

Appendices

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Appendix 1: Implementation organizations

(1) Universiti Malaysia Sabah (UMS) and Institute for Tropical Biology and Conservation (ITBC)

Universiti Malaysia Sabah (UMS)

The Universiti Malaysia Sabah (UMS) was established in November 1994 as 9th Public Universities in Malaysia under the Ministry of Education of Federal Government. Students' enrolment to UMS occupies 1.3% of the total students of public universities in Malaysia in 1999 (Table 1-1-1). The percentage of the students' enrolment of UMS to the total students in Malaysia was low because of new universiti, but it increases steady according to rise of new students. Main campus of UMS locates in north part of Kota Kinabalu City in Sabah, and the University has branch campus of School of Forestry in Sandakan, and that of School of international Finance and school of Information Science in Labuan. A total of RM1.2 billion was invested for phase-I development of the University by the federal government. There are 10 Schools and 2 Centres for undergraduate students, 5 institutes of units for research and education on postgraduate students, and supporting facilities like as library and academic services (Figure 1-1-1). The 3 research institutes including Institute for Tropical Biology and Conservation (ITBC) have doctoral courses for postgraduate students and confer doctoral degree on qualified scholars. Approximate 7,300 of full time undergraduate students and 330 of part time students are enrolled in UMS (September 2001) (Table 1-1-2).

Table 1-1-1. Public Universities in Malaysia and number of student enrolment (1999)

	Universiti	Male Enrolment	Female Enrolment	Total	%
1	Universiti of Malaya	9,264	13,682	22,946	10.8
2	University of Science Malaysia	7,369	10,672	18,041	8.5
3	National Universiti of Malaysia	7,424	13,311	20,735	9.8
4	University Putra Malaysia	13,399	19,609	33,008	15.6
5	University of Technology Malaysia	19,011	10,880	29,891	14.1
6	International Islamic University of Malaysia	4,047	5,342	9,389	4.4
7	Northern Universiti of Malaysia	5,118	9,931	15,049	7.1
8	Universiti of Malaysia Sarawak	1,383	1,547	2,930	1.4
9	Universiti of Malaysia Sabah	1,332	1,358	2,690	1.3
10	Sultan Idris Education Universiti	1,534	1,776	3,310	1.6
11	Universiti of Technology MARA	22,758	30,837	53,595	25.3
	Total	92,639	118,945	211,584	

Data Source: Ministry of Education, Malaysia Education Statistics 1999

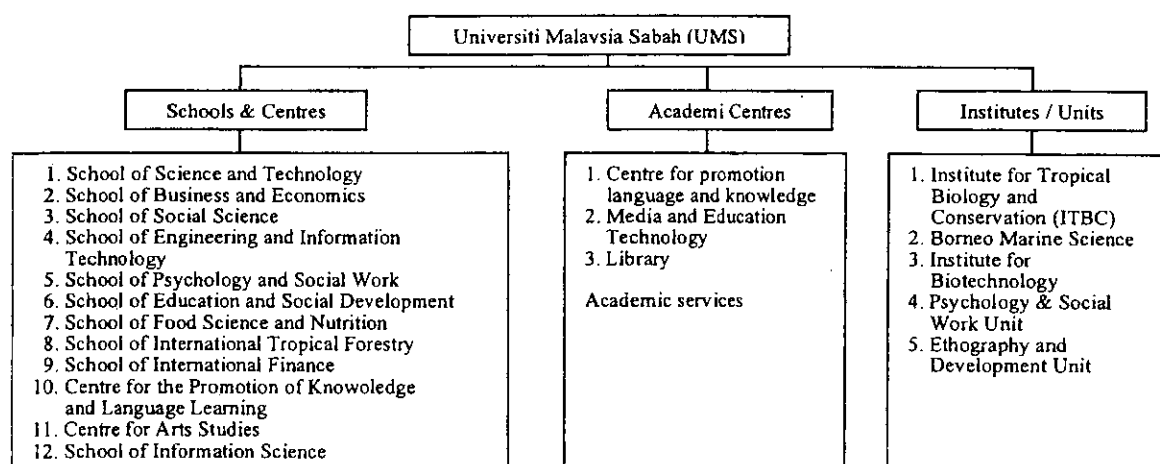


Figure 1-1-1. Organization and Schools structure of Universiti Malaysia Sabah

Table 1-1-2. Number of undergraduate students of UMS

Year	June 1999/2000	June 2000/2001	Nov. intake	June 2001/2002	Total
Full time Student	2,225	2,529	521	2,036	7,311
Part time Student	232	30	-	70	332

Source: UMS

Institute for Tropical Biology and Conservation (ITBC)

Institute for Tropical Biology and Conservation (ITBC) was established as a Unit of UMS in 1995. The founding of the institute has allowed for local scientist to work more closely together to explore the diverse and vast center of natural resource – the Tropical Rain Forest. Four research areas are currently being emphasized; 1) Biodiversity and Biosystematic, 2) Ecological Process, 3) Advancement of Biodiversity, and 4) Nature Tourism. There are four sections in ITBC, and 23 staff and 23 graduate students belong to the institute (August, 2001) (Figure 1-1-2). The numbers of staff and graduate student increase steadily (Table 1-1-3, Table 1-1-4). Table 1-1-5 shows contributions (paper and reports) by the ITBC staffs from 1998 to 2000. Research subjects of the ITBC staffs and students are shown Appendix 16. Annual operation budget and international fund (scholarship) for ITBC is indicated in Table 1-1-6. One of major activities of ITBC, the institute conducts specimen collection for biodiversity research. ITBC has about 18,600 animal specimens (2,300 species) and about 2,500 plant specimens collection (see Appendix 6, Table 6-1). A new building of ITBC with collection rooms is under construction. ITBC has about 528 reference books on biodiversity study. Newsletters of ITBC have been published once or twice times annually from 1996, 3 monographs on scientific expedition, 7 "Siri Alam Sekitar", and 1 textbook for identification have been published from ITBC. ITBC also makes web page and provide collection and specimen data of "BORNEENSIS", but the collection data of most of taxa is under preparing and number of access through internet is not counted (Table 1-1-7). Table 1-1-8 shows major equipment of the institute. ITBC has made agreement with following 8 institutes / Universities for research; 1) Royal Science Society, 2) British Museum, 3) American Museum for Natural History, 4) Hyogo Museum, 5) Hokkaido University, 6) Primate Institute of Kyoto University, 7) Kagoshima University, and 8) Kyoto University for textile and industrial art.

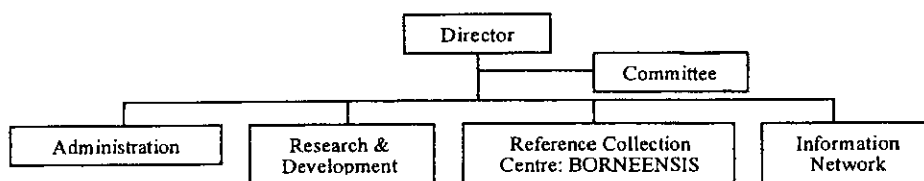


Figure 1-1-2. Structure of ITBC

Table 1-1-3. Number of graduate students and staffs of ITBC (1997-2001)

Year	Graduate students		Staffs					Total	Postgraduate Student staffs ¹⁾
	Master course	Doctoral course	Professor	Associate Professor	Lector /Tutor	Supporting staffs	Administration		
1997	9	1	1	1	5	2	2	11	7
1998	17	1	1	2	7	2	4	16	8
1999	25	1	1	2	7	2	4	16	8
2000	25	0	1	2	10	2	4	19	5
2001	23 ^{2),3)}	0	1	2	11	4 ⁴⁾	5	23	5
2002 (expect)	(23)	(1)	(2)	(2)	(13)	(6)	(6)	(29)	(5)

1) Number of student staffs on payroll after finishing master course or doctoral course

2) Including students passed final test in 2001

3) Full time students = 13, Part time students = 10 (SWD = 2, Sabah Parks = 1, Sabah Foundation = 3< Ministry of Health = 1, Teacher = 2, ITBC staff = 1)

4) Not including temporal supporting staff for DANCED project and public awareness

Table 1-1-4. Number of graduate students certificate master degree or doctoral degree from ITBC

Year	Master degree		Doctoral degree	
	Full time student ¹⁾	Part time student*	Full time student	Part time student*
1999	1	-	1	-
2000	1	2	-	-
2001	3	1	-	-

Source: Information from ITBC * Government staff /others who enter graduate student course of ITBC

Table 1-1-5. ITBC Operation cost and international fund (scholarship)(1999 - 2001)

(RM)

Year	Operation cost from UMS	International fund ¹⁾					
		Darwin initiative ²⁾	GTZ ³⁾	WWF ⁴⁾	Kosimar ⁵⁾	DANCED ⁶⁾	Rhino SOS
1999	110,949	500,000	26,667	70,000	70,000	440,000	-
2000	141,000	500,000	26,667	70,000	70,000	440,000	36,000
2001	201,000	650,000	-	70,000	70,000	440,000	-
2002 (expect)	(204,960)	550,000	-	-	-	-	-

Source: Information from ITBC

1) Mainly scholarship for graduate students

2) Annual scholarship averaged (Total = RM 3,000,000 (1996 – 2004) (Phase I – V))

3) Annual average scholarship for 3 years (Total = RM 80,000 (1998 – 2000))

4) Annual average scholarship for 3 years (Total = RM 210,000 (1999 – 2001))

5) Private Company Scholarship (annual average scholarship for 3 years (Total = RM 210,000 (1999 – 2001))

6) Annual average scholarship for 5 years including field study support (Total = RM 2,200,000 (1997 – 2001) (except Danish expert cost))

Table 1-1-6. Number of contribution (paper and reports) by ITBC staffs (1998 – 2000)

Name	Year	First author / Co-author	Media			Expedition report (book by ITBC)		
			Journal	Proceeding	Book	Maliau B.	Tabin WR	Klias
Dr. Maryati Mohamed	1998	First author				1		
		Co-author				1		
	1999	First author		3	1			
		Co-author		2	1		9	
	2000	First author						3
		Co-author	2					
Dr. Mashitah Yusoff	1998	First author		1				
		Co-author	3	1				
	1999	First author		2				
		Co-author		1	1			
	2000	First author		1				1
		Co-author		4				
Dr. Menno Schilthuisen	1998	First author	4					
		Co-author	1					
	1999	First author	2	1				
		Co-author	3					
Dr. Mohad Zahedi Daud	1999	First author		1				
Dr. Monica Suleiman	1998	First author				1		
		Co-author		1				
Dr. Homathevi Rahman	1999	First author					1	
		Co-author			1			
Mr. Henry Bernard	1999	First author	1	1			1	
		Co author						1
Mr. Mahadimenakbar	1999	First author		1				
		Co author	1					
Mr. Ahmad Sudin	1999	First author		1				
		Co author						1
Mr. Bakhitar Effendi	1998	First author				1		
		Co author		1				
Mr. Mohd Fairus Jalil	1998	First author	1					
		Co author	1					
	1999	First author		2			2	
		Co author		1				1
Total	1998	First author	5			1		
		Co-author	5			3		
	1999	First author	3	15	2		4	
		Co-author	1	4	3		10	
	2000	First author	3	1				6
		Co-author	2	6				4

Source: Information from ITBC

Table 1-1-7. Collection and specimen data prepared for web page of ITBC-UMS

Taxa (biological group)	Data prepared (Excel format)	Number of species identified
Mammals	509	45
Birds	493	101
Reptiles	116	20
Frogs	1,404	64
Fishes	3,145	47
Bryophytes (moss etc.)	1,063	156
Ferns	150	nd
Gingers	891	90
Herbs	820	nd
Tree and shrubs	331	123
Other plants (palmae etc.)	150	nd
RDB	not yet	

Source: Information from ITBC-UMS

Table 1-1-8. Major equipment of ITBC (not including camping equipment, writing materials, etc.)

	Name of equipment	No.		Name of equipment	No.		Name of equipment	No.
1	Altimeter	2 units	18	Dissecting set	1	35	Note book PC	1
2	Aluminum box	8	19	Dry cabinet	3	36	Oven	5
3	Analytical balance	1	20	Dry specimen cabinet	1	37	Photo microscopy	1
4	Berlese trap	4	21	Flowmeter	2 unit	38	Portable display panel	1
5	Binocular for zoology	3	22	Freezer	5	39	SLR camera+lenses	3
6	Butterflies net	40	23	Fridge	2	40	Small mammal traps	200
7	Camera & lucida	3+2	24	Gas Chromatography	1	41	Snail box	40 units
8	Canvas	2	25	Generator	1	42	Specimen box	70 units
9	Chainsaw	2	26	Hand-held GPS	1	43	Stereo microscope	4
10	Compactor for collection room (conventional)	3	27	High performance liquid chromatography	1	44	Taxonomy software	2
11	Compound microscopes	3	28	Image analyzer	1	45	UV spectrophotometer	2
12	Cooler boxes	5	29	Incubator	1	46	Video camera	2
13	Dehumidifier	3	30	Insect cabinets	16	47	Water distiller	1 unit
14	Digital camera + battery	1	31	Laser printer	1	48	Water pump	1 unit
15	Digital pH meter	1	32	Cabinet for herbarium	48			
16	Digital portable balance	1 unit	33	Micro centrifuge	1			
17	Display panel	8 sets	34	Mist net	10			

Source: Information from ITBC

(2) Sabah Parks

General description

Sabah Parks is a governmental agency under the Ministry of Tourism Development, Environment, Science and Technology (MTDEST) of Sabah. The Sabah Parks manages 6 Sabah State Parks according to the Parks Enactment in 1984 (Table 1-2-1)(Figure 1-2-1). Kinabalu park is the oldest state park in Sabah, and was listed in the World Heritage Site as first site in Malaysia in 2001. A new marine park for coral reef area is in planning in southeast coast of Sabah including Pulau Sipadan. A total of 478,833 people visited the state parks, and brought RM1.16 million entrance fee to the State in 2000 (see Appendix 11).

Table 1-2-1. Sabah State Parks managed by Sabah Parks

Name of Park	Park type	IUCN Category	Year established	Area (ha)		
				On land	Marine water	Total
Kinabalu Park	Mountain park	II	1964	75,370	0	75,370
Tunku Abdul Rahman Park	Marine park	II	1974	1,289	3,640	4,929
Turtle Island Park	Marine park	II	1977	18	1,722	1,740
Pulau Tiga State Park	Marine park	II	1978	607	15,257	15,864
Tawau Hills Park	Hill park	II	1979	27,972	0	27,972
Crocker Range Park	Mountain park	II	1984	139,919	0	139,918
Total				243,357	20,618	263,972

Source: MOSTE (1997) and Sabar Parks (<http://www.jaring.my/sbhpark/>)

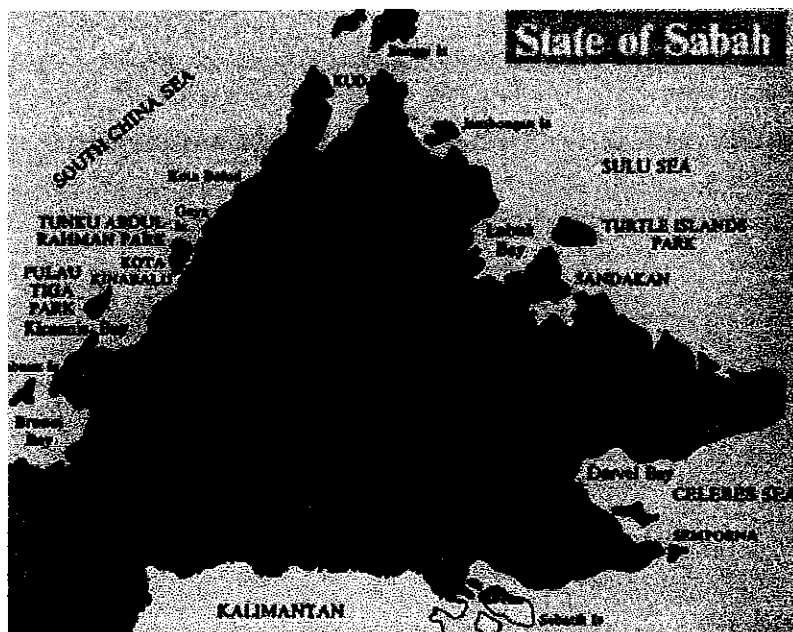


Figure 1-2-1. Location of Sabah State Parks (<http://www.jaring.my/sbhpark/>)

Organization chart of the Sabah parks is shown in **Figure 1-2-2**. Operation and enforcement section charges planning and law enforcement, and research and education section conducts survey and monitoring in the parks. A total number of personnel employed by the Board is 277 excluding park office ranger and local staff for research section (July 2001)(**Table 1-2-2**). Head office is located in Kota Kinabalu, but there area park museum, research laboratories and other major facilities are established in Kinabalu Park. Annual operation cost of the Head office is shown in **Table 1-2-3**. Under the research and education section, there are 6 units (Education and Interpretation, Botany, Entomology, Zoology, Marine and Park Anthropology).

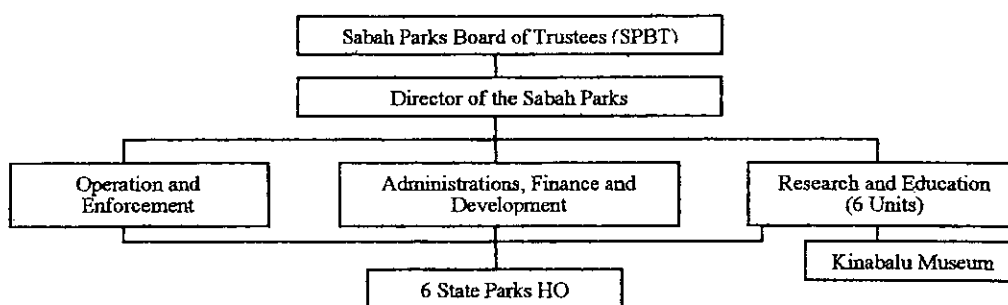


Figure 1-2-2. Organization chart of the Sabah Parks

Table 1-2-2. Number of Staffs of Sabah Parks (by occupation)

Section	Head Office in KK (HQ)		Park office		
	Officer	Supporting staff	Officer	Ranger	Local staff
Operation and Enforcement	2	2	3	51	-
Administration, Finance and Development	7	-	-	33	176
Research and Education	2	4	7	13	21

Source: Reply to questionnaire on August, 2001

Table 1-2-3. Budget of Head Office of Sabah Parks (1998 – 2002) (RM)

Year	Operation cost
1998	2,400,000
1999	2,300,000
2000	2,300,000
2001	2,300,000
2002 (expect)	11,300,000

Source: Answer for questionnaire (August 2001)

Crocker Range Park (CRP)

Crocker Range Park (CRP) is the biggest and the newest park in the 6 state parks. CRP locates mountain area in southeast area of Kota Kinabalu City. The park is long and narrow shape of northeast to southwest axis with approximate 110 km length and 20 km width. Temporal head quarter of CRP is situated in west part of Keningau city. A total of 29 personnel (1 director, 1 research supporting staff, 7 park rangers, and 20 local staffs) works for the CRP (Table 1-2-4). Table 1-2-5 shows facilities in CRP provided by the Sabah Parks. Fernum and insectarium of 6 ha area with about 500 plants, and rehabilitation of 160 ha abandoned farm area are under preparing near the HQ of CRP. Five new substations (park ranger post) will be established in 5 site around CRP according to 8th Malaysia Plan (Table 1-2-6). Operation cost of CRP is about RM80,000 per year (Table 1-2-7).

Table 1-2-8 shows number of specimens collected in CRP and stored in Kinabalu Museum of the Sabah Parks. Kinabalu Park and CRP are the only two areas in Malaysia in where wild breeding populations of orang-utan inhabit in mountain ranges. Payne (1988) estimated that the size of the orang-utan population in CRP lies within the range 25 to 160 individuals. There are 1,350 ha of lowland forest below 1,000 ft and only 240 ha below 500 ft, however all the forest below 500 ft and most forest below 1000 ft was burned between 1983 to 1998. CRP is divided into 8 districts and about 23,000 people inhabit in 72 villages surrounding areas. There are about 50 illegal shifting cultivation sites inside CRP. Two major illegal farming areas with 500 – 1,000 ha are identified in Tenom and Keningau district in southeast part, and other small-scale illegal activity areas concentrates in upper Papar river area in northwest part of CRP.

Tourists visiting Sabah has been growing recent years. In 2000, tourism receipts hit RM 714 million with total arrivals of 408,938 international and 365,537 domestic visitors. About 65% of the international tourists visited one of 6 Sabah Parks, in which 40% tourists traveled to Kinabalu Park in 2000 (see Appendix 10). But, visitor of CRP is very limited because of insufficient facilities and information for the tourists (Table 1-2-9).

CRP was established in 1984, however, management plan is not prepared. A survey on CRP was conducted in "Identification of Potential Protected Areas" programme supported by DANCED and prepared environmentally sensitive maps. Biological study by UMS-ITBC and Hyogo Museum of Japan was carried out in 1999. The Sabah Parks staffs conducted periodically bird census. Preliminary survey on ecosystem and socio-culture of CRP was published by Sabah Parks in August 2001 (see Appendix 13).

Table 1-2-4. Number of staff in Head Office and CRP (by educational background)

Office	Secondary School	High school	Collage	Bachelor	Master (Eg)	Doctor
CRP	11	16	1	1	-	-

Source: Answer to questionnaire on August, 2001

Table 1-2-5. Facilities in CRP

	Facility				Equipment		
	Office	Staff house	Laboratory	Guest house	Research	Vehicle	Motorcycle
Number	1	17	1	1	No	3	2

Source: Answer to questionnaire (March 2001)

Table 1-2-6. New substation (park ranger post) site planned in CRP

Area	Name of Station	Area	Name of Station
West side	Kibamsangan Inobong	East side	Mehua
	Ulu Kimenis / Mandal pan		Ulu senagang / Melelep
	Ulu menbaknt / Magindanen		

Source: CRP staff of Sabah Parks

Table 1-2-7. Operation cost of Crocker Range Park (1998- 2002)

Year	Operation cost (RM)
1998	500,000
1999	550,000
2000	800,000
2001	800,000
2002 (expect)	1,100,000

Source: Answer for questionnaire (August 2001)

Table 1-2-8. Number of specimens collected in CRP and preserved in Kinabalu Museum

	Plants	Mammals	Birds	Reptiles & Amphibian	Fishes	Insects
Number of specimens	1,020	201	272	718	361	9,224

Source: Answer to questionnaire (March 2001)

Table 1-2-9. Number of tourist and researcher visiting Crocker Range Park

Group	Nationality	1996	1997	1998	1999	2000
Tourist	Domestic	30	10	25	12	76
	International	nd	nd	nd	nd	14
Researcher	Domestic	7	11	5	19	13
	International	3	5	2	7	10

Source: Answer to questionnaire (March 2001)

(3) Sabah Wildlife Department (SWD)

General description

Sabah Wildlife Department (SWD) was set up officially in 1988 as an agency under MTDEST. SWD was formerly a division in the Forestry Department Sabah, which was known as the Wildlife and Forest Recreation Division. The policy of SWD is "to preserve all wildlife species for the heritage of Sabah for conservation, research, recreation, tourism, training and education" according to the Wildlife Conservation Enactment (1997) as an amendment of the Fauna Conservation Ordinance of Sabah issued in 1963. SWD designates protected animal species (see **Appendix 15**), controls animal trade and manages two wildlife reserves (Class VII forest). The Department also conducted orang-utan rehabilitation programme in Sepilok and several environmental education projects for wildlife protection (see **Appendix 12**). However, SWD has not direct responsibility for area management of other bird sanctuaries or protected areas in **Table 1-3-1**. Kota Belud-Tempasuk Plain Bird Sanctuary and Pulau Mantanani Bird Sanctuaries are listed as protected areas in MOSTE (1997), but the two sanctuaries are not approved by local government, and SWD does not conduct actual activities for wildlife conservation in those areas. Organization chart of SWD is shown in **Figure 1-3-1**. New buildings including captive animal breeding facilities are prepared for the head office of SWD in southeast part of Kota Kinabalu. **Table 1-3-2** shows the number of staffs and **Table 1-3-3** indicates operation cost of SWD.

Table 1-3-1. Protected area managed by Sabah Wildlife Department

Name and protected area classification in Sabah	IUCN Category	Area (ha)	Year established	Status note
Tabin Wildlife Reserve	IV	120,521	1984	Gazetted as Class VII forest
Kulamba Wildlife Reserve	IV	20,682	1984	Gazetted as Class VII forest
Lower Kinabatangan Wildlife Sanctuary	-	41,765	--	Under coordination
Sepilok orang-utan rehabilitation centre (Sepilok Virgin Jungle Forest (VJR))	I (VJR)	1,235 (VJR)	1931 (VJR)	SWD conduct only rehabilitation programme of orang-utan
Gomantong and Supu Forest Reserve (Gomantong-Materis-Bod Tai-Keruak VJR)	I (VJR)	1,816 (VJR)	1984 (VJR)	SWD manage swallow nest collection and visitor facilities
Pulau Sipadan Bird Sancturay	IV	11	NA	SWD manage wildlife (sea birds and marine turtles)
Kota Belud – Tempasuk Plain Bird Sanctuary	IV	12,000	NA	Proposed as bird sanctuary, but local community not approved
Pulau Mantanani Bird Sanctuary	IV	NA	NA	

Source: Sabah Wildlife Department, MOSTE (1997)

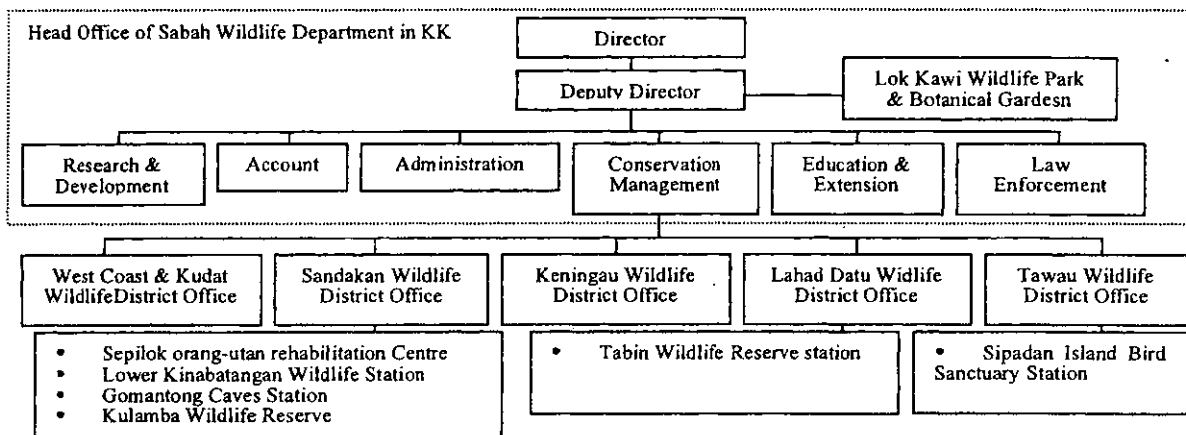


Figure 1-3-1. Organization structure of SWD

Table 1-3-2. Number of Staffs of Sabah Wildlife Department (1996)¹⁾

Category ²⁾	HQ	West Coast	Sandakan	Keningau	Lahad Datu	Tawau	Tabin	Semporna	Sepilok	Kota Kinabatangan	Total
Division I	5	1	2	1	1	1	1	0	1	1	14
Division II	3	0	1	0	0	0	0	0	0	0	4
Division III	15	2	2	4	3	4	3	2	6	5	46
Division IV	30	9	11	6	11	10	8	8	30	8	131
Total	53	12	16	11	15	15	12	10	37	14	195 (229) ³⁾

Source: Sabah Wildlife Department and JICA (1996)

1) Update data was not provided from SWD, but the number of staff and assignment is not so much different from 1996 to 2001

2) Division I; Director and deputy director and officers, Division II; Assistant officer (G6, W6, N6), Division III; rangers (G7, 8), assistant administrators (N7, 9), Division IV; junior rangers (G1), junior administrators (N11), others

3) Data from Laporan Tahunan 1996 (SWD)

Table 1-3-3. Budget of Head Office of Sabah Wildlife Department

Year	Operation cost	International fund
2000 *	approximate RM4.0 million	DKK 13,997,070

Source: Information from SWD (September 2000) and DANCED, SWD-CAB Papers (2001)

* Other year budget was not provided from SWD

Tabin and Kulamba Wildlife Reserve

The Tabin Wildlife Reserve (TWR) was originally registered as "Silabukan and Lumerau" forest reserve from 1950's. TWR and Kulamba Wildlife Reserve (KWR) where is located north-west of TWR are now

wildlife forest reserves of forest category class VII by the Forest Enactment of Sabah in 1968. Though primary forest is still remained in core zone and in virgin jungle forests, major part of TWR is covered by disturbed forest affected selecting logging in lowland, and it is surrounded by oil palm plantation except north-east side connecting wetland of Segama River.

TWR is a most important habitat of large mammals such as Asian elephant, Sumatra rhino, banteng, clouded leopard, proboscis monkey in Sabah. Population size estimated of Asian elephant in TWR is ± 300 , banteng is ± 100 , and Sumatra rhino is in the range of 7 to 20. Table 1-3-4 shows flora and fauna reported in TWR. KWR was established for conservation of banteng and estuarine crocodile at first, but orang-utan and proboscis monkey also distribute there. KWR is predominantly fresh water swamp forest, mangrove and beach vegetation. Scientific study and facilities is very limited on KWR. Number of staffs, facilities, budgets and crop damage by wildlife in TWR and KWR are shown in Table 1-3-5 to Table 1-3-8.

TWR management plan was made in 1994, however that for KWR is not prepared. A biological expedition on TWR was conducted by ITBC-UMS in 1996. Several studies on wildlife ecology and wildlife-human conflict by graduate students of UMS supported by DANCED are conducted in TWR. Sumatra rhino census is operated by a NGO (Rhino-SOS), and Asian elephant monitoring is carried out by SWD every 2 years. Bird and Amphibian survey are conducted by JOCVs. But, there is almost nothing survey or monitoring in KWR. SWD-Capacity building project (SWD-CAP) is supported by DANCED from 2001-2002. The project is covering six components including study tour to Peninsular Malaysia and Philippines; 1) Wildlife department policy paper and strategy, 2) Training needs assessment and human resources development plan, 3) Staff training, 4) Wildlife conservation strategy and program for Sabah, 5) Communication and awareness raising, and 6) Local stakeholder involvement in wildlife conservation. As pilot project site, Lower Kinabatangan area is selected in the project. Newsletter was produced as an activity and temporal website is established (www.borneo-online.com.my/swd/). The project partially overlaps with the JICA programme, but mobile exhibition and habitat expansion planning are not covered by the DANCED project.

Table 1-3-4. Plant and animal species recorded in Tabin Wildlife Reserve

Taxon	Plants	Mammals	Birds	Reptiles	Fresh water fishes
Number of species	945	75	252	45	24

Source: Sabah Wildlife Department. Fresh water fishes; after Maryati et al., (1999)

Table 1-3-5. Number of facilities in Tabin Wildlife Reserve and Kulamba Wildlife Reserve

	Facility				Equipment		
	Office	Staff house	Laboratory	Guest house	Research	Vehicle	Motorcycle
Tabin WR	1	17	0	0	GPS 1, binocular 2	3	1
Kulamba WR	There is almost nothing facility and equipment in Kulamba WR						

Source: Answer to questionnaire (March 2001)

Table 1-3-6. Number of staff in Tabin and Kulamba Wildlife Reserve (by occupation)

	Management	Research	Accommodation	Facility management	Environment education	Total
Tabin WR	5	3	7	11	2	15
Kulamba WR	No assignment of staff for Kulamba WR management					

Source: Answer to questionnaire to Sabah Wildlife Department

Table 1-3-7. Operation cost of Tabin Wildlife Reserve (1998 - 2001)

Year	Operation cost
1998	RM54,000
1999	RM54,000
2000	RM54,000
2001	RM54,000

Source: Answer for questionnaire (February, 2001)

Table 1-3-8. Crop damage by wildlife in Tabin Wildlife Reserve

Wildlife Reserve	year	1998	1999	2000
Tabin Wildlife Reserve (RM/year)		35,000	RM30,000	50,000
Kulamba WR		nd	nd	nd

Source: Answer from SWD to questionnaire in March, 2001

(4) Unit of Science and Technology (UST)

Unit of Science and Technology (UST) is one organization under MTDEST to enhance Sabah's international competitiveness through capability building in Science and Technology. UST adopts a participating and teamwork instead of hierarchy organization structure and 4 divisions are built as Figure 1-4-1. Number of staff and budget of UST are shown in Table 1-4-1 and Table 1-4-2. Table 1-4-3 shows activities ("Nature Lover Science Camp") on environmental public awareness carried out by UST. UST also operates following 3 web sites to promote science and technology in Sabah.

- SabahNet: Main Platfor (www.sabah.net.my/)
- EduNet: Education Net (www.sabah.edu.my/)
- E-Mas: Communication Net (www.sabah.org.my/)

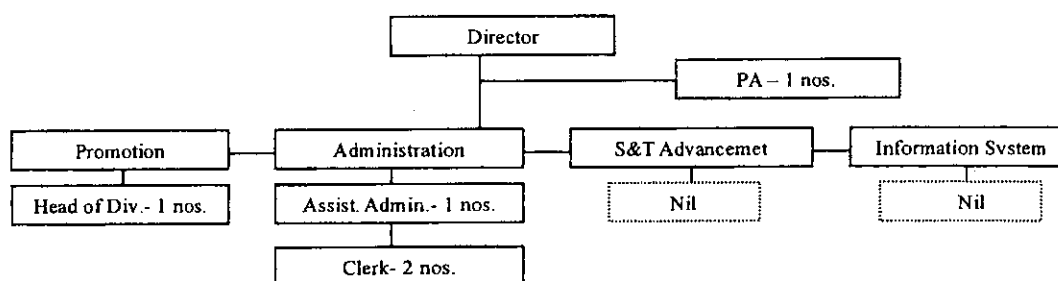


Figure 1-4-1. UST Organization structure (current structure, August 2001)

Table 1-4-1. Number of Staff of Science & Technology

Occupation	Division				
	Administration	Science Policy	S & T Advancement	Promotion	Information System
Director	1	-	-	-	-
Researcher	-	-	-	-	-
Officer	1	-	-	1	-
Supporting staff	3	-	-	-	-
Total	5	-	-	1	-

Source: Answer to questionnaire (August 2001)

Table 1-4-2. Budget of Science and Technology Unit (1998 - 2002)

(RM)

Year	Operation cost	Estimated operation cost for public awareness	Capital investment	International fund
1998	240,000	-	240,000	40,000
1999	85,000	15,000	85,000	40,000
2000	190,000	-	190,000	40,000
2001	190,000	15,000	190,000	40,000
2002 (expect)	190,000	15,000	190,000	40,000

Source: Answer to questionnaire (August 2001)

Table 1-4-3. "Nature Lover Science Camp" carried out by UST

Target Group	Number of Participation	Cost (RM)	Organizations Involved	Frequency per year
Students	60	15,000	UMS, Education Department	1

Source: Answer to questionnaire (August 2001)

(5) Forestry Department Sabah (FDS)

Main body and forest reserve

Forestry Department Sabah (FDS) has responsibility for management of forest reserve (3,594,516 ha) in Sabah including Sabah Foundation concession area (972,804 ha) on the Forest Enactment in 1968. Except the forest reserve under FDS, large scale commercial plantation areas (61,109 ha) for timber and other production is managed by Sabah Forestry Development Authority (SAFODA) established in 1976. Sabah Softwood Sdn. Bhd. has another tree plantation area in southeast part of Sabah. The forest reserve under FDS is classified into 7 categories (Table 1-5-1).

Table 1-5-1. Forest classification in Sabah

Class	Forest Reserve (Permanent forest)	Area (ha)		% in 1997
		1984	1997	
I	Protection Forest	99,977	342,216	9.5
II	Commercial Forest	2,674,576	2,685,119	74.7
III	Domestic Forest	7,355	7,355	0.2
IV	Amenity Forest	20,767	20,767	0.6
V	Mangrove Forest	316,457	316,024	8.8
VI	Virgin Jungle Forest	88,306	90,382	2.5
VII	Wildlife Reserve Forest	141,203	132,653	3.7
Total		3,348,641	3,594,516	100

Source: Government of Sabah 1968, Forest Enactment Sabah No. 2 of 1968, Amended 1992.

Note	Class I: Protection Forest	Maintenance of forest essential on climatic or physical grounds
	Class II: Commercial Forest	For supply of timber and other produce to meet the general demands of trade (Production forest < 800 m in altitude)
	Class III: Domestic Forest	For supply of timber and other produce for local consumption
	Class IV: Amenity Forest	For local amenity arboretum work
	Class V: Mangrove Forest	For supply of mangrove timber or other produce to meet the general demands of trade
	Class VI: Virgin Jungle Forest	For forest research purpose
	Class VII: Wildlife Reserve Forest	For protection forest of wildlife

Figure 1-5-1 shows organization structure of FDS that has 22 divisions including Forest Research Centre (FRC). FDS is one of biggest governmental organization in Sabah with about 1,800 staffs. Six divisions shown in the figure 1-5-1 in the Department mainly have responsibility for the JICA programme. FRC is a key division for research component of FDS. The mapping division conducts digitizing forest management unit. Number of staff who will be allocated for each programme components is shown in Table 1-5-2. FDS has received RM67,804,582 from the Sabah State Government and RM6,352,100 from the Federal Government as 2000's budget.

Forest management is one of most important issue in Sabah, so that there are several international funded project and domestic project (Table 1-5-3). The international funded forest projects for FDS are comprised of two major activities, 1) sustainable forest management, and 2) biodiversity conservation in protected forests.

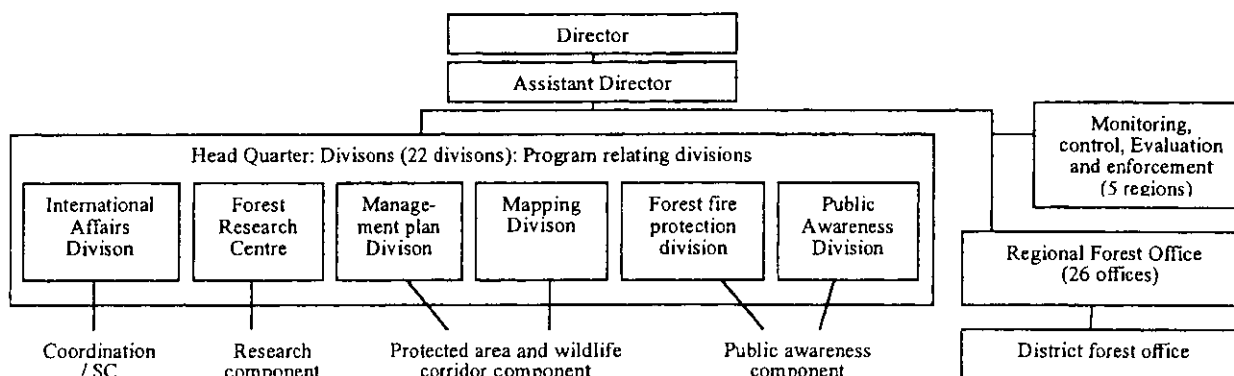


Figure 1-5-1. Organization chart of Forestry Department Sabah

Table 1-5-2. Number of Staffs of Forestry Department Sabah related to the programme

Human Resource Category	Programme component			
	Research	Protected area	Wildlife corridor	Public awareness
I	5	1	1	3
II	-	1	1	2
III	5	1	1	1
IV	20	3	3	3

Source: Answer to questionnaire (August, 2001)

Table 1-5-3. International funded project for forest management and biodiversity conservation for FDS

Foreign Organization	Project site	Scope of cooperation	Duration & Cost
GTZ	Deramakot	Implementation of sustainabl forest management	1989-2000 RM19,000,000
EU	HQ, Sandakan	Forestry training (update operational skill)	RM1,147,644
JICA	HQ, Sandakan	Sabah forest fire management plan	
GEF/UNDP co-financed DANCED	Klias Penisular	Biodiversity conservation of peat swamp	RM2,095,000
DANCED	Maliau Basin	Management plan for Maliau Basin	1999-2002 RM19,09,567
ITTO	Conservation area in Sabah	Assessment of status of conservation area in Sabah	Malaysia=US\$402,200 ITTO=US\$391,620

Source: Information from Forestry Department Sabah

Forest Research Center (FRC)

The Forest Research Centre was established in 1974 at adjoin area to Sepilok Forest Reserve in Sandakan. Herbarium under natural forest division collects about 240,000 plant specimens and entomology section under environmental science division has 111,000 insect collection (Figure 1-5-2). Twenty-two research officers and 170 permanent staffs work for FRC. Rainforest interpretation centre (RIC) is established for environmental education supported by GTZ and WWF at about 1-km off from main building of FRC. RIC conducts students' programme, teacher's programme and public awareness programme to promote positive change in public attitudes for rain forest and environment conservation. About 8,000 people visit RIC annually, and approximate 300 teachers received the teacher's programme from 1996 to 2000.

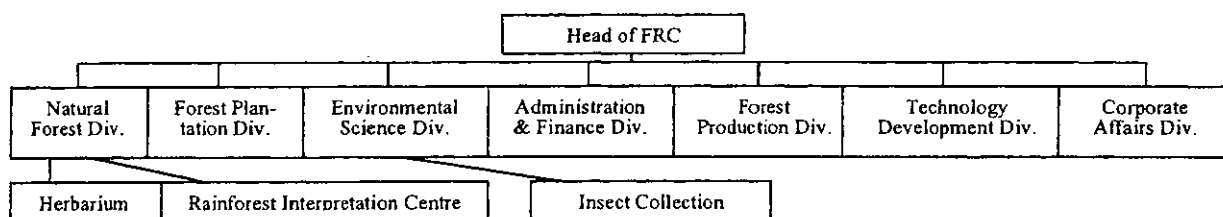


Figure 1-5-2 Organization structure of Forest Research Center

(6) Environmental Conservation Department (ECD)

The Environmental Conservation Department (ECD) is a new department established on August 1998 under MTDEST to manage environmental issue. ECD has responsibility mainly for brown issue and environment impact assessment according to the Federal Law of the Environmental Quality Act in 1974, and the Sabah State Law of the Conservation of Environment Enactment in 1996. Nine specific issues linked to land development and conservation processes in Sabah are recognized by ECD; 1) soil erosion, 2) freshwater, 3) natural forests, 4) biodiversity, 5) coastal and marine resources, 6) roads and hill cutting, 7) plantation forests, 8) riparian reserves, and 9) forest fire. Five major activities concerning the specific

issues are conducted under the director and the environmental conservation council. **Figure 1-6-1** shows organization structure of ECD. Number of staff and budget of ECD are shown in **Table 1-6-1** and **Table 1-6-2**.

DANCED supports capacity building project of ECD (ECD-CAB) for environmental management from 2000 to 2002. The six components are conducted in the project: 1) planning, 2) environmental assessment, 3) monitoring and enforcement, 4) communication and awareness, 5) environmental information system, and 6) administration area.

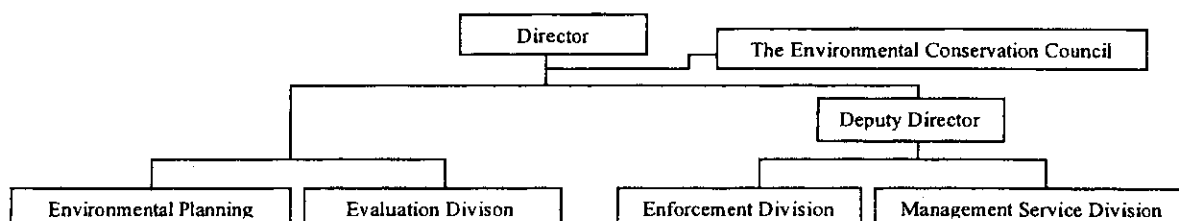


Figure 1-6-1. Major activities of Environmental Conservation Department

Table 1-6-1. Number of Staffs of Environment Conservation Department

Occupation	Director division	Division			
		I	II	III	IV
Officer	1	5	8	-	-
Supporting staff	-	-	-	10	6

Source: Answer for questionnaire (September 2001)

Table 1-6-2. Budget of Environment Conservation Department (1998 - 2002)

Year	Operation cost	International fund	Budget for Public Awareness
1999	748,793	1999-2002 Approximate RM7 million (DANCED)	Approx. RM1,750
2000	826,146		Approx. RM118,000
2001	2,070,699		Approx. RM49,000
2002 (expect)	1,782,768		RM53,000

Source: Environmental Conservation Department

(7) Land and Survey Department

The Land and Survey Department is established under the Chief Minister Department. The main function and responsibility of the Department are to alienate land under the Land Ordinance under Cop 68 and other Ordinances in compliance with the Government Policies to individuals, departments and agencies. The Department also conducts taking of aerial photography, mapping the whole State, managing of land data bank, and implementation of surveys for cadastral purposes. The aerial photography is taken every year in city areas and once in every 10 years in urban areas. Governmental organizations are able to borrow the aerial photography on condition to limit survey it to higher officers. The Department also makes digitized land distribution map.

(8) Sabah Foundation (Yayasan Sabah)

The Sabah Foundation was established in 1966 by financing from the Sabah State Government for social development of Sabah through forest resource development. Innoprise Corporation Sdn Bhd (ICSB) was also organized under the Foundation for practical business. The foundation has Sabah Foundation Concession area of 972,000 ha for 99 years in southeast part of Sabah, and conducts logging, forest plantation and other activities. In the concession area, there are two Class I forests, 1) Mariau Basin (39,000 ha), and 2) Danum Valley (43,800 ha). A total of about 20% of the concession area is protected areas

including Class VI virgin jungle forests (Table 1-8-1). It is under planning to include 30,000 ha primary forest to the existing protected forest. On the other hand, about 200,000 ha softwood plantation area is newly proposed to develop chip production for paper manufacture as a joint venture of China and Malaysia. Figure 1-8-1 shows the organization chart of the Sabah Foundation and related division and department to the JICA Programme. Number of staff related the programme is indicated in Table 1-8-2.

The Sabah Foundation is conducting several activities as international funded project for biodiversity conservation and forest management (Table 1-8-3). "Danum Valley Field Centre" is established for tropical forest research and the activities is supported by the Royal Society. "Borneo Rainforest Lodge" built in Danum Valley is operated for eco-tourism promotion by the Foundation. In Maliau Basin, research stations (Camel Trophy Camp and Agathis Camp) are established for research and eco-tourism supported by DANCED.

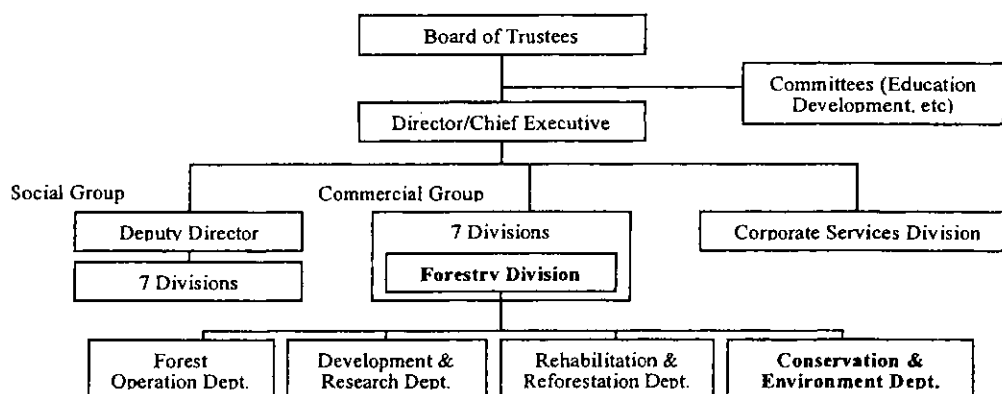


Figure 1-8-1. Group management structure of Sabah Foundation / Innoprise Corporation Sdn. Bhd. (Block letter show related Division and Department to the programme)

Table 1-8-1. Classification of protected forest in Sabah Foundation Concession Area

Category of Forest	Area (ha)	%
Total area of Sabah Foundation Concession Area	972,804	100.00
Existing Protected Area	82,800	8.50
Danum Valley = 43,800 ha (4.5%)		
Maliau Basin = 39,000 ha (4.0%)		
Proposed Virgin Jungle Reserve	1,705	0.20
Unworkable area; steep/no-commercial	97,280	10.00
Road Side Reserves	500	0.05
Riparian Reserves	4,000	0.40
Water Catchments	5,550	0.60
Total of Existing Protected Forest	191,835	19.75
Other forest (not yet protected by Law)		
Other Virgin Jungle Reserves	26,876	2.76
Other Water Catchment	2,590	0.27
Total of Potential Protected Forest	29,466	3.03

Source: Danum Valley Conservation Area, Management Plan (1995)

Table 1-8-2. Number of Staffs of Sabah Foundation related to programme

Occupation	HQ in KK	Danum Valley	Maliau Basin	Other
Forest research/planning	-	-	-	-
Biologist	-	-	-	-
Supporting staff	11	17	8	-
Others	-	17	30	-

Source: Answer for questionnaire (August, 2001)

Table 1-8-3. International funded project for forest management and biodiversity conservation for SFD

Foreign Organization	Project site	Scope of cooperation	Duration & Cost
DANCED	Maliau Basin	Management plan for Maliau Basin	1999-2002, RM19,100,000
FACE foundation	YS concession	Rehabilitation of logged over forest	25 years plan (150,000 ha rehabilitation)
ICSB/CIRAD	YS concession	Plant improvement & seed production	1989-2002 (RM 4,420,00, Phase III)
JIRCAS	YS concession	Ecology and control of insect pest	JIRCAS contribution, RM860,000
Royal Society UK	Danum Valley	Research, training and environmental education	Start 1984
IKEA-Sweden	YS concession	Rehabilitation of degraded forests	
British Columbia Forest Service, Canada	YS concession	Exchange information technology, and forest fire management	MOU signed in 1997

Source: Information from Forestry Department Sabah

(9) Environmental Action Committee (EAC)

Environmental Action Committee (EAC) was organized in 1997 for promotion of environmental public awareness under MTDEST. There are 4 sub-committees under EAC secretary (Figure 1-9-1). Public awareness and education sub-committee is one of them and it conducts 1) plastic bag reduction campaign, 2) environmental awareness exhibition, 3) love Kota Kinabalu campaign, 4) environmental awareness camp, and 5) Moyoy river cleanliness campaign with UMS and NGOs. However, the sub-committee still does not compile handbook or teacher guidebook for environmental education and nor conduct questionnaire survey on environmental conservation attitude of people ("nature lovers"). Printed materials and web site are used for the campaign. The EAC secretary allocate about RM50,000 to the Public awareness sub-committee for annual activities (2001).

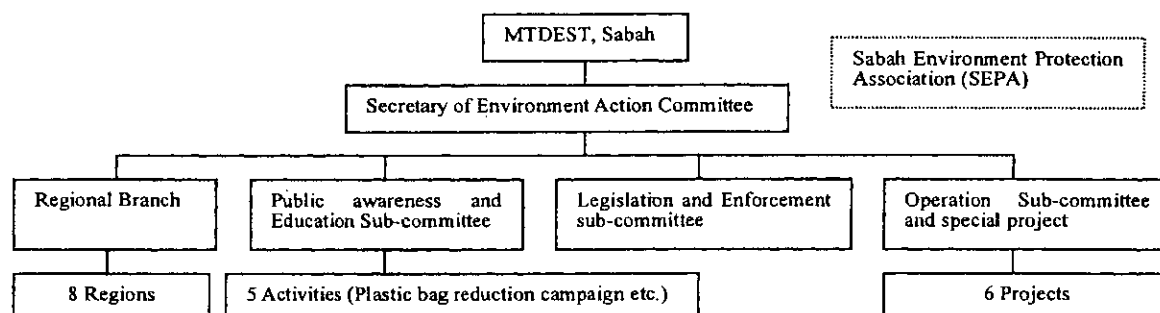


Figure 1-9-1. Organization structure of Environmental Action Committee (EAC)

(10) District Offices of Pilot Protected Areas

There are 24 Districts in Sabah and the District Offices are established under the State Government. Crocker Range Park extends 8 districts, and Tabin Wildlife Reserve stretches 2 districts (Figure 1-10-1). Each District office has 2 units and council unit (Figure 1-10-2). Development unit charges regional development planning and the council unit coordinate community interests. Table 1-10-1 shows population of Malaysian and non-Malaysian, and land use of each district. District areas of East Sabah, Lahad Datu and Kinabatangan, are larger than that of West Sabah surrounding Crocker Range Park, and have more Non-Malaysian people and oil palm plantation area.

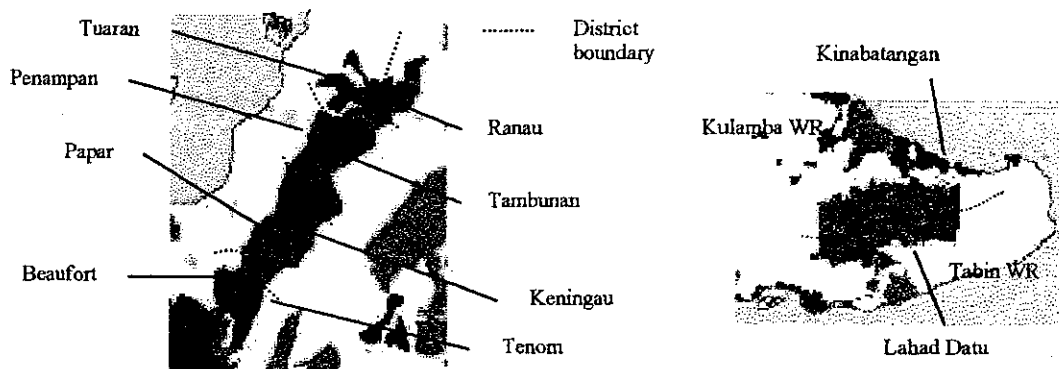


Figure 1-10-1. Districts related to Crocker Range Park (left) and Tabin & Klumba WR (right)

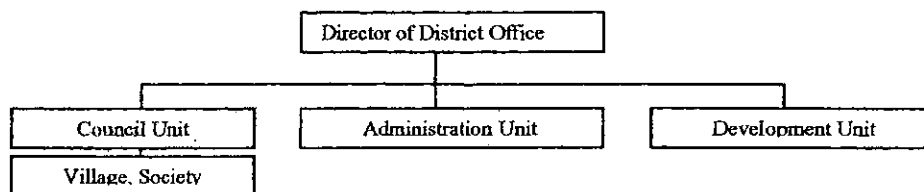


Figure 1-10-2. Organization structure of District Office

Table 1-10-1. Population and land use of districts surrounding area of Crocker Range Park

District	Population (1991)				Land use (ha) (1998)				
	Malaysian	Non-Malaysian	% of non-Malaysian	Density /km ²	Total	State Park Area	Forest	Oil Palm	Others
Tuaran	60,752	3,243	5.1	55	116,500	nd	nd	413	nd
Penampang	76,367	10,574	12.2	187	46,600	nd	nd	0	nd
Papar	65,585	4,888	6.9	48	124,300	nd	nd	2,630	nd
Beaufort	45,360	3,382	6.9	28	219,468	10,502	60,602	10,543	148,364
Tenom	34,228	3,726	9.8	16	233,597	11,900	135,851	34	85,846
Keningau	69,375	19,081	21.6	25	270,508	59,732	103,424	374	107,352
Tambunan	19,072	654	3.3	15	132,892	17,592	27,595	0	87,705
Ranau	45,183	4,175	8.5	17	294,224	30,800	98,699	144	164,725

Source: Yearbook of Statistics, Sabah 1999

Table 1-10-2. Population and land use of districts surrounding area of Tabin and Kulumba Wildlife Reserve

District	Population (1991)				Land use (ha) (1998)				
	Malaysian	Non-Malaysian	% of non-Malaysian	Density /km ²	Total	Class VII forest (WR)	Forest	Oil Palm	Others
Lahad Datu	63,735	54,361	46.0	18	626,844	78,331	365,078	188,826	261,766
Kinabatangan	26,977	32,095	54.3	3	921,309	54,322	377,559	265,111	543,750

Source: Yearbook of Statistics, Sabah 1999

Appendix 2: Habitat and protected area change in Malaysia and other countries

Percentage of forest areas managed good condition in Malaysia decreased 48% to 38% from 1980's to 1990's (Figure 2-1) (the statistics record does not agree with Figure 2-1 because of difference of data source and forest classification), whereas protected areas in the country increased from 5.0% to 7.3% in this period (Sayer 1995). Forest area and protected area change in the period is different in each country in Asia. Increase of Protected area is small and decrease of good forest habitat is large in Malaysia in the period comparing with other Asian countries. Increase of plantation and agriculture area were major causes of decrease the forest (Table 2-1 and Figure 2-2). Logging was another major cause of decrease of good habitats in Sabah (Table 2-2, Figure 2-3, Figure 2-4)

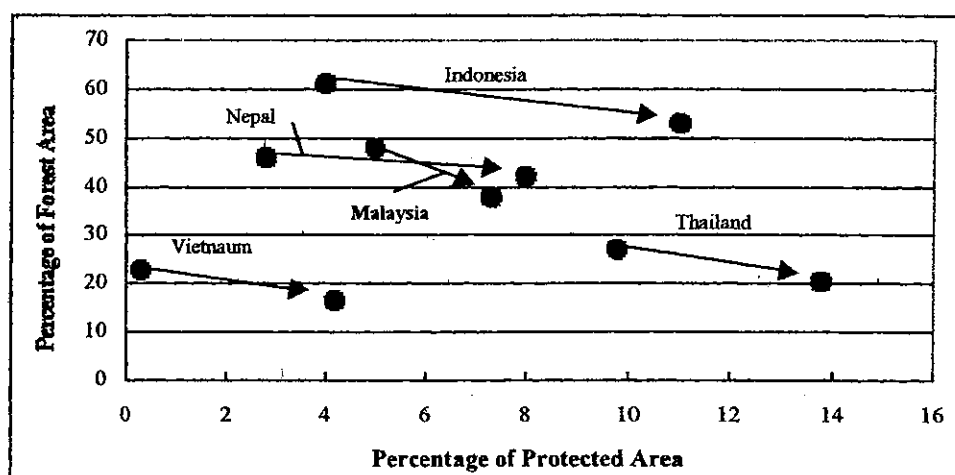


Figure 2-1. Percentage change of protected area and forest of 5 countries in Asia from 1980's to 1990's (After Sayer, 1995)

Table 2-1. Land use change in Malaysia (1964-1994)

Study period	Agriculture land	Pasture	Forest	Others (including plantation)
1964-66	11.2	0.1	75.7	13.0
1983-85	13.3	0.1	62.9	23.7
1992-94	22.9	0.1	46.9	30.1

Source: Japan Wildlife Research Center (1992)

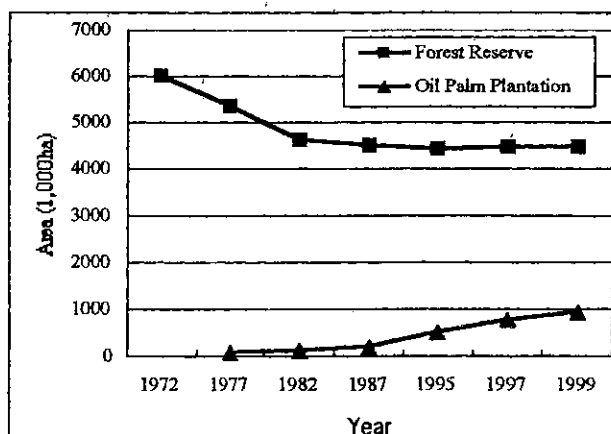


Figure 2-2. Area change of forest reserve and oil palm plantation in Sabah (see Table 2.1-3 in project document)

Table 2-2. Log production, export and local processing in Sabah (1963-1996)

Year	Log production (m ³)	Export (m ³)	Export %	Local (m ³)	Processing (%)
1963	3,455,963	NA	-	NA	-
1964	3,584,721	NA	-	NA	-
1965	4,162,190	NA	-	NA	-
1966	5,553,962	NA	-	NA	-
1967	5,707,028	NA	-	NA	-
1968	3,745,043	NA	-	NA	-
1969	6,200,232	NA	-	NA	-
1970	6,559,782	6,146,550	93.7	395,232	6.0
1971	6,952,188	6,561,100	94.4	391,088	5.6
1972	8,525,737	7,714,700	90.5	811,037	9.5
1973	11,102,942	10,130,050	91.2	972,892	8.8
1974	9,921,003	9,733,500	98.1	187,503	1.9
1975	9,118,362	8,991,012	98.6	127,350	1.4
1976	12,636,293	12,103,184	95.8	533,109	4.2
1977	11,916,087	12,337,265	103.5	421,178	3.5
1978	13,289,035	12,375,082	93.1	913,953	6.9
1979	10,786,970	10,332,238	95.8	454,732	4.2
1980	9,062,949	8,510,441	93.9	552,505	6.1
1981	11,730,102	9,361,200	79.8	2,368,902	20.2
1982	11,739,262	9,949,666	84.8	1,789,596	15.2
1983	11,991,410	9,495,489	79.2	2,495,921	20.8
1984	10,504,738	7,339,578	69.9	3,165,160	30.1
1985	10,757,425	8,442,266	78.5	2,315,159	21.5
1986	9,811,078	8,692,939	88.6	1,118,139	11.4
1987	12,174,345	10,264,404	84.3	1,909,941	15.7
1988	10,980,563	8,237,700	75.0	2,742,863	25.0
1989	9,494,113	6,134,300	64.6	3,359,813	35.4
1990	8,443,725	4,562,700	54.0	3,881,025	46.0
1991	8,163,409	3,304,093	40.5	4,859,316	59.5
1992	11,632,596	3,422,201	29.4	8,210,395	70.6
1993	9,291,020	977,577	10.5	8,313,443	89.5
1994	7,951,020	0	0	7,951,020	100.0
1995	6,319,989	0	0	6,319,989	100.0
1996	2,663,085	0	0	2,663,085	100.0

Source: Sabah State Government (1998)

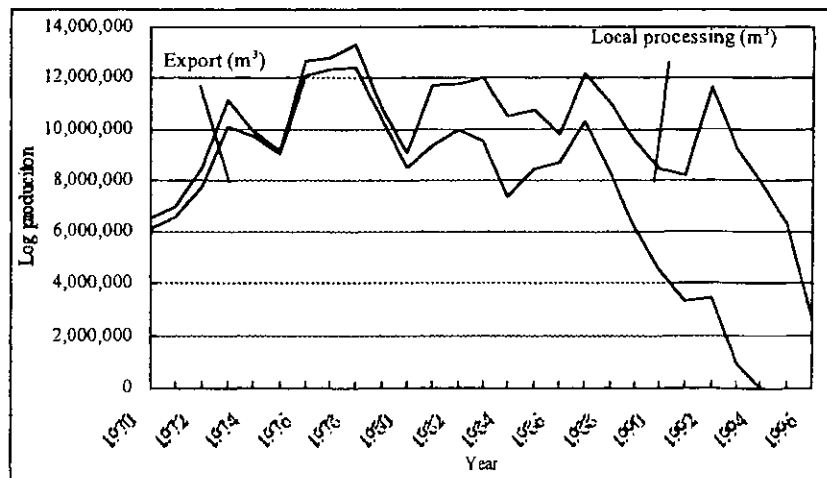


Figure 2-3. Change of log production, export and local processing in Sabah (m³)

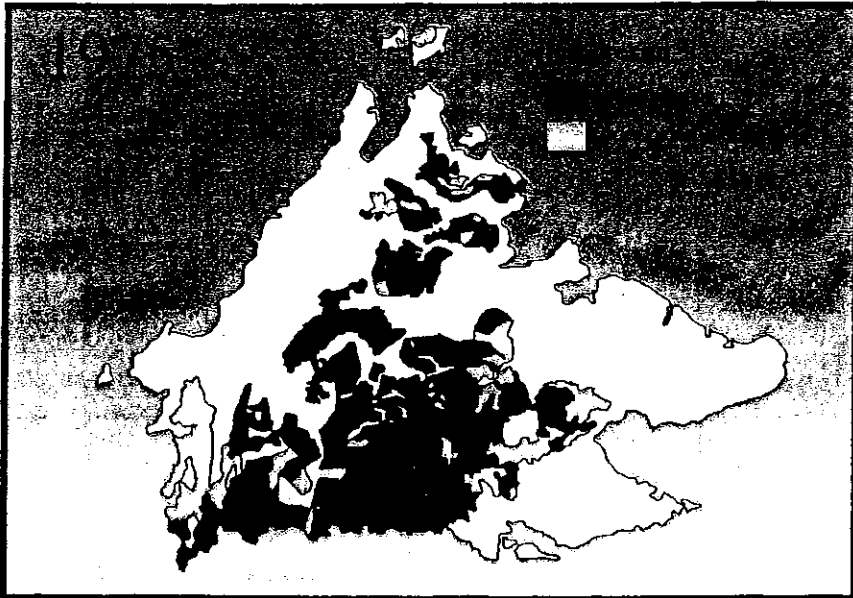


Figure 2-4 (a). Logged disturbed forest and virgin forest remained in forest reserve in Sabah (1975)

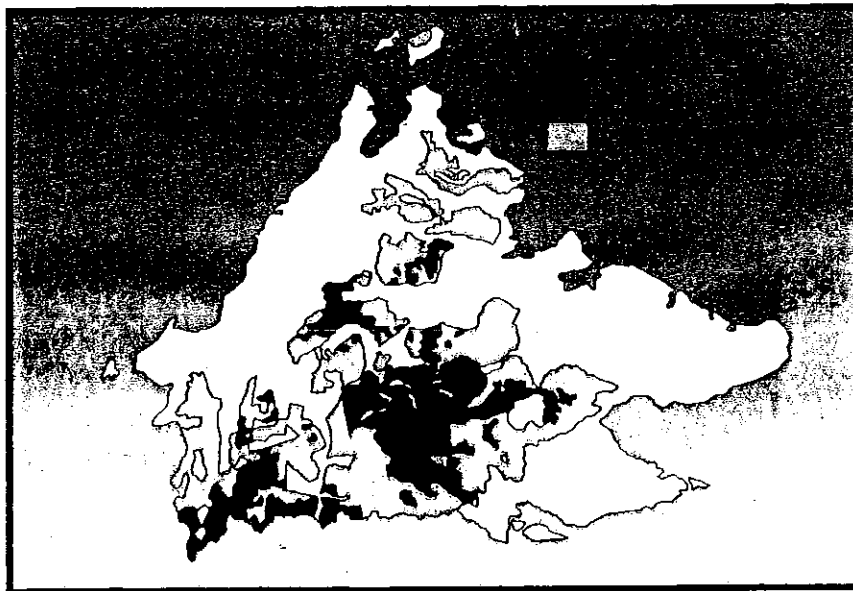


Figure 2-4 (b). Logged disturbed forest and virgin forest remained in forest reserve in Sabah (1985)



Figure 2-4 (c). Logged disturbed forest and virgin forest remained in forest reserve in Sabah (1995)

Appendix 3: Natural resource utilization and economic value

Table 3-1. Comparison of natural resource utilization value in Sabah

(Note: not including investment cost and not concerning negative impact to biodiversity/ecosystem degradation)

Land use	Area in Sabah	Income (direct value)	Year	Income (RM)/ha	Note
Forest (logging)	5,353,000 ha ¹⁾	RM1,110,000,000 ²⁾	1979	RM207/ha	Government revenue base value
	3,594,516 ha ³⁾	RM602,900,000 ⁴⁻¹⁾	1995	RM168/ha	
		RM1,895,996,700 ⁴⁻²⁾		RM527/ha	Sales price value
Timber products		RM3579,605,969 ⁴⁻³⁾		RM996/ha	Export price value
Oil palm plantation	941,322 ha ⁵⁾	RM2,228/ton ⁶⁾ , 2.7ton/ha ⁷⁾	1998	RM6,016/ha	Sales price value
		RM1,200/ton ⁶⁾ , 2.7ton/ha ⁷⁾	1999	RM3,240/ha	
Sabah Parks (tourism)	243,357 ha ⁸⁾	RM441,030,000 ⁹⁾	2000	RM1,812/ha	Non consumption value
Ecosystem function ¹⁰⁾	nd	(nd in Sabah)	-	RM1,134 ~ 35,074/ha ¹¹⁾	non-marketing value (Ecosystem services)

1) Forest reserve area in 1977

2) Government revenue from forest (maximum annual revenue record from forest from 1965 to 1995)

3) Total forest reserve including protection forest (1997)

4-1) Government revenue from forest (1995)

4-2) Estimation of sales value of log production (production volume (6,319,989 m³) x price (rough estimate: RM300/m³))

4-3) Value of export of all timber products from Sabah

5) Oil palm plantation area

6) Oil palm price

7) Oil palm product / Oil palm plantation (whole Malaysia) = 8,319,000 ton/3,078,100 ha = 2.7 ton/ha (1998)

8) State Parks area in 2000

9) RM723,000,000 (total receipt from tourist in 2000) x 0.61 (% of tourist visiting Sabah Parks (478,833/774,475 person = 0.61)) (in 2000)

10) Non disturbed forest, wetlands, protected areas so on providing medical plants, tourism site, flood control etc.

11) After Turner et al. (1994) (US\$ = RM3.8)

Source: 1)~4): Forestry Department Sabah (1997) Forest Sector Coordination towards Sustainable Development.

5): Palm oil research institute of Malaysia

6), 7): Monthly Statistics Bulletin Malaysia (December 1999)

8), 9): Information from Sabah Parks

Appendix 4: Fauna and Flora in Sabah

Table 4-1. Number of plants and animals species known in Sabah and Borneo

Taxson	Number of species known		Endemic species in Borneo	Protected animals in Sabah		Note
	Sabah	Borneo		Totally Protected	Protected	
Mammals	196 (land mammals)	221 (land mammals)	44	6	65 (53 land, 12 marine mammals)	92 species of 221 ones are bats. 168 species found mainly or only in lowlands and hills.
Birds	539	358	37	-	131	Number of Sabah species includes migration birds
Reptiles	-	254	13	3	7	
Amphibian	143	<150	?	-	-	Kinabalu Park is a "hot spot" of amphibian in Sabah
Fresh water fishes	155 (North Borneo)	-	?	-	-	Number of species of North Borneo including 12 imported ones and 3 subspecies
Insects	Beetles:(Mt. Kinabalu) = 290 Butterfly = 845	Beetles = 30,000 Butterflies = 937	?	-	2	
Flowering plants		11,000 -12,000	40-50% of total species	4 taxa	13 taxa	Up to 80% of endemic species in Borneo occur in Sabah & Sarawak
Ferns	621 (Mt. Kinabalu)	-	?	-	-	
Bryophytes (mosses)	323 (Mt. Kinabalu)	649	?	-	-	

Source: Land Mammals; Malim, Sabah Wildlife Department (report).
 Birds; MacKinnon & Phillipps (1993) A Field Guide of the Birds of Borneo, Sumatra, Java and Bali (resident bird number of Borneo and endemic species). Francis, "Checklist of the Birds of Sabah (Sabah Wildlife Department)" (Number of species of Sabah).
 Reptiles: MacKinnon et al. (1996) The Ecology of Kalimantan.
 Amphibian: Mr. Ahmad Sudin and Mr. Kelvin Kueh (personal information)
 Fresh water fishes: Inger and Chir (1990) The fresh-water fishes of North Borneo.
 Insects: MacKinnon et al. (1996) The Ecology of Kalimantan, and ITBC-UMS information
 Flowering plants: Soepadmo and Wong (1995) Tree flora of Sabah and Sarawak.
 Ferns: Parris, Beaman & Beaman (1992) The plants of Mount Kinabalu.
 Bryophytes (mosses): Frahn et al (1996) Moss and liverwort of Mount Kinabalu
 Protected animals: "Spesis Dilindungi di Sabah, Sabah Wildlife Department

Table 4-2. Species richness in East Malaysia and Whole Malaysia

Area	Area (10 ³ -km ²)	Plants		Land mammals		Birds (resident)		Reptiles	
		Known species	No./10 ³ -km ²	Known species	No./10 ³ -km ²	Known species	No./10 ³ -km ²	Known species	No./10 ³ -km ²
East Malaysia	198	12,000	60.6	221	1.12	539	2.73	254	1.28
Whole Malaysia	330	15,000	45.5	286	0.87	736	2.23	268	0.81

Data source: East Malaysia = Table 1 above, Whole Malaysia = MOSTE (1997)

Appendix 5: Status of conspicuous endangered species in Sabah

Table 5-1. Habitat and population size estimated of 5 endangered mammals in Sabah

Species	Habitat	Total individuals estimated in Sabah	Note
Sumatran rhino (<i>Dicerorhinus sumatrensis</i>)	Lowland forest near river, swamp (Eastern part of Sabah)	48-68	Local population estimated: Tabin=2+(7~20), Kretam=18-28, Sabah Foundation concession area =10-20, Ulu Segama=10-20
Asian Elephant (<i>Elephas maximus</i>)	Lowland – hill forest (Eastern part of Sabah)	1,105-1,504 (Elephant range = 1,503,858 ha)	Local population estimated: Tabin = 108-248 (Dawson, 1992), Lower Kinabatangan = 150, Dermakot = 180, Ulu Segama = 285, +10% of scattered group
Banteng (Tembadau) (<i>Bos javanicus</i>)	Lowland – hill forest (Eastern part of Sabah)	300-350	Most population inhabit Tabin WR
Orang-utan (<i>Pongo pygmaeus</i>)	Lowland – hill forest	10,000-20,000 (Payne, 1990) 4,000 individuals in range of 5,000-km ² (Davies, 1986)	Local population estimated: Crocker Range Park = 25-160 (Payne, 1988) Danum Valley = 224 (WWF, 1999) A total population size estimated in Borneo island is 50,000 (MacKinnon et al., 1996)
Proboscis monkey (<i>Nasalis larvatus</i>)	Mangrove forest - Peat swamp forest - lowland forest	* Habitat is isolated	6 isolated habitats in Sabah: 1. Sepilok Forest Reserve 2. Lower Kinabatangan 3. Kulamba Wildlife Reserve (+ Tabin Wildlife Reserve (northern part)) 4. Danum Valley 5. Maliau Baisn 6. Binsulok (Bukau river, Klias Peninsula)

Source; Sumatran rhino: SWD-JICA (1996)
 Asian Elephant: Titol Peter Malim et al. (1998), SWD (1994), Dawson (1992)
 Banteng: Jane Thornback, IUCN (1983)
 Orang-utan: Payne (1988, 1990), Davies (1986),
 Proboscis monkey: Information of Rainforest Interpretation Centre in Sandakan (Binsulok information added)