarpaceae are listed in the IUCN Red Data List; hence some tree species would need to be identified and conserved within the logging concession. For endangered and rare flora species, the viable population would be estimated before cutting limits and/or qouta are determined. For highest endemic species protection, it is recommended to consider conserving the compartment in part or full. In the case of Chengal (*Neobalanocarpus heimii*) it *is* recommended that a population study of the species be conducted for Pasir Raja PRF.

x) Selective logging operators and tree fellers will be continuously reminded to take extreme care that the forest area is not excessively opened up.

xi) The management of KPKKT will continue to allow and facilitate the continued use of forest for the identified forest-dependent communities. It is suggested for KPKKT

to allow co-management by local community for extraction of NTFP. KPKKT also gives priority to local residents to fill up any suitable job opportunities or contract jobs at the company. This is in order to reduce their dependence on forest resources. At the same time, KPKKT will take the initiative to also prevent unauthorised outsiders from encroaching into DTC, and local communities will be engaged in the effort.

xii) SOPs will be critical to address the HCV values identified for DTC. It must be rolled out in collaboration with all stakeholders (including the local communities) in appropriate form. This SOPs will have to be monitored twice a year to ensure that FR's value are maintained and continuously being enhanced.

5.4 General Recommendations for the Management and Conservation of Biodiversity

5.4.1 Avifauna conservation

Regular patrols along the roads near the borders of the forest reserves could deter hunting activities at DTC and mitigate the loss of threatened birds. Patrols will continue to be carried out with the cooperation of TSFD and PERHILITAN. A community outreach programme including socio-economic improvement to educate the surrounding communities on the importance of biodiversity, will play a meaningful role in mitigating hunting activites and inculcate a sense of belonging for the forest and its wildlife.

5.4.2 Large mammal conservation

Evidence points to the fact that much of DTC area still harbours iconic wildlife species such as the Malayan tiger, Asian elephant and Malayan Tapir. However, these HCVs are in serious threat and their survival in under pressure. In order to ensure the survival of these species, appropriate strategies will be developed aimed at reducing encroachment into DTC area. Effective enforcement to stop poaching and encroachment will be immediately implemented through increased patrolling and security as well as community engagement and awareness campaigns with assistance from Perhilitan, TSFD, FDPM, MNS and WWF-Malaysia. The presence of browse vegetation along the roadsides; serves as important food source for deers and other herbivores. In term of primates and other frugivores, KPKKT will help by replanting fruit trees (e.g. *Ficus sp*.) as part of the company's silviculture treatment.

5.5 Future Activities and Plan of Actions to be Undertaken within HCVFs

The following general line of activities will be followed by KPKKT to ensure the HCVF's continued usefulness and relevance

i) Demarcation and maintenance of the boundary of the area

ii) Conduct Multi-Resource Inventory on the HCVF

iii) Maintenance of database and documentation and marking on the ground of relevant features and resources

iv) Regular Monitoring of flowering and fruiting and collection of seeds.

v) Tracking and collection of wildings.

vi) Establishment of nursery for planting stock propagation and improvement.

vii) Re-census of trees and other resources to monitor growth rates, health condition and phenological behaviour.

viii) Collaborative Research and Development (R & D) on population biology, reproductive system, breeding programme with relevant institutions and NGOs.

5.6 Training Needs and Capacity Building

The following will be some of the areas in which training and capacity building on HCVF might be relevant to KPKKT:

1) Plant and tree identification within HCVF area;
2) Fauna and faunal habitat identification and conservation;
3) Multi-resource Survey methodologies;
4) Monitoring of environmental parameters within HCVF areas;
5) Conflict resolution.

5.7 Review of the HCVF Management Plan

The HCVF Management Plan will be reviewed and updated on an **annual basis** with the following objectives:

1) To consider new inputs and proposals for the possibility of establishing new HCVF areas based on the evidence presented before the HCVF Committee, or to drop or adjust existing HCVF areas;
2) To apprise the progress during the preceding year, with emphasis on complying with the relevant Principle and Criteria of the Forest Stewardship Council (FSC);
3) To assess and consider the need for new research;
4) To evaluate the relevance of existing HCVFs and, if necessary reinforce them;

5) To collate relevant findings from surveys and research and, if deemed appropriate, publish such findings;
6) To evaluate existing and new collaborations on HCVF research and management with external parties/ agencies.

5.8 HCVF Committee/ Core Working Group (CWG)

It is proposed that the management of HCVF within DTC is overseen by a high level committee/ Core Working Group (CWG) whose members should comprise representatives of the following:

1) Golden Pharos Berhad, Pesama Timber Corporation Sdn Bhd & KPKKT
2) Forestry Department (TSFD and/or FDPM)
3) WWF-Malaysia
4) Research & academic institutions, e.g. FRIM, UPM, UMT, USM
5) Malaysian Nature Society (MNS)
6) JaKOA
7) Local Forest-Dependent Community
8) Relevant International agencies and donors, etc.
9) Independent Consultants.

Please refer to **Annex 5** for the Terms of Reference (TOR) for the proposed HCVF Core Working Group to be established for KPKKT.

6.0 Plan Implementation

6.1 Plan of Action (PoA) Relative to FSC Criteria & Indicators

Based on the foregoing, the implementation of this HCVF Management Plan for DTC over the period 2018 - 2027 takes place along the time line as summarised in **Table 12, i.e.** in general compliance with **FSC Criterion 9.4**. Specifically, the latter requires that "annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes". The five indicators under this criterion along with their respective treatments under this Plan are as follows:

Indicator 9.4.1: measurable effecfiveness indicators (MEI) are developed and presented in the HCVF section of the HCVF Management Plan.

→ These are being elaborated in the following section **6.2.**

Indicator 9.4.2: forest managers utilises biological and ecological experts in developing indicators for monitoringHCVF.

→ Expert opinions and advises from the Forest Departments (JPNT and FDPM), WWF-Malaysia, FRIM, UMT, UPM and individual consultants were continuously being sought after from time to time in all aspects of HCVF management, including the development of monitoring indicators. In this relation, our professional discourses in this subject had been exceptionally active with JPNT and WWF-Malaysia, and to some degree FRIM.

Indicator 9.4.3: reflective of the scale and intensity of the operations, annual monitoring is conducted that focuses on the effectiveness by which HCVF management and protection measures are maintaining and/ or enhancing the pertinent conservation attributes.

→ This provision has always remained as KPKKT's guiding principle in all our annual monitoring activities. In most cases however, our monitoring of

the HCVFs is conducted very frequently, i.e. more than once a year. Furthermore since KPKKT itself is under the constant monitoring of JPNT, all of KPKKT's activities in terms of their depth and breadth in this field are subject to TSFD's scrutiny, and should follow the latter's procedures and standards.

Indicator 9.4.4: the results of HCVF monitoring are used adaptively in modifying HCVF management and protection policies as well as in revising the management plan.

→ It has been our policy that results and findings from all monitoring activities conducted within as well as outside of HCVFs must be recorded for future references and used as guide which would enable us to be more adaptive in our management and protection of the ecosystems and resources. A case in point is when certain protected wildlife species or their habitats have been detected in certain localities, or forest compartment or HCVF, the company would immediately alert and notify the concerned stakeholders such as TSFD, contractors and local forest-dependent communities etc.

Table 12: Summary of 10-year Plan of Actions for HCVFs Within DTC, 2018 – 2027.

	ACTIVITY	Y E A R									
		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1	Start of HCVF Management Plan (Rev. 1)	√									
2	***Documentation***										
2a	HCVF Management Plan revised and approved	√				√		√		√	
2b	HCVF Management Plan updating	√		√		√		√		√	
2c	HCVF Management Plan review		√	√	√	√	√	√	√	√	√
3	***HCV/ HCVF Monitoring and Maintenance***										
3a	**H1: Keruing Sarawak, Jerangau PRF**	√	√	√	√	√	√	√	√	√	√

	- Maintain signboard and map - Maintain Permanent Plots (PP) and their boundaries - Maintain access and path into PP - Maintain safety - Identify and record potential threats to HCVF - Data collection (on growth, phenology, wildlife, soils, microorganisms, etc) - Facilitate R & D workers working in PP - Regular reporting										
3b	**H2: Water Catchment Forest in C52 Jengai PRF** - Maintain signboard and map - Maintain boundaries of HCVF - Cleaning of water catchment pond - Maintain and repair delivery pipes (1km) - Monitor water quantity & quality (physical, chemical, biological) - Monitor trees and plants, esp those falling into water catchment pond (windthrows). - Identify and document threats e.g. encroachment to HCVF - Identify potential danger against usage and consumption of water - Identify and document presenxe of wildlife. - Plan ways to tackle/ overcome threats - Maintain communication with immediate stakeholders (i.e Residents of Kg Raja) - Regular consultation with health authority concerning quality of water. - Control/ regulate access to HCVF by visitors & researchers. - Regular reporting	√	√	√	√	√	√	√	√	√	√
4	Stakeholder Consultation	√	√	√	√	√	√	√	√	√	√
5	Establishment of HCVF Core Working Group (CWG). - Consultation with WWF Malaysia and other key partners. -	√					√		√		√
6	Training, Capacity Building & FSC Mentoring	√	√	√	√	√	√	√	√	√	√
7	Multi-resource Inventory		√			√			√		
8	Patrolling (Routine) (Incl. monitoring of impacts of management activities)	√	√	√	√	√	√	√	√	√	√
9	Evaluation of impacts of management activities on HCVF - identify potential impacts - identify evaluation criteria - conduct measurement/ evaluation - report writing	√	√	√	√	√	√	√	√	√	√
10	Adaptation to management activities - close consultaion with TSFD and other relevant authorities		√	√	√	√	√	√	√	√	√

	- prepare adaptive S.O.P - field briefing and training to staff & contractors - implement adaptation measures - monitor impacts - report writing.										
11	R&D (in collaboration with relevant R&D and academic institutions and NGOs)	√	√	√	√	√	√	√	√	√	√
12	HCVF Committee Meeting & presentation – HCVF Committee to deliberate on how to enhance the HCVF and their values and services - Capacity building for HCVF committee.		√	√	√	√	√	√	√	√	√
13	Formulation and implementation of "Measureable Effectiveness Indicators" - identify indicators - identify measurement criteria for effectiveness of indicators - training of staff & contractors - field testing - report writing			√		√		√		√	
14	***FSC Auditing***										
14a	Certification Audit	√					√				
14b	Surveillance Audit		√	√	√	√	√	√	√	√	√
15	Report Writing			√			√			√	

concerning the presence of such wildlife, whereas KPKKT itself woud take proactive measures to adapt and, where necessary modify, its management and field operations decision, in order to accommodate any new findings.

Indicator 9.4.5: the results of annual HCVF monitoring are made available to SCS auditors and a summary of the results are made available to interested stakeholders.

→ These are summarised and being publicly made available on KPKKT's website www.kpkkt.com.my

6.2 Measurable Effectiveness Indicators (MEI)

As of the moment the following sets of variables and parameters have been shortlisted as having the potential to serve as possible indicators to be used to measure the level of effectiveness of the identified HCVFs within DTC. Their respective measurement protocols and format as well as units of measurementwill be developed by KPKKT in due course.

6.2.1 Keruing sarawak HCVF Area

(1) The increase in awareness about D. sarawakensis and its auecology could possibly be measured in the following ways

i. Number of research conducted, institutions, research grants/ funds

ii. Number of technical reports prepared and published

iv. Number of querries on the species and plot

v. Number of meetings & discourses held on *Dipterocarpus sarawakensis* and other species in the area

vi. Number of visitations to the site.

(2) ***The increase in protection level accorded the species could be evidenced by:***

i. HCVF area being well-protected through clearly-demarcated boundaries - this is being affected by KPKKT in close cooperation with TSFD whereby the distribution of tasks and responsibilities between the two parties have been clearly identified. Under the arrangement, KPKKT bears the responsibility to maintain the integrity of the HCVF areas whereas TSFD exerts its enforcement authority where appropriate. At the same time interested agencies such a WWF-Malaysia, FRIM and academic institutions are welcome and permitted to conduct their respective work in close coordination by KPKKT.

ii. Sample plot well-demarcated and maintained

iii. Sample trees and wildings are well-marked and protected

iv. Zero encroachment into the area

v. Zero modification/ manipulation of the site

vi. Zero intrusion of foreign objects and/or organism into the site

vii. Zero incidence of fire

viii. Incidence of windthrow

ix. Incidence of floods.

(3) ***Increased conservation of the species through the following efforts:***

i. Wildings collected and raised in the nursery (number, quality, survival rates)

ii. Growth, mortality and recruitment of the species under natural condition

iii. Phenological behaviour of the species (e.g. flowering, fruiting, seeding, shooting).

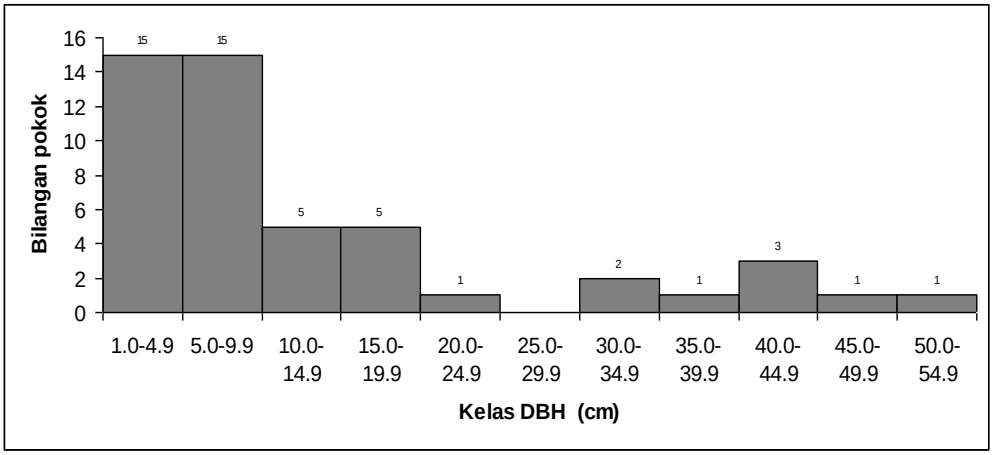


Figure 13. Distribution of Keruing sarawak trees in the HCVF Plot.

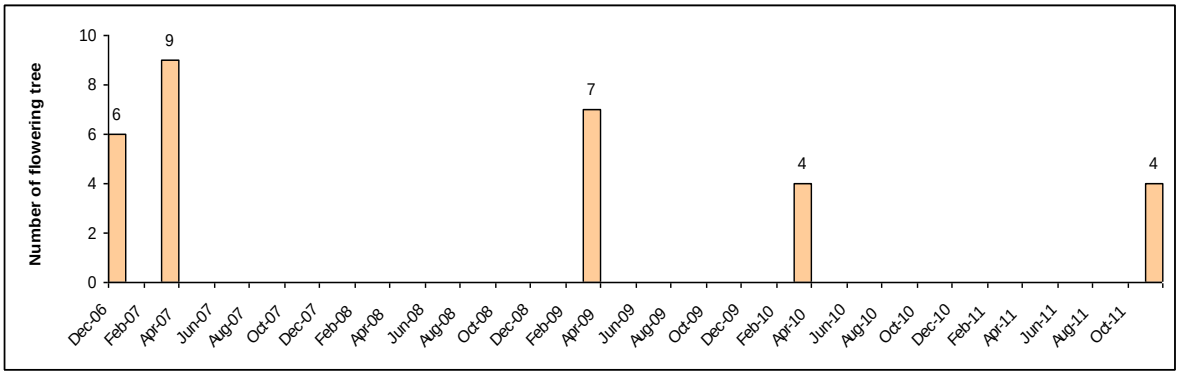


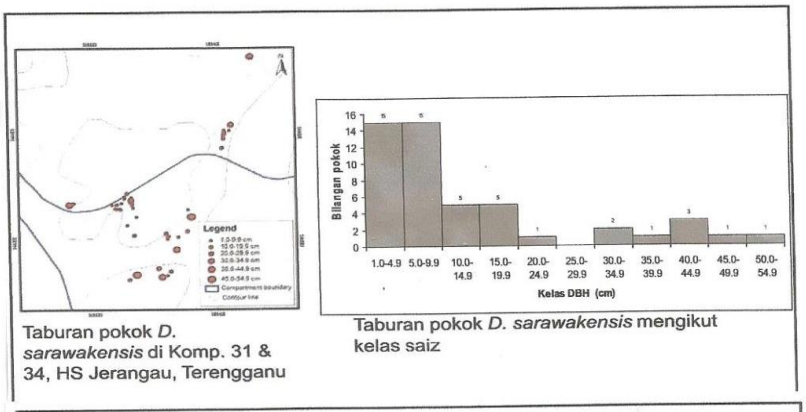
Fig. 14 (a)

Fig. 14 (b)

Fig. 14(a) & (b): Results of Phenological Monitoring of Keruing sarawak, 2006 – 2012

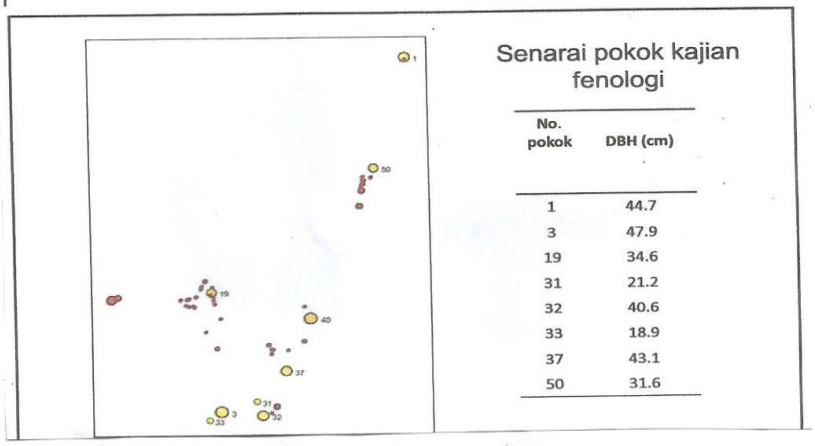
Fig. 15. Preliminary Findings from Keruing sarawak HCVF Plot**.**
(Source: Yong & Chua (2015)

15 (a)



Taburan pokok *D. sarawakensis* di Komp. 31 & 34, HS Jerangau, Terengganu

Taburan pokok *D. sarawakensis* mengikut kelas saiz



Senarai pokok kajian fenologi

No. pokok	DBH (cm)
1	44.7
3	47.9
19	34.6
31	21.2
32	40.6
33	18.9
37	43.1
50	31.6

- Kajian atas pokok no. 19 dijalankan pada April 2012

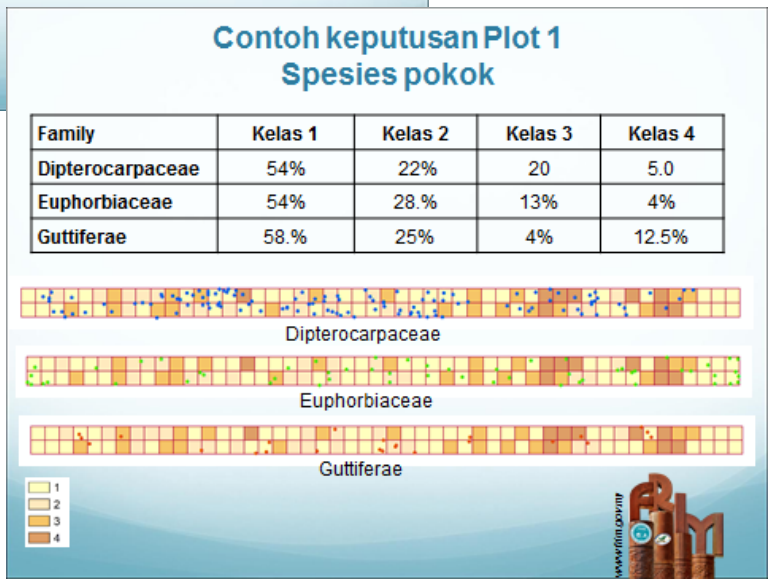
-Kamera dipasang pada pokok kapur bersebelahan pokok no. 19 untuk merakam perkembangan bunga dan aktiviti serangga

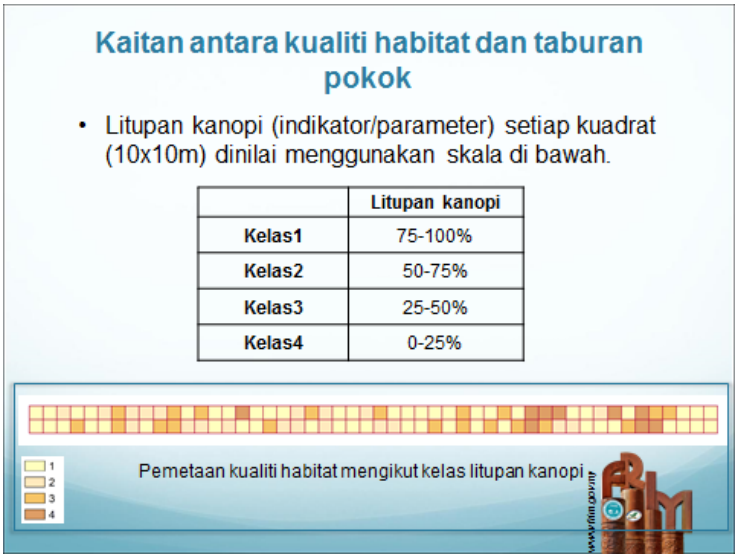
-Rakaman bermula 6 petang hingga 10.30 malam

15 (b)


Dipterocarpus sarawakensis
65 pokok telah direkodkan
Bilangan pokok
0
10
20
30
40
1.0-9.9
10.0-19.9
20.0-29.9
30.0-39.9
40.0-49.9
50.0-59.9
60.0-69.9
Kelas diameter DBH (cm)

15 (c)


Contoh keputusan Plot 1
Spesies pokok
Family | Kelas 1 | Kelas 2 | Kelas 3 | Kelas 4
Dipterocarpaceae | 54% | 22% | 20 | 5.0
Euphorbiaceae | 54% | 28.% | 13% | 4%
Guttiferae | 58.% | 25% | 4% | 12.5%
Dipterocarpaceae
Euphorbiaceae
Guttiferae
1
2
3
4


Kaitan antara kualiti habitat dan taburan pokok
• Litupan kanopi (indikator/parameter) setiap kuadrat (10x10m) dinilai menggunakan skala di bawah.
Litupan kanopi
Kelas1 | 75-100%
Kelas2 | 50-75%
Kelas3 | 25-50%
Kelas4 | 0-25%
1
2
3
4
Pemetaan kualiti habitat mengikut kelas litupan kanopi

15(d)

Table 13:

Results from a series of observations made on the flowering behaviour of *D. sarawakensis* trees in HCVF Plot, May – November 2014.

Hasil pemerhatian:
Pemerhatian berkala *D. sarawakensis* setiap 2 minggu sekali (atau 4 minggu sekali) telah dijalankan pada Mei hingga November 2014.

	Tarikh	Bilangan pokok berbunga	Bilangan pokok berbuah
1.	8 Mei 2014	Tiada	Tiada
2.	22 Mei 2014	Tiada	Tiada
3.	5 Jun 2014	Tiada	Tiada
4.	26 Jun 2014	Tiada	Tiada
5.	10 Julai 2014	Tiada	Tiada
6.	5 Ogos 2014	1 (Pokok no. 32)	
7.	21 Ogos 2014	Tiada	1 (Pokok no. 32)
8.	11 September 2014	Tiada	1 (Pokok no. 32)
9.	23 September 2014	Tiada	1 (Pokok no. 32)
10.	9 Oktober 2014	Tiada	1 (Pokok no. 32)
11.	4 November 2014	Tiada	Tiada
12.	18 November 2014	Tiada	Tiada

Sebanyak 9 pokok iaitu pokok 1, 3, 19, 32, 33, 37, 40, 42 dan 50 direkodkan berbunga pada bulan Mac 2014. Pada 9 Mei 2014, buah pada pokok-pokok tersebut telah matang dan gugur. Tiada aktiviti penghasilan bunga dan buah direkodkan selepas itu sehingga November 2014 kecuali pokok no. 32 yang direkodkan berbunga pada 5 Ogos 2014 (0-25% silara menghasilkan bunga).

Kajian tentang jumlah pembentukan bunga dan buah sedang dijalankan menggunakan kaedah perangkap buah "seed trap" di pokok 1, 19 dan 37. Kajian ini bertujuan untuk menganggar bilangan bunga dan buah yang terbentuk pada musim ini. Bilangan bunga dan buah yang jatuh dalam perangkap dari awal peringkat kudup sehingga buah matang direkodkan untuk analisis.

Penghargaan
Jutaan terima kasih diucapkan kepada Jabatan Perhutanan Semenanjung Malaysia, Pengarah Perhutanan Negeri Terengganu, Pegawai Hutan Daerah Terengganu Barat, pihak Kumpulan Pengurusan Kayu Kayan Terengganu Sdn. Bhd. (KPKKT), pegawai-pegawai hutan dan Renjer-renjer di Pegawai Hutan Daerah Terengganu Barat dan Pejabat Renjer Jerangau atas kebenaran dan kerjasama yang diberikan untuk menjalankan lawatan kajian ini.

Laporan disediakan oleh,
Wendy Yong Sze Yee
Institut Penyelidikan Perhutanan Malaysia (FRIM)
16 December 2014

6.2.2 Community Water Catchment HCVF in Compt 52, Jengai PRF

Measurable effectiveness indicators for this unique HCVF site will be developed along the following line:

(1) Area protection

i. Watershed area well-protected
ii. Watershed boundaries well-demarcated, maintained and protected
iii. Zero encroachment into the area
iv. Zero modification/ manipulation of the site
v. Zero intrusion of foreign objects and/or organism into the area
vi. Zero incidence of fire
vii. Incidence of windthrow monitored
viii. Zero disturbance/ pollution of the headwater& along stream.

(2) River protection

i. Incidence of soil erosion monitored
ii. Incidence of river bank failure/ collapse monitored
iii. Incidence of treefall into river monitored
iv. Dead animal, animal waste & human waste falling into stream prohibited
v. Polluting substance into stream (e.g. waste oil, rubbish, etc) prohibited.

(3) Water supply

i. Quantity of water per unit time (KPKKT to install water meter at main outlet pipe to Kg Pasir Raja village)
ii. Regularity of flow (zero damage to delivery pipes & piping system, monitoring

of low flow and high flow)

iii. Quality of water (pH, turbidity, *E. coli* content, chemical contents, oil and grease, suspended sediment, etc) should meet the minimum health and Department of Environment's standards of drinkable water (see **Annex 6**). KPKKT to conduct regular water quality monitoring at source and main outlet pipe. An EIA consultant has been appointed to this effect.

(4) ***Rapport with stakeholders***

i. Number of households benefiting from the scheme

ii. Types of uses to which the water is being put

iii. Estimated amount of cash savings by household offset by free supply of water

iv. Negative effects from usage of water (incidence of diseases, incidence of crop failures from usage of water, incidence of damage to tools, machines & facilities)

v. Feedbacks from Health Department.

(5) ***Publicity and reputation***

i. Number of compliments received by KPKKT

ii. Number of studies and visits by outsiders.

7.0 Summary and Recommendations

According to WWF-Malaysia (2009), the identification and management of HCVFs at the Forest Management Unit (FMU) level requires the following steps:

(1) Interpret the global definition

(2) Identify potential HCVF

(3) Identify specific HCVF components in the field and through consultation

(4) Zone HCVF areas and buffer zones

(5) Identify Limits of Acceptable Change (LAC) for maintaining HCVF

(6) Plan precautionary management prescriptions for HCVF compartments

(7) Implement management activities

(8) Monitor impacts of management activities

(9) Evaluate impacts of management activities

(10) Adapt management where appropriate.

For the case of DTC, it is recommended for KPKKT to adopt the approach of management as propounded in this HCVF Managament Plan document while at the same time adapting wherever possible, the above conceptual approach of WWF-Malaysia as well as that of the Forestry Department.

Among immediate future activities that need to be taken by KPKKT in respect of the two HCVFs include strengthening those HCVFs by:

(1) adapting as much as possible findings from research on HCVF1 (*D. sarawakensis*) into nursery and silvicultural research and practices at KPKKT,

(2) taking concrete steps to **(a)** reaffirm the legal status of HCVF4 (Community water catchment) by applying for the appropriate Use Permit for water harvesting from TSFD,i.e. in comformity with FSC Principle No. 1, **(b)** seeking the appropriate advice and guidance from the relevant authorities, such as SPAN (*Suruhanjaya Perbekalan Air Negara* – National Commission for Water Supplies) as well as the Health Department on matters concerning safety and health from the use of the water supplied..

(3) conducting further consultations with the relevant stakeholders on the HCVFs mentioned.

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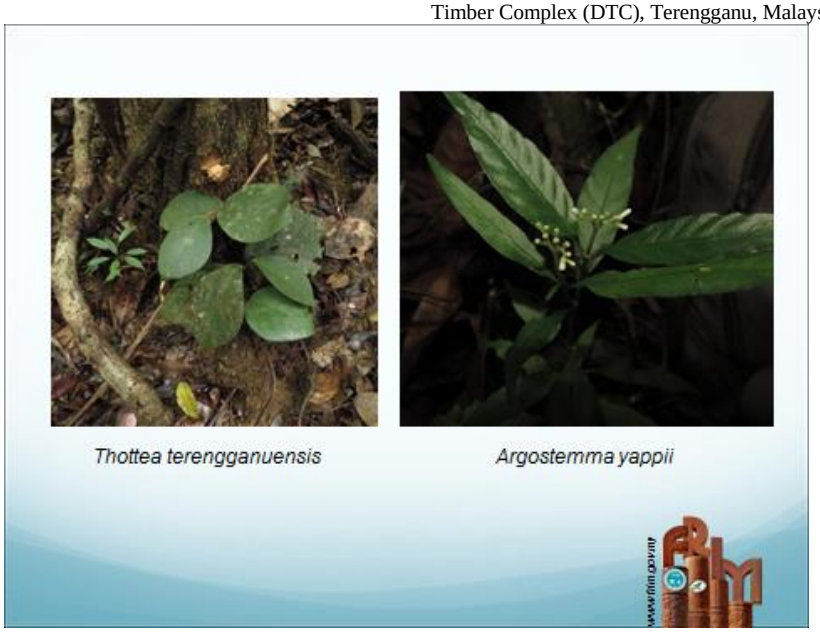
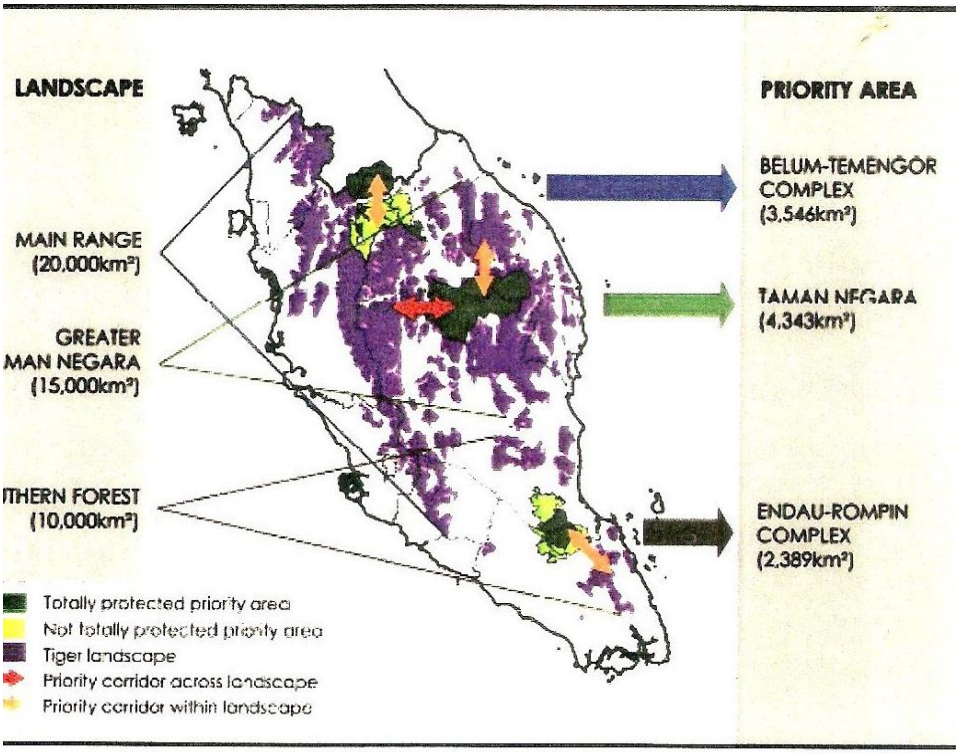
Annex 1: Photos of HCV Findings in DTC

Flora


Thottea terengganuensis
Argostemma yappii

Fauna



13: The greater Taman Negara landscape: a Tiger Priority Area (DWNP, 2008)

Mouse Deer Track

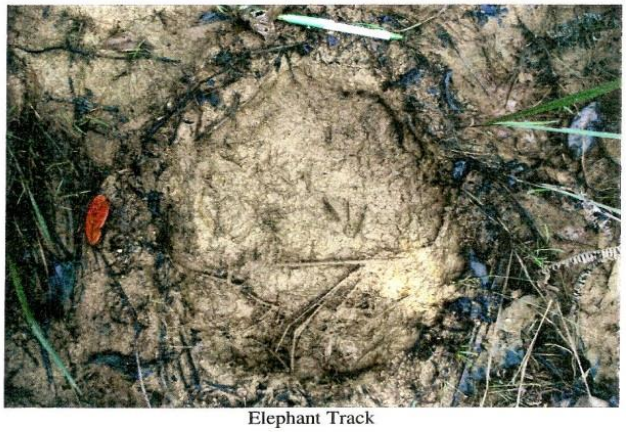
Seladang Track

Ungulate track

Elephant Dung

Wild Boar (Left) and Tapir (Right)

Tapir Track



Elephant Track

Annex 2:

A PRELIMINARY CHECKLIST OF VASCULAR PLANTS FOR THE JERANGAU F.R., TERENGGANU, PENINSULAR MALAYSIA

by

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Ferns						
Family	**Scientific Name**	**Vernacular Name**	**A**	**B**	**C**	**D**
Adiantaceae	Adiantum sp.				x	
Adiantaceae	Haplopteris sp.		x			
Adiantaceae	Taenitis sp.				x	
Aspleniaceae	Asplenium nidus L.		x		x	
Aspleniaceae	Asplenium sp.1		x			
Aspleniaceae	Asplenium sp.2		x			
Aspleniaceae	Asplenium tenerum G.Forst.		x			
Blechnaceae	Blechnum sp.				x	
Blechnaceae	Blechnum orientale L.					x
Blechnaceae	Stenochlaena palustris (Burm.f.) Bedd.	Paku Miding				x
Cyatheaceae	Cyathea latebrosa (Wall. ex Hook.) Copel.	Paku Gajah	x			
Davalliaceae	Davallia sp.				x	
Dennstaedtiaceae	Lindsaea sp.		x		x	
Dennstaedtiaceae	Orthiopteris sp.		x			
Dryopteridaceae	Diplazium cordifolium Blume var. cordifolium		x			
Dryopteridaceae	Diplazium tomentosum Blume			x		
Dryopteridaceae	Pleocnemia sp.				x	
Gleicheniaceae	Dicranopteris linearis (Burm.f.) Underw.	Resam	x			x
Hymenophyllaceae	Hymenophyllum sp.				x	
Hymenophyllaceae	Trichomanes javanicum Blume		x		x	
Hymenophyllaceae	Trichomanes sp.		x			
Lomariopsidaceae	Bolbitis heteroclita (C.Presl) Ching		x			
Nephrolepidaceae	Nephrolepis auriculata (L.) Trimen					x
Oleandraceae	Nephrolepis sp.		x			
Ophioglossaceae	Helminthostachys zeylanica (L.) Hook.					
Polypodiaceae	Drynaria sp.			x		
Polypodiaceae	Pyrrosia angustata (Sw.) Ching		x	x		
Pteridaceae	Pteris sp.				x	
Schizaeaceae	Lygodium flexuosum (L.) Sw.					x
Selaginellaceae	[Tg]Selaginella willdenowii (Desv) Baker					
Thelypteridaceae	Pronephrium rubicundum (Alderw.) Holttum			x		
Vittariaceae	Anthrophyum sp.				x	
Lycophytes						
Family	**Scientific Name**	**Vernacular Name**	**A**	**B**	**C**	**D**
Lycopodiaceae	Huperzia phlegmaria (L.) Rothm.		x			
Lycopodiaceae	Huperzia sp.		x			
Selaginellaceae	Selaginella intermedia (Blume) Spring var. intermedia				x	
Selaginellaceae	Selaginella sp.1		x			
Selaginellaceae	Selaginella sp.2		x			

Monocots						
Family	**Scientific Name**	**Vernacular Name**	**A**	**B**	**C**	**D**
Araceae	Aglaonema sp.1		x			
Araceae	Aglaonema sp.2				x	
Araceae	Amorphophallus sp.		x			
Araceae	Homalomena sagittifolia Jungh. ex Schott var. sagittifolia	Kemoyang				x
Commelinaceae	Amischotolype sp.1		x			
Commelinaceae	Amischotolype sp.2				x	
Costaceae	Costus speciosus (J.König) Sm.	Setawar				x
Cyperaceae	Mapania cuspidata (Miq.) Uittien var. petiolata (C.B.Clarke) Uittien	Serapat	x	x	x	
Cyperaceae	Mapania sp.		x	x	x	x
Cyperaceae	Scleria sp.	Seyanit	x			
Dracaenaceae	Dracaena elliptica Thunb.	Senjuang Hutan				
Gramineae	Centotheca sp.				x	x
Gramineae	Scrotochloa urceolata (Roxb.) Judz.			x		x
Gramineae	[Tg]Themeda villosa (Poir.) A.Camus					x
Hanguanaceae	Hanguana malayana (Jack) Merr.	Bakong	x	x	x	
Hypoxidaceae	Molineria latifolia (Dryand.) Herb. ex Kurz var. latifolia (Dryand.) Herb. ex Kurz	Lemba	x			x
Lowiaceae	[E]Orchidantha fimbriata Holttum		x			
Marantaceae	Donax grandis (Miq.) K.Schum.	Bemban	x	x		x
Marantaceae	Phrynium pubinerve Blume		x	x		
Musaceae	Musa gracilis Holttum	Pisang Hutan	x	x		
Orchidaceae	Coelogyne cumingii Lindl.		x	x		
Orchidaceae	Dendrobium indivisum (Blume) Miq.		x	x		
Orchidaceae	Dendrobium rhodostele Ridl.		x			
Orchidaceae	[ETg]Eria atrovinosa Carr			x		
Palmae	Calamus castaneus Griff.	Rotan Cucur	x	x	x	
Palmae	Caryota mitis Lour.	Tukas	x		x	x
Palmae	Daemonorops geniculata (Griff.) Mart.		x	x	x	
Palmae	Daemonorops verticillaris (Griff.) Mart.	Rotan Sabong	x		x	
Palmae	Eleiodoxa conferta (Griff.) Burret	Kelubi			x	
Palmae	[E]Eugeissona brachystachys Ridl.	Bertam	x		x	
Palmae	[E]Eugeissona tristis Griff.	Bertam	x	x		x
Palmae	Iguanura sp.1	Teronoh	x			
Palmae	Iguanura sp.2	Teronoh			x	
Palmae	Iguanura wallichiana (Wall. ex Mart.) Hook.f. var. major Becc.	Teronoh	x	x	x	
Palmae	[Tg]Johannesteijsmannia altifrons (Reichb.f. et Zoll.) Moore	Payung, Kor	x		x	
Palmae	[E]Licuala bayana Saw	Palas			x	
Palmae	[E]Licuala fractiflexa Saw	Palas	x			
Palmae	Nenga macrocarpa Scort. ex Becc.	Pinang Hutan				x
Palmae	Oncosperma horridum Scheff.	Bayas	x	x		x
Palmae	[E]Pholidocarpus kingianus (Becc.) Ridl.	Sai			x	
Palmae	Pinanga auriculata Becc. var. leucocarpa C.K.Lim	Pinang Hutan	x			
Palmae	[ETg]Pinanga beccariana Furtado	Pinang Hutan	x			
Palmae	Pinanga disticha (Roxb.) Blume ex H.Wendl.	Pinang Hutan	x	x	x	x
Palmae	[E]Pinanga glaucescens Ridl.	Pinang Hutan	x			x
Palmae	Pinanga limosa Ridl.	Pinang Hutan	x			x
Palmae	Pinanga malaiana (Mart.) Scheff.	Pinang Hutan	x	x	x	
Palmae	[E]Pinanga scortechinii Becc.	Pinang Hutan	x	x	x	
Palmae	Pinanga simplicifrons (Miq.) Becc.	Pinang Hutan	x	x	x	

Taccaceae	Tacca integrifolia Ker Gawl.	Keladi Murai	x	x		
Zingiberaceae	Boesenbergia prainiana (Baker) Schltr.		x			
Zingiberaceae	Camptandra parvula (King ex Baker) Ridl.		x			
Zingiberaceae	Elettariopsis sp.		x			
Zingiberaceae	Etlingera punicea (Roxb.) R.M.Sm.				x	
Zingiberaceae	[E]Globba corneri A.Weber		x			
Zingiberaceae	[E]Scaphochlamys atroviridis Holttum		x	x		x
Zingiberaceae	[ETg]Scaphochlamys breviscapa Holttum				x	x
Zingiberaceae	[E]Scaphochlamys kunstleri (Baker) Holttum		x			
Zingiberaceae	Zingiber puberulum Ridl.		x			
Dicots						
Family	**Scientific Name**	**Vernacular Name**	**A**	**B**	**C**	**D**
Acanthaceae	Asystasia gangetica (L.) T.Anderson ssp. gangetica	Rumput Israel	x			x
Acanthaceae	Staurogyne kingiana C.B.Clarke		x			
Acanthaceae	Staurogyne sp		x			
Actinidiaceae	Saurauia pentapetala (Jack) Hoogland	Taban	x			
Alangiaceae	Alangium ebenaceum (C.B.Clarke) Harms var. ebenaceum	Mentulang Daun Bujor			x	
Alangiaceae	[Tg]Alangium nobile (C.B.Clarke) Harms	Mentulang Bulu				x
Anacardiaceae	Bouea oppositifolia (Roxb.) Meisn.	Kundang Rumenia	x	x	x	
Anacardiaceae	Buchanania sessifolia Blume	Otak Udang Daun Tajam	x			
Anacardiaceae	Campnosperma auriculatum (Blume) Hook.f.	Terentang Daun Besar	x	x	x	x
Anacardiaceae	Campnosperma squamatum Ridl.	Terentang Daun Kecil			x	
Anacardiaceae	Dracontomelon dao (Blanco) Merr. & Rolfe	Sengkuang	x			x
Anacardiaceae	Drimycarpus luridus (Hookf) Ding Hou	Rengas Api	x			
Anacardiaceae	Gluta aptera (King) Ding Hou	Rengas Kerbau Jalang	x	x	x	x
Anacardiaceae	Gluta elegans (Wall.) Hook.f.	Rengas Kerbau Jalang	x			
Anacardiaceae	[E]Mangifera gracilipes Hook.f.	Machang Hutan				x
Anacardiaceae	Mangifera macrocarpa Blume	Machang Hutan			x	
Anacardiaceae	Mangifera magnifica Kochummen	Machang Hutan				x
Anacardiaceae	Mangifera quadrifida Jack	Sepam, Asam Kumbang, Machang	x			
Anacardiaceae	Melanochyla angustifolia Hook.f.	Rengas Padi	x	x	x	x
Anacardiaceae	[Tg]Melanochyla auriculata Hook.f.	Rengas Padi	x	x		
Anacardiaceae	Melanochyla caesia (Blume) Ding Hou	Rengas Padi			x	
Anacardiaceae	[Tg]Melanochyla fulvinervis (Blume) Ding Hou	Rengas Padi	x	x	x	x
Anacardiaceae	[Tg]Melanochyla tomentosa Hook.f.	Rengas Padi	x	x	x	x
Anacardiaceae	Parishia paucijuga Engl.	Sepul			x	x
Anacardiaceae	Pentaspadon motleyi Hook.f.	Pelong Lilin	x	x	x	
Anacardiaceae	Swintonia schwenkii (Teijsm. & Binn.) Teijsm. & Binn.	Merpauh Periang	x			
Anisophylleaceae	Anisophyllea corneri Ding Hou	Delek	x	x	x	x
Anisophylleaceae	Anisophyllea disticha (Jack) Baill.	Delek	x	x	x	x
Anisophylleaceae	Anisophyllea rhomboidea Baill.	Delek				x
Anisophylleaceae	Anisophyllea scortechinii King	Delek	x	x	x	
Anisophylleaceae	Anisophyllea sp.	Delek	x			
Annonaceae	Alphonsea cylindrica King	Mempisang	x			
Annonaceae	Desmos chinensis Lour.	Akar Mempisang	x			x
Annonaceae	[ETg]Enicosanthum fuscum (King) Airy Shaw	Mempisang	x			
Annonaceae	[Tg]Friesodielsia affinis (Hook.f. & Thomson) D.Das	Akar Mempisang				x
Annonaceae	[ETg]Goniothalamus curtisii King	Gajah Beranak	x		x	
Annonaceae	Goniothalamus macrophyllus (Blume) Hook.f. & Thomson	Selada	x	x		x
Annonaceae	Goniothalamus sp.			x		
Annonaceae	[Tg]Goniothalamus wrayi King	Gajah Beranak	x			

Annonaceae	Mezzettia parviflora Becc.	Mempisang	x	x	x	
Annonaceae	Mitrephora maingayi Hook.f. & Thomson	Mempisang	x			
Annonaceae	Monocarpia marginalis (Scheff.) J.Sinclair	Mempisang	x	x	x	x
Annonaceae	[Tg]Phaeanthus ophthalmicus (Roxb. ex G.Don) J.Sinclair	Mempisang	x	x	x	
Annonaceae	Polyalthia bullata King	Mempisang			x	
Annonaceae	Polyalthia cauliflora Hook.f. & Thomson	Mempisang	x			
Annonaceae	Polyalthia cauliflora Hook.f. & Thomson var. cauliflora	Mempisang	x		x	
Annonaceae	Polyalthia rumphii (Blume) Merr.	Mempisang	x			x
Annonaceae	Polyalthia sp.1					x
Annonaceae	Polyalthia sp.2	Mempisang	x			
Annonaceae	Polyalthia stenopetala (Hook.f. & Thomson) Ridl.	Mempisang			x	
Annonaceae	Polyalthia sumatrana (Miq.) Kurz.	Mempisang	x	x	x	x
Annonaceae	Popowia pisocarpa (Blume) Endl.	Mempisang	x	x		x
Annonaceae	Pseuduvaria macrophylla (Oliv.) Merr.	Mempisang	x	x	x	
Annonaceae	[Tg]Trivalvaria macrophylla (Blume) Miq.	Mempisang	x			
Annonaceae	[Tg]Xylopia caudata Hook.f. & Thomson	Jangkang	x		x	x
Annonaceae	Xylopia ferruginea (Hook.f. & Thomson) Hook.f. & Thoms	Jangkang Bukit	x	x		x
Annonaceae	[E]Xylopia magna Maingay ex Hook.f. & Thomson	Jangkang	x			x
Annonaceae	Xylopia malayana Hook.f. & Thomson var. malayana	Jangkang	x		x	x
Apocynaceae	[Tg]Alstonia angustifolia Wall. ex DC.	Pulai Penipu Paya				x
Apocynaceae	Alstonia angustiloba Miq.	Pulai	x	x	x	x
Apocynaceae	Alstonia macrophylla Wall. ex G.Don	Pulai Penipu Bukit				x
Apocynaceae	Dyera costulata (Miq.) Hook.f.	Jelutong	x	x	x	x
Apocynaceae	[Tg]Kibatalia maingayi (Hookf) Woodson	Jelutong Pipit	x	x		x
Apocynaceae	Tabernaemontana corymbosa Roxb. ex Wall.		x			x
Aquifoliaceae	Ilex macrophylla Hook.f.	Timah-timah Bulan, Medang Tulok			x	
Araliaceae	Arthrophyllum diversifolium Blume	Susun Pelepah	x			x
Araliaceae	Schefflera sp.		x			
Araliaceae	Trevesia burckii Boerl.	Tapak Hantu	x			
Aristolochiaceae	Thottea grandiflora Rottb.	Hempedu Beruang			x	
Aristolochiaceae	Thottea sp.	Hempedu Beruang			x	
Begoniaceae	[E]Begonia barbellata Ridl.	Asam Batu	x			
Begoniaceae	[ETg]Begonia holttumii Irmsch.	Asam Batu	x			
Bignoniaceae	Radermachera glandulosa (Blume) Miq.		x	x		
Bombacaceae	Coelostegia griffithii Benth.	Punggai			x	
Bombacaceae	Durio graveolens Becc.	Durian Merah	x			
Bombacaceae	Durio lowianus Scort ex King	Durian Daun	x			
Bombacaceae	[E]Durio singaporensis Ridl.	Durian Bujor				x
Bombacaceae	Neesia synandra Mast.	Benggang, Ha Ha		x	x	
Burseraceae	Canarium littorale Blume	Kedondong Bulan	x	x	x	x
Burseraceae	Canarium patentinervium Miq.	Kedondong	x			x
Burseraceae	Canarium pilosum Benn	Kedondong	x			
Burseraceae	Dacryodes laxa (Benn.) H.J.Lam	Kedondong Mempelas	x	x	x	
Burseraceae	Dacryodes rostrata (Blume) H.J.Lam	Kedondong Kerut	x	x	x	x
Burseraceae	[Tg]Santiria apiculata Benn. var. apiculata	Kedondong Kerantai	x			
Burseraceae	Santiria griffithii (Hook.f.) Engl.	Kedondong Kerantai	x			x
Burseraceae	Santiria laevigata Blume	Kedondong Kerantai Licin	x	x		x
Burseraceae	Santiria tomentosa Blume	Kedondong Kerantai Bulu	x			
Cardiopteridaceae	[Tg]Gonocaryum lobbianum (Miers) Kurz				x	
Celastraceae	Bhesa paniculata Arn.	Biku-biku	x	x	x	x
Celastraceae	Euonymus javanicus Blume		x			
Celastraceae	Glyptopetalum quadrangulare Prain ex King			x		
Celastraceae	Lophopetalum sp.	Perupuk	x			
Celastraceae	Salacia grandiflora Kurz					x

Chrysobalanaceae	Atuna nannodes (Kostermans) Kostermans	Merbatu		x		
Chrysobalanaceae	Atuna racemosa Raf.	Merbatu	x		x	
Chrysobalanaceae	Licania splendens (Korth.) Prance	Merbatu	x		x	
Chrysobalanaceae	Parinari rigida Kostermans	Merbatu				x
Compositae	Chromolaena odorata (L.) R.M.King & H.Rob.	Kapal Terbang				x
Compositae	Emilia sonchifolia (L.) DC.					x
Compositae	Mikania cordata (Burm.f.) B.L.Rob.	Selaput Tungul				x
Compositae	[Tg]Vernonia arborea Buch.-Ham	Gambong	x			x
Connaraceae	Cnestis palala (Lour.) Merr.	Akar Banik		x		
Convallariaceae	Peliosanthes teta Andrews ssp. humilis (Andrews) Jessop	Derhaka Mertua	x	x		x
Crypteroniaceae	Crypteronia griffithii C.B.Clarke	Bekoi	x			
Dilleniaceae	Acrotrema costatum Jack	Akar Mempelas				x
Dilleniaceae	Dillenia grandifolia Wall. ex Hook.f. & Thomson	Simpoh Daun Merah	x			
Dilleniaceae	[Tg]Dillenia reticulata King var. psilocarpella Hoogland	Simpoh Gajah	x		x	x
Dilleniaceae	[Tg]Dillenia sumatrana Miq.	Simpoh	x			
Dilleniaceae	Tetracera indica (Christm. & Panz.) Merr.	Akar Mempelas				x
Dipterocarpaceae	Anisoptera laevis Ridl.	Mersawa Durian	x	x		
Dipterocarpaceae	Dipterocarpus concavus Foxw.	Keruing Sendok			x	x
Dipterocarpaceae	[Tg]Dipterocarpus coriaceus Slooten	Keruing Paya			x	
Dipterocarpaceae	Dipterocarpus costulatus Slooten	Keruing Kipas			x	
Dipterocarpaceae	Dipterocarpus crinitus Dyer	Keruing Mempelas	x			x
Dipterocarpaceae	Dipterocarpus eurynchus Miq.	Keruing Baran	x			
Dipterocarpaceae	Dipterocarpus grandiflorus (Blanco) Blanco	Keruing Belimbing	x	x		
Dipterocarpaceae	Dipterocarpus lowii Hook.f.	Keruing Sol			x	x
Dipterocarpaceae	Dipterocarpus sarawakensis (Browne) Slooten	Keruing Sarawak			x	x
Dipterocarpaceae	Dipterocarpus verrucosus Foxw.	Keruing Merah	x			
Dipterocarpaceae	Dryobalanops aromatica C.F.Gaertn.	Kapur			x	x
Dipterocarpaceae	Dryobalanops oblongifolia Dyer ssp. occidentalis P.S.Ashton	Keladan	x		x	
Dipterocarpaceae	Hopea mengerawan Miq.	Merawan Penak			x	
Dipterocarpaceae	Hopea nutans Ridl.	Giam			x	x
Dipterocarpaceae	Hopea sp.	Giam/ Merawan				x
Dipterocarpaceae	Neobalanocarpus heimii (King) P.S.Ashton	Chengal		x		
Dipterocarpaceae	Parashorea stellata Kurz	Gerutu-gerutu	x	x		
Dipterocarpaceae	Shorea acuminata Dyer	Meranti Rambai Daun	x	x	x	x
Dipterocarpaceae	Shorea assamica Dyer	Meranti Pipit	x			
Dipterocarpaceae	Shorea atrinervosa Symington	Balau Hitam	x			
Dipterocarpaceae	Shorea balanocarpoides Symington	Damar Hitam Katup				x
Dipterocarpaceae	Shorea bracteolata Dyer	Meranti Pa'ang	x	x	x	x
Dipterocarpaceae	[E]Shorea collina Ridl.	Balau Merah	x			
Dipterocarpaceae	Shorea curtisii Dyer ex King ssp. curtisii	Meranti Seraya	x	x		
Dipterocarpaceae	Shorea faguetiana F.Heim	Damar Hitam Siput			x	
Dipterocarpaceae	Shorea foxworthyi Symington	Balau Bukit	x			
Dipterocarpaceae	Shorea hopeifolia (F.Heim) Symington	Damar Hitam Siput Jantan	x			
Dipterocarpaceae	Shorea lepidota (Korth.) Blume	Meranti Langgong	x	x		x
Dipterocarpaceae	Shorea leprosula Miq.	Meranti Tembaga	x	x	x	x
Dipterocarpaceae	Shorea longisperma Roxb.	Damar Hitam Bulu	x			
Dipterocarpaceae	Shorea macroptera Dyer	Meranti Melantai	x	x	x	x
Dipterocarpaceae	[E]Shorea maxima (King) Symington	Damar Hitam Sengkawang Putih		x		
Dipterocarpaceae	Shorea multiflora (Burck) Symington	Damar Hitam Pipit	x	x	x	x
Dipterocarpaceae	Shorea ovalis (Korth.) Blume	Meranti Kepong	x	x	x	x
Dipterocarpaceae	Shorea palembanica Miq.	Meranti Tengkawang Ayer	x	x		
Dipterocarpaceae	Shorea parvifolia Dyer ssp. parvifolia	Meranti Sarang Punai	x	x	x	
Dipterocarpaceae	Shorea pauciflora King	Meranti Nemesu	x	x		x

Dipterocarpaceae	Shorea platycarpa F.Heim	Meranti Paya				x
Dipterocarpaceae	Shorea singkawang (Miq.) Miq. Ssp. scabrosa P.S.Ashton	Meranti Sengkawang Bulu	x			
Dipterocarpaceae	Shorea singkawang (Miq.) Miq. ssp. singkawang	Meranti Sengkawang Merah		x		x
Dipterocarpaceae	Shorea sumatrana (Slooten) Desch	Balau Sengkawag Ayer			x	
Dipterocarpaceae	Vatica havilandii Brandis	Resak Degong				x
Dipterocarpaceae	Vatica nitens King	Resak Daun Panjang	x	x		
Dipterocarpaceae	Vatica pauciflora (Korth.) Blume	Resak Laru	x		x	
Dipterocarpaceae	Vatica sp.	Resak				x
Dipterocarpaceae	Vatica stapfiana (King) Slooten	Resak Mempening	x	x		
Ebenaceae	**Tg**Diospyros areolata King & Gamble	Kayu Arang	x			
Ebenaceae	**E**Diospyros argentea Griff.	Kayu Arang	x		x	x
Ebenaceae	Diospyros buxifolia (Blume) Hiern.	Meribut	x	x	x	x
Ebenaceae	Diospyros confertiflora (Hiern.) Bakh.	Kayu Arang				x
Ebenaceae	**Tg**Diospyros diepenhorstii Miq.	Kayu Arang	x		x	
Ebenaceae	**Tg**Diospyros ellipsoidea King & Gamble	Kayu Arang	x			
Ebenaceae	Diospyros lanceifolia Roxb.	Kayu Arang	x			
Ebenaceae	Diospyros latisepala Ridl.	Kayu Arang	x			
Ebenaceae	Diospyros maingayi (Hiern.) Bakh.	Kayu Arang			x	x
Ebenaceae	**ETg**Diospyros nutans King & Gamble	Kayu Arang	x			
Ebenaceae	**ETg**Diospyros penangiana King & Gamble	Kayu Arang	x		x	
Ebenaceae	Diospyros pilosanthera Blanco var. oblonga (Wall. ex G.Don) Ng	Kayu Arang		x		
Ebenaceae	Diospyros rigida Hiern.	Kayu Arang				x
Ebenaceae	**E**Diospyros rufa King & Gamble	Kayu Arang	x			
Ebenaceae	**E**Diospyros scortechinii King & Gamble	Kayu Arang	x	x		
Ebenaceae	**ETg**Diospyros singaporensis Bakh.	Kayu Arang	x		x	
Ebenaceae	Diospyros sp.1	Kayu Arang				x
Ebenaceae	Diospyros sp.2	Kayu Arang				x
Ebenaceae	Diospyros sp.3	Kayu Arang	x			
Ebenaceae	Diospyros sumatrana Miq.	Kayu Arang	x			
Ebenaceae	Diospyros venosa Wall. ex DC. var. venosa	Kayu Arang			x	
Ebenaceae	**Tg**Diospyros wallichii King & Gamble ex F.N.Williams	Tuba Buah	x			x
Elaeocarpaceae	Elaeocarpus ferrugineus (Jack) Steud. ssp. ferrugineus	Mendong	x			x
Elaeocarpaceae	Elaeocarpus nitidus Jack var. nitidus	Mendong	x	x		x
Elaeocarpaceae	Elaeocarpus palembanicus (Miq.) Corner	Mendong			x	x
Elaeocarpaceae	**E**Elaeocarpus rugosus Roxb.	Mendong				x
Elaeocarpaceae	Elaeocarpus sp.	Mendong	x			
Euphorbiaceae	Agrostistachys gaudichaudii Müll.Arg.	Jenjulong				x
Euphorbiaceae	Agrostistachys longifolia (Wight) Benth. var. longifolia	Jenjulong			x	x
Euphorbiaceae	Antidesma coriaceum Tul.	Berunai	x			x
Euphorbiaceae	Antidesma cuspidatum Müll.Arg.	Berunai				x
Euphorbiaceae	Antidesma neurocarpum Miq.	Berunai			x	
Euphorbiaceae	Antidesma sp.	Berunai			x	
Euphorbiaceae	Baccaurea brevipes Hook.f.	Rambai Hutan	x	x	x	
Euphorbiaceae	Baccaurea kunstleri King ex Gage	Jintek Bukit	x			
Euphorbiaceae	Baccaurea lanceolata (Miq.) Müll.Arg.	Asam Pahong	x			
Euphorbiaceae	**Tg**Baccaurea minor Hook.f.	Tampoi	x			
Euphorbiaceae	Baccaurea parviflora (Müll.Arg.) Müll.Arg.	Setambun Tahi	x	x	x	
Euphorbiaceae	**ETg**Baccaurea polyneura Hook.f.	Setambun				x
Euphorbiaceae	Baccaurea racemosa (Reinw.) Müll.Arg.	Setambun			x	
Euphorbiaceae	Baccaurea reticulata Hook.f.	Tampoi	x			
Euphorbiaceae	Blumeodendron calophyllum Airy Shaw	Gaham Badak				x
Euphorbiaceae	**Tg**Blumeodendron kurzii (Hook.f.) J.J.Sm.	Gaham Badak	x	x		
Euphorbiaceae	Bridelia tomentosa Blume	Kenidai				x
Euphorbiaceae	Chondrostylis kunstleri (King ex Hook.f.) Airy Shaw		x	x		

Euphorbiaceae	[Tg]Cleistanthus sumatranus (Miq.) Müll.Arg.	Kaum Getah	x			x
Euphorbiaceae	Croton argyratus Blume	Hujan Panas	x	x	x	x
Euphorbiaceae	Croton laevifolius Blume		x	x	x	x
Euphorbiaceae	Drypetes pendula Ridl.	Lidah-lidah	x	x	x	x
Euphorbiaceae	Elateriospermum tapos Blume	Perah	x			
Euphorbiaceae	Endospermum diadenum (Miq.) Airy Shaw	Sesenduk	x	x	x	x
Euphorbiaceae	Epiprinus malayanus Griff.		x			
Euphorbiaceae	Glochidion glomerulatum (Miq.) Boerl.	Ubah	x	x	x	x
Euphorbiaceae	Glochidion superbum Baill.	Ubah			x	x
Euphorbiaceae	Macaranga conifera (Zoll.) Müll.Arg.	Mesepat	x	x		x
Euphorbiaceae	Macaranga gigantea (Rchb.f. & Zoll.) Müll.Arg.	Mahang Gajah				x
Euphorbiaceae	[Tg]Macaranga heynei I.M.Johnst.	Mahang				x
Euphorbiaceae	Macaranga hosei King ex Hook.f.	Mahang	x	x		x
Euphorbiaceae	Macaranga hypoleuca (Rchb.f. & Zoll.) Müll.Arg.	Mahang Putih	x	x	x	x
Euphorbiaceae	Macaranga tanarius (L.) Müll.Arg.	Mahang				x
Euphorbiaceae	Macaranga triloba (Blume) Müll.Arg.	Mahang Merah	x	x		
Euphorbiaceae	[E]Mallotus griffithianus Hook.f.	Balik Angin			x	x
Euphorbiaceae	Mallotus macrostachyus (Miq.) Müll.Arg.	Balik Angin	x	x		x
Euphorbiaceae	Mallotus oblongifolius (Miq.) Müll.Arg.	Balik Angin	x			
Euphorbiaceae	Mallotus paniculatus (Lam.) Müll.Arg.	Balik Angin				x
Euphorbiaceae	Mallotus sp.					x
Euphorbiaceae	Neoscortechinia kingii (Hook.f.) Pax & K.Hoffm.		x	x	x	x
Euphorbiaceae	Paracroton pendulus (Hassk.) Miq.		x	x	x	x
Euphorbiaceae	Phyllanthus emblica L.	Pokok Melaka	x	x		
Euphorbiaceae	Pimelodendron griffithianum (Müll.Arg.) Benth.	Perah Ikan	x	x	x	
Euphorbiaceae	[E]Ptychopyxis caput-medusae (Hook.f.) Ridl.	Rambai Hutan			x	
Euphorbiaceae	[E]Ptychopyxis costata Miq. var. oblanceolata Airy Shaw	Mendaroh	x	x		
Euphorbiaceae	Sapium baccatum Roxb.	Ludai	x	x		x
Euphorbiaceae	[Tg]Sapium discolor (Champ. ex Benth.) Müll.Arg.	Mamah Pelandok				x
Euphorbiaceae	Sauropus androgynus (L.) Merr.	Cekur Manis				x
Euphorbiaceae	[Tg]Triadica cochinchinensis Lour.			x		x
Euphorbiaceae	Trigonostemon laevigatus Müll.Arg.		x			
Fagaceae	[Tg]Castanopsis inermis (Lindl. ex Wall.) Benth. & Hook.f.	Berangan	x	x		
Fagaceae	Castanopsis schefferiana Hance	Berangan	x	x	x	
Fagaceae	Lithocarpus ewyckii (Korth.) Rehder	Mempening	x	x		x
Fagaceae	Lithocarpus lucidus (Roxb.) Rehder	Mempening	x	x		x
Fagaceae	Lithocarpus rassa (Miq.) Rehder	Mempening	x			
Fagaceae	Lithocarpus wallichianus (Lindl. ex Hance) Rehder	Mempening	x	x		
Flacourtiaceae	Homalium dictyoneurum (Hance) Warb.		x		x	
Flacourtiaceae	Hydnocarpus castanea Hook.f. & Thomson	Setumpol	x			
Flacourtiaceae	[E]Hydnocarpus filipes Symington ex Sleumer	Setumpol			x	
Flacourtiaceae	[E]Hydnocarpus kunstleri (King) Warb. var.tomentosa (King) Sleumer	Setumpol	x	x		x
Flacourtiaceae	[E]Hydnocarpus nana King	Setumpol				x
Flacourtiaceae	Hydnocarpus sp.					x
Flacourtiaceae	Hydnocarpus wrayi King	Setumpol				x
Flacourtiaceae	[Tg]Ryparosa kunstleri King		x			
Flacourtiaceae	[ETg]Scaphocalyx spathacea Ridl.	Serapok	x			
Flacourtiaceae	Scolopia macrophylla (Wight & Arn.) Clos					x
Flacourtiaceae	Scolopia spinosa (Roxb.) Warb.				x	
Gentianaceae	Fagraea racemosa Jack ex Wall.	Kopi Hutan	x	x	x	x
Gesneriaceae	[ETg]Cyrtandra cupulata Ridl.		x	x		
Gesneriaceae	Cyrtandra wallichii (C.B.Clarke) B.L.Burtt		x	x		
Gesneriaceae	Cyrtandromoea subsessilis (Miq.) B.L.Burtt					x
Gesneriaceae	Didymocarpus sp.		x			

Gesneriaceae	[E]Henckelia atrosanguinea (Ridl.) A.Weber		x	x		
Gesneriaceae	[E]Henckelia floribunda (M.R.Hend.) A.Weber		x	x		
Gesneriaceae	Henckelia platypus (C.B.Clarke) A.Weber					x
Gesneriaceae	Henckelia sp.		x	x		
Guttiferae	[Tg]Calophyllum ferrugineum Ridl. var. ferrugineum	Bintangor		x	x	x
Guttiferae	Calophyllum sclerophyllum Vesque	Bintangor Jangkang			x	
Guttiferae	[Tg]Calophyllum soulattri Burm.f.	Bintangor	x			
Guttiferae	Calophyllum sp.					x
Guttiferae	Calophyllum tetrapterum Miq.	Bintangor Kuning		x		
Guttiferae	[ETg]Calophyllum wallichianum Planch. & Triana var. wallichianum	Bintangor Lilin	x			x
Guttiferae	Cratoxylum arborescens (Vahl) Blume var. arborescens	Geronggang Geronggang			x	
Guttiferae	Cratoxylum formosum (Jack) Dyer	Geronggang Derum	x	x	x	x
Guttiferae	Garcinia atroviridis Griff. ex T.Anderson	Asam Gelugor	x			
Guttiferae	Garcinia bancana (Miq.) Miq. var. bancana	Kandis	x			
Guttiferae	Garcinia eugeniifolia Wall. ex T.Anderson	Kandis	x			
Guttiferae	Garcinia griffithii T Anderson	Kandis	x	x		
Guttiferae	[E]Garcinia maingayi Hook.f.	Kandis		x	x	
Guttiferae	Garcinia malaccensis Hook.f.	Manggis Hutan	x	x	x	
Guttiferae	Garcinia nervosa Miq. var. nervosa	Kandis	x		x	
Guttiferae	Garcinia nigrolineata Planch. ex T. Anderson	Kandis	x			
Guttiferae	Garcinia parvifolia (Miq.) Miq.	Kandis	x			x
Guttiferae	Garcinia rostrata (Hassk.) Miq.	Kandis			x	
Guttiferae	Garcinia scortechinii King	Kandis	x	x	x	
Guttiferae	Garcinia sp.	Kandis		x		
Guttiferae	Kayea grandis King	Penaga Bayan	x		x	x
Guttiferae	Kayea lepidota (T.Anderson) Pierre	Penaga Tikus				x
Guttiferae	Kayea racemosa Planch. & Triana	Penaga Bayan	x			
Guttiferae	Mesua ferrea L.	Penaga Lilin	x	x	x	x
Icacinaceae	Gonocaryum gracile Miq.		x		x	x
Icacinaceae	Medusanthera gracilis (King) Sleumer		x			x
Irvingiaceae	Irvingia malayana Oliv. ex Benn.	Pauh Kijang	x		x	
Ixonanthaceae	Ixonanthes icosandra Jack	Pagar Anak	x			x
Ixonanthaceae	Ixonanthes reticulata Jack	Inggir Burong	x			x
Labiatae	Clerodendrum deflexum Wall.	Pepanggil	x			x
Labiatae	Clerodendrum hispidum M.R.Hend.	Pepanggil	x		x	
Labiatae	Clerodendrum laevifolium Blume	Pepanggil	x			
Labiatae	Clerodendrum villosum Blume	Pepanggil				x
Labiatae	Teijsmanniodendron coriaceum (C.B.Clarke) Kostermans		x			
Labiatae	Teijsmanniodendron pteropodum (Miq.) Bakh.					x
Labiatae	Vitex pinnata L.	Leban				x
Labiatae	Vitex vestita Wall. ex Schauer	Leban	x			
Lauraceae	[ETg]Actinodaphne pruinosa Nees	Medang Payung	x	x		x
Lauraceae	[Tg]Beilschmiedia lucidula (Miq.) Kostermans	Medang	x			
Lauraceae	Beilschmiedia madang Blume	Medang	x			
Lauraceae	Beilschmiedia sp. Gamble	Medang			x	
Lauraceae	Cinnamomum iners Reinw.	Medang Teja	x	x	x	x
Lauraceae	[Tg]Cinnamomum javanicum Blume	Medang Teja				x
Lauraceae	Cryptocarya ferrea Blume	Medang	x			
Lauraceae	Cryptocarya griffithiana Wight	Medang	x			
Lauraceae	Cryptocarya kurzii Hook.f.	Medang	x			
Lauraceae	[Tg]Dehaasia tomentosa (Blume) Kostermans	Medang	x			
Lauraceae	Lindera sp.	Medang	x			
Lauraceae	Litsea castanea Hook.f.	Medang	x			
Lauraceae	Litsea elliptica Blume	Medang	x	x	x	

Lauraceae	Litsea ferruginea (Blume) Blume	Medang	x		x	
Lauraceae	[Tg]Litsea grandis (Wall. ex Nees) Hook.f.	Medang Lebar Daun	x	x	x	x
Lauraceae	[Tg]Litsea machilifolia Gamble	Medang	x	x		x
Lauraceae	[Tg]Litsea magnifica (Miq.) Fern.-Vill.	Medang	x	x		x
Lauraceae	Litsea nidularis Gamble	Medang				x
Lauraceae	Litsea sp.	Medang				x
Lecythidaceae	[E]Barringtonia fusiformis King	Putat	x			
Lecythidaceae	Barringtonia macrostachya (Jack) Kurz	Putat	x	x	x	x
Lecythidaceae	Barringtonia pendula (Griff.) Kurz	Putat	x	x		x
Lecythidaceae	Barringtonia racemosa (L.) Spreng.	Putat	x			
Lecythidaceae	Barringtonia scortechinii King	Putat	x			x
Lecythidaceae	Barringtonia sp.	Putat	x			
Leeaceae	Leea indica (Burm.f.) Merr.	Mali-mali	x	x	x	x
Leeaceae	Leea sp.	Mali-mali	x			
Leguminosae	Adenanthera malayana Kostermans	Saga Daun Tajam	x			
Leguminosae	Albizia splendens Miq.	Kungkur	x			
Leguminosae	Archidendron bubalinum (Jack) IC Nielsen	Kerdas	x		x	
Leguminosae	Archidendron clypearia (Jack) I.C.Nielsen ssp. clypearia		x		x	x
Leguminosae	[ETg]Archidendron kunstleri (Prain) I.C.Nielsen	Kerdas				x
Leguminosae	Callerya atropurpurea (Wall.) Schot	Tulang Daing	x	x	x	x
Leguminosae	[Tg]Cynometra malaccensis Meeuwen	Kekatong	x	x		
Leguminosae	Cynometra ramiflora L.	Kekatong Laut	x			x
Leguminosae	Dialium indum L. var. indum	Keranji Paya			x	
Leguminosae	Dialium platysepalum Baker	Keranji Kuning Besar	x	x		x
Leguminosae	Intsia palembanica Miq.	Merbau	x		x	x
Leguminosae	Koompassia excelsa (Becc.) Taub.	Tualang	x	x	x	
Leguminosae	Koompassia malaccensis Maing. ex Benth.	Kempas	x	x		x
Leguminosae	Paraserianthes falcataria (L.) I.C.Nielsen	Batai				x
Leguminosae	Parkia speciosa Hassk.	Petai	x	x	x	x
Leguminosae	Saraca cauliflora Baker	Gapis	x	x	x	
Leguminosae	Sindora coriacea (Baker) Maingay ex Prain	Sepetir Licin	x			
Leguminosae	Sindora echinocalyx (Benth.) Prain	Sepetir Daun Nipis	x	x	x	
Loganiaceae	Strychnos ignatii Berg.		x			x
Loranthaceae	Dendrophthoe pentandra (L.) Miq.	Dedalu				
Loranthaceae	[Tg]Lepeostegeres beccarii (King) Gamble					x
Maesaceae	Maesa ramentacea Wall. ex Roxb.	Gambir Hutan	x		x	x
Magnoliaceae	[Tg]Magnolia elegans (Blume) H.Keng	Cempaka Hutan	x	x		
Magnoliaceae	Magnolia liliifera Baill. var. obovata (Korth.) Govaerts				x	
Malvaceae	Hibiscus macrophyllus Roxb. ex Hornem	Tutor				x
Melastomataceae	Clidemia hirta (L.) D.Don	Senduduk Bulu	x	x	x	x
Melastomataceae	Medinilla sp.					x
Melastomataceae	Melastoma malabathricum L.	Senduduk				x
Melastomataceae	[E]Oxyspora bullata (Griff.) J.F.Maxwell		x			
Melastomataceae	Oxyspora sp.		x	x		
Melastomataceae	[Tg]Pachycentria constricta (Blume) Blume				x	
Melastomataceae	Phyllagathis rotundifolia (Jack) Blume	Selusuh Fatimah	x			
Melastomataceae	Pternandra coerulescens Jack	Sial Menahun	x	x	x	x
Melastomataceae	Pternandra echinata Jack	Sial Menahun	x	x		x
Melastomataceae	[ETg]Sonerila barbata Ridl.		x			
Melastomataceae	Sonerila obliqua Korth.		x			
Meliaceae	Aglaia forbesii King	Bekak	x			
Meliaceae	Aglaia sp.	Bekak	x			
Meliaceae	Chisocheton ceramicus (Miq.) DC.	Bekak	x			
Meliaceae	Chisocheton macrophyllus King	Bekak	x			
Meliaceae	Chisocheton patens Blume	Bekak	x			
Meliaceae	Dysoxylum cauliflorum Hiern	Bekak	x	x		x

Meliaceae	Lansium domesticum Corrêa	Langsat Hutan	x	x	x	
Meliaceae	Sandoricum koetjape (Burm.f.) Merr.	Sentul	x			
Memecylaceae	Memecylon amplexicaule Roxb.	Nipis Kulit	x	x	x	
Memecylaceae	Memecylon megacarpum Furtado	Nipis Kulit	x		x	
Memecylaceae	Memecylon minutiflorum Miq.	Nipis Kulit	x		x	x
Memecylaceae	Memecylon fruticosum King	Nipis Kulit	x			
Memecylaceae	Memecylon paniculatum Jack	Nipis Kulit				x
Memecylaceae	Memecylon pubescens (C.B.Clarke) King	Nipis Kulit	x			
Moraceae	Artocarpus integer (Thunb.) Merr. var. silvestris Corner	Cempedak Bangkong	x			
Moraceae	Artocarpus kemando Miq.	Pudu			x	
Moraceae	Artocarpus lanceifolius Roxb.	Keledang Keledang	x	x	x	x
Moraceae	Artocarpus nitidus Trécul ssp. griffithii (King) F.M.Jarrett	Keledang Tampang	x	x	x	
Moraceae	Artocarpus rigidus Blume	Keledang Temponek	x	x		
Moraceae	Artocarpus scortechinii King	Terap Hitam			x	x
Moraceae	Ficus deltoidea Jack var. deltoidea	Mas Cotek	x	x	x	x
Moraceae	Ficus fulva Reinw. ex Blume	Ara				x
Moraceae	Ficus glandulifera (Wall. ex Miq.) King	Ara				x
Moraceae	Ficus grossularioides Burm.f. var. grossularioides	Ara				x
Moraceae	Ficus hispida L.f.	Ara				x
Moraceae	Ficus lepicarpa Blume	Ara				x
Moraceae	Ficus obscura Blume var. borneensis (Miq.) Corner	Ara				x
Moraceae	Ficus scortechinii King	Ara	x			
Moraceae	Ficus variegata Blume	Ara				x
Moraceae	Ficus vasculosa Wall. ex Miq.	Ara	x			
Moraceae	Hullettia dumosa King		x			x
Moraceae	Streblus elongatus (Miq.) Corner	Tempinis	x	x	x	x
Myristicaceae	Gymnacranthera farquhariana (Hook.f. & Thomson) Warb.	Penarahan			x	
Myristicaceae	Gymnacranthera forbesii (King) Warb.	Penarahan	x		x	
Myristicaceae	[Tg]Horsfieldia polyspherula (Hook.f. ex King) J.Sinclair	Penarahan	x		x	
Myristicaceae	Horsfieldia sp.	Penarahan				x
Myristicaceae	Horsfieldia superba (Hookf & Thomson) Warb.	Penarahan	x			
Myristicaceae	Knema curtisii (King) Warb. var. curtisii	Penarahan	x			
Myristicaceae	Knema furfuracea (Hookf & Thomson) Warb.	Penarahan	x		x	
Myristicaceae	Knema hookeriana (Wall. ex Hook.f. & Thomson) Warb.	Penarahan	x			x
Myristicaceae	Knema kunstleri (King) Warb.	Penarahan			x	
Myristicaceae	Knema laurina (Blume) Warb.	Penarahan	x	x	x	x
Myristicaceae	Knema patentinervia (J.Sinclair) W.J.de Wilde	Penarahan	x	x	x	x
Myristicaceae	Knema scortechinii (King) J.Sinclair	Penarahan	x	x	x	x
Myristicaceae	Knema sp.	Penarahan				x
Myristicaceae	Myristica cinnamomea King	Penarahan Arang	x	x		
Myristicaceae	Myristica gigantea King	Penarahan Arang Bukit	x	x		
Myrsinaceae	Ardisia korthalsiana Scheff.	Mata Pegar	x			
Myrsinaceae	Ardisia sp.1		x			
Myrsinaceae	Ardisia sp.2		x			
Myrsinaceae	Labisia pumila (Blume) Fern.-Vill. var. alata Scheff.	Kacip Fatimah	x			
Myrtaceae	Rhodamnia cinerea Jack	Mempoyan	x	x	x	x
Myrtaceae	Syzygium cerasiforme (Blume) Merr. & L.M.Perry	Kelat	x	x		
Myrtaceae	Syzygium cinereum (Kurz) Chant. & J.Parn.	Kelat	x		x	
Myrtaceae	Syzygium filiforme (Wall. ex Duthie) Chant.	Kelat	x			
Myrtaceae	Syzygium griffithii (Duthie) Merr. & L.M.Perry	Kelat	x	x	x	x
Myrtaceae	Syzygium papillosum (Duthie) Merr. & L.M.Perry	Kelat Paya	x			
Myrtaceae	Syzygium polyanthum (Wight) Walp. var. polyanthum	Kelat	x			
Myrtaceae	[E]Syzygium pseudocrenulatum (M.R.Hend.) I.M.Turner	Kelat	x		x	

Myrtaceae	Syzygium ridleyi (King) Chant. & J.Parn.	Kelat	x	x		
Myrtaceae	Syzygium sp.		x			
Myrtaceae	Tristaniopsis merguensis (Griff.) P.G.Wilson & J.T.Waterh.	Pelawan			x	x
Nepenthaceae	[Tg]Nepenthes ampullaria Jack	Periuk Kera			x	
Nymphaeaceae	[Tg]Barclaya motleyi Hook.f.		x			
Ochnaceae	Brackenridgea hookeri (Planch.) A.Gray	Mata Ketam	x		x	x
Ochnaceae	Campylospermum serratum (Gaertn.) Bittrich & M.C.E.Amaral	Mata Ketam	x			x
Ochnaceae	Sauvagesia serrata (Korth.) Sastre		x			
Olacaceae	Ochanostachys amentacea Mast.	Petaling	x	x	x	x
Olacaceae	Scorodocarpus borneensis (Baill.) Becc.	Kulim	x	x		x
Olacaceae	[Tg]Strombosia javanica Blume	Dedali	x	x		
Olacaceae	Strombosia sp.1		x			
Onagraceae	Ludwigia sp.					x
Opiliaceae	Champereia manillana (Blume) Merr.	Chemperai				x
Oxalidaceae	Sarcotheca griffithii (Planch. ex Hook.f.) Hallier f.	Pupoi	x			
Oxalidaceae	[E]Sarcotheca laxa (Ridl.) Knuth var. laxa	Belimbing Hutan			x	
Oxalidaceae	Sarcotheca sp.					x
Pandaceae	Galearia fulva (Tul.) Miq.		x	x	x	x
Pandaceae	Microdesmis caseariifolia Planch.		x	x	x	x
Passifloraceae	Paropsia vareciformis (Griff.) Mast.	Dendulang	x	x	x	x
Passifloraceae	Passiflora foetida L.	Akar Letup-letup				x
Pentaphragmataceae	[Tg]Pentaphragma ellipticum A.D.Poulsen var. ellipticum		x	x	x	x
Phyllanthaceae	Aporosa arborea (Blume) Müll.Arg.	Sebasah	x	x	x	
Phyllanthaceae	Aporosa aurea Hook.f.	Sebasah	x		x	x
Phyllanthaceae	Aporosa bracteosa Pax & K.Hoffm.	Sebasah	x			
Phyllanthaceae	Aporosa falcifera Hook.f.	Sebasah	x	x	x	
Phyllanthaceae	[ETg]Aporosa globifera Hook.f.	Sebasah	x			
Phyllanthaceae	Aporosa microstachya (Tul.) Müll.Arg.	Sebasah	x	x	x	x
Phyllanthaceae	Aporosa miqueliana Müll.Arg.	Sebasah	x		x	x
Phyllanthaceae	Aporosa nigricans Hook.f.	Sebasah	x			
Phyllanthaceae	Aporosa prainiana King ex Gage	Sebasah	x	x		x
Piperaceae	Piper sp.				x	
Polygalaceae	Xanthophyllum affine Korth. ex Miq.	Minyak Berok	x			x
Polygalaceae	Xanthophyllum eurhynchum Miq. ssp. eurhynchum	Minyak Berok	x	x		
Polygalaceae	[Tg]Xanthophyllum griffithii Hook.f. ex A.W.Benn.	Minyak Berok			x	x
Polygalaceae	Xanthophyllum rufum Benn.	Minyak Berok			x	
Polygalaceae	Xanthophyllum sp.1	Minyak Berok	x			
Polygalaceae	Xanthophyllum sp.2	Minyak Berok		x		
Polygalaceae	Xanthophyllum sp.3	Minyak Berok				x
Polygalaceae	[Tg]Xanthophyllum wrayi King	Minyak Berok	x			
Proteaceae	Helicia attenuata (Jack) Blume	Sawa Luka	x			
Rhizophoraceae	Gynotroches axillaris Blume	Mata Keli	x	x	x	x
Rhizophoraceae	Pellacalyx axillaris Korth.	Membuluh			x	x
Rosaceae	[Tg]Prunus javanica (Teijsm. & Binn.) Miq.	Pepijat	x			
Rosaceae	Prunus polystachya (Hook.f.) Kalkman	Pepijat	x	x	x	x
Rosaceae	[Tg]Rubus moluccanus L. var. moluccanus					x
Rubiaceae	Aidia densiflora (Wall.) Masam.	Menterbang	x			
Rubiaceae	Argostemma sp.1		x			
Rubiaceae	Argostemma sp.2				x	
Rubiaceae	Chassalia sp.		x			
Rubiaceae	Diplospora malaccense Hook.f.	Gading-gading	x	x		x
Rubiaceae	Gardenia tubifera Wall. var. tubifera	Cempaka Hutan	x		x	x
Rubiaceae	Gardeniopsis longifolia Miq.	Serkam Bulan	x	x	x	
Rubiaceae	Greenea corymbosa (Jack) K.Schum.		x	x		x

Rubiaceae	Hedyotis sp.				x	x
Rubiaceae	Ixora concinna Hook.f.	Pecah Piring	x			
Rubiaceae	[E]Ixora kingstoni Hook.f.	Pecah Piring		x		
Rubiaceae	[E]Ixora scortechinii King & Gamble var. scortechinii	Pecah Piring			x	
Rubiaceae	Ixora sp.1	Pecah Piring				x
Rubiaceae	Ixora sp.2	Pecah Piring				x
Rubiaceae	Ixora umbellata Koord & Valeton var. umbellata	Pecah Piring	x	x	x	
Rubiaceae	Jackiopsis ornata (Wall.) Ridsdale				x	
Rubiaceae	Lasianthus sp.				x	
Rubiaceae	Metadina trichotoma (Zoll. & Moritzi) Bakh.f.					
Rubiaceae	Mussaenda glabra Vahl		x	x	x	x
Rubiaceae	Mussaenda sp.		x			
Rubiaceae	Nauclea officinalis (Pierre ex Pit.) Merr. & Chun	Mengkal			x	x
Rubiaceae	Neolamarckia cadamba (Roxb.) Bosser	Kelempayan			x	x
Rubiaceae	Pertusadina eurhyncha (Miq). Ridsdale	Meraga	x	x		
Rubiaceae	Porterandia anisophyllea (Jack ex Roxb.) Ridl.	Tinjau Belukar	x	x	x	x
Rubiaceae	Prismatomeris glabra (Korth.) Valeton	Tongkat Hj. Samat	x		x	
Rubiaceae	[E]Psychotria griffithii Hook.f.			x		
Rubiaceae	Psychotria malayana Jack		x	x		
Rubiaceae	Psychotria sp.			x		
Rubiaceae	Psydrax nitidum (Craib) K.M.Wong		x			
Rubiaceae	[E]Saprosma glomerulata King & Gamble	Sekentut		x		
Rubiaceae	[E]Saprosma scortechinii King & Gamble	Sekentut		x		
Rubiaceae	Tarenna mollis (Wall. ex Hook.f.) B.L.Rob.		x			
Rubiaceae	Timonius flavescens (Jack) Baker				x	x
Rubiaceae	Timonius sp.					x
Rubiaceae	[Tg]Timonius wallichianus (Korth.) Valeton		x			x
Rubiaceae	Urophyllum glabrum Wall.		x	x	x	x
Rubiaceae	Urophyllum sp.		x	x		x
Rutaceae	Glycosmis chlorosperma Spreng. var. chlorosperma		x			
Rutaceae	Maclurodendron porteri (Hook.f.) T.G.Hartley	Kaum Limau	x		x	x
Rutaceae	Melicope glabra (Blume) T.G.Hartley	Pepauh	x	x	x	
Sapindaceae	Lepisanthes rubiginosa (Roxb.) Leenh.	Mertajam	x			
Sapindaceae	Lepisanthes tetraphylla (Vahl) Radlk.		x	x	x	x
Sapindaceae	[E]Nephelium costatum Hiern.	Rambutan Hutan	x			
Sapindaceae	[Tg]Nephelium cuspidatum Blume var. eriopetalum (Miq.) Leenh.	Lotong		x		x
Sapindaceae	Nephelium maingayi Hiern.	Redan	x	x		x
Sapindaceae	Pometia pinnata J.R.Forst. & G.Forst.	Kasai Daun Besar	x	x	x	
Sapindaceae	Xerospermum noronhianum (Blume) Blume	Rambutan Pacat	x	x	x	x
Sapotaceae	Madhuca sp.	Nyatoh				x
Sapotaceae	[Tg]Palaquium gutta (Hook.f.) Baill.	Nyatoh Taban Merah				x
Sapotaceae	[Tg]Palaquium hexandrum (Griff.) Baill.	Nyatoh Jambak	x	x	x	
Sapotaceae	Palaquium leiocarpum Boerl.	Nyatoh	x	x	x	x
Sapotaceae	[E]Palaquium maingayi (C.B.Clarke) King & Gamble	Nyatoh Tembaga	x			
Sapotaceae	Palaquium rostratum (Miq.) Burck	Nyatoh Sidang		x		x
Sapotaceae	Palaquium sp.1	Nyatoh			x	
Sapotaceae	Palaquium sp.2	Nyatoh		x		
Sapotaceae	Palaquium sp.3	Nyatoh				x
Sapotaceae	Pouteria malaccensis (C.B.Clarke) Baehni	Nyatoh Nangka Kuning	x	x	x	x
Simaroubaceae	Eurycoma longifolia Jack	Tongkat Ali	x			
Stemonuraceae	Stemonurus malaccensis (Mast.) Sleumer	Sampul Keris	x	x	x	
Stemonuraceae	Stemonurus scorpioides Becc.				x	
Sterculiaceae	Commersonia bartramia (L.) Merr.					x
Sterculiaceae	Heritiera javanica (Blume) Kostermans	Mengkulang Jari	x			x
Sterculiaceae	Heritiera simplicifolia (Mast.) Kostermans	Mengkulang Siku Kelawang	x	x	x	x

Sterculiaceae	Leptonychia caudata (Wall. ex G.Don) Burret		x			
Sterculiaceae	Pterospermum javanicum Jungh.	Bayur				x
Sterculiaceae	Scaphium linearicarpum (Mast.) Pierre	Kembang Semangkok Bulat	x	x	x	x
Sterculiaceae	Scaphium macropodum (Miq.) Beumée ex Heyne	Kembang Semangkok Jantung	x	x		
Sterculiaceae	Sterculia coccinea Jack	Kelumpang	x		x	
Sterculiaceae	[Tg]Sterculia parvifolia Wall. ex R.Br.	Kelumpang			x	
Sterculiaceae	Sterculia rubiginosa Vent.				x	
Styracaceae	Styrax benzoin Dryand. var. benzoin	Kemenyan	x			x
Symplocaceae	Symplocos crassipes C.B.Clarke var. curtisii (Oliv.) Noot.	Sawa Luka	x	x		
Ternstroemiaceae	Eurya acuminata DC.					x
Theaceae	Adinandra sp.	Tetiup			x	
Theaceae	Pyrenaria acuminata Planch.	Tetiup				x
Theaceae	Pyrenaria sp.	Tetiup			x	
Thymelaeaceae	Aquilaria hirta Ridl.	Karas			x	
Thymelaeaceae	Aquilaria malaccensis Lam.	Karas	x	x		
Thymelaeaceae	Gonystylus brunnescens Airy Shaw	Ramin Daun Tebal				x
Thymelaeaceae	Gonystylus confusus Airy Shaw	Ramini Pinang Muda	x	x	x	
Thymelaeaceae	Gonystylus sp.	Ramin		x		
Tiliaceae	Diplodiscus sp.1		x			
Tiliaceae	Diplodiscus sp.2				x	
Tiliaceae	Microcos fibrocarpa (Mast.) Burret	Damak-damak	x			
Tiliaceae	Microcos lanceolata (Miq.) Burret	Damak-damak	x			
Tiliaceae	Microcos latifolia Burret	Damak-damak			x	x
Tiliaceae	Microcos tomentosa Sm.	Chenderai				x
Tiliaceae	Pentace adenophora Kostermans	Melunak	x	x	x	x
Tiliaceae	[Tg]Pentace floribunda King	Melunak	x		x	
Tiliaceae	Pentace sp.A	Melunak			x	
Tiliaceae	[E]Pentace strychnoidea King	Melunak	x	x	x	x
Tiliaceae	Pentace triptera Mast.	Melunak Pusat Beludu	x			
Tiliaceae	Schoutenia accrescens (Mast.) C.H.Curtis ssp. accrescens	Bayur Bukit	x			
Torricelliaceae	Aralidium pinnatifidum Miq.	Sebalai, Chengpuk	x	x	x	
Trigoniaceae	Trigoniastrum hypoleucum Miq.	Marajali	x			
Ulmaceae	Gironniera nervosa Planch.	Hempas Tebu	x	x		x
Ulmaceae	Gironniera parvifolia Planch.	Hempas Tebu	x	x	x	x
Ulmaceae	Gironniera subaequalis Planch.	Hempas Tebu	x	x	x	x
Ulmaceae	Trema cannabina Lour.	Mengkirai Daun Kecil	x			x
Ulmaceae	Trema tomentosa (Roxb.) Hara	Mengkirai Daun Besar				x
Urticaceae	Elatostema sp.					x
Urticaceae	Poikilospermum suaveolens (Blume) Merr.					x
Verbenaceae	Stachytarpheta indica (L.) Vahl	Indian Snake Weed				x
Violaceae	Rinorea anguifera (Lour.) Kuntze	Sentil Tembakau	x	x	x	x
Violaceae	Rinorea longiracemosa (Kurz) Craib	Sentil Tembakau	x			

Annex 3:

TSFD's Directive on HCVF in Terengganu State

جباتن ڤرهوتانن نکري، ترڠکانو
JABATAN PERHUTANAN NEGERI TERENGGANU
Tingkat 8, Wisma Negeri,
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Emel : phnt@forestry.terengganu.gov.my

DITERIMA
29 SEP 2015
KUMPULAN PENGURUSAN KAYU KAYAN TRENGGANU SDN. BHD.

Rujukan kami : PHNT.6/3/8/17 (43)
Tarikh 28 September 2015
Bersamaan 14 Zulhijjah 1436H

Pengurus Besar
Kumpulan Pengurusan Kayu Kayan Terengganu Sdn. Bhd.,
Jalan Kalsium, Bukit Besi,
23200 Dungun,
TERENGGANU

PPHD (CPP)
4
1/10

Tuan,

HUTAN YANG MEMPUNYAI NILAI PEMELIHARAAN YANG TINGGI (HCVF) DI NEGERI TERENGGANU

Dengan segala hormatnya saya merujuk kepada perkara tercatat di atas dan surat tuan bil.(01) dlm.2071 bertarikh 20 September 2015 adalah berkaitan.

2. Sukacitanya dimaklumkan bahawa sehingga kini Jabatan Perhutanan Negeri Terengganu telah mengenalpasti sebanyak lima (5) kawasan yang terletak dalam Hutan Simpanan Kekal Negeri Terengganu untuk dijadikan kawasan Hutan Yang Mempunyai Nilai Pemeliharaan Yang Tinggi (HCVF) mengikut Prinsip 9: Kriteria dan Petunjuk Malaysia Untuk Pensijilan Hutan MC&I (Hutan Asli) seperti **Lampiran 1**.

3. Untuk makluman tuan jua, definisi istilah HCVF yang digunakan dalam Standard MC&I (Hutan Asli) iaitu Hutan Yang Tinggi Nilai Pemeliharaannya adalah merupakan hutan yang memiliki satu atau lebih ciri berikut :-

3.1 Kawasan-kawasan hutan yang mengandungi penumpuan nilai-nilai kepelbagaian biologi yang tinggi (cth: bersifat endemik, spesies terancam, spesies dilindungi) pada peringkat global, serantau atau nasional; dan/atau hutan-hutan pada peringkat landskap yang besar, di dalamnya atau mengandungi unit pengurusan, di mana kebanyakkan atau semua populasi yang mampu hidup sendiri ditemui dalam bentuk semulajadi berdasarkan kepada penyebaran dan kuantitinya;

Maklumon
1) Pengurus Hutan kanan
2) Pen. Pengurus Operasi
3) Pengelola Pemeliharaan

3.2 Kawasan-kawasan hutan yang di dalamnya atau mempunyai ekosistem-ekosistem yang jarang ditemui, terancam atau berada dalam keadaan bahaya kepupusan;

3.3 Kawasan-kawasan hutan yang menyediakan kemudahan-kemudahan asas semulajadi dalam situasi-situasi kritikal (cth: perlindungan kawasan tadahan air dan kawalan hakisan); dan

3.4 Kawasan-kawasan hutan yang membekalkan keperluan asas masyarakat-masyarakat tempatan (cth: mata pencarian, kesihatan) dan/atau kritikal kepada identiti budaya masyarakat tempatan (kawasan-kawasan budaya, ekologi, mempunyai nilai ekonomi atau keagamaan yang penting yang dikenalpasti dengan bantuan masyarakat tempatan.

4/10/15

Cert. No. : AJAMY 13/1451

(Sila nyatakan rujukan Jabatan ini apabila berurusan)

s.d
File HCVF
4/10/15

PHNT.6/3/8/17 (43)

4. Sehubungan dengan itu, sebagai memenuhi kriteria dan petunjuk MC&I untuk pensijilan hutan (hutan asli) Jabatan Perhutanan Negeri Terengganu telah melaksanakan kesemua kriteria yang ditetapkan di bawah Prinsip 9 iaitu :-

Kriteria 9.1

Membuat penilaian untuk menentukan kehadiran sifat-sifat yang konsisten dengan Hutan Yang Tinggi Nilai Pemeliharaannya (HCVF) bersesuai dengan skala dan intensiti pengurusan hutan di dalam FMU Negeri Terengganu.

Kriteria 9.2

Membuat perundingan dengan pemegang taruh (stakeholders) di mana semasa rundingan dalam proses pensijilan, penekanan yang dibuat mestilah diberikan kepada sifat-sifat pemeliharaan yang telah dikenalpasti dengan mengambil tindakan untuk menyelenggara sifat-sifat berkenaan iaitu memasukkan HCVF ke dalam Rancangan Pengurusan Hutan (RPH).

Kriteria 9.3

Mengambilkira pelaksanaan langkah-langkah spesifik dalam RPH bagi memastikan penyelenggaraan dan/atau mempertingkatkan sifat-sifat pemeliharaan yang digunapakai selaras dengan pendekatan secara berwaspada yang dinyatakan secara terperinci dalam RPH untuk pengetahuan dan makluman umum kepada orang awam.

Kriteria 9.4

Melaksanakan pemantauan tahunan bagi menilai keberkesanan langkah-langkah yang diambil untuk mengekal atau mempertingkatkan sifat-sifat pemeliharaan yang digunapakai.

5. Segala perhatian dan tindakan lanjut pihak tuan selaku Pengurus Hutan Konsesi di dalam FMU Negeri Terengganu berhubung perkara ini untuk mengenalpasti kawasan-kawasan HCVF yang memenuhi kriteria dan pentunjuk yang dinyatakan di dalam Prinsip 9 ini amatlah dialu-alukan dan dihargai.

Sekian, terima kasih.

"TRANSFORMASI TERENGGANU BAHARU"
"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(DATO' HAJI AZMI BIN NORDIN)
Pengarah Perhutanan Negeri
TERENGGANU

s.k Penolong Pengarah Silvikultur dan Perlindungan Hutan

Lampiran 1

Kawasan-Kawasan Yang Dikenalpasti Oleh JPNT Untuk Dijadikan Kawasan HCVF Di Negeri Terengganu.

Bil.	Kawasan HCVF	HSK	Daerah Hutan	Ciri-ciri Istimewa	Catitan dan Kesesuaian
(i)	Cengal Besar	Kompt. 5, Pasir Raja	Terengganu Selatan	Telah dikenali sebagai Pokok Cengal (*Neobalanocarpus heimii*) terbesar di dunia dan merupakan kawasan tarikan pelancongan di Negeri Terengganu.	Mengikut pengitirafan 'The Malaysian Book of Records' umur pokok dianggarkan pada 1,300 tahun dengan perepang dan ketinggian sebanyak 16.75 m dan 65 m masing-masing. **Sangat Sesuai.**
(ii)	Petak Keruing Sarawak	Kompt. 31, Jerangau	Terengganu Barat	Kawasan ini mengandungi spesis pokok Keruing Sarawak dan merupakan antara spesis endemik di Semenanjung Malaysia dan Sarawak.	'Spesis ini walaupun terdapat di Sarawak dan Brunei tetapi hanya dijumpai di HS Jerangau. **Sangat Sesuai**.
(iii)	Petak Pokok Sal	Kompt. 34, Jerangau	Terengganu Barat	Kawasan ini mempunyai spesis palma *Johannesteijsmannia altifrons*. Satu dari 4 spesis dari genus *Johannesteijsmannia* yang dijumpai di Semenanjung Malaysia, Selatan Thailand dan Sumatra.	*Johannesteijsmannia altifrons* adalah antara spesis *Johannesteijsmannia* yang terbanyak sekali dan boleh dijumpai Kedah, Perak, Pahang, Johor, Negeri Sembilan dan Terengganu. **Sesuai.**
(iv)	Pusat Pengumpulan Genetik Herba, Hutan Lipur Sekayu	Hulu Terengganu	Terengganu Barat	Kawasan ini mengandungi spesis pokok herba istimewa untuk kegunaan sebagai ubatan dan boleh digunakan untuk para penyelidik, pelajar dan agensi kerajaan yang lain.	Merupakan konservasi ex-situ dan tidak melibatkan lokasi dan habitat. **Kurang Sesuai.**
(v)	Pusat Pengumpulan Genetik Orkid Liar, Hutan Lipur Sekayu	Hulu Terengganu	Terengganu Barat	Kawasan ini merupakan tempat pengumpulan genetik orkid di Negeri Terengganu. Di sini juga ada satu spesis baru yang ditemui iaitu *Dendrobium Terengganuensis.*	Kurang Sesuai. Merupakan konservasi ex-situ dan tidak melibatkan lokasi dan habitat. **Kurang Sesuai.**

Sumber: http://trgforestry.terengganu.gov.my/ (laman web rasmi JPNT)

Annex 6:

Malaysia Drinking Water Quality Standard

MALAYSIA WATER DRINKING WATER QUALITY STANDARD

Parameter	Group	RECOMMENDED RAW WATER QUALITY Acceptable Value (mg/litre (unless otherwise stated))	DRINKING WATER QUALITY STANDARDS Maximum Acceptable Value (mg/litre (unless otherwise stated))
Total Coliform	1	5000 MPN / 100 ml	0 in 100 ml
E.coli	1	5000 MPN / 100 m	0 in 100 m
Turbidity	1	1000 NTU	5 NTU
Color	1	300 TCU	15 TCU
pH	1	5.5 - 9.0	6.5 - 9.0
Free Residual Chlorine	1	-	0.2 - 5.0
Combined Chlorine	1	-	Not Less Than 1.0
Temperature	1	-	-
Clostridium perfringens (including spores)	1	-	Absent
Coliform bacteria	1	-	-
Colony count 22°	1	-	-
Conductivity	1	-	-
Enterococci	1	-	-
Odour	1	-	-
Taste	1	-	-
Oxidisability	1	-	-
Total Dissolved Solids	2	1500	1000
Chloride	2	250	250
Ammonia	2	1.5	1.5
Nitrat	2	10	10
Ferum/Iron	2	1.0	0.3
Fluoride	2	1.5	0.4 - 0.6
Hardness	2	500	500
Aluminium	2	-	0.2
Manganese	2	0.2	0.1
Chemical Oxygen Demand	2	10	-
Anionic Detergent MBAS	2	1.0	1.0
Biological Oxygen Demand	2	6	-

…. Malaysia Drinking Water Quality Standard…..ctd.

Nitrite	2	-	-
Total organic carbon (TOC)	2	-	-
Mercury	3	0.001	0.001
Cadmium	3	0.003	0.003
Arsenic	3	0.01	0.01
Cyanide	3	0.07	0.07
Plumbum/Lead	3	0.05	0.01
Chromium	3	0.05	0.05
Cuprum/Copper	3	1.0	1.0
Zinc	3	3	3
Natrium/Sodium	3	200	200
Sulphate	3	250	250
Selenium	3	0.01	0.01
Argentum	3	0.05	0.05
Magnesium	3	150	150
Mineral Oil	3	0.3	0.3
Chloroform	3	-	0.2
Bromoform	3	-	0.1
Dibromoklorometana	3	-	0.1
Bromodiklorometana	3	-	0.06
Fenol/Phenol	3	0.002	0.002
Antimony	3	-	0.005
Nickel	3	-	0.02
Dibromoacetonitrile	3	-	0.1
Dichloroacetic acid	3	-	0.05
Dichloroacetonitrile	3	-	0.09
Trichloroacetic acid	3	-	0.1
Trichloroacetonitrile	3	-	0.001
Trihalomethanes - Total	3	-	1.00
Aldrin / Dealdrin	4	0.00003	0.00003
DDT	4	0.002	0.002
Heptachlor & Heptachlor Epoxide	4	0.00003	0.00003
Methoxychlor	4	0.02	0.02
Lindane	4	0.002	0.002

….Malaysia Drinking Water Quality Standard…..ctd…

Chlordane	4	0.0002	0.0002
Endosulfan	4	0.03	0.03
Hexachlorobenzena	4	0.001	0.001
1,2-dichloroethane	4	-	0.03
2,4,5-T	4	-	0.009
2,4,6-trichlorophenol	4	-	0.2
2,4-D	4	0.03	0.03
2,4-DB	4	-	0.09
2,4-dichlorophenol	4	-	0.09
Acrylamide	4	-	0.0005
Alachlor	4	-	0.02
Aldicarb	4	-	0.01
Benzene	4	-	0.01
Carbofuran	4	-	0.007
MCPA	4	-	0.002
Pendimethalin	4	-	0.02
Pentachlorophenol	4	-	0.009
Permethrin	4	-	0.02
Pesticides	4	-	-
Pesticides - Total	4	-	-
Polycyclic aromatic hydrocarbons	4	-	-
Propanil	4	-	0.02
Tetrachloroethene and Trichloroethene	4	-	-
Vinyl chloride	4	-	0.005
Gross alpha (α)	5	0.1Bq/l	0.1Bq/l
Gross beta (β)	5	1.0 Bq/l	1.0 Bq/l
Tritium	5	-	-
Total indicative dose	5	-	

Annex 4:

NATIONAL RIVER WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	CLASSES					
	I	IIA	IIB	III	IV	V
Ammonical Nitrogen	0.1	0.3	0.3	0.9	2.7	>2.7
BOD (mg/l)	1	3	3	6	12	>12
COD (mg/l)	10	25	25	50	100	>100
DO	7	5-7	5-7	3-5	<3	<1
pH	6.5-8.5	6.9	6.9	5-9	5-9	--
Colour (TCU)	15	150	150	--	--	--
Conductivity (umhos/cm)	1000	1000	--	--	6000	--
Floatables	N	N	N	--	--	--
Odour	N	N	N	--	--	--
Salinity (%)**	0.5	1	--	--	2	--
Taste	N	N	N	--	--	--
Total Dissolved Solids (mg/l)	500	1000	--	--	4000	--
Total Suspended Solids (mg/l)	25	50	50	150	300	>300
Temperature (C)	--	Normal+2	--	Normal+2	--	--
Turbidity (NTU)	5	50	50	--	--	--
Feacal Coliform (Counts/100ml)	10	100	400	5000 (20000)@	5000 (20000)@	--
Total Coliform (counts/100ml)	100	5000	5000	50000	50000	>50000
Al (mg/l)	ENL	--	--	(0.06)	0.5	IV
As (mg/l)	ENL	0.05	0.05	0.4 (0.05)	0.1	IV
Ba (mg/l)	ENL	1	1	--	--	IV
Cd (mg/l)	ENL	0.01	0.01	0.01* (0.001)	0.01	IV
Cr (IV) (mg/l)	ENL	0.05	0.05	(0.05) 1.4	0.1	IV
Cr (III) (mg/l)	ENL	--	--	-- (2.5)	--	IV
Cu (mg/l)	ENL	0.02	0.02	--	0.2	IV
Hardness (mg/l)	ENL	250	250	--	--	IV
Ca (mg/l)	ENL	--	--	--	--	IV
Mg (mg/l)	ENL	--	--	--	--	IV
Na (mg/l)	ENL	--	--	--	3 SAR	IV
K (mg/l)	ENL	--	--	--	--	IV
Fe (mg/l)	ENL	1	1	1	1 (leaf)	IV
Pb (mg/l)	ENL	0.05	0.05	0.02* (0.01)	5 Other	IV
Mn (mg/l)	ENL	0.1	0.1	0.1	5	IV
Hg (mg/l)	ENL	0.001	0.001	0.0004 (0.0001)	0.002	IV
Ni (mg/l)	ENL	0.05	0.05	(0.9*)	0.2	IV

PARAMETER	CLASSES					
	I	IIA	IIB	III	IV	V
Se (mg/l)	ENL	0.01	0.01	0.25 (0.04)	0.02	IV
Ag (mg/l)	ENL	0.05	0.05	-- 0.0002	--	IV
Sn (mg/l)	ENL	--	--	0.04		> IV
U (mg/l)	ENL	--	--	--	--	> IV
Zn (mg/l)	ENL	5	5	0.4*	2	> IV
B (mg/l)	ENL	1	1	-- (3.4)	0.8	> IV
Cl (mg/l)	ENL	200	200	--	80	> IV
Cl_2 (mg/l)	ENL	--	--	(0.02)	--	> IV
CN (mg/l)	ENL	0.2	NR	0.06 (0.02)	--	> IV
F (mg/l)	ENL	1.5	1.5	10	1	> IV
NO_3/NO_2 (mg/l)	ENL	0.4/7	0.4/7	0.04 (0.03) /--	--/(5)	> IV
P (mg/l)	ENL	0.2	0.2	0.1	--	> IV
Silica (mg/l)	ENL	-50	-50	--	--	> IV
SO_4 (mg/l)	ENL	250	250	--	--	> IV
S (mg/l)	ENL	0.05	0.05	0.001	--	> IV
CO_2 (mg/l)	ENL	--	--	--	--	> IV
Gross- (Bql)	ENL	0.1	0.1	--	--	> IV
Gross- (Bql)	ENL	1	1	--	--	> IV
Ra-226 (Bql)	ENL	<0.1	<0.1	--	--	> IV
Sr 90 (Bql)	ENL	<1	<1	--	--	> IV
CCE (ug/l)	ENL	500	500	--	--	> IV
MBAS/BAS (ug/l)	ENL	500	5000	5000	--	--
O & G (mineral) (ug/l)	ENL	40;NF	40;NF	N	--	--
O & G (Emusified Edible) (ug/l)	ENL	7000;NF	7000;NF	N	--	--
PCB (mg/l)	ENL	0.1	0.1	0.6 (0.06)	--	--
Phenol (ug/l)	AB	10	10	--	--	--
Aldrin/	AB	0.02	0.02	0.2	--	--
Dieldrin (ug/l)	AB	--	--	--	--	--
BHC (ug/l)	AB	2	2	9 (0.1)	--	--
Chlordane (ug/l)	AB	0.08	0.08	2 (0.02)	--	--
t-TTD (ug/l)	AB	0.1	001	(0.01)	--	--
Endosulfan (ug/l)	AB	10	10	--	--	--
Heptachlor /	AB	0.05	0.05	0.9 (0.06)	--	--
Epoxide (ug/l)	AB					
Lindane (ug/l)	AB	2	2	3 (0.4)	--	--

cont

PARAMETER	CLASSES					
	I	IIA	IIB	III	IV	V
2, 4-D (ug/l)	AB	70	70	450	--	--
2, 4, 5-t (ug/l)	AB	10	10	160	--	--
2, 4, 4-TP (ug/l)	AB	4	4	850	--	--
Paraquat (ug/l)	AB	10	10	1800	--	--

NOTES	
CLASS I:	Conservation of natural environment Water Supply I - Practically no treatment necessary. Fishery I - very sensitive aquatic species
CLASS IIA:	Water Supply II - conventional treatment required
	Fishery II - sensitive aquatic species
CLASS IIB:	Recreational use with body contact
CLASS III:	Water Supply III - extensive treatment required
	Fishery III - common, of economic value, and tolerant species, life stock drinking
CLASS IV:	Irrigation
CLASS V:	None of the above
NV -	No Visible floatable materials or debris
NOO -	No Objectable Odour
** -	Related Parameters, only one recommended for use
NOT -	No Objectable Taste
@ -	Maximum, Not to be exceeded
NR -	No Recommendation
* -	At hardness 50mg/l $CaCO_3$
# -	24 hr average and maximum (bracketed) concentrations shown
NF -	Free from visible film, sheen, discoloration and deposits
NL -	Free from visible layer, discoloration and deposits
ENL -	Expected Natural Level
AB -	Absent

Annex 5:

KPKKT HCVF Management Plan Team Members

1. AHMAD BAZLI
2. MOHD SHAMSOL
3. BORHAN
4. SITI NURUL ASHIKIN
5. NURUL SAERAH
6. NOORIZAN
7. NIK NUR HAFIZI
8. OSMADI
9. ARNINA
10. SAHARA
11.