APPENDIX B3.1-I

VEGETATION INVENTORY PLOT LOCATION INFORMATION

Table 1 Vegetation Inventory Plot Location Information

Plot	Location			Plant Community
	Latitude[(a)]	Longitude	Project Area	
VD001	-10.60374	26.13099	Goma	copper-cobalt steppe-savanna
VD002	-10.60275	26.13286	Goma	degraded miombo woodland
VD003	-10.60295	26.13418	Goma	copper-cobalt steppe-savanna
VD004	-10.60884	26.13943	Goma	degraded miombo woodland
VD005	-10.57968	26.19017	Kwatebala	copper-cobalt rock outcrop
VD007	-10.57644	26.18518	plant site	miombo woodland
VD008	-10.57132	26.17889	tailings	agricultural mosaic
VD009	-10.56832	26.17671	tailings	agricultural mosaic
VD010	-10.57075	26.17233	tailings	miombo woodland
VD011	-10.57283	26.16485	tailings	miombo woodland
VD012	-10.56845	26.18342	water dam	degraded miombo woodland
VD013	-10.58620	26.16259	alternate plant site (southwest)	miombo woodland
VD014	-10.58214	26.15776	Kavifwafwaulu	copper-cobalt steppe-savanna
VD015	-10.57290	26.19052	plant site	degraded miombo woodland
VD016	-10.53587	26.28124	quarry	degraded miombo woodland
VD017	-10.53551	26.28013	quarry	degraded miombo woodland
VD018	-10.61435	26.35396	growth	old fallow field
VD019	-10.58320	26.18244	Kwatebala	copper-cobalt steppe-savanna
VD020	-10.58195	26.18421	Kwatebala	copper-cobalt steppe-savanna
VD021	-10.58179	26.18459	Kwatebala	copper-cobalt steppe-savanna
VD022	-10.57911	26.19304	Kwatebala	copper-cobalt rock outcrop
VD023	-10.57907	26.19296	Kwatebala	copper-cobalt rock outcrop
VD024	-10.57869	26.19299	Kwatebala	copper-cobalt steppe-savanna
VD025	-10.57855	26.19296	Kwatebala	copper-cobalt rock outcrop
VD026	-10.57865	26.19301	Kwatebala	copper-cobalt steppe-savanna
VD027	-10.58135	26.17934	Kwatebala	copper-cobalt steppe-savanna
VD028	-10.55550	26.18741	alternate water dam	gallery forest
VD029	-10.57698	26.18616	plant site	miombo woodland
VD030	-10.55171	26.17364	alternate plant site (northwest)	degraded miombo woodland
VD031	-10.58531	26.16659	alternate plant site (southwest)	miombo woodland
VD032	-10.61268	26.23889	Dipeta River	gallery forest
VR001	-10.57064	26.17216	tailings	agricultural mosaic
VR002	-10.55864	26.19055	alternate water dam	agricultural mosaic
VR003	-10.55224	26.17286	alternate plant site (northwest)	agricultural mosaic
VR004	-10.55268	26.17197	alternate plant site (northwest)	agricultural mosaic

[(a)] GPS Datum in WGS83.

APPENDIX B3.1-II

VEGETATION INVENTORY SPECIES LISTS BY VEGETATION TYPE

Table 1 Species Occurrence in Agriculture Mosaic Study Plots

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD008	VD009	VR001	VR002	VR003	VR004
Anisophylleaceae	*Anisophyllea*	*boehmii*	ANISBOEH	X					
Annonaceae	*Annona*	*senegalensis*	ANNOSENE	X					
Apiaceae	*Steganotaenia*	*araliacea*	STEGARAL		X				
Araliaceae	*Cussonia*	*arborea*	CUSSARBO	X	X				
Asteraceae	*Acanthospermum*	*glabratum*	ACANGLAB						1
	Aspilia	*natalensis*	ASPINATA						1
	Bidens	*pilosa*	BIDEPILO	X					
	Coreopsis	*oligoflora*	COREOLIG						1
Bignoniaceae	*Markhamia*	*lanata*	MARKLANA	X					
		obtusifolia	MARKOBTU		X				
Euphorbiaceae	*Uapaca*	*kirkiana*	UAPAKIRK	X					
Fabaceae	*Acacia*	*pilispina*	ACACPILI					P	
		polyacantha	ACACPOLY					P	
	Albizia	*adianthifolia*	ALBIADIA	X					
	Brachystegia	*boehmii*	BRACBOEH	X	X				
		spiciformis	BRACSPIC		X				
	Dalbergia	*boehmii*	DALBBOEH		X				
	Erythrina	*abyssinica*	ERYTABYS		X				
	Mucuna	*poggei*	MUCUPOGG					5	
	Pterocarpus	*angolensis*	PTERANGO	X					
Lamiaceae	*Coleus*	*homblei*	COLEHOMB						P
	Leucas	*fulva*	LEUCFULV						P
Loganiaceae	*Strychnos*	*cocculoides*	STRYCOCC	X					
Meliaceae	*Ekebergia*	*benguelensis*	EKEBBENG		X				

Table 1 Species Occurrence in Agriculture Mosaic Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD008	VD009	VR001	VR002	VR003	VR004
Myrtaceae	*Syzygium*	*guineense* subsp. *macrocarpum*	SYZYGUIN	X					
Nephrolepidaceae	*Nephrolepis*	*undulata*	NEPHUNDU	X					
Poaceae	*Pennisetum*	*purpureum*	PENNPURP	3	X				
	Poaceae	sp.	POACSP					4	
	Setaria	*pallide-fusca*	SETAPALL	2					
	Zea	*mays*	ZEAMAYS	X	X	X	X		5
Polygalaceae	*Securidaca*	*longipedunculata*	SECULONG	X					
Rubiaceae	*Agathisanthemum*	*globosum* var. *globosum*	AGATGLOB						P
Sterculiaceae	*Sterculia*	*quinqueloba*	STERQUIN		X				
Verbenaceae	*Vitex*	*madiensis*	VITEMADI	X					
Zingiberaceae	*Aframomum*	*alboviolaceum*	AFRAALBO					4	
		stipulatum	AFRASTIP	2					

[(a)] Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

Table 2 Species Occurrence in Copper-Cobalt Rock Outcrop Study Plots

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot			
				VD005	VD022	VD023	VD025
Acanthaceae	*Strophanthus*	*welwtischii*	STROWELW		X		
Apiaceae	*Diplolophium*	*zambesianum*	DIPLZAMB				2
Asteraceae	*Crassula*	*vaginata*	CRASVAGI	2			
Chrysobalanaceae	*Parinari*	*curatellifolia*	PARICURA		X		
Combretaceae	*Combretum*	*platypetalum*	COMBPLAT		X		
Commelinaceae	*Commelina*	*diffusa*	COMMDIFU			X	
		sp.	COMMSP	2			
	Cyanotis	*longifolia*	CYANLONG	2		X	2
Convolvulaceae	*Ipomoea*	*katangensis*	IPOMKATA	2			
Cyperaceae	*Ascolepis*	*metallorum*	ASCOMETA			X	
	Bulbostylis	*cupricola*	BULBCUPR	3			
		macra	BULBMACR				4
		pseudoperennis	BULBPSEU	2		X	
Euphorbiaceae	*Hymenocardia*	*acida*	HYMEACID		X		
Fabaceae	*Aeschynomene*	*pararubrofarinacea*	AESCPARA		X		
	Albizia	*antunesiana*	ALBI ANTU		X		
	Brachystegia	*spiciformis* var. *latifoliolata*	BRACSPIC		X		
Iridaceae	*Gladiolus*	sp.	GLADSP	1			
	Moraea	*carsonii*	MORACARS				2
Lamiaceae	*Becium*	*obovatum*	BECIOBOV			X	2
	Haumaniastrum	*prealpum* var. *homblei*	HAUMPREA				2
Liliaceae	*Eriospermum*	*abyssinicum*	ERIOABYS			X	
	Liliaceae	sp.	LILISP	2			
Ochnaceae	*Ochna*	*schweinfurthiana*	OCHNSCHW		X		

Table 2 Species Occurrence in Copper-Cobalt Rock Outcrop Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[a] by Plot			
				VD005	VD022	VD023	VD025
Olacaceae	*Olax*	*obtusifolia*	OLAXOBTU		X		
Poaceae	*Digitaria*	*nitens*	DIGINITE			X	
	Diheteropogon	*emarginatus*	DIHEEMAR	2			2
	Eragrostis	*racemosa*	ERAGRACE	2		X	2
	Loudetia	*simplex*	LOUDSIMPL				4
	Sporobolus	sp.	SPORSP			X	
	Tristachya	sp.	TRISSP 2			X	
Pteridaceae	*Cheilanthes*	sp.	CHEISP	2		X	
Rubiaceae	*Vangueriopsis*	*tomentosa*	VANGTOME		X		
Santalaceae	*Thesium*	sp.	THESSP				2
Schizeaceae	*Mohria*	*lepigera*	MOHRLEPI	2		X	
Scrophulariaceae	*Sopubia*	*neptunii*	SOPUNEPT	2			1
Tiliaceae	*Triumfetta*	*welwitschii* var. *rogersii*	TRIUWELW			X	2
Velloziaceae	*Xerophyta*	*equisetoides*	XEROEQUI	2			
		sp.	XEROSP		X	X	

[a] Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

Table 3 Species Occurrence in Copper-Cobalt Steppe-Savannah Study Plots

Family	Genus	Species	Species Code	Cover Class[(a)] By Plot								
				VD001	VD003	VD014	VD019	VD020	VD021	VD024	VD026	VD027
Amaranthaceae	*Pandiaka*	*carsonii*	PANDCARS							X		
Apiaceae	*Diplolophium*	*zambesianum*	DIPLZAMB				2					
		zambezianum	DIPLZAMB			2						
	Spurodaucus	*quarrei*	SPURQUAR		2							
Asteraceae	*Dicoma*	*anomala*	DICOANOM				2					
	Lapeyrousia	*welwitschii*	LAPEWELW	1								
		welwtischii	LAPEWELW				2					
	Pasaccardoa	*grantii*	PASAGRAN				2					
	Vernonia	sp	VERNSP	2	2				2			2
Combretaceae	*Combretum*	*molle*	COMBMOLL	X								1
Commelinaceae	*Commelina*	*carsonii*	COMMCARS	2	2							
		diffusa	COMMDIFU							X		
		sp.	COMMSP				2		2			
	Cyanotis	*longifolia*	CYANLONG	2	2		2		4	X		
Convolvulaceae	*Ipomoea*	*linosepala*	IPOMLINO	2	2	2						
		sp.	IPOMSP						1			
		sp.1	IPOMSP 1				2					
		sp.2	IPOMSP 2				2		1			
Cyanophyceae	*Cyanophyceae*	sp.	CYANSP					5		X		
Cyperaceae	*Ascolepis*	*metallorum*	ASCOMETA					2		X		
		sp.	ASCOSP			2	2					2
	Bulbostylis	*cupricola*	BULBCUPR					2				
		pseudoperennis	BULBPSEU			2		1	2			
		sp.	BULBSP	X			2					
Cyphiaceae	*Cyphia*	*erecta* var. *erecta*	CYPHEREC								X	

Table 3 Species Occurrence in Copper-Cobalt Steppe-Savannah Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[a] By Plot								
				VD001	VD003	VD014	VD019	VD020	VD021	VD024	VD026	VD027
Euphorbiaceae	*Acalypha*	*cupricola*	ACALCUPR						2			2
	Uapaca	*robynsii*	UAPAROBY	X								
Fabaceae	*Adenodolichos*	*rhomboideus*	ADENRHOM		2	4						
	Aeschynomene	*pararubrofarinacea*	AESCPARA				1					
		pygmaea	AESCPYGM						2			
		sp.	AESCSP		2							
	Albizia	*adianthifolia*	ALBIADIA	2								
	Brachystegia	*spiciformis*	BRACSPIC	X								
	Crotalaria	*cornetii*	CROTCORN			2	2					
		sp.	CROTSP			1	1		1			
	Cryptosepalum	*dasycladum*	CRYPDASY			2						
		maraviense	CRYPMARA	2			2		2			2
	Dalbergia	*nitidula*	DALBNITI									1
	Droogmansia	*munamensis*	DROOMUNA						1			2
	Eriosema	*shimperi*	ERIOSHIM				2					
		sp.	ERIOSP	X								
	Humularia	sp.	HUMUSP		1							
	Tephrosia	sp.	TEPHSP			2						
Iridaceae	*Gladiolus*	sp.	GLADSP				2				X	1
		tshombeanus	GLADTSHO	1								
Lamiaceae	*Aeollanthus*	sp.	AEOLSP			2						
	Becium	*obovatum*	BECIOBOV						2			2
	Haumaniastrum	*prealpum* var. *homblei*	HAUMPREA		2		2		2			1
		robertii	HAUMROBE					1				

Table 3 Species Occurrence in Copper-Cobalt Steppe-Savannah Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] By Plot								
				VD001	VD003	VD014	VD019	VD020	VD021	VD024	VD026	VD027
	Ocimum	sp.	OCIMSP						2			
	Tinnea	*coerulea*	TINNCOER				2					2
Liliaceae	*Chlorophytum*	sp.	CHLOSP	1								
	Eriospermum	*abyssinicum*	ERIOABYS		1		1	1				
	Liliaceae	sp.	LILISP				1					
Musci (Class)	*Musci*	sp.	MUSCSP					3				
Olacaceae	*Olax*	*obtusifolia*	OLAXOBTU	X								1
Oxalidaceae	*Oxalis*	*obliquifolia*	OXALOBLI								X	
Poaceae	*Digitaria*	*nitens*	DIGINITE	2								
		sp.	DIGISP									2
	Diheteropogon	*emarginatus*	DIHEEMAR	2	2		2		2			2
	Eragrostis	*racemosa*	ERAGRACE	2				2	2	X		
	Loudetia	*simplex*	LOUDSIMP	4	4	3	2		4			2
		superba	LOUDSUPE			2						
	Microchloa	*kunthii*	MICRKUNT				2					
	Poaceae	sp.	POACSP		2			2				
	Sacciolepis	sp.	SACCSP	2								
		typhura	SACCTYPH				2		2			
	Sporobolus	sp.	SPORSP			2			2			
	Tristachya	sp.	TRISSP						2			
		sp.2	TRISSP 2						2			2
	Zonotriche	*superba*	ZONOSUPE				2					
Polygalaceae	*Securidaca*	*longipedunculata*	SECULONG	X								
Proteaceae	*Protea*	sp.	PROTSP	X								

Table 3 Species Occurrence in Copper-Cobalt Steppe-Savannah Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] By Plot								
				VD001	VD003	VD014	VD019	VD020	VD021	VD024	VD026	VD027
Pteridaceae	*Actiniopteris*	*pauciloba*	ACTIPAUC			2						
	Pellaea	*longipilosa*	PELLLONG				2					
		pectiniformis	PELLPECT								X	
Rubiaceae	*Otiophora*	*coerulea*	OTIOCOER		2							
		sp.	OTHISP						2			
Santalaceae	*Thesium*	*sp.*	THESSP	2			X		2			
Schizaeaceae	*Anemia*	*angolensis*	ANEMANGO				2				X	
Schizeaceae	*Mohria*	*lepigera*	MOHRLEPI								X	
Scrophulariaceae	*Sopubia*	*neptunii*	SOPUNEPT					1	1	X		
Tiliaceae	*Triumfetta*	*likasiensis*	TRIULIKA				2					
		welwitschii	TRIUWELW	2	1							
		welwitschii subsp. *rogersii*	TRIUWELW			2	2					
		welwitschii var. *rogersii*	TRIUWELW						2			2
Velloziaceae	*Xerophyta*	*equisetoides*	XEROEQUI	2								

(a) Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

Table 4 Species Occurrence in Gallery Forest Study Plots

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot	
				VD028	VD032
Anacardiaceae	*Lannea*	*welwitschii*	LANNWELW	1	
	Rhus	*anchietae*	RHUSANCH	1	
Annonaceae	*Annona*	*senegalensis* subsp. *senegalensis*	ANNOSENE		1
	Xylopia	*odorata*	XYLOODOR	2	
Apocynaceae	*Rauwolfia*	*caffra*	RAUWCAFF	2	2
Aquifoliaceae	*Ilex*	*mitis*	ILEXMITI	1	
Aspleniaceae	*Asplenium*	sp.	ASPLSP	2	
Asteraceae	*Bidens*	*pilosa*	BIDEPILO	1	
	Blumea	*brevipes*	BLUMBREV	1	
	Laggera	*alata*	LAGGALAT		P
	Melanthera	*scandens*	MELASCAN		2
	Mikania	*cordata*	MIKACORD	2	2
	Vernonia	*cinerea*	VERNCINE	1	
		sp.	VERNSP	1	1
Balsaminaceae	*Impatiens*	sp.	IMPASP	1	
Bignoniaceae	*Markhamia*	*obtusifolia*	MARKOBTU		1
	Stereospermum	*kunthianum*	STERKUNT		1
Commelinaceae	*Commelina*	*africana*	COMMAFRI	2	
		diffusa	COMMDIFF	2	
Connaraceae	*Byrsocarpus*	*orientalis*	BYRSORIE	1	1
Convolvulaceae	*Ipomoea*	*alpina* subsp. *argylophylla*	IPOMALPI	1	
		eriocarpa	IPOMERIO	1	
		sp.	IPOMSP		2
Cucurbitaceae	*Coccinia*	*barteri*	COCCBART	1	
Cyperaceae	*Cyperus*	*alternifolius*	CYPEALTE		3
		esculentus	CYPEESCU	1	
		sp.	CYPESP	1	
Ebenaceae	*Dioscorea*	sp.	DIOSSP	5	1
Euphorbiaceae	*Acalypha*	*senensis*	ACALSENE	1	2
		sp.	ACALSP		1
	Antidesma	*venosum*	ANTIVENO		1
	Bridelia	*micrantha*	BRIDMICR		1
	Cleistanthus	*milleri*	CLEIMILL		1
Fabaceae	*Acacia*	*macrothyrsa*	ACACMACR	1	
		polyacantha	ACACPOLY		1

Table 4 Species Occurrence in Gallery Forest Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot	
				VD028	VD032
		polyacantha subsp. *campylacantha*	ACACPOLY	2	
	Albizia	*adianthifolia*	ALBIADIA		P
		versicolor	ALBIVERS		1
	Brachycorythis	sp.	BRACSP	1	
	Desmodium	*barbatum* var. *argyreum*	DESMBARB	1	
		helenae	DESMHELE	1	
		salicifolium	DESMSALI	2	
	Indigofera	sp.	INDISP	1	
	Mucuna	*poggei*	MUCUPOGG	3	5
	Newtonia	*buchananii*	NEWTBUCH		1
	Rhynchosia	sp.	RHYNSP	1	
	Sphenostylis	sp.	SPHESP	2	
Icacinaceae	*Apodytes*	*dimidiata*	APODDIMI	2	
Lamiaceae	*Leucas*	*deflexa*	LEUCDEFL	1	
Liliaceae	*Asparagus*	*racemosus*	ASPARACE	1	1
	Gloriosa	*superba*	GLORSUPE	1	
	Urginea	*altissima*	URGIALTI	1	
Loganiaceae	*Nuxia*	*congesta*	NUXICONG	3	
	Strychnos	*spinosa*	STRYSPIN		P
Malvaceae	*Sida*	sp.	SIDASP	1	
Meliaceae	*Khaya*	*nyasica*	KHAYNYAS	5	5
	Turraea	*floribunda*	TURRFLOR	P	
Melianthaseae	*Bersama*	*abyssinica*	BERSABYS	P	
Menispermaceae	*Cissampelos*	*owariensis*	CISSOWAR	1	1
	Stephania	*abyssinica* var. *abyssinica*	STEPABYS	2	
Moraceae	*Ficus*	*brachypoda*	FICUBRAC	1	1
		capensis	FICUCAPE	2	1
	Treculia	*africana*	TRECAFRI	P	3
Myrtaceae	*Syzygium*	*cordatum*	SYZYCORD	2	
		guineense subsp. *afromotanum*	SYZYGUIN		3
Orchidaceae	*Habenaria*	sp.	HABESP	1	
Passifloraceae	*Adenia*	*gummifera* var. *gummifera*	ADENGUMM		2
		lobata	ADENLOBA	2	
		sp.	ADENSP	1	1

Table 4 Species Occurrence in Gallery Forest Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot	
				VD028	VD032
Poaceae	*Hyparrhenia*	sp.	HYPASP	1	
	Panicum	*maximum*	PANIMAXI		2
	Pennisetum	*purpureum*	PENNPURP		2
	Setaria	*pallide-fusca*	SETAPALL	1	
		sp.	SETASP	2	
Polygalaceae	*Polygala*	*africana*	POLYAFRI	P	
Pteridaceae	*Adiantum*	sp.	ADIASP	2	
	Pteris	sp.	PTERSP	2	
Ranunculaceae	*Clematis*	*welwitschii*	CLEMWELW	1	
Rhamnaceae	*Rhamnus*	sp.	RHAMSP	P	
Rubiaceae	*Agathisanthemum*	*globosum* var. *globosum*	AGATGLOB		1
	Canthium	*afzelianum*	CANTAFZE	1	
	Cephaelis	*peduncularis*	CEPHPEDU	1	
Rutaceae	*Clausena*	*anisata*	CLAUANIS		2
Sapindaceae	*Allophylus*	*fulvo-tomentosus*	ALLOFULV	2	1
	Paullinia	*pinnata*	PAULPINN	1	1
Sapotaceae	*Manilkara*	*discolor*	MANIDISC	P	
Smilacaceae	*Smilax*	*anceps*	SMILKAUS	2	
Solanaceae	*Physalis*	*angulata*	PHYSANGU	1	
Sterculiaceae	*Sterculia*	*tragacantha*	STERTRAG	1	1
Tiliaceae	*Corchorus*	sp.	CORCSP	1	
Vitaceae	*Ampelocissus*	sp.	AMPESP	1	
	Cissus	*cornifolia*	CISSCORN	1	
		quadrangularis	CISSQUAD	2	2
	Rhoicissus	*tridentata*	RHOITRID		1
Zingiberaceae	*Aframomum*	*angustifolium*	AFRAANGU		2
		luteoalbum	AFRALUTE	2	
(Unknown)	*Mezoneurom*	*angolense*	MEZOANGO		2

[(a)] Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

Table 5 Species Occurrence in Miombo Woodland Study Plots

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
Acanthaceae	*Acanthaceae*	sp.	ACANSP		1	1			1
	Hypoestes	sp.	HYPOSP					1	
	Justicia	*elegantula*	JUSTELEG					1	
	Thunbergia	*oblongifolia*	THUNOBLO					P	
Amaranthaceae	*Achyranthes*	*aspera*	ACHYASPE						1
Anacardiaceae	*Ozoroa*	*nigricans*	OZORNIGR					1	
		reticulata	OZORRETI					X	
Annonaceae	*Annona*	*senegalensis*	ANNOSENE	X				X	
		senegalensis var. *senegalensis*	ANNOSENE					1	
Apiaceae	*Diplolophium*	sp.	DIPLSP				2		
		zambesianum	DIPLZAMB					1	
	Pimpinella	sp.	PIMPSP					1	
	Steganotaenia	*araliacea*	STEGARAL						1
Apocynaceae	*Diplorhynchus*	*condylocarpon*	DIPLCOND	X			X	X	
		condylocarpon subsp. *mossambicensis*	DIPLCOND						1
	Landolphia	*parvifolia*	LANDPARV			2			
Araliaceae	*Cussonia*	*arborea*	CUSSARBO	X				1	
		corbisieri	CUSSCORB	X		1	1		P
Asteraceae	*Aspilia*	*ciliata*	ASPICILI						1
		natalensis	ASPINATA					1	2
	Conyza	*stricta*	CONYSTRI					1	
	Coreopsis	*oligoflora*	COREOLIG						1
	Gerbera	sp.	GERBSP						P
	Melanthera	*scandens*	MELDSCAN					1	

Table 5 Species Occurrence in Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
	Schistostephium	*homblei*	SCHIHOMB						1
	Vernonia	sp.	VERNSP		1		2		
Begoniaceae	*Begonia*	*princeae* var. *princeae*	BEGOPRIN			2		P	
Bignoniaceae	*Markhamia*	*obtusifolia*	MARKOBTU			X			
Burseraceae	*Commiphora*	*habessinica*	COMMHABE						1
Capparidaceae	*Boscia*	*caloneura*	BOSCCALO			X			
Celastraceae	*Cassine*	*aethiopica*	CASSAETH						1
Chrysobalanaceae	*Parinari*	*curatellifolia*	PARICURA		X			1	
Clusiaceae	*Psorospermum*	*febrifugum*	PSORFEBR					1	
Combretaceae	*Combretum*	*mechowianum*	COMBMECH					X	
		mechowianum subsp. *gazense*	COMBMECH						1
		molle	COMBMOLL					1	
Commelinaceae	*Commelina*	*africana*	COMMAFRI	X	1	2	2		
		africana var. *africana*	COMMAFRI					1	1
		umbellata	COMMUNBE					1	
	Cyanotis	*longifolia*	CYANLONG					2	
		sp.	CYANSP		2	2		2	
	Murdannia	sp.	MURDSP				2		2
Convolvulaceae	*Ipomoea*	sp.	IPOMSP					P	
Cucurbitaceae	*Coccinia*	*adoensis*	COCCADOE					1	
Cyperaceae	*Ascolepis*	sp.	ASCOSP			2			
	Cyperus	sp.	CYPESP					1	1
	Scleria	*bulbifera*	SCLEBULB			1			
		sp.	SCLESP				2		

Table 5 Species Occurrence in Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
Dipterocarpaceae	*Monotes*	*katangensis*	MONOKATA					1	1
		sp.	MONOSP				X	X	
Dryopteridaceae	*Dryopteris*	sp.	DRYOSP						1
Ebenaceae	*Dioscorea*	*dumetorum*	DIOSDUME					1	
Euphorbiaceae	*Phyllanthus*	*muellerianus*	PHYLMUEL					1	
		ninuriensis	PHYLNINU					P	
	Pseudolachnostylis	*maprouneifolia*	PSEUMAPR					1	1
	Uapaca	*kirkiana*	UAPAKIRK				X		P
		nitida	UAPANITI			X			1
		pilosa	UAPAPILO						1
Fabaceae	*Adenodolichos*	*rhomboideus*	ADENRHOM				2		
	Albizia	*adianthifolia*	ALBIADIA				X	P	1
		antunesiana	ALBIANTU		1				P
	Bracharia	*brizantha*	BRACBRIZ					1	1
	Brachystegia	*boehmii*	BRACBOEH		X	X		X	P
		longifolia	BRACLONG	X			X	2	P
		sp.	BRACSP	X				X	
		spiciformis	BRACSPIC	X	X	X	X		
		spiciformis var. *latifoliola*	BRACSPIC					5	5
		stipulata	BRACSTIP					1	
	Brachystelma	*buchananii*	BRACBUCH					1	
	Chamaecrista	*mimosoides*	CHAMMIMO		1				P
	Crotalaria	*ochroleuca*	CROTOCHR					1	
		retusa	CROTRETU					1	

Table 5 Species Occurrence in Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
		sp.	CROTSP		1				
	Dolichos	sp.	DOLISP	X	1	1	1		
	Eminia	sp.	EMINSP					2	
	Erythrina	*abyssinica*	ERYTABYS		X				
	Indigofera	sp.	INDISP			2			
		sutherlandoides	INDISUTH		2	2	2	1	1
	Pericopsis	*angolensis*	PERIANGO					1	P
	Pterocarpus	*angolensis*	PTERANGO		X	X	X		
		tinctorius var. *chrysothrix*	PTERTINC				X	1	P
	Rhynchosia	sp	RHYNSP					1	
		sp.	RHYNSP		2				
	Sphenostylis	*erecta*	SPHEEREC			2			
	Swartzia	*madagascariensis*	SWARMADA	X			X	1	1
Lamiaceae	*Becium*	*knyanum*	BECIKNYA						1
	Coleus	sp.	COLESP					P	
	Haumaniastrum	*timpermanii* subsp. *kambovianum*	HAUMTIMP						1
	Ocimum	sp.	OCIMSP			2			
Liliaceae	*Asparagus*	*abyssinicus*	ASPAABYS					1	1
	Chlorophytum	sp.	CHLOSP					1	1
Loganiaceae	*Strychnos*	*inocua*	STRYINOC		X			1	
Malvaceae	*Azanza*	*garckeana*	AZANGARC			X			
Meliaceae	*Ekebergia*	*arborea*	EKEBARBO					X	
		benguelensis	EKEBBENG					1	
Menispermaceae	*Cissampelos*	*owariensis*	CISSOWAR				2		

Table 5 Species Occurrence in Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
	Stephania	*abyssinica* var. *abyssinica*	STEPABYS					2	
Moraceae	*Dorstenia*	sp.	DORSSP						P
	Ficus	*dekdekena*	FICUDEKD						1
Myrtaceae	*Eugenia*	sp.	EUGESP			2			
	Syzygium	*guineense subsp. macrocarpum*	SYZYGUIN		1			1	
Nephrolepidaceae	*Nephrolepis*	*undulata*	NEPHUNDU	X	4	1	4	2	
Ochnaceae	*Ochna*	*schweinfurthiana*	OCHNSCHW	X	1				1
Olacaceae	*Olax*	*obtusifolia*	OLAXOBTU					1	1
Orchidaceae	*Calyptrochilum*	*christyanum*	CALYCHRI			2			
	Eulophia	sp.	EULOSP						P
	Liparis	*nervosa*	LIPANERV				2		
	Nervilia	sp.	NERVSP		2				
Oxalidaceae	*Oxalis*	sp.	OXALSP		2	2			
Passifloraceae	*Adenia*	*lobata*	ADENLOBA	X					
Poaceae	*Digitaria*	*nitens*	DIGINITE					1	1
		sp.	DIGISP		2				
	Hyparrhenia	*confinis*	HYPECONF					1	
	Loudetia	*superba*	LOUDSUPE				2		
	Poaceae	sp.	POACSP					5	
	Rottboellia	*exaltata*	ROTTEXAL				2		
	Setaria	*anceps*	SETAANCE				2	P	
		thermitaria	SETATHER		3	3			
	Sporobolus	sp.	SPORSP		2	2	2		
	Tristachya	*bequaertii*	TRISBEQU						1

Table 5 Species Occurrence in Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
Polygalaceae	*Polygala*	*africana*	POLYAFRI					1	
Proteaceae	*Faurea*	*speciosa*	FAURSPEC		X				1
	Protea	*madiensis*	PROTMADI						P
		sp.	PROTSP	X					
		welwitschii subsp. *goetzeana*	PROTWELW					1	
Pteridaceae	*Aspidotis*	*schimperi*	ASPISCHI			2			
Ranunculaceae	*Clematopsis*	*scabiosifolia*	CLEMSCAB					1	
Rubiaceae	*Canthium*	*crassum*	CANTCRAS					1	
		gueinzii	CANTGUEI				2		
	Gardenia	*jovis-tonantis*	GARDJOVI	X		X			P
	Geophila	*iodes*	GEOPIOID	X	2				
		ioides	GEOPIOID			2	2	1	
	Hymenodictyon	*floribundum*	HYMEFLOR						1
	Pavetta	*schumanniana*	PAVESCHU			2			P
	Psychotria	*eminiana*	PSYCEMIN						1
		sp.	PSYCSP			2	1		
	Spermacoce	*dibrachiata*	SPERDIBR			1			
	Tapiphyllum	*cinerescens*	TAPICINE				2		
	Temnocalyx	*fuchsioides*	TEMNFUCH		2	2	2	2	1
		obovata	TEMNOBOV					1	1
		verdickii	TEMNVERD				2		
Rutaceae	*Fagara*	*chalybea*	FAGACHAL			X			
Sapindaceae	*Allophylus*	*africanus*	ALLOAFRI						1
Taccaceae	*Tacca*	*leontopetaloides*	TACCLEON	X				1	1

Table 5 Species Occurrence in Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot					
				VD007	VD010	VD011	VD013	VD029	VD031
Verbenaceae	*Clerodendrum*	sp.	CLERSP			2		1	
Vitaceae	*Cyphostemma*	sp	CYPHSP	X					
		sp.	CYPHSP	X		4			
Zingiberaceae	*Costus*	*spectabilis*	COSTSPEC		1	1	1		1
(Unknown)	*Becheropsis*	*uniseta*	BECHUNIS					1	

(a) Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

Table 6 Species Occurrence in Degraded Miombo Woodland Study Plots

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot						
				VD002	VD004	VD012	VD015	VD016	VD017	VD030
Acanthaceae	*Acanthaceae*	sp.	ACANSP				X			
	Thunbergia	*oblongifolia*	THUNOBLO							1
Amaryllidaceae	*Crinum*	sp.	CRINSP		X					
Anacardiaceae	*Lannea*	*anticorbutica*	LANNANTI		X					
	Ozoroa	*reticulata*	OZORRETI				X			
	Rhus	*anchietae*	RHUSANCH							0.2
		natalensis	RHUSNATA					X		
Annonaceae	*Annona*	*senegalensis*	ANNOSENE				X	X	X	X
		senegalensis subsp. *senegalensis*	ANNOSENE							0.2
Apiaceae	*Steganotaenia*	*araliacea*	STEGARAL						X	0.2
Apocynaceae	*Diplorhynchus*	*condylocarpon*	DIPLCOND		X					
Araliaceae	*Cussonia*	*arborea*	CUSSARBO					X	X	X
		corbisieri	CUSSCORB		X		X			
		sp.	CUSSSP							0.2
Asteraceae	*Bidens*	*pilosa*	BIDEPILO					X		
	Coreopsis	sp.	CORESP				X			
	Tridax	*procumbens*	TRIDPROC					X		
Begoniaceae	*Begonia*	*princeae* var. *princeae*	BEGOPRIN		X					
Bignoniaceae	*Stereospermum*	*kunthianum*	STERKUNT						X	0.2
Celastraceae	*Maytenus*	*ovatus*	MAYTOVAT				X			
Chrysobalanaceae	*Parinari*	*curatellifolia*	PARICURA				X			
Combretaceae	*Combretum*	*molle*	COMBMOLL							0.2
		psidioides	COMBPSID		X					

Table 6 Species Occurrence in Degraded Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot						
				VD002	VD004	VD012	VD015	VD016	VD017	VD030
		sp.	COMBSP		X					
		zeyheri	COMBZEYH						X	X
Commelinaceae	*Commelina*	*africana*	COMMAFRI		X					
		africana var. *africana*	COMMAFRI							1
Convolvulaceae	*Ipomoea*	*linosepala*	IPOMLINO	X						
		sp.	IPOMSP							1
Cucurbitaceae	*Coccinia*	*adoensis*	COCCADOE					X		
		sp.	COCCSP						X	
	Trochomeria	*macrocarpa*	TROCMACR				X			
Cyphiaceae	*Cyphia*	sp.	CYPHSP					X		
Dipterocarpaceae	*Monotes*	*katangensis*	MONOKATA		X					
		sp.	MONOSP	X						
Ebenaceae	*Dioscorea*	*dumetorum*	DIOSDUME						X	
		shimperi	DIOSSHIM				X		X	
		sp.	DIOSSP							1
Euphorbiaceae	*Acalypha*	sp.	ACALSP						X	
	Bridelia	*ferruginea*	BRIDFERR					X		
	Pseudolachnostylis	*maprouneifolia*	PSEUMAPR							0.2
	Sapium	*cornutum*	SAPICORN					X		
	Uapaca	*nitida*	UAPANITI		X		X			
Fabaceae	*Acacia*	*macrothyrsa*	ACACMACR							0.2
		sieberiana	ACACSIEB						X	
	Aeschynomene	sp.	AESCSP	X						
	Albizia	*adianthifolia*	ALBIADIA		X		X			

Table 6 Species Occurrence in Degraded Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot						
				VD002	VD004	VD012	VD015	VD016	VD017	VD030
		antunesiana	ALBIANTU	X	X					
	Alysicarpus	sp.	ALYSSP					X		
	Brachystegia	*boehmii*	BRACBOEH			X	X			5
		longifolia	BRACLONG		X		X			
		sp.	BRACSP		X					
		spiciformis	BRACSPIC	X		X	X			0.2
	Dalbergia	*boehmii*	DALBBOEH		X					
	Desmodium	sp.	DESMSP				X			
	Dolichos	sp.	DOLISP				X			
	Droogmansia	*pteropus* var. *quarrei*	DROOPTER	X						
	Eminia	*polyadenia*	EMINPOLY							1
		sp.	EMINSP				X			
	Indigofera	sp.	INDISP				X			
		sutherlandoides	INDISUTH			X	X			1
	Isoberlinia	*angolensis*	ISOBANGO		X					
	Mucuna	*poggei*	MUCUPOGG							2
	Pericopsis	*angolensis*	PERIANGO		X		X			
	Piliostigma	*thonningii*	PILITHON							0.2
	Pterocarpus	*angolensis*	PTERANGO		X					0.2
		tinctorius var. *chrysothrix*	PTERTINC		X					0.2
	Rhynchosia	sp.	RHYNSP				X			1
	Sphenostylis	*emarginata*	SPHEEMAR		X					
		erecta	SPHEEREC			X				

Table 6 Species Occurrence in Degraded Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot						
				VD002	VD004	VD012	VD015	VD016	VD017	VD030
		marginata var. *erecta*	SPHEMARG							2
		sp.	SPHESP				X			
	Swartzia	*madagascariensis*	SWARMADA		X		X			
	Tylosema	*fassoglensis*	TYLOFASS						X	
Lamiaceae	*Coleus*	sp.	COLESP		X				X	
Liliaceae	*Asparagus*	*abyssinicus*	ASPAABYS							1
		sp.	ASPASP				X		X	
	Chlorophytum	*stolzii*	CHLOSTOL							1
Loganiaceae	*Strychnos*	*cocculoides*	STRYCOCC				X			
		spinosa	STRYSPIN						X	
Meliaceae	*Ekebergia*	*arborea*	EKEBARBO				X			
Menispermaceae	*Stephania*	*abyssinica*	STEPABYS		X					
		abyssinica var. *abyssinica*	STEPABYS							2
Moraceae	*Ficus*	*capensis*	FICUCAPE					X		
		sycomorus	FICUSYCO					X		
Nephrolepidaceae	*Nephrolepis*	*undulata*	NEPHUNDU		X		X			2
Ochnaceae	*Ochna*	*schweinfurthiana*	OCHNSCHW				X			
Oleandraceae	*Arthropteris*	sp.	ARTHSP		X					
Orchidaceae	*Habenaria*	*huillense*	HABEHUIL		X					
		huillensis	HABEHUIL	X						
Oxalidaceae	*Oxalis*	sp.	OXALSP				X			
Passifloraceae	*Adenia*	*gummifera*	ADENGUMM						X	
		lobata	ADENLOBA				X			
Poaceae	*Antephora*	*elongata*	ANTEELON		X					

Table 6 Species Occurrence in Degraded Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot						
				VD002	VD004	VD012	VD015	VD016	VD017	VD030
	Arthraxon	*micans*	ARTHMICA					X		
	Digitaria	sp.	DIGISP		X					
	Hyparrhenia	sp.	HYPASP					X		0.2
	Panicum	sp.	PANISP							0.2
	Pennisetum	*purpureum*	PENNPURP			X				
		sp.	PENNSP				X		X	
	Poaceae	sp.	POACSP							5
	Rottboellia	*exaltata*	ROTTEXAL							0.2
	Setaria	*anceps*	SETAANCE				X			1
		thermitaria	SETATHER		X					
	Sporobolus	sp.	SPORSP				X			
Polygalaceae	*Polygala*	sp.	POLYSP					X		
	Securidaca	*longipedunculata*	SECULONG	X						
		longipedunculata var. *parvifolia*	SECULONG				X			
Polygonaceae	*Rumex*	*abyssinicus*	RUMEABYS						X	
Proteaceae	*Protea*	sp.	PROTSP	X						
Pteridaceae	*Adianthum*	*lunulatum*	ADIALUNU						X	
	Aspidotis	*schimperi*	ASPISCHI		X					
Ranunculaceae	*Clematopsis*	*scabiosifolia*	CLEMSCAB				X			2
Rubiaceae	*Fadogia*	sp.	FADOSP							1
	Geophila	*ioides*	GEOPIOID				X			
	Pavetta	sp.	PAVESP					X	X	
	Rothmannia	*englerana*	ROTHENGL		X					
	Temnocalyx	*fuchsioides*	TEMNFUCH				X			1

Table 6 Species Occurrence in Degraded Miombo Woodland Study Plots (continued)

Family	Genus	Species	Species Code	Cover Class[(a)] by Plot						
				VD002	VD004	VD012	VD015	VD016	VD017	VD030
		obovata	TEMNOBOV							1
	Vangueriopsis	*lanciflora*	VANGLANC		X					
Sapindaceae	*Allophylus*	*africanus*	ALLOAFRI						X	
Selaginellaceae	*Selaginella*	*kraussiana*	SELAKRAU		X					
Sterculiaceae	*Dombeya*	*rotundifolia*	DOMBROTU				X			
	Sterculia	*quinqueloba*	STERQUIN					X	X	
Taccaceae	*Tacca*	*leontopetaloides*	TACCLEON					X		1
Urticaceae	*Urticaceae*	sp	URTISP					X		
Velloziaceae	*Xerophyta*	*equisetoides*	XEROEQUI					X		
Verbenaceae	*Lantana*	sp.	LANTSP					X		
Vitaceae	*Cissus*	sp.	CISSSP					X	X	
	Cyphostemma	sp.	CYPHSP		X					
		sp.2	CYPHSP 2				X			
		sp.3	CYPHSP 3				X			
	Rhoicissus	*erythrodes*	RHOIERYT						X	
Zingiberaceae	*Costus*	*spectabilis*	COSTSPEC		X		X			2

[(a)] Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

Table 7 Species Occurrence in Old Fallow Field Study Plot

Family	Genus	Species	Species Code	Cover Class[(a)] By Plot
				VD018
Acanthaceae	*Acanthaceae*	sp.	ACANSP	X
Apiaceae	*Steganotaenia*	*araliacea*	STEGARAL	X
Apocynaceae	*Diplorhynchus*	*condylocarpon*	DIPLCOND	X
Araliaceae	*Cussonia*	*corbisieri*	CUSSCORB	X
Clusiaceae	*Psorospermum*	*febrifugum*	PSORFEBR	X
Commelinaceae	*Commelina*	sp.	COMMSP	X
Ebenaceae	*Diospyros*	*batocana*	DIOSBATO	X
Euphorbiaceae	*Phyllanthus*	*muellerianus*	PHYLMUEL	X
Fabaceae	*Albizia*	*antunesiana*	ALBIANTU	X
	Brachystegia	*boehmii*	BRACBOEH	X
	Dalbergia	*boehmii*	DALBBOEH	X
		nitidula	DALBNITI	X
	Dolichos	sp.	DOLISP	X
	Isoberlinia	*tomentosa*	ISOBTOME	X
	Lonchocarpus	sp.	LONCSP	X
	Pterocarpus	*angolensis*	PTERANGO	X
		tinctorius var. *chrysothrix*	PTERTINC	X
	Swartzia	*madagascariensis*	SWARMADA	X
Hippocrateaceae	*Salacia*	*rhodesiaca*	SALARHOD	X
Loganiaceae	*Strychnos*	*cocculoides*	STRYCOCC	X
Meliaceae	*Ekebergia*	sp.	EKEBSP	X
Moraceae	*Ficus*	*capensis*	FICUCAPE	X
		dekdekena	FICUDEKD	X
Nephrolepidaceae	*Nephrolepis*	*undulata*	NEPHUNDU	X
Oxalidaceae	*Oxalis*	sp.	OXALSP	X
Passifloraceae	*Adenia*	*gummifera*	ADENGUMM	X
Rubiaceae	*Rothmannia*	*englerana*	ROTHENGL	X
		fischeri	ROTHFISH	X
Sapotaceae	*Chrysophyllum*	*bangweolense*	CHRYBANG	X
Taccaceae	*Tacca*	*leontopetaloides*	TACCLEON	X
Verbenaceae	*Vitex*	*doniana*	VITEDONI	X
Vitaceae	*Cyphostemma*	sp.	CYPHSP	X
(unknown)	*Dasistachys*	sp.	DASISP	X

[(a)] Plot coverage uses Braun-Blanquet class system: + or P = a few individuals, R = <1%, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-100%. X = species present in plot, but no coverage data available.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

APPENDIX B3.1-III

REPORT ON FLORA SPECIES OF CONCERN

Submitted to:

Tenke Fungurume Mining S.A.R.L. (TFM)
Democratic Republic of the Congo

March 2007 **05-1334-035**

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1 INTRODUCTION

1.1 THE CONTEXT OF FLORA DIVERSITY ON COPPER HILLS

Soil with high concentrations of heavy metals (metalliferous soil) is a good example of scattered habitat. Because of their phytotoxicity, metalliferous soils represent very restrictive habitats for plants (Antonovics et al. 1971). In addition, metalliferous soils are generally limited in size and geographically isolated from each other within a landscape matrix with background metal concentrations. Such sites offer outstanding examples of microevolution and speciation processes due to the severe selection pressure induced by heavy metal and founder effects and genetic drift induced by the insularity of these habitats (Lefèbvre and Vernet, 1990).

As a result, metalliferous sites very often host rare, ecologically endemic taxa adapted to high concentrations of heavy metals (i.e., metallophytes). Metalliferous sites are highly significant to biodiversity conservation at three levels:

- The population genetics level, because of the genetic and physiological peculiarities needed to cope with heavy metal stress.
- The species level, because of ongoing speciation.
- The ecosystem level, because of the high distinctiveness of plant communities that they host (Ernst 1974; Brooks et al. 1992; Whiting et al. 2002, 2004).

The south of the Democratic Republic of the Congo (DRC) (i.e., Katanga) and adjoining regions in the north of Zambia (i.e., the “Copperbelt”) comprise some of the largest orebodies of copper and cobalt in the world. In Katanga, heavy metal rich outcrops occur on approximately 70 hills (hereafter referred to as copper hills) scattered over more than 400 kilometers in a west to east direction and forming the so-called “Katanga Copper Arc” (Leteinturier 2002). Concentrations of copper in the soil overtopping mineralised rocks are often in excess of 10,000 milligrams per kilogram - (versus <100 milligrams per kilogram - in normal soils) (Duvigneaud and Denaeyer-De Smet 1963; Malaisse et al. 1994, 1999). Copper and cobalt at high concentrations in the soil are extremely toxic to most species of plants (Marschner 1995).

The flora supported by copper hills in Katanga comprises approximately 550 species (Leteinturier and Malaisse 1999b; Leteinturier 2002). A relatively

large number of these are local metallophytes. Forty species are specialists (i.e., metallophytes) (Leteinturier and Malaisse 1999b; Leteinturier 2002). These species can be referred to as holoendemics. Some of these holoendemics are restricted to a single population or very few populations (Leteinturier et al. 1999). There is little doubt that new endemic species remain to be discovered because many sites have still to be explored and a substantial number of plant samples collected in the copper arc must still be identified (Leteinturier and Malaisse 1999b; Malaisse pers. comm.). Active evolutionary processes are still in progress in the copper arc and offer outstanding examples of incipient speciation (Baker et al. 1983; Malaisse et al. 1983; Brooks and Malaisse 1990). According to Malaisse et al. (1983) and Leteinturier and Malaisse (1999b), most copper endemics have close relatives in the non-copper flora of Katanga and would thus be neoendemics, with only few species assumed to be palaeoendemics.

Katangan copper hills harbor particular steppic plant communities, which sharply contrast with surrounding vegetation of open forest (i.e., miombo forest). Each copper hill hosts a relatively wide diversity of habitats and plant communities in line with variation in metal concentrations in the soil, soil depth, slope, etc. (Duvigneaud and Denaeyer-De Smet 1963; Brooks et al. 1992; Malaisse et al. 1994).

The flora of copper-rich soils in Katanga is critically threatened in the short term. Mining activities have already destroyed a number of sites and brought to extinction a few holoendemics (Leteinturier and Malaisse 1999a; Malaisse et al. 1999; Leteinturier 2002; Leteinturier et al. 2001). Due to a recent revival of mining activities, the flora on many of the copper hills of Katanga are threatened more now than ever. The copper endemic plant species of Katanga rank among the most critically endangered endemic plant species in the world.

1.2 INTERNATIONAL AND LEGAL CONTEXT

Conservation of copper flora and copper flora plant communities fits in several priority concerns of international conventions to which the DRC is committed:

- Articles 7/8/9/12/13/15 of the Convention on Biological Diversity (CBD) (CBD 2005a).
- Focus 1 and 3 of the BIO DISCOVERY program of the DIVERSITAS initiative (Diversitas 2005).
- Performance Standard 6 Biodiversity Conservation and Sustainable Natural Resource Management of the International Finance Corporation (IFC 2006)

- Decision VI/9 of the CBD adopting the Global Strategy for Plant Conservation of which this contributes 14 of the 16 targets (CBD 2005b).

The mineral industry has recognized the importance of establishing a code of practice for sustainable operation, including consideration of biological diversity. The Mining, Minerals and Sustainable Development (MMSD) project commissioned by the Global Mining Initiative was the first industry-wide step towards this goal (ICMM 2005). The final version of MMSD was released in May 2002 which, via the 2002 Toronto Declaration, provides a road map for the industry's future contributions to the change to sustainable development (Hoadley et al. 2002). At the company/stakeholder level, metallophyte conservation might be incorporated in Environmental Management Systems as guided by ISO 14001. Table 1 summarizes information that has been gathered regarding mining activities in the DRC from the "Journal officiel – Numéro Spécial – 1er avril 2003.

Table 1 Overview of Flora Information from Mining Activities in the DRC

Journal Section	Pages	Summary of Content
natural habitat description (description du milieu)	248-251	The type of ecosystem has to be precise. The seven units suggested are more coarse as the ones used in the present report. Rare and threatened species have to be listed. Moreover 11 families, 12 genera and 15 species are listed in Table B. They concern hydrophytic plants.
chapter iii: biological environment description (chapitre iii: de la description de l'environnement biologique)	291	Units have to be listed, plant species identified and mapped.
chapter vii: mitigation and rehabilitation measures after mining activities (chapitre vii: des mesures d'atténuation et de réhabilitation après la fermeture du site)	324-326	Article 96 indicates clearly that all the places that have been site of mining activities, including sterile deposits have to be covered by vegetation. This implicates a strong approach of phytoremediation knowledge.
annex xii: vulnerable habitat (annexe xii: les milieux sensibles)	345	Sensible environments quoted include, between others: marshes (in or at less 10 km of the area), lake, spring of edible water. These ecosystems exist in the TFM area, but not on copper/cobalt outcrops.

1.3 THE TFM CONTEXT

The Tenke Fungurume Mining SARL (TFM) concession contains many mineralized copper (Cu) and cobalt (Co) outcrops. These outcrops are vegetated by a unique and diverse flora that is adapted to high copper and cobalt concentrations. A previous vegetation survey and taxonomic study of these

"copper loving" plants was undertaken by Malaisse (1997) and Dikumbwa et al. (1998) within the TFM concession in 1998. However, the inventories at that time were not considered to be complete, and some of the latter's collection were not properly identified. Recent reviews of the copper cobalt flora (e.g., Leteinturier and Malaisse 2001) have also been undertaken. TFM intends to develop some of the ore body resources within its concession and therefore an assessment of the endemic flora is required.

2 OBJECTIVES

The primary objective of the study is to compile information on the flora and plant communities within the region prior to exploitation for incorporation into an analysis of the anticipated impacts that will result from mining. More specifically, objectives for this study were to:

- Update species list of plants found on copper-cobalt plant communities in the region including Kwatebala and Goma hills and adjacent hills that may be mined.
- Identify which plant species are endangered or rare in the region and the proposed measures to move, transplant or re-establish these species.
- Map and describe the ecology and species composition of the vegetation subunits on Kwatebala and Goma hills.
- Outline the ecology of plant species that require protection and/or will need to be transplanted or re-established prior to project initiation.
- Outline the propagation and transplant methods with the greatest chance of success in re-establishing plants from the mine area to areas outside the project area.
- Identify candidate areas outside the project footprint that may be suitable for transplanting and/or establishing endangered or rare flora found on the potentially disturbed areas.
- Identify candidate areas outside the project footprint that could be set aside for protection. These areas would be protected to insure there are remnant copper-cobalt plant communities in the region that represent the communities that will be affected by the project.
- Identify suitable candidates for possible employment by TFM.
- Identify a transition plan whereby, over time, the above described mitigation can be undertaken by local TFM employees.
- Prepare a workplan to include both transplantation and propagation trials.

An additional field survey was completed in November 2006 to complement data from previous surveys. The program included four tasks:

- Floristic diversity and Plant Micro-Reserves (PMRs) definition on Kwatebala, Kavifwafwalu, Goma; delimitate areas of high biological interest and discuss possibility of PMR strategy with mining staff.
- Population structure and status of taxon of concerns and seed collection.
- Exploration of new hills to mitigate for the lost of Fungurume V.
- Identification and training of TFM employee.

3 METHODS

3.1 INTRODUCTION

The present study is devoted to the plant kingdom. The kingdoms of Monera, Protista, Fungi and Animalia are not covered within this report. However, some Cyanophycae play an important role in the first step of pedogenesis on copper-cobalt rich soils, such black crusts are frequent in steppes. In the same way, lichens play an important role in the first step of colonization of rocky outcrops, including on malachite.

With regard to the plant kingdom, two concepts arise: flora and vegetation. Flora deals with the list of plants occurring in a given area, namely the TFM area. This implicates correct identification of vouchers (reference material). Species identification is not an easy task and several difficulties were encountered (Attachment 1). Names used in this report have been chosen according to:

- Flore d'Afrique centrale (formerly Flore du Congo belge, et du Ruanda-Urundi, later Flore du Congo, du Rwanda et du Burundi). The publication of this Flora is not complete (1958 to present). Also, more recent publications were taken into account.
- Flora Zambesiaca (not complete).
- Flora of Tropical East Africa (not complete).

Moreover, we took into account any recent revisions of genera concerned, both revisions at the African level and at the local level (Congo or Katanga). Sometimes the last revision is old. All together more than 200 papers were consulted.

The vegetation studies carried out previously in Katanga have been based on methods from several phytosociological schools including:

- The Zuricho-Montpellier School (Schmitz, Streel).
- The Dynamic School (Toulouse).
- The method of Ecological groups of Brussels (Duvigneaud) (an approach through transect and catena concepts, etc).

Local inventories are, in each case a first step, but they are located either in homogenous vegetation sites, along transects or in ecotones, etc. Outputs and limits of these different methods have been discussed, notably regarding salt

vegetation and copper vegetation (Malaisse 1997; Leteinturier 2002). For the flora study conducted specifically for TFM, the following background knowledge and information sources were utilized in the overall assessment:

- Background botanical studies in Katanga are supported both by an acute knowledge of the main vegetations units observed in this Province as well as by an updated knowledge of the copper/cobalt flora and vegetation of Katanga.
- Knowledge of the main vegetation units takes into account the following considerations:
  - Flora diversity.
  - Ecology of the units.
  - Dynamic nature of the units.
  - The phytosociology of the units.
- Available information on the plant communities included:
  - Dry evergreen forest (Schmitz 1962; Malaisse 1984; Dikumbwa 1990).
  - Forest galleries (Schmitz 1963, 1971).
  - Open forests (Schmitz 1963 ; Malaisse 1976, 1978, 1985 ; Malaisse et al. 1982).
  - Savannahs (Streel 1962, 1963).
  - Steppe savannahs (Duvigneaud 1958 ; Lisowski et al. 1971).
- Main publications related to copper/cobalt flora and vegetation included:
  - Duvignaud 1958, 1959.
  - Duvigneaud and Denaeyer-De Smet 1961, 1963.
  - Brooks and Malaisse 1985.
  - Leteinturier and Malaisse 2000.
  - Letenturier 2002.

3.2 SITE SELECTION

3.2.1 Framework of Site Selection

The aims of the rare and endangered flora assessment were to:

- Provide a description of the flora and plant communities of the sites expected to be impacted by mining exploitation either directly (Kwatebala and Goma) or indirectly (Kavifwafwaulu) as a result of the project.
- Explore other sites in order to gain a better knowledge of the distribution of rare plants and plant communities in the concession and to identify potential candidates for translocation and/or protection.

Under this context, two sets of sites were explored:

- TYPE A: Goma, Kavifwafwaulu and Kwatebala where intensive surveys were carried out on the flora and communities with the most detailed work carried out at Kwatebala and Kavifwafwaulu.
- TYPE B: Other sites inside the TFM concession including: Fungurume, Goma, Kazinyanga, Kwatebala, Mambilima, Mwadikomba, Mwinansefu, Pumpi, Shadirandzoro, Shinkusu and Zikule.

3.2.2 Survey Sites

Due to the very scattered nature of copper-cobalt plant communities on copper soils and the need to identify, as precisely as possible, the distribution of rare species and these communities within the TFM concession, a precise nomenclature of sites was developed. Based on topographic maps published or produced by UMHK (Union minière du Haut-Katanga), Gécamines (Générale des Carrières et des Mines), CSK (Comité Spécial du Katanga) and TFM, each independent unit was differentiated based on physical characteristics and level of disturbance. The different sites surveyed are shown in Table 2 and mapped in Attachment 2.

Table 2 List of Type A and Type B Survey Sites

General Site Name	Specific Site Name
Site Type A	
Goma	Goma southwest
Goma	Kabwelunono
Goma	Kakavilondo (Apostolo)
Goma	Tenke east (orthodoxe)
Goma	Shimbidi
Kavifwafwaulu	Kavifwafwaulu
Kavifwafwaulu	Kavifwafwaulu south-east
Kwatebala	Kwatebala
Kwatebala	Kwatebala west
Kwatebala	Mwinansefu
Kwatebala	Mwinansefu east
Site Type B	
Fungurume	Fungurume V
Fungurume	Fungurume XII (Katufungurume)
Fungurume	Fungurume II
Goma	Goma central
Goma	Goma north-east
Kazinianga	Kazinianga
Kwatebala	Kwatebala west
Mambilima	Mambilima
Mwadikomba	Mwadikomba (principal)
Mwinansefu	Mwinansefu east
Pumpi	Pumpi XI
Shadirandzoro	Shadirandzoro west
Shadirandzoro	Shadirandzoro central
Shinkusu	Shinkusu west
Zikule	Zikule east
Zikule	Zikule west

3.3 DATA COLLECTION METHODS

The objectives of the flora surveys included description of both the flora and plant communities. To prepare for the surveys, a significant amount of

preliminary work was conducted prior to field visits. Particularly, existing herbarium specimens were examined to increase field sampling effectiveness.

3.3.1 Preliminary Herbarium Data Collection

Methods consisted of a review of the recent literature and visits to the main European herbaria hosting a collection of copper flora to identify specimen herbaria that were collected within the TFM concession. Herbarium consultation effort is listed in Table 3.

Table 3 Herbarium Consultation Effort

Herbarium	Acronym[(a)]	Dates Visited
Belgian National Botanic Garden at Meise	BR	April 14-15, 18-19, 21-22, 25-26, 28-29, 2005; May 17-20, 2005 January 9-10, 16-17, 2006 February 9-10, 14, 17, 21, 24, 27, 2006-06-17 March 1, 3, 8-9, 14, 27-28, 30, 2006-06-17 May 8-9, 16, 19, 2006
Laboratoire de Botanique systématique of the Brussels Free University	BRLU	December 13-14, 2005
Kew Royal Botanic Gardens	K	March 21-24, 2005

[(a)] Acronyms according to Holmgren et al. (1990).

3.3.2 Field Data Collection

3.3.2.1 Mapping of Type A Sites

For Type A sites, the different vegetation units were visually identified in the field. Plant formations represent a collection of vegetation units. Both of these terms are explained more fully below:

- **Plant Formation**: First plant formations were identified on physiognomic criteria including number of strata, cover of the different strata, etc. This step provided a broad vegetation classification in broad general plant formations including:
  - Open forest.
  - Siliceous cellular rocks plant communities.
  - Siliceous foliated rocks plant communities.
  - Mining work plant communities.

- Steppe.
- Rocky steppe.
- Transition rocky steppe.
- Steppe Savanna.
- Lawn.

- **Vegetation Unit**: Secondly, within those plant formations, we identified homogeneous vegetation units corresponding a priori to environmental variation reflected in the nature of the substrate and/or in dominant plant species and/or characteristic species. When the same plant formation was found in two different sites, we noted a priori that it represented different vegetation units. Validation of this assumption was derived from data analysis (see Section 4 Results).

The different patches of each plant formation were digitized into the GIS on the basis of recent satellite imagery and through field validation with use of a hand-held GPS unit. Plant formations were mapped in the vicinity of Kwatebala and Kavifwafwaulu.

For sites situated in the Goma area, plant formations could not be mapped on the whole area due in part to large number of hills in the area (see Table 2 and Attachment 2). Greater effort was afforded to Kabwelunono and Kakavilondo, two hills with moderate levels of human disturbances and where vegetation was found to vary along environmental gradients.

3.3.2.2 Mapping of Type B Sites

On Type B sites, vegetation units were not mapped as the work focused on flora composition. Nevertheless, some preliminary observations provided an assessment of plant species diversity on these sites.

3.3.2.3 Flora Data Collection

Field Data Collection

Data were collected within vegetation units in February, April and November 2006. Collection of flora data was made in selected vegetation units (see Section 4 Results for details) representative of plant formations thought to be typical of copper hill vegetation. These hills are significantly different in species composition from the miombo forest landscape matrix. Each vegetation unit was surveyed by walking transects, covering the range of topographic variation and identifying each species noted.

Unidentified specimens (whether they had not been previously described or whether there was some uncertainty regarding their identity) were collected and kept as herbarium specimens for further identification.

The collected material was numbered (reference collections are Malaisse; Malaisse and Kisimba; Malaisse, Mahy and Kisimba; Malaisse, Kisimba and Saad) and referenced to the collection site. Each evening, samples collected the same day were arranged, numbered and morphological notes reported. Each morning, wet collecting papers were replaced with dry ones. Material was transported to the National Herbarium of Belgium (BR), dried, frozen and prepared. Labels were established for each voucher.

Specimen Identification

Specimen identification was carried out in three steps. First, family names were given to each specimen. Second, well known plants were named until subspecies names could be given if applicable. Critical material was initially named at the genus level. All material was compared with existing herbarium material by specialists. Critical material was reviewed using the Floras (Flore d'Afrique centrale, Flora Zambesiaca and Flora of Tropical East Africa) as well as with local or African revisions. Some additional material has been or will be sent to experts for final identification or validation.

Compilation of Flora Lists

Based on field observations and species identification, a list of species was compiled by vegetation unit and site.

3.3.2.4 Fine Scale Plant Communities Description

The aim of this task was to describe more precisely the conditions (mean and variability) of plant communities in the different vegetation units. This was a prerequisite to considering ecosystem reconstruction for community and/or species conservation.

Fourteen out of the 22 selected vegetation units were included in this analysis. They were selected as representing the range in variation among the units that seemed a priori the more representative of copper hills.

In each selected vegetation unit, five, 1 square meter plots were randomly located within each unit for a total of 60 plots within 14 units. In each plot, vegetation structure was assessed by noting percent cover of rocks, percent cover of vegetation by strata and maximum vegetation height. In addition, species lists

were developed. In addition, in three plots per vegetation unit, soil samples were collected to analyze for pH and trace elements concentrations (42 samples in total). Samples consisted of three bulked sub-samples which were taken at two corners and the center of a 1 square meters plot. The depth at which samples were taken was fixed at 10 centimeters below the ground surface. Samples were air-dried and sieved to 2 millimeters. pH was measured in water suspension (weight per volume ratio of 2:5). Copper, zinc, lead, cobalt and cadmium were measured by atomic absorption flame spectrometry following ammonium acetate-EDTA (1N; pH 4.65) extraction (10 grams per 50 milliliters).

3.4 DATA ANALYSIS

3.4.1 Copper-Cobalt Vegetation in the Local Study Area

An updated species list of plant taxa found on the copper-cobalt plant communities in the LSA was provided by compiling data from different sources including:

- Data from the existing herbarium collection.
- Data from flora lists collected in each vegetation units.
- Data from plant community description sites.

The following lists were produced:

- Species lists derived from herbarium collections for Kwatebala and Kavifwafwaulu.
- Species lists per vegetation unit (species observed in the field).
- Species lists per site (species observed in the field and taxon hosted in herbarium collections).

In addition, a synthesis of the specimens that needed to be assessed in a herbarium study was also provided.

3.4.2 Species of Concern: Rare and Threatened Plants on Copper Hills in the Regional Study Area

A first assessment of species of concern was made by identifying species on the following lists:

- Currently listed in one of the CITES Appendices (CITES 2005).

- Currently included on the IUCN Red List (IUCN 2006).

Because of the very poor knowledge of the copper flora and the limited number of studies in the area of interest, it was expected that those lists would poorly take into account the copper flora. Thus, a second assessment of species of concern was made on the following criteria:

- Species endemic to copper hills.
- Species known from the LSA area only.
- Species known from the RSA only.
- Species with a limited number of known populations.

In order to refine the list of species of concern, additional criteria included:

- Species with populations that will be directly impacted by mining activities versus species that exist outside the disturbance boundary in the TFM area.
- Species with a limited number of populations were also divided into two subcategories on the basis of whether their distribution is thought to reflect rarity and/or a restricted distribution or whether it is more likely an artifact of inadequate collecting (based on best expert judgment).

Based on the above criteria and the data collected during the different surveys, the potential IUCN status of the species of concern was assessed. Priority lists were established based on this assessment. In addition, a list was established for those species that do not fit criteria to be listed under IUCN status but present a conservation interest.

3.4.3 Ecology and Propagation/Transplant Methods for Species of Concern

For the species of most concern identified above, a fact sheet has been compiled on the basis of literature, unpublished work from the Ecology team of FUSAGx, and information collected as part of this baseline assessment. The fact sheets contain the following information:

- Historical background.
- Habit.
  - Ecology.

  - General distribution.
  - Phytogeochemistry.
  - Rehabilitation.
- Phenology.
- Distribution.
- Urgent research needs.
- Conservation proposal.
- References.
- Iconography.

3.4.4 Map and Describe Ecology and Species Composition of Vegetation Units on the Kwatebala and Goma Hills

3.4.4.1 Description of Vegetation Unit

Plant Diversity

Alpha Diversity

For each vegetation unit and site surveyed, the following parameters were computed to describe plant species richness:

- Total number of species observed during field work.
- Total number of specimens still in need of species identification.

For each vegetation unit in which one square meter plots were established, the mean number of plant species was calculated per square meter (local diversity). Mean local diversity was compared among vegetation units using ANOVA tests followed by post-hoc analysis (Tukey test).

Beta Diversity

Floristic similarity among vegetation units was derived from a hierarchical classification using the Euclidian distance on presence/absence species data and using the Ward's method of grouping. Only species for which a preliminary identification was available were taken into account. Only species observed in April were taken into account in order to keep the sampling effort constant and avoid bias due to temporal variation of community composition.

Species-Area Curves

Species-area curves were used on six vegetation units to determine the smallest surface that may be representative of community species richness.

Plant Species Composition

Dominant species were identified visually in the field for each vegetation unit. Indicator species (species that are more strictly linked to a community than to other independently of their relative importance within the community) were identified for each vegetation unit using the indicator value method (INDVAL) with presence/absence species data found in one square meter plots (Dufrêne and Legendre 1997). Indicator species were detected for groups of plots from the same vegetation unit after 999 permutations, at a significance level of $p = 0.01$. This method combines measurements of the degree of specificity of a species to an ecological state (e.g., a habitat type) and its fidelity within that state (species with a high specificity and high fidelity within a habitat will have a high indicator value) (Dufrêne and Legendre 1997).

Because one square meter plots did not cover the full range of the species composition within a vegetation unit, additional indicator species were identified by qualitative comparisons of the species lists among vegetation units.

Environmental Conditions

Average value of vegetation structure parameters were computed for each vegetation unit and compared using ANOVA tests (with arcsin transformed data for proportions) followed by post-hoc analysis (Tukey test).

Maximum, minimum, and average values of top soil heavy metal concentrations and pH were computed for each vegetation unit. Because of the low number of samples (n = three per vegetation unit), no statistical test was used for means comparisons.

Relationships between floristic data, community structure and soil parameters were examined by an indirect ordination using a Detrended Correspondence Analysis (DCA) with CANOCA for WINDOWS version 4.5.

4 RESULTS

The present report presents a synthesis of data obtained up to November 30, 2006. Surveys were conducted in February, April, August and November 2006. It is evident that much work is still remaining with existing data to process and further surveys to conduct.

4.1 HISTORY OF BOTANICAL EXPLORATION OF THE TFM AREA

With the exception of the mineralized outcrops, the botanical diversity and the vegetation of the TFM area is poorly documented. Leteinturier and Malaisse (2001) have recently summarized the botanical exploration of the mineralized outcrops of Upper Katanga region. According to this account, the first botanical collection in the TFM area was in August 1956 by P. Duvigneaud. More than 20 botanists or para-botanists have since collected plants in the area.

All together, some 3,302 plant specimens have been collected in the TFM study area. Of these, about 2,102 remain available in collections. This material is deposited in several institutions; most important are BR, BRLU and to a lesser degree K and POZN. Of note is that the plants collected and transported to K in the late 1990's have been destroyed (but some doubles exist at BR), as have nearly all collections at the University of Lubumbashi.

Unfortunately, this material has been incompletely studied, and determinations to species level are sometimes erratic or even inconsistent. It will therefore be necessary to set up a database for all of these collections and to properly identify the plants.

Attachment 3 reports on the efforts carried out by the various collectors regarding plant collections on the 23 copper-cobalt outcrops recognized in the TFM area. Attachment 4 reports on the studies of Dikumbwa, Kisimba and Muzinga in 1997 to 1998 (Golder 1999).

Published data are scarce. To our knowledge, they are limited to about 20 papers and deal with the following:

- History of botanical collection:
  - Leteinturier and Malaisse (2001).

- Vegetation description of diverse outcrops in TFM area:
  - Duvigneaud and Denaeyer-De Smet (1963).
  - Malaisse et al. (1979).
  - Shewry et al. (1979).
  - Leteinturier (2002).
- Description of new taxa with holotype collected in TFM area:
  - Duvigneaud and Denaeyer-De Smet (1963).
  - Robbrecht (1981).
  - Bamps (1982).
  - Malaisse and Lecron (1990).
  - Champluvier (2005) (in preparation).
  - Malaisse and Bamps 2005.
- Comments on rehabilitation via phytostabilization:
  - Leteinturier and Malaisse (1999).
  - Leteinturier et al. (1999).
  - Leteinturier (2002).
- Copper and cobalt content of plants in the TFM area:
  - Duvigneaud and Denaeyer-De Smet (1963).
  - Brooks et al. (1977).
  - Morrison et al. (1979).
  - Brooks et al. (1978, 1980, 1987).

Little information is available on the non-mineralized vegetation in the concession. Very short comments on this subject were written by Duvigneaud and Denaeyer-De Smet (1963).

4.2 SUMMARY OF FIELD SAMPLING EFFORT AND STRUCTURE OF DATA

Plant formations localization in Kwatebala and Kavifwafwaulu are depicted on Maps 1 and 2 (Attachment 5) with the localization of vegetation units selected for floristic relevés (total species lists and mean by one square meter plots).

Tables 4 and 5 provide the field survey efforts and map unit and site codes.

Table 4 Summary of Field Survey Effort

Map Unit (Plant Formation)	Code	Number of Study Units
shrubby cellular siliceous rocks	ShCSR	0
cellular siliceous rocks	CSR	0
degradation bushy savanna	DBS	0
humid steppe savanna	HStS	1
rendlia altera lawn	LW	1
rocky steppe savanna	RStS	7
rocky substratum derived from mining works	RMW	1
ruderal savanna	RuS	0
steppe savanna	StS	8
transition steppe 1 (between xerophyta steppe and steppe savanna)	TrSt1	1
transition steppe 2 (between steppe savanna and ruderal savanna)	TrSt2	0
tree savanna	TS	0
xerophyta steppe	XSt	3
Total		**22**

A total of 14 sites were visited (Kwatebala, Kwatebala west, Mwinansefu, Mwinansefu east, Kavifwafwaulu, Kavifwafwaulu south-east, Goma south-west, Kabwelunono, Shimbidi, Apostolo, Orthodoxe, Fungurume II, Fungurume V, Katufungurume, Kazinianga) but collection efforts were focused on 12 of them.

Twelve plant formations were identified (CSR, DShS, HStS, RMW, RStS, RuS, ShCSR, StS, TrSt1, TrSt2, TS, XSt) and the example of Rendlia lawn (LW) was added to give a comparative basis of potential rehabilitation vegetation. A floristic list was established for 22 vegetation units.

The species list of plants found on copper-cobalt vegetative community in the Project Local Study Area (LSA, the area that includes Kwatebala, Kavifwafwaulu and Goma Hills) was updated. The target sites (Kwatebala, Kavifwafwaulu and Goma) were surveyed as well as the site of Kazinianga. Species lists per site are presented in Attachment 6.

One square meter plots were established in 14 vegetation units for a more refined community description.

Herbarium collections from the April 2006 field survey are listed in Attachment 7 and the November 2006 field survey are listed in Attachment 8.

Table 5 Details of Field Survey Effort

Sites Name	Plant Formation (Map Unit)	Vegetation Unit (Floristic Relevés)	Vegetation Unit Code	List of Species			1 m² Plots	
				February 2006	April 2006	November 2006	April 2006	November 2006
Kwatebala	inside XSt	siliceous foliated rocks	XSt1i-KWA	X	X			
Kwatebala	RMW	rocky substratum derived from mining works	RMW-KWA	X	X			
Kwatebala	XSt	xerophyta equisetoides steppe (summit ridge)	XSt1-KWA	X	X	X	X	X
Kwatebala	TrSt1	transition rocky steppe	TrSt1-KWA	X	X	X	X	X
Kwatebala	StS	steppe savanna (valley)	StS1-KWA	X	X	X	X	X
Kwatebala	RStS	rocky steppe savanna	RStS7-KWA	X	X	X	X	X
Kwatebala west	RStS	rocky steppe savanna	RStS1-KWA-W		X	X		
Mwinansefu	RStS	rocky steppe savanna	RStS2-MW		X	X		
Kavifwafwaulu	HStS	steppe savanna (humiferous soil)	HStS-KA		X	X	X	X
Kavifwafwaulu south-east	RStS	rocky steppe savanna (rock flagstone)	RStS3-KA-SE		X	X	X	X
Kavifwafwaulu south-east	RStS	rocky steppe savanna (gentle slope)	RStS4-KA-SE		X	X	X	X
Kavifwafwaulu south-east	RStS	rocky steppe savanna (droogmansia quarrei)	RStS5-KA-SE		X	X		
Goma	RStS	rocky steppe savanna (rocky slope)	RStS6-GO		X	X	X	
Kabwelunono	StS	steppe savanna (dembo)	StS2-KAB		X	X	X	X
Shimbidi	StS	steppe savanna (plecthrantus esculentus)	StS3-SHI		X	X	X	X
Kabwelunono	XSt	xerophyta equisetoides steppe (slope)	XSt2-KAB		X	X	X	
Kabwelunono	StS	steppe savanna (slope)	StS4-KAB		X	X	X	X
Kabwelunono (Apostolo)	StS	steppe savanna (dembo-pseudoeriosema)	StS5-KAK		X	X	X	X
Tenke east (orthodoxe)	StS	steppe savanna	StS6-TEN		X			
Fungurume II	LW	rendlia altera lawn	LW-FUN		X		X	
Katufungurume	StS	steppe savanna (monadenium cupricola)	StS7-KAT		X			
Kazinianga	StS	steppe savanna (dembo)	StS8-KAZ		X			

4.2.1 Copper-Cobalt Vegetation in the Local Study Area

The general list of taxa observed during field surveys was compiled in an excel file and provided in this report (Attachment 10). The folder contains a list of species per vegetation unit as well as a general list of species observed with their priority criteria. From this information, different lists have been produced including:

- Attachment 11: species list from the existing herbarium collection from Kwatebala Hill.
- Attachment 12: species list from the existing herbarium collection from Kavifwafwaulu.
- Attachment 13: species list for each explored sites (or group of sites) including data from surveys of February, April and November 2006, and herbarium collection.
- Species lists for each vegetation unit including data from surveys of April 2006 (Attachment 14 Fact Sheets for Vegetation Units and Attachment 15 – Photo Plates).
- Attachment 6: updated species lists of Kwatebala and Kavifwafwaulu based on November 2006 field visit.

From the species and specimens recorded and collected, a high proportion need further work for identification because they are believed to be unknown to science (never described before) or the preliminary species identification is in doubt. Attachment 1 provides a synthesis of the work needed to provide a complete list of species on the basis of specimens collected in February and April 2006.

4.2.2 Species of Concern: Rare and Threatened Plants on Copper Hills in the Regional Study Area

Species in the TFM area have not been studied by the IUCN. A provisional ranking of species based on IUCN criteria led to the potential ranking of species of concern as shown in Table 6. Details on the species (fact sheets) are provided in Attachment 16. When known, the distribution of the species in the TFM area is given in the fact sheet.

Table 6 Species of Concern

Species	Potential IUCN Status Equivalence [a]	Potentially Impacted by Project[b]	Vegetation Units Where Species Found
Chlorophytum sp. nov.	CR	yes	Kwatebala
Cheilanthes sp. nov.	CR	yes	Kwatebala: XSt1-KWA; Pumpi XI:
Aeollanthus saxatilis P.A.Duvigneaud and Denaeyer-De Smet	CR	no	Fungurume II and V
Faroa malaissei Bamps	CR	yes	Fungurume V, Kwatebala, Goma, Pumpi [c]
Basananthe kisimbae Malaisse and Bamps	EN	yes	Kavifwafwaulu: HStS MWINANSEFU: RStS Goma, Kwatebala, Kwatebala West, Shimbidi, Kabwelunono, Kavifwafwaulu North and Southeast
Barleria lobelioides Champluvier nov. sp. (nomen nudum)	EN	yes	Fungurume V, Kwatebala, Mambilima, Kabwelunono, Shimbidi, Kavifwafwaula
Wahlenbergia verbascoides Thulin	VU	yes	Kwatebala
Monadenium cupricola Malaisse and Lecron	VU	no	Fungurume V, Katufungurume XII
Euphorbia fanshawei C.L. Leach	VU	no	Fungurume II and V
Haumaniastrum robertii (Robyns) P.A.Duvigneaud and Plancke	LR	yes	Kwatebala: XSt1-KWA MWINANSEFU: RStS2-MW Fungurume II and V, Kakavilondo, Goma Southwest, Katufugurume, Kabwelunono, Kavifwafwaulu, Shimbidi
Triumfetta likasiensis De Wild.	LR	yes	Kwatebala: TrSt1-KWA Kavifwafwaulu: HStS-KA, RStS4-KA-SE Tenke, Kabwelunono
Pellea pectiniformis Baker var nana Leteinturier var nov.	LR	yes	MWINANSEFU: RStS2-MW Kakavilondo, Kavifwafwaulu, Kwatebala, Fungurume, Mambilima

[a] The World Conservation Union (known by the acronym IUCN) has yet to analyze data on flora within the project area and has not made formal determination on individual species. For the purposes of the baseline study, the ESIA team has rated the potential conservation status of flora species based on existing data on population size, reduced extent of occurrence and/or area of occupancy, assuming application of the IUCN criteria. CR = critically endangered; EN = endangered; LR = lower risk; VU = vulnerable. Refer to Attachment 8 for IUCN ranking categories.

[b] Species present on Kwatebala and Kavifwafwaulu and are susceptible to be directly impacted by TFM mining activities.

[c] Mark Hardin, personal communication, 30 March2007.

There are 22 potentially new taxa for Katangan copper flora (Table 7). Eleven of these are confirmed, and eleven other are waiting further study.

Table 7 Taxa New for Katangan Copper Flora

Families	Taxa	Site(s)
Acanthaceae	*Blepharis glumacea* S.Moore	Kavifwafwaulu South MKS 462
Acanthaceae	*Thunbergia* cream flower	several sites MKS 719, 828, 970
Anacardiaceae	*Lannea edulis* (Sond.) Engl.	Mwinansefu East MKS 698
Anthericaceae	*Chlorophytum* sp. nov. 5	Kwatebala (1) = MKS 546, 639
Anthericaceae	*Chlorophytum* sp. nov. 6	MKS 675, 679
Aristolochiaceae	*Aristolochia hockii* De Wild.	Mwadikomba MKS 836
Asclepiadaceae	Gymnadenia *sp.2*	Mambilima MKS 922
Asteraceae	Helichrysum ceres *S.Moore*	several sites MKS 757
Caryophyllaceae (Aizoaceae)	???	Kwatebala (2) MKS 926
Colchicaceae	*Littonia lindeni* Baker	many sites MKS 782, 824, 852, 1010
Commelinaceae	cf. *Murdannia* sp.	several sites MKS 738, 811
Convolvulaceae	*Ipomoea crassipes* Hook.	Pumpi XI MKS 862
Cyperaceae	cf. *Pycreus*	several sites MKS 570
Hyacinthaceae	*Ledebouria* sp.2	several sites Kavifwafwaulu MKS 554
Hypoxidaceae	*Hypoxis subspicata* Pax	Kavifwafwaulu MKS 776
Liliaceae	3 leaves on soil surface	MKS 946, 969
Liliaceae	cordate leaf	Kavifwafwaulu MKS 562
Moraceae	*Dorstenia barnimiana* Schweinf.	Kavifwafwaulu (droite) MKS 555, 795
Orchidaceae	*Nervilia kotschyi* (Reich.) Slecht.	Zikule MKS 1014
Sinopteridaceae	*Cheilanthes similis* Ballard	Pumpi XI MKS 865, 875
Sinopteridaceae	*Cheilanthes* sp.	Pumpi XI MKS 869
Tecophilaeaceae	Walleria mackenzie *Kirk*	Mwinansefu West MKS 632

For *Cheilanthes* sp. nov., which occurs on both Kwatebala and Pumpi hills, a detailed study of the distribution of the species and its regeneration status has been conducted. The population on Kwatebala will be directly affected under the current mine plan. Results and a proposed method for subpopulation translocation are given in the fact sheet (Attachment 16).

The population of *Cheilanthes* sp. nov. was found on Pumpi Hill XI in November 2006. Further assessment of this population (number of individuals, habitat, reproduction) should be performed as its distribution seems limited to a patch of RSC not longer that 20 meters.

A new taxon, *Chlorophytum* sp. nov. was discovered during the November 2006 survey. The population was found on Kwatebala Hill. Further surveys will be conducted to assess whether there are other populations located in the TFM area and if this species could be potentially removed from the potentially critically endangered ranking. *Faroa malaissei* is currently known for four hills (Table 6), making this species less of a concern than *Chlorophytum* and *Cheilanthes*, which are known for one and two hills, respectively.

Basananthe kisimbae had not been retrieved in August, but we confirmed that it was due to its phenology as plants were found in November. However, and as suspected, the establishment of a camp in Kwatebala West has affected the population that was present there. Around 60 individuals were censused at this location.

With the increase in field exploration, it was found that *Sopubia neptunii* target species that was previously though to be rare, is present on quite a lot of sites within the TFM concession. Indeed, five new locations were found during the November 2006 field trip. These findings coupled with the fact that the species is generally found in locally abundant populations, allow us to say that it can be removed from the priority list, at least currently.

For the species of concern which are predicted to be affected by the project, special attention should be paid to the vegetation units where they are present. The locations of these species should serve as PMR core areas wherever possible. To ensure that the species may be preserved in the future, seed should be collected as soon as possible to build an ex-situ seed bank that can be used in the future for reintroduction or translocation into a botanical garden.

4.3 PLANT COMMUNITIES DESCRIPTION

4.3.1 Communities Characteristics

Table 8 provides a summary of the main characteristics of the surveyed vegetation units with respect to species richness, community structure and soil conditions. This information is detailed on fact sheets for the different vegetation units (Attachment 14).

There was a tremendous variation in species richness among the vegetation units. Total species richness varied from 6 to 58 species (or taxa) observed per vegetation unit for plots established in April 2006. Mean local species richness per vegetation unit varied from 3 to 14.8 species/square meters. Total species richness and local species richness were highly correlated ($r^2 = 0.64$, $p < 0.05$).

Table 8 **Summary of Vegetation Unit Characteristics**

Vegetation Unit	Species Diversity[a]		Plant Community Structure[a]			Soil Heavy Metals Concentrations (milligrams per kilogram) and pH [d]					
	Total[b]	Mean[c]	Rock Cover (percent)	Herb Cover (percent)	Maximum Height (centimeters)	Cu	Pb	Zn	Co	Cd	pH
XSt1-KWA	18	7.6 (1.9)[b]	45 (37)[c]	47 (13)[a]	46 (9)[a] [b] [c] [d]	6067 (2800–8200)	14.5 (3.3–35.0)	5.1 (0.4–13.0)	137.7 (65.0–240.0)	0.4 (0–1)	6.0 (5.9–6.2)
TrSt1-KWA-1	36	10.0 (1.6)[b] [c] [d]	0 [a]	77 (22)[a] [b] [c] [d]	102 (40)[e]	2572 (385–6850)	1.6 (0.7–2.6)	1.3 (1.0–1.9)	3.5 (2.5–5.2)	0.0 (–)	5.6 (5.4–6.0)
StS1-KWA	39	12.6 (2.7)[c] [d] [e]	0[a]	96 (5)[b] [c] [d]	98 (37)[e]	720 (130–1850)	1.8 (0.7–2.7)	1.1 (0.5–2.0)	12.8 (0.5–15.0)	0.0 (–)	5.4 (5.3–5.7)
HStS-KA	53	13.4 (2.6)[d] [e]	0[a]	100 (0)[d]	116 (32)	367 (310–450)	5.8 (4.8–6.9)	3.5 (3.4–3.5)	17.7 (15.0–21.0)	0.1 (–)	5.8 (–)
RStS3-KA-SE	20	8.8 (1.8)[b] [c]	30[b] [c]	58 (26)[a] [b]	96 (35)[e]	227 (85–350)	1.2 (1.0–1.3)	0.9 (0.7–1.1)	18.2 (9.7–23.0)	0.0 (–)	5.3 (5.2–5.5)
RStS4-KA-SE	22	11.0 (2.2)[b] [c] [d] [e]	0[a]	68 (16)[a] [b] [c]	80 (12)[c] [d] [e]	47 (23–80)	1.6 (1.2–2.1)	0.9 (0.8–1.3)	24.3 (11.0–49.0)	0.0 (–)	5.5 (5.4–5.7)
RStS7-KWA	33	14.0 (1.9)[d] [e]	24 (15)[b] [c]	90 (22)[b] [c] [d]	34 (11)[a] [b] [c]	48 (33–66)	1.9 (1.5–3.0)	0.9 (0.8–1.2)	19.7 (13.0–27.0)	0.0 (–)	5.4 (5.3–5.5)
RStS6-GO	31	8.8 (1.8)[b] [c]	38 (21)[b] [c]	56 (13)[a]	82 (13)[d] [e]	348 (260–490)	2.0 (1.8–2.4)	1.1 (0.9–1.2)	50.0 (38.0–64.0)	0.0 (–)	5.6 (5.5–5.7)
StS2-KAB	35	14.2 (1.5)[d] [e]	0[a]	98 (4)[c] [d]	66 (21)[a] [b] [c] [d] [e]	393 (260–565)	2.7 (2.1–2.8)	1.7 (1.6–1.8)	5.4 (2.2–10.0)	0.0 (–)	5.4 (5.3–5.5)
StS3-SHI	27	10.8 (1.5)[b] [c] [d]	52 (14)[c]	60 (33)[a] [b]	88 (13)[d] [e]	62 (53–77)	1.7 (1.6–1.8)	1.0 (–)	5.1 (4.6–6.1)	0.0 (–)	5.2 (5.0–5.3)
XSt2-KAB	17	6.8 (0.8)[a] [b]	50 (0)[c]	40 (0)[a]	25 (0)[a] [b]	– [e]	–	–	–	–	–
StS4-KAB	35	16.0 (2.9)	8 (8)[a] [b]	74 (11)[a] [b] [c] [d]	20 (0)[a]	272 (85–366)	4.9 (1.6–8.3)	1.3 (1.1–1.5)	10.6 (7.1–15.0)	0.0 (–)	5.5 (5.4–6.0)
StS5-KAK	58	14.6 (1.1)[e]	0[a]	94 (8)[b] [c] [d]	32 (4)[a] [b]	229 (211–264)	1.8 (1.3–2.3)	1.1 (0.9–1.3)	6.3 (5.4–7.4)	0.0 (–)	5.4 (5.2–5.5)
LW-FUN	6	3.0 (1.6)[a]	0[a]	96 (5)[b] [c] [d]	70 (0)[b] [c] [d] [e]	2365 (1975–2900)	16.0 (12.0–23.0)	4.3 (2.7–7.6)	163.7 (99.0–240.0)	0.1 (–)	6.5 (6.5–6.6)

[a] When present, different letters denote statistically significant differences in means between vegetation units. Standard error of the mean is presented in parenthesis.

[b] Total species richness based on April 2006 survey.

[c] Mean species richness at 1 m² scale.

[d] Mean (and range) heavy metal concentration in top 10 soil cm; Cu = copper; Zn = zinc; Pb = lead; Co = cobalt; Cd = cadmium.

[e] No data.

The vegetation unit expressing a low species richness value was represented by the Rendlia lawn (LW-FUM) unit at both the local and global scale. Conversely, the vegetation unit expressing a high species richness value was represented by the StS4-KAB and StS5-KAK units. In general, there was a decrease in species richness (both globally and locally) from Xerophyta steppes to typical steppe savannahs.

The structure of plant communities ranged from open rocky low grasslands, typical of Xerophyta steppe (XSt1-KWA, XSt2-KAB) to closed non-rocky tall grasslands (HStS-KA) with all the intermediary structure corresponding to different combinations of openness and height. Vegetation units displayed a tremendous variability of structure. Percent apparent rocks and vegetation cover were significantly correlated ($r = -0.71$, $p < 0.05$) indicating an influence of the nature of the substrate on the vegetation structure. In contrast, no significant relationship ($p < 0.05$) was found between vegetation height and other structural parameters (percent apparent rocks and vegetation cover).

Heavy metal concentrations correspond to heavy metal elements available for plants (i.e., extraction method for the bio-available portion). Consequently, the values observed may be lower than those reported in the classical literature on copper hills that generally considered total concentrations. Available concentrations were chosen because they are more representative of the plants and plant community requirements. These values may be compared to a soil reference situated in a zone without high quantities of heavy metals analyzed using the same methodology (University of Lubumbashi: copper: 48 milligrams per kilogram; zinc: 11.0 milligrams per kilogram; lead: 8.7 milligrams per kilogram; cobalt: 3.1 milligrams per kilogram; cadmium: 0.70 milligrams per kilogram). Cadmium concentrations were most often under the detection level of the method. Zinc and lead did not display concentrations different from the reference soil. Only copper and cobalt were present in concentrations that generally exceeded those found in the reference soil.

Table 9 depicts the ratios of heavy metal concentration in soils of the surveyed vegetation units to heavy metal concentrations in a reference soil. For zinc, ratios range from 1 to 126. For cobalt, ratios range from 1.6 to 53. In addition to the variation of concentrations for individual elements, different combinations of heavy metal excess were found among the different vegetation units:

- Very high excess of copper and cobalt (XSt1-KWA; LW-FUN).
- High excess of copper with no excess of cobalt (TrSt1-KWA-1).
- Moderately high excess of copper with very low excess of cobalt (StS2-KAB).

- Moderately high excess of cobalt with very low excess of copper (RStS7-KWA, RStS4-KA-SE).
- Moderately high excess of copper and cobalt (all others to the exception of StS3-SHI).

In one case (StS3-SHI), there were no significant levels of heavy metal ($p<0.05$). Further analysis of this vegetation unit is needed to understand its ecological conditions. The variations in soil conditions underline the very complex nature of the ecological characteristics of vegetation units on copper hills and the need to take into account the very precise nature of the native environment of those communities to plan restoration actions. In contrast to heavy metal, pH was less variable ranging from 5.2 to 6.5.

Table 9 Ratios of Copper-Cobalt Soil to Reference Soil among Sampled Vegetation Units

Vegetation Unit	Copper Concentrations (milligrams per kilogram)	Copper Ratio	Cobalt Concentrations (milligrams per kilogram)	Cobalt Ratio
XSt1-KWA	6067 (2800–8200)	126.4	137.7 (65.0–240.0)	44.1
TrSt1-KWA-1	2572 (385–6850)	53.6	3.5 (2.5–5.2)	1.1
StS1-KWA	720 (130–1850)	15.0	12.8 (0.5–15.0)	4.1
HStS-KA	367 (310–450)	7.6	17.7 (15.0–21.0)	5.7
RStS3-KA-SE	227 (85–350)	4.7	18.2 (9.7–23.0)	5.9
RStS4-KA-SE	47 (23–80)	1.0	24.3 (11.0–49.0)	7.8
RStS7-KWA	48 (33–66)	1.0	19.7 (13.0–27.0)	6.4
RStS6-GO	348 (260–490)	7.3	50.0 (38.0–64.0)	16.1
StS2-KAB	393 (260–565)	8.2	5.4 (2.2–10.0)	1.7
StS3-SHI	62 (53–77)	1.3	5.1 (4.6–4.1)	1.7
StS4-KAB	272 (85–366)	5.7	10.6 (7.1–15.0)	3.4
StS5-KAK	229 (211–264)	4.8	6.3 (5.4–7.4)	2.0
LW-FUN	2365 (1975–2900)	49.3	163.7 (99.0–240.0)	52.8
reference	48		3.1	

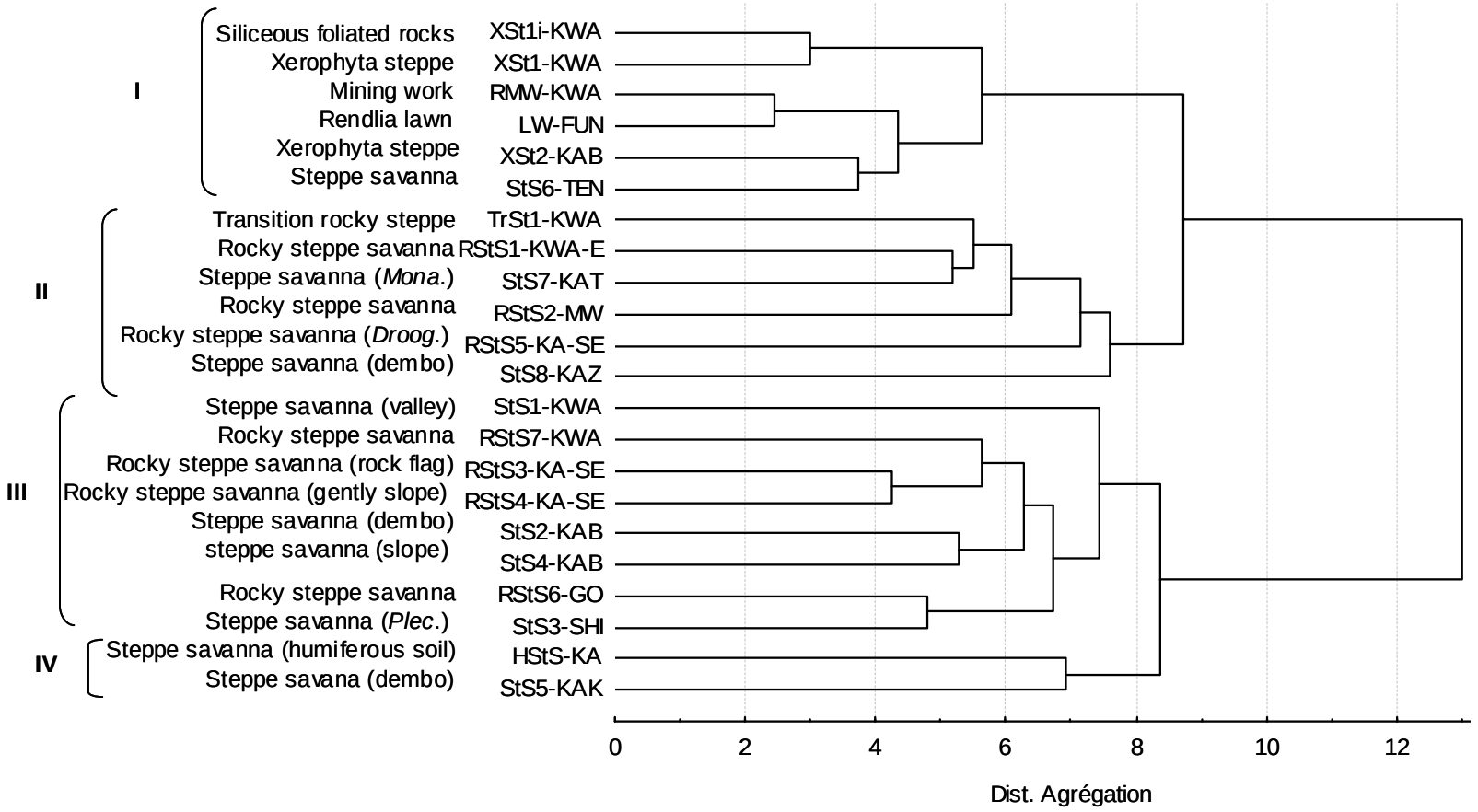
4.3.2 Beta-diversity and Community Similarity

Figure 1 depicts the floristic similarity and differences among vegetation units estimated on the basis of the global list of species, using presence/absence data, Euclidian distances and followed by Ward's grouping method. The first division of the dendrogram issued from the classification clearly separates groups of vegetation on more shallow soils from groups of vegetation on more deeply structured soils.

Beside the first division, four main groups of vegetation units can be identified at the level of 60 percent aggregation. One of the striking results of the classification is the evidence of very low level of floristic similarity among most of the vegetation units surveyed. Indeed, branching of single units in the dendrogram were most often observed at distances higher than one third the maximum aggregation distance.

Group I mainly contains vegetation units developed on harsh rocky substrate including Xerophyta steppes but also vegetation units that colonize mining work wastes or mining bare soils (Rendlia lawn). However, the mining works (RNW-KWA) and Rendlia lawn (LW-FUN) represent very impoverished communities as compared to Xerophyta steppe, despite their apparent floristic similarity. The grouping of these artificial vegetation units with the spontaneous Xerophtyta steppe may in part come from the fact that the analysis was based on presence/absence data. Based on total species cover estimates and visual inspection of the survey sites, it was evident that Rendlia lawn was quite different from any other vegetation unit, as Rendlia altera formed continuous cover and almost monospecific stands (only a mean of three species per one square meter plot). Then, Rendlia lawn and mining work vegetation form specific communities that are not equivalent to spontaneous Xerophyta steppe and can not serve as mitigation communities for the alteration of the very specific Xerophyta steppe communities.

Figure 1 Clustering of Vegetation Units Based on Floristic Similarity

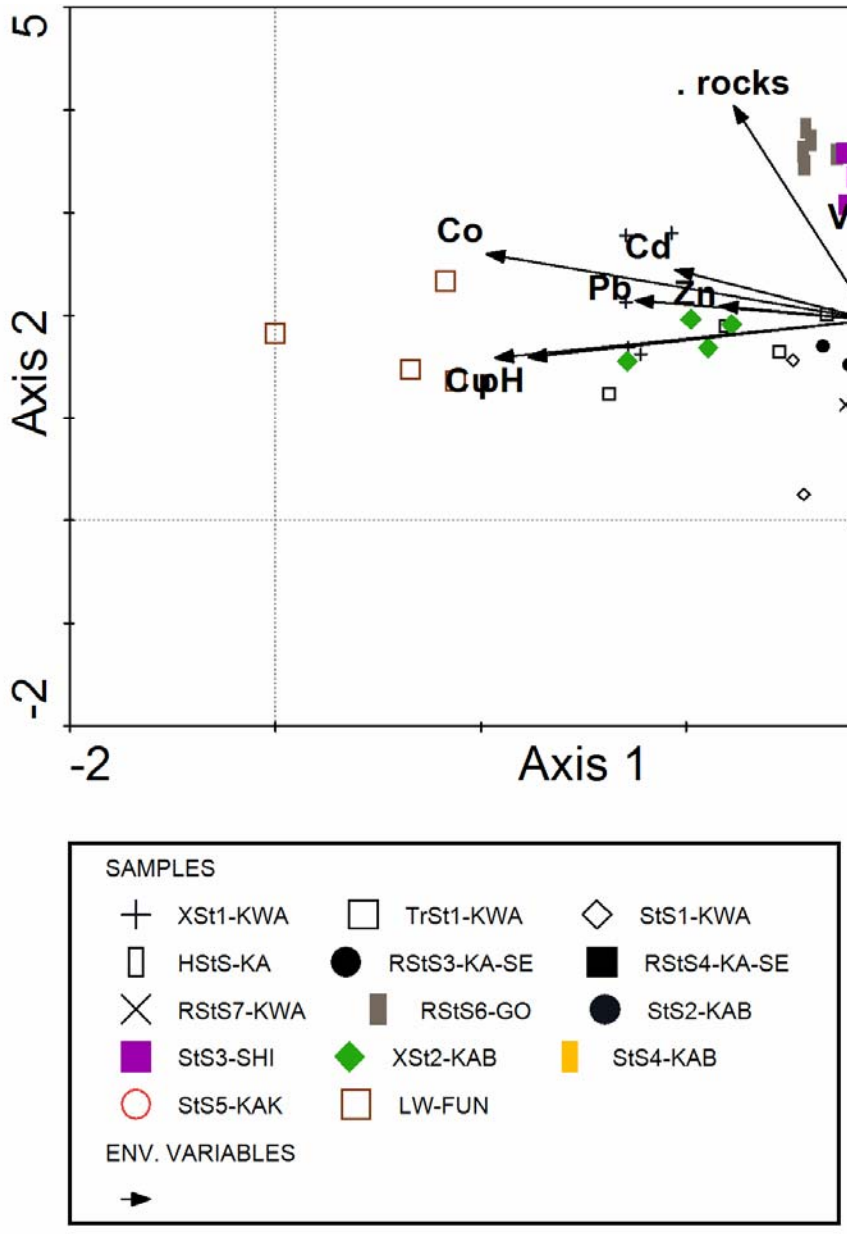


Other groups are more difficult to separate and do not fit exactly the plant formation classification used in the field. This underlines the very complex nature of those vegetation units and the possible interactions of many factors in shaping the floristic composition of those communities. It also stresses the need for a detailed floristic survey that complements the global plant formation assessment and mapping. Group II tends to represent the majority of the vegetation units that have developed on a rocky substrate. This underlines the importance of habitat xericity in shaping plant communities on copper hills. Group III is more heterogeneous containing both rocky steppes and true steppe savannahs. Group IV is composed of only two vegetation units with the very particular and original vegetation units of humiferous steppe savannah from Kavifwafwaulu (HsTs-Ka). Globally, the water status of the soil seems to be an important factor of floristic similarities among vegetation units and should be taken into account when planning translocation or communities reconstruction.

Figure 2 depicts an ordination scatter plot of vegetation u based on a detrended correspondence analysis (DCA). The analysis takes provides the relationships between species composition of the vegetation units, soil conditions and vegetation structure. Vegetation quadrants from vegetation unit LW-FUN were clearly separated from other vegetation units. This corresponds to the Rendlia lawn unit and again underlines the dissimilarity of this unit with all other vegetation units. Together, axis 1 and axis 2 of the DCA explains 28 percent of the species-environment relationship variability.

Positions of the relevés along axis 1 were highly correlated to copper and cobalt content within the top 10 centimeters of soil. Position of the relevés along axis 1 also reflects a xericity gradient with clear opposition among Xerophyta steppes and steppe savannahs with humid steppe savannah situated at the extreme positive value (HSts-Ka). In contrast, rocky steppe savannah and typical steppe savannah were not clearly differentiated. Axis 2 mainly differentiates among steppe savannah units as differentiation between steppe savannah and Xerophyta steppes was already taken into account in the variability explained by axis 1. Positions of the relevés along axis 2 were correlated to soil and vegetation structure (percent rock cover and percent vegetation cover). As the two factors were highly correlated, it should be interpreted as an influence of percent cover on floristic composition. This indicates that within steppe savannah vegetation, the physical structure of the soil may be a determinant of floristic composition.

Figure 2 **Ordination Scatter Plot of Vegetation Units Derived from Detrended Correspondence Analysis (DCA)**



Because of the very specific nature of the Rendlia lawn vegetation unit, DCA was rerun without data from these units (Figure 3). Results were nevertheless rather similar. Axis 1 and 2 accounted for 24 percent of species-environment variation. On axis 1, Xerophyta steppes separated clearly from other vegetation units. The axis was correlated to all soil parameters with copper and cobalt showing the highest correlation ($r = -0.77$ and $r = -0.54$, respectively) followed by pH and cadmium to a lesser degree ($r = -0.40$ and $r = -0.38$). The influence of heavy metal was mainly due to the higher values observed in Xerophyta steppes. Percent rock cover was also highly correlated to axis 1 ($r = -0.44$). Axis 2 was correlated to vegetation structure.

Species-area relationships were evaluated in six vegetation units, namely two Xerophyta steppes and four steppe savannahs (Figure 4). While the specie-area curve reaches its asymptote at 10 square meters for Xerophyta steppes, maximum species richness was not attained for the maximum area studied (32 square meters) for the other vegetation units. Those results point to different minimal ecosystem surface areas to protect or translocate representative plant species to maintain floristic diversity of each vegetation unit. For Xerophyta steppes, translocation of different small ecosystem surfaces may be sufficient to ensure representativeness of the vegetation unit (but without any insurance on small population viability). For steppe savannahs, minimal areas need to be determined for each vegetation unit.

4.4 RECOMMENDATIONS

4.4.1 Strategies for Copper-Cobalt Flora Conservation

Concerted efforts should be directed at protecting the native environments of metallophytes because mining activities will be located in the same place that rare and endangered plant species occur. For those sites containing copper-cobalt flora, it is necessary to consider alternative conservation strategies, including the establishment of metallophyte collections in seed banks, botanic gardens and ecosystem reconstruction (Whiting et al. 2004). A flora action plan and a flora biological diversity plan, built upon the recommendation that follow, are provided in Appendices D3.1-I and D3.1-II.

Figure 3 **Ordination Scatter Plot of Vegetation Units (Excluding Rendlia Lawn) Derived from Detrended Correspondence Analysis (DCA)**

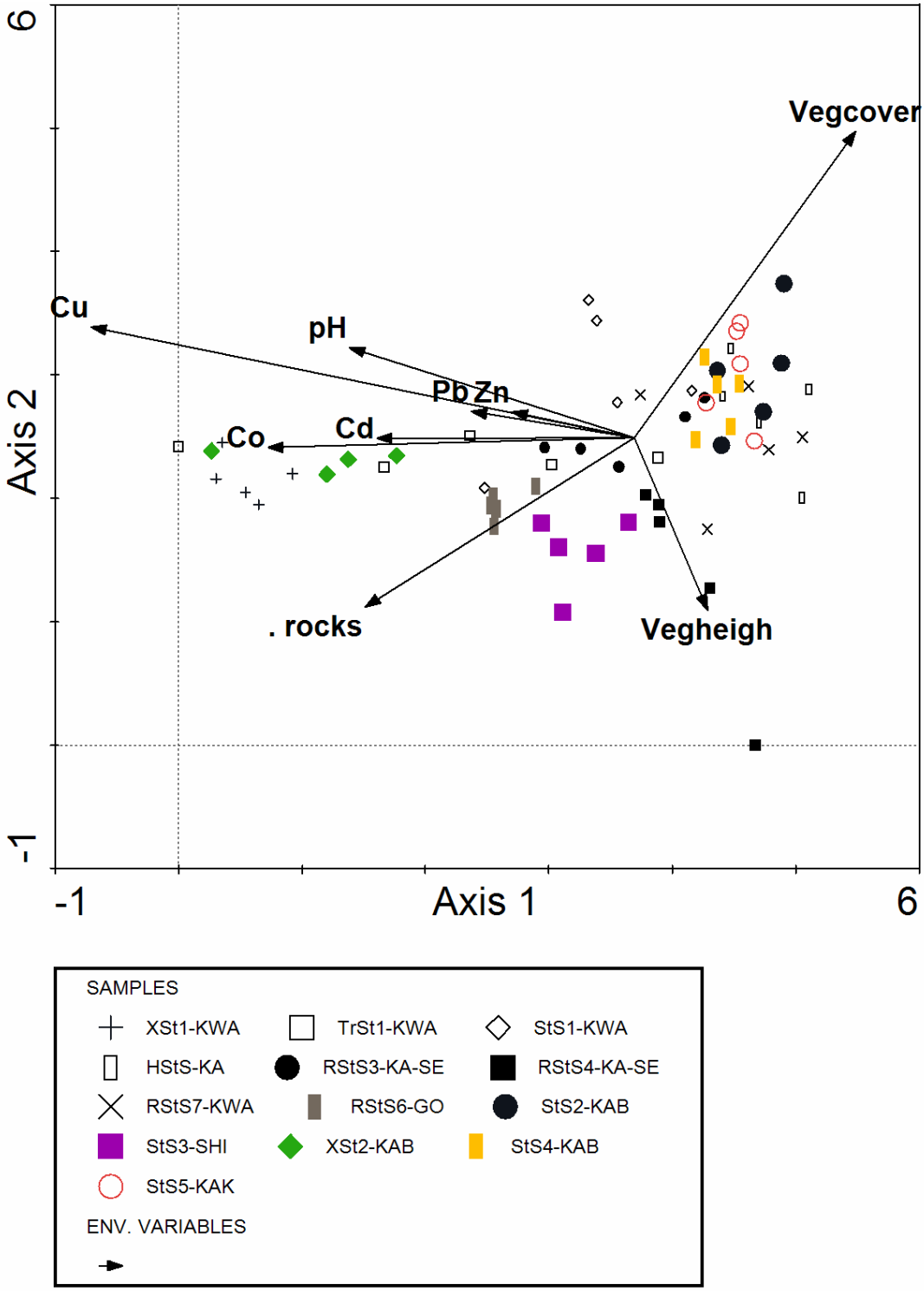
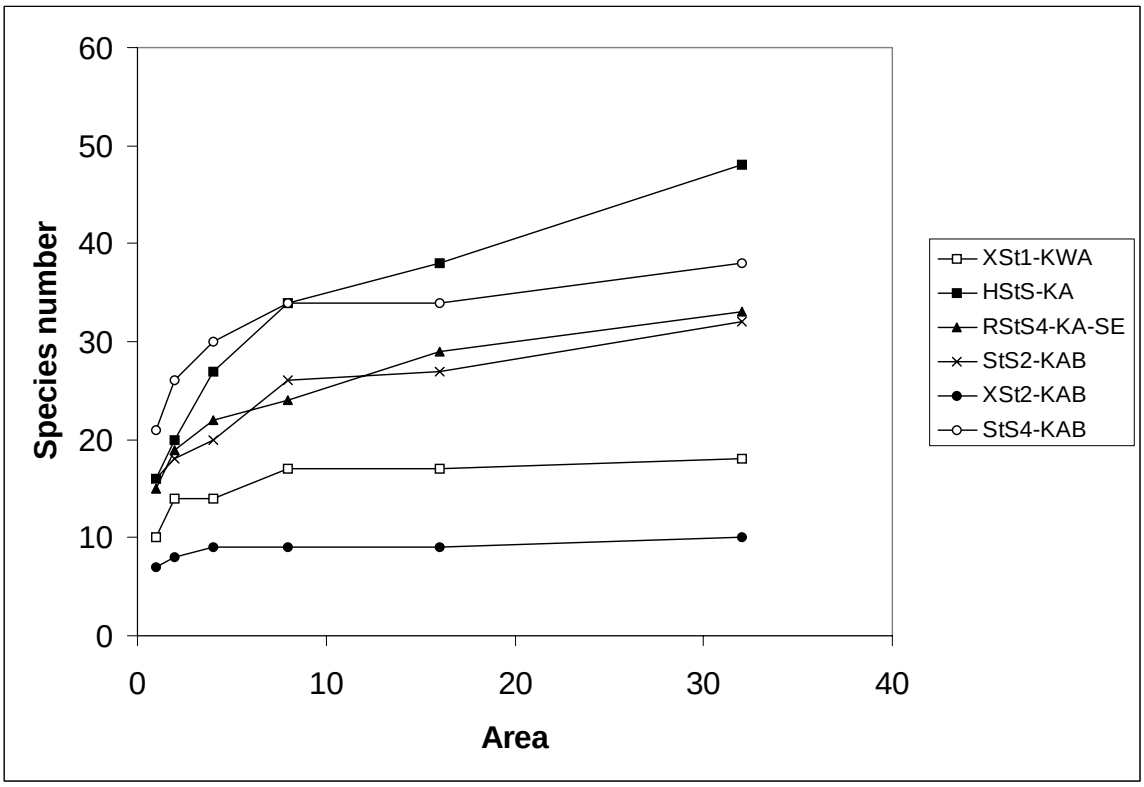


Figure 4 Species Area Relationships for Different Vegetation Units



Vegetation of copper hills is comprised of highly specialized plant communities, each being restricted to a particular combination of soil metal content, soil depth and texture, slope and water regime. In situ conservation is the only way to preserve the complexity of ecosystems developed on copper-rich substrates in Katanga. Three strategies may be considered to conserve these specialized plant communities:

- Conservation of intact hills.
- Conservation of intact ecosystems with a PMR strategy.
- Ecosystem reconstruction.

Conservation of intact hills (or portions of hills) is discussed below. However, due to the high economic value of those sites, it is clear that only a small sample of copper hills may be expected to be totally allotted to conservation.

To achieve a more comprehensive protection of plant diversity in plant-rich territories, a small scale approach to plant conservation is advocated (Cowling and Bond 1991; Medail and Quezel 1999). PMRs are a relatively recent concept and a novel approach for the conservation and management of populations of threatened and rare plant species (Laguna et al. 2001, 2004). PMRs are small plots of land of peak value in terms of plant species richness, endemism or rarity, given over to long-term monitoring and conservation of plant species and vegetation types. Within PMRs, active management of vegetation plots and protected plant populations is carried out – seed collection and storage, population reinforcements and introductions, herbivore exclusion, scrub clearance, restoration of suitable environmental conditions, population monitoring. Thus, PMRs are designed to conserve vegetation and to develop or test active conservation methods that bring together ex situ and in situ actions (Laguna et al. 2004).

Another strategy that may be considered is the relocation of threatened populations to reconstructed sites. Mining activities produce large amounts of waste rock with relatively low grade mineral content. Landscape restoration and rehabilitation is compulsory under the terms of the Congolese environmental legislation. Such deposits might be used to recreate “artificial hills” on which metallicolous ecosystems might be reconstructed. Such sites may be recolonised either by moving entire “pieces of ecosystems” (using facilities from the mining activities) by sowing seeds from natural sites or by planting species propagated from a botanical garden (Leteinturier 2002).

4.4.2 Developing a PMR approach

In the context of TFM, it is proposed that identification of locations should focus on vegetation unit of interest identified in the assessment and that within those vegetation units delimitation of PMRs take into account primarily the locations of rare species of concern identified in the report. Ideally, PMRs locations should encompass populations (or a representative part of populations) of rare species of concern. When it is not possible, due to mining activities constraints, PMR locations should focus on representative part of vegetation units where environmental condition are adequate for further translocation/reintroduction of rare species of concern.

When a mineral exploitation scheme of a site does not disturb all ground surfaces, an evaluation of the conservation value of the potential remnants should be conducted. This evaluation should take into account the following:

- Representativeness of the flora hosted by those remnants as compared to the flora of the site.
- Do the remnants host rare plant species population.
- The size and structure of the population in the remnant with a crude population viability assessment.

In collaboration with mining planners, the possibility to keep those remnants with conservation value intact should be considered. This would include an evaluation of the direct and indirect impacts of mining activities on the integrity of the remnants and the development of management plans to avoid accidental degradation of those remnants.

Those remnants should be erected in small protection areas and may serve as sites for transplantation of species not included in the remnant areas. Potentially, population reinforcement should be considered if viability of plant populations is threatened by habitat surface reduction.

Two measures are proposed to safeguard target species that are highly threatened:

1. A temporary PMR was defined for *Cheilanthes* sp. nov on Kwatebala 4, which encompass a trench where the fern grows. This trench will be delimited and its purpose should be clearly indicated (sign, special color for environmental zones) before translocation of the target species.

2. Remnant individuals of *Basananthe kisimbae* still present on Kwatebala West should be individually marked in order to be protected until their transfer to another place (to be defined).

4.4.3 Ecosystem Reconstruction

When there are no options available to explore high value in situ conservation, ecosystem reconstruction outside of the mining activity zone may be considered. The characterization of vegetation units in the TFM area provided some preliminary insight into the site factors that should be considered when attempting to reconstruct complex ecosystems of the copper-cobalt vegetation.

The first insight gained from the current investigation is evidence of the very particular combination of environmental conditions of the vegetation units explored. Taking heavy metal conditions, substrate rockiness and resulting vegetation structure, it appears that most vegetation units are characterized by a particular set of environmental conditions. This clearly demonstrates that more study is required of the vegetation units before any attempt of reconstruction is initiated.

Besides the particularities of each vegetation unit, some general guidelines should be taken into account when planning to reconstruct these complex ecosystems:

- The reconstruction of different vegetation units need to consider different substrates with different combinations of copper an cobalt content including at least the following combinations:
  - copper rich/cobalt poor.
  - copper rich/cobalt rich.
  - copper moderately rich/cobalt poor.
  - copper poor/cobalt moderately rich.
  - copper moderately rich/cobalt moderately rich.
- Associated with this variation, a gradient of proportion of rocks on the surface and in the soil will also have to be considered.
- Our interpretations of community similarity pointed to the potential role of the water content of the soil and humus development. Those characteristics of the vegetation units and total soil depth need to be studied directly in more details in a future mission as well. We can also hypothesised that nutrient status may play a significant role in relation to

humus development while this hypothesis is not well supported by the low variation of pH.

- Species-areas relationships point to the difference in minimal areas to translocate ecosystems depending upon the vegetation unit. For Xerophyta steppes, translocation of different small ecosystem surfaces may be sufficient to ensure representativeness of the sampling (however without any insurance on small population viability). For steppe savannah, minimal areas need to be determined for each vegetation unit.

4.4.4 Transplant Site

Candidate areas suitable for transplanting are not readily evident within the LSA. Indeed the study indicates that several vegetation units are restricted to one copper outcrop and that no identical ecological conditions occur elsewhere. It may be possible to construct a man-made substratum outside of the proposed footprint to transplant rare or endangered flora.

The location would need to be protected and under control of TFM to avoid disturbance and outside the bounds of traffic. This site may be regarded as an "Ecosystem Reconstruction Area". Large rocks where rare plants are hosted could be moved into this Botanic Garden.

4.4.5 Off-site Conservation Areas

Off-site conservation areas would be protected to ensure there are remnant copper-cobalt floral communities in the region that represent the communities that will be impacted by the project. Due to the high dissimilarity among vegetation units observed during recent surveys, it is improbable that such an area can be found. However, conservation areas could focus on sites that host particularly high species richness and/or high density of rare plant species.

Additional botanical surveys will be undertaken prior to construction if conservation areas are to be created within the concession.

4.4.6 Training of TFM Employee

There is the need for a permanent position for the flora work. Within this capacity building objective, some courses of action were investigated including the possibility of developing local collaborations for the conservation of the copper flora along with the long term objective of leaning on feasible local skills.

During the November mission, one day was spent at the Faculty of Agronomy of the University of Lubumbashi in order to learn about an ongoing project on the copper flora and to visit their propagation facilities.

The project entitled “Plant biology and environment: multiscale remediation of polluted soils” is a collaborative project between The Democratic Republic of Congo and Belgium, in which the laboratory of Ecology (FUSAGx) is involved. The project aims at developing local skills on flora conservation and remediation. As it is an educative project (master courses), the experimental part is just starting up. A botanical garden for the conservation of the copper flora is currently being set up. It is suggested to follow up the development of this project and to consider a potential future collaboration if suitable and profitable for both parties.

ATTACHMENT 1

DETERMINATION OF EFFORT FOR THE FUTURE

A large amount of vouchers collected in the TFM area from several surveys have yet to be identified. The Dikumbwa-Kisimba-Muzinga collection represents the top priority of plants to be identified from sampled in the TFM area collected in 1997. Many vouchers collected in January, February, April, May, August and November 2006 also need to be identified.

Table 1-1 presents the identification effort that remains to be done for the survey in April and May, 2006. Priority will be given to genera with the greatest chance of identifying new species including: Cheilanthes, Pellaea, Thesium, Monadenium, Vigna, Tephrosia, Humularia, Commelina and Cyanotis.

Table 1-1 Taxa with Further Determination at Species Level Required

Family	Collection Number for M-Kis-Sa Collection	Total Number of Vouchers
Acanthaceae	72, 114, 116, 142, 168, 172, 255, 271, 278, 280, 288, 294, 457, 462, 482, 525, 536	17
Apiaceae	473, 494, 503	3
Asteraceae	83, 112, 143, 169, 174, 177, 189, 196, 211, 215, 220, 224, 230, 231, 241, 259, 273, 276, 277, 297, 301, 302, 303, 315, 319, 328, 349, 357, 370, 385, 401, 407, 414, 427, 429, 439, 444, 480, 485, 510, 522	41
Campanulaceae	133, 171, 292, 333	4
Commelinaceae	94, 116, 155, 175, 188, 222, 237, 281, 289, 296, 312, 323, 376, 388, 428, 509	16
Convolvulaceae	93, 245	2
Cyperaceae	108, 109 , 110, 111, 141, 147, 197, 210, 240, 340, 409, 410, 436, 470, 483, 517	16
Dipsacaceae	262, 317	2
Euphorbiaceae	137, 486	2
Fabaceae	71, 74, 82, 84, 90, 112, 127, 149, 150, 153, 161, 164, 178, 179, 185, 186, 192, 195, 201, 203, 204, 217, 249, 253, 257, 263, 268, 270, 275, 306, 311, 356, 358, 359, 360, 384, 389, 391, 395, 397, 400, 403, 408, 411, 421, 452, 454, 460, 490, 493, 497, 500, 501, 502, 506, 511, 513, 518, 528	59
Gentianaceae	156, 366, 623	3
Iridaceae	88, 144, 148, 216, 362, 376, 416, 446, 463, 471, 478, 526	12
Lamiaceae	170, 261, 264, 450, 495, 521	6
Lichens	415, 479	2
Liliaceae	265, 291, 298, 299, 331, 377, 387, 467	8
Melastomataceae	240, 524	2
Musci	305, 310, 380, 465	4
Ophioglossaceae	200, 272	2
Orchidaceae	338, 339, 453	3
Pteridophyta	382, 474, 475; Pellaea 466; Cheilanthes 98, 131	6

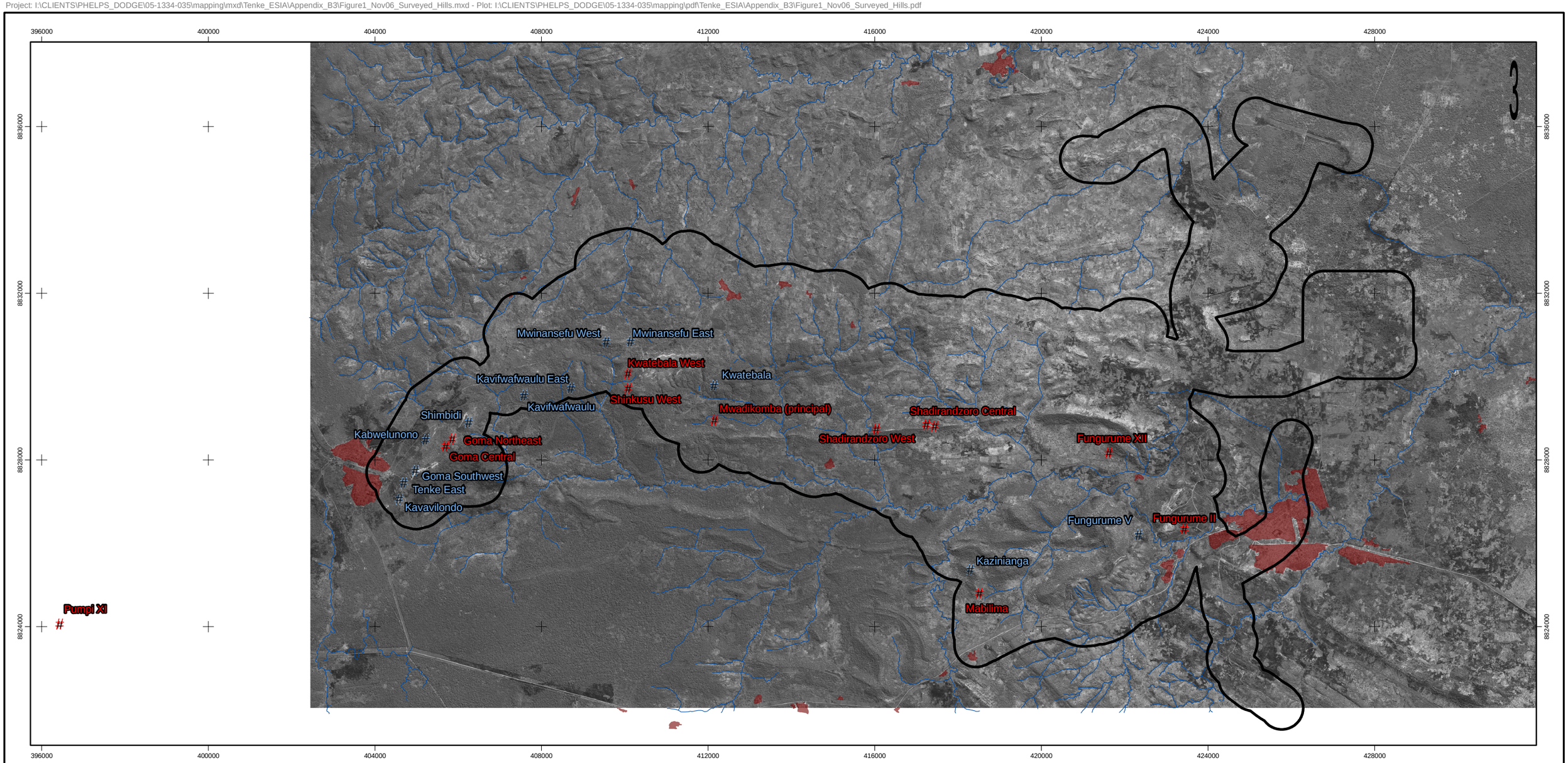
Table 1-1 Taxa with Further Determination at Species Level Required (continued)

Poaceae	70, 107, 136, 175, 163, 167, 182, 184, 206, 235, 258, 292, 350, 351, 352, 367, 371, 412, 417, 418, 489, 491	21
Polygalaceae	62, 89, 105, 126, 212, 392, 445, 448, 476, 498, 529	11
Proteaceae	118, 267	2
Rubiaceae	102, 113, 129, 191, 234, 254, 267, 274, 287, 337, 369, 406, 469, 488, 512, 515	16
Santalaceae	73, 117, 159, 187, 198, 221, 229, 322 422, 449, 508	11
Scrophulariaceae	75, 87, 124, 181, 207, 225, 248, 295, 320, 355, 398, 437, 443, 455, 477, 492, 519, 531	18
Total number of vouchers where determination is needed		**289**
Total number of vouchers where determination is known		**243**

Also note that 11 taxa from the April and May, 2006 survey still need to be assessed to the genus level. These include the following voucher numbers from the M-Kis-Sa collection: 125, 135, 183, 190, 334, 335, 364, 413, 442, 514 and 516.

ATTACHMENT 2

SITE NOMENCLATURE AND LOCATIONS



LÉGENDE / LEGEND

COLLINES CUPRIFÈRES ÉTUDIÉES AU COURS DES CAMPAGNES 2006 / COPPER HILLS SURVEYED DURING 2006 MISSIONS

- # NOVEMBRE 06 / NOVEMBER 06
- # AVANT DE NOVEMBER 06 / PRIOR TO NOVEMBER 06
- RIVIÈRE / RIVER
- RIVIÈRE INTERMITTENTE / SEASONAL RIVER
- ÉTABLISSEMENT HUMAIN / SETTLEMENT
- ZONE D'ÉTUDE LOCALE - TERRESTRE / LOCAL STUDY AREA - TERRESTRIAL

3 0 3

ÉCHELLE / SCALE 1:90000 / 1:90000 KILOMÈTRES / KILOMETERS

RÉFÉRENCE / REFERENCE

Projection : Mercator transverse. Système géodésique : WGS 84 Système de coordonnées : UTM Zone 35S / Projection: Transverse Mercator Datum: WGS 84 Coordinate System: UTM Zone 35S

PROJET / PROJECT

tfm

PROJET MINIER TENKE FUNGURUME
TENKE FUNGURUME PROJECT
TENKE FUNGURUME MINING SARL

TITRE / TITLE

COLLINES CUPRIFÈRES ÉTUDIÉES AU COURS DES CAMPAGNES 2006 / COPPER HILLS SURVEYED DURING 2006 MISSIONS

Golder Associates
Calgary, Alberta

N° PROJET / PROJECT NO. 05-1334-035			ÉCHELLE TELLE QU'INDIQUÉE / SCALE AS SHOWN	REV. 0
DESSIN / DESIGN	CW	02 Feb. 2007		
GIS / SIG	AC	29 Mar. 2007		
VÉRIFIÉ / CHECK	MR	29 Mar. 2007		
APPROUVÉ / REVIEW	MR	29 Mar. 2007		

FIGURE: 1

Table 1 List of Copper-Cobalt Sites in TFM Area

Copper-Cobalt Hill [(a)]	Mean or Range in Altitude (m)	Area (ha)
Fungurume I	1200-1248	
Fungurume II	1210-1269	
Fungurume III	1210-1294	
Fungurume IV	1230-1281	
Fungurume V north	1180-1292	
Fungurume V south-west	1270-1394	
Fungurume VI	1317-1407	
Fungurume VII		
Fungurume VIII		
Fungurume IX		
Fungurume X		
Fungurume XI		
Katufungurume (= XII)	1225-1262	
Goma south-west	1475	32.4
Goma central		
Goma north-east		
Kabwelunono	1475	25.9
Kakalalwe		
Kakavilondo (=Apostolo)	1425	8.3
Kavifwafwaulu	1450	5.3
Kavifwafwaulu south-east		
Kazinyanga		
Kwatebala		
Kwatebala west (annexe 1)		
Mambilima	1300	
Mwadikomba I		
Mwadikomba II		
Mwinansefu		
Mwinansefu east		
Pumpi		
Shimbidi		
Shinkusu east		
Tenke east (=orthodoxe)		
Zikule	1350	

[(a)] For photographs of the sites see Attachment 15.

ATTACHMENT 3

PLANT COLLECTION EFFORTS ON COPPER–COBALT HILLS IN THE TENKE-FUNGURUME AREA

PLANT COLLECTION EFFORTS

Table 1 provides a list of copper-cobalt hills in the Tenke-Fungurume area along with the number of plant sample vouchers collected at each site. Voucher values are given in the form of xx(yy), this means that xx plant specimens were collected, but that only yy plant specimens still exist at the Belgian National Botanic Garden at Meise and that the complete collection that are supposed to exist at the Kew Royal Botanic Gardens has been destroyed.

The material is deposited in several herbaria. The collections of Duvigneaud (Duv), Plancke (Pl) and Ledocte (Led) are at the Laboratoire de Botanique systématique of the Brussels Free University, the Tropmetex collection is at the Kew Royal Botanic Gardens, the collection of Lisowski (L) is at the herbarium in Poznan, Poland, and the other collections are at the Belgian National Botanic Garden at Meise.

Plants collected from the hills of Kwatebala and Kavifwafwaulu are presently hosted at the Belgian National Botanic Garden at Meise.

Table 1 Plant Collection Efforts on Copper-Cobalt Hills in the Tenke-Fungurume Area

Copper-Cobalt Hill	Collector[(a)]	Date	Voucher Identifier	Number of Vouchers [(b)]
Kakavilondo	Duv	22 December 1959	4741-4742	27
Kakavilondo	M,Kis,Muz	9 June 1997	128-132	5
Kakavilondo	Lef,Let,M	17 November 2001	118-136	20
Tenke (=Kakavilondo)	Duv	22 December 1959	4743-4750	87
Tenke (=Kakavilondo)				1
Kabwelunono	Tropmetex	13 April 1990	256-274	19
Kabwelunono	M,Kis,Muz	9 June 1997	134-149	16
Kabwelunono	M	9 June 1997	14.946, 14.948	2
Kabwelunono	Dik,Kis,Muz	7-28 June .1997	151-194(disc.)	7(†)
Kabwelunono	Dik,Kis,Muz	15 September to 8 October 1997	526-569	44(26)
Kabwelunono	Dik,Kis,Muz	5-27 December 1997	794-842, 1079-1086	59(8)
Kabwelunono	Dik,Kis,Muz	27 February to 19 March 1998	1134-1199	66(27)
Kabwelunono	Dik,Kis,Muz	May to June 1998	1849, 1852-1879	29(20)
Kabwelunono	Lef,Let,M	16 November 2001	108-117	10
Shimbidi	M,Kis,Muz	9 June 1997	108-127	20
Shimbidi	Dik,Kis,Muz	15 September to 8 October 1997	406-448	43(25)
Shimbidi	Dik,Kis,Muz	5-27 December 1997	757-793, 1071-1078	45(5)
Shimbidi	Dik,Kis,Muz	27 February to 19 March 1998	1477-1546, 1698	71(2)
Shimbidi	Dik,Kis,Muz	May to June 1998	1881-1882, 1911, 1919-1956	41(30)
Kavifwafwaulu	M,Kis,Muz	9 June 1997	80-107	28
Kavifwafwaulu	Lef,Let,M	17 November 2001	137-154	18
Shikunsu				0
Mwinansefu				0
Kwatebala	Led	February 1960	s.n.	1
Kwatebala	M	29 January 1980	10.225-10.270	46
Kwatebala	M	31 May 1980	10.902-10.929	28
Kwatebala	M	3 July 1981	11.842-11.846	5
Kwatebala	M,Kis,Muz	7-8 June 1997	30-73	44
Kwatebala	M	8 June 1997	14.937-45, 47	10
Kwatebala	Dik,Kis,Muz	7-28 June 1997	160-250(disc.), 330-336, 346-348	42(2)
Kwatebala	Dik,Kis,Muz	15 September to 8 October 1997	353-405	53(45)

Table 1 Plant Collection Efforts on Copper-Cobalt Hills in the Tenke-Fungurume Area (continued)

Copper-Cobalt Hill	Collector[(a)]	Date	Voucher Identifier	Number of Vouchers [(b)]
Kwatebala	Dik,Kis,Muz	5-27 December 1997	697-755, 1061-1070	69(28)
Kwatebala	Dik,Kis,Muz	27 February to 19 March 1998	1200, 1202-1253, 1255-1272, 1274-1278	97(3)
Kwatebala	Dik,Kis,Muz	May to June 1998	1880, 1883-1910, 1912-1918	36(34)
Kwatebala	Lef,Let,M	16 November 2001	75-107	33
Madikomba I	M,KisMuz	9 June 1997	74-79	6
Madikomba I	Lef,Let,M	17 November 2001	155-169	15
Madikomba II				0
Mambilima	M,Kis,Muz	7 June 1997	10-23, 28,133	16
Mambilima	Let & M	20 April 2000	201-224	24
Kazinyanga	Let & M	20 April 2000	225-239	15
Zikule	M,Kis,Muz	7 June 1997	24-27	4
Goma	Led	1960	?	5
Goma	M	12 April 1980	10.571-10.573	3
Goma	M	18 April 1980	10.586-10.617	32
Goma	M	4 June 1981	11.790-11.794	5
Goma east	Dik,Kis,Muz	15 September to 8 October 1997	487-521, 524	36(21)
Goma east	Dik,Kis,Muz	5-27 December 1997	886-923, 1096-1102	45(12)
Goma east	Dik,Kis,Muz	27 February to 19 March 1998	1620-1697, 1700	79(6)
Goma east	Dik,Kis,Muz	v-vi.1998	1802-1809, 115-1825, 1848	20(13)
Goma west	Dik,Kis,Muz	15 September to 8 October 1997	449-486, 487b, 522-52	40(17)
Goma west	Dik,Kis,Muz	5-27 December 1997	84-885, 1087-1095	52(16)
Goma west	Dik,Kis,Muz	27 February to 19 March 1998	1547-1619	73(7)
Goma west	Dik,Kis,Muz	May to June 1998	1827-1847, 1960	22(13)
Fungurume general	Duv			297
Fungurume general	Duv	April 1957	2245, 2247	28
Fungurume general	Duv	5 May 1957	3022	4
Fungurume general	Duv	10 June 1957	3444-3449	44
Fungurume general	Duv	13 November 1959	4106-4115	68
Fungurume general	Duv	22 December 1959	4726-4740	66
Fungurume general	Pl	?		
Fungurume general	Bre	?		6
Fungurume general	Sym,DB,Schw	7 January 1971	18	?

Table 1 Plant Collection Efforts on Copper-Cobalt Hills in the Tenke-Fungurume Area (continued)

Copper-Cobalt Hill	Collector[(a)]	Date	Voucher Identifier	Number of Vouchers [(b)]
Fungurume general	Pau	April 1975	5352-536	12
Fungurume general	Emp	?		25
Fungurume general	S	?		28
Fungurume general	Wec	1977	?	6
Fungurume general	M,Go	May 1985	?	?
Fungurume I	Duv	4 May 1957	3013-3014	19
Fungurume I	Duv	13 November 1959	4116	11
Fungurume II	Duv	4-5 May 1957	3017-19, 21	28
Fungurume II	Dik,Kis,Muz	7-28 June 1997	302-325 (disc.)	13(†)
Fungurume II	Dik,Kis,Muz	15 September to 8 October 1997	616-660	45(14)
Fungurume II	Dik,Kis,Muz	5-27 December 1997	1018-1060, 1126-1134	51(5)
Fungurume II	Dik,Kis,Muz	27 February to 19 March 1998	1279-1338	60(1)
Fungurume II	Dik,Kis,Muz	May to June 1998	1698-1732	35(9)
Fungurume I-II	Lef,Let,M	18 November 2001	170-194	25
Fungurume III	Dik,Kis,Muz	15 September to 8 October 1997	661-688	28(1)
Fungurume III	Dik,Kis,Muz	5-27 December 1997	975-1017b, 1114-1125	66(17)
Fungurume III	Dik,Kis,Muz	27 February to 19 March 1998	1349-1398	50(1)
Fungurume III	Dik,Kis,Muz	May to June 1998	933-1964	33(13)
Fungurume IV	Duv	5 May 1957	3020	1
Fungurume IV	M	February 1977	9213-9239	27
Fungurume V	M	22 March 1974	7681-7695	15
Fungurume V	M	24 April 1974	7732-7855, 7888-7889	26
Fungurume V	M	13 February 1979	9672-9676	5
Fungurume V	M	28 November 1979	10130-10135	6
Fungurume V	M	11 February 1980	10330-10362	33
Fungurume V	M	11 April 1980	10524-10542	19
Fungurume V	M	11 April 1980	10574-10578	5
Fungurume V	M	10 January 1981	11451-11459	9
Fungurume V	M	23 January 1981	11535-11537	3
Fungurume V	M	19 March 1981	11687-11689	3
Fungurume V	M	27 July 1984	13164	1
Fungurume V	M,Gre	15 February 1978	1-123	123
Fungurume V	M,Kis,Muz	6 June 1997	1-9	9
Fungurume V	M,Rob	February 1982	?	42
Fungurume V	Tropmetex	6 April 1990	120-180	61

Table 1 Plant Collection Efforts on Copper-Cobalt Hills in the Tenke-Fungurume Area (continued)

Copper-Cobalt Hill	Collector[(a)]	Date	Voucher Identifier	Number of Vouchers [(b)]
Fungurume V	Bod,M,Go	May 1985	1076-82,87-88	11
Fungurume V	Lef,Let,M	18 November 2001	195-200	6
Fungurume VI	Dik,Kis,Muz	7-28 June 1997	260-301 (disc.), 338-340, 350-352	18(†)
Fungurume VI	Dik,Kis,Muz	15 September to 8 October 1997	570-615	46(27)
Fungurume VI	Dik,Kis,Muz	5-27 December 1997	924-974, 1103-1113	62(16)
Fungurume VI	Dik,Kis,Muz	27 February to 19 March 1998	139-1476, 1701	79(2)
Fungurume VI	Dik,Kis,Muz	May to June 1998	1768-1801, 1826, 1959	36(19)
Fungurume VII				0
Fungurume VIII				0
Fungurume IX				0
Fungurume X				0
Fungurume XI				0
Fungurume XII				0
collections in the TFM area				
	L	to be completed		
	Woolhouse	idem		

(a) Name of Collector: Bod = Bodenghien; Bre = Breyne; DB = De Bilde; Duv = Duvigneaud; Emp = Empain; Go = Goetghebeur; Gre = Gregoire; Kis = Kisimba; L = Lisowski; Led = Ledocte; Lef = Lefèbvre; Let = Leteinturier; M = Malaisse; Muz = Muzinga; Pau = Pauwels; Pl = Plancke; Schw = Schwind; Sym = Symoens; Tropmetex = Baker, Brooks, Malaisse and Schats; Wec = Wechuyzen.

(b) † = Material collected but presently destroyed or lost.

ATTACHMENT 4

DIKUMBWA, KISIMBA AND MUZINGA COLLECTION

Table 1 outlines the plant collecting efforts by Dikumbwa, Kisimba and Muzinga in the Tenke-Fungurume area during the 1997-98 period.

Table 2 provides a list of existing plant specimens from the collection efforts of Dikumbwa, Kisimba and Muzinga at the Belgian National Botanic Garden at Meise (i.e., after destruction of the main collection hosted in Maidenhead, U.K.). Of the 1,691 plant specimens originally collected, approximately 491 still exist.

Table 1 Dikumbwa, Kisimba and Muzinga Collection

Date (Day, Month, Year)	Number of Plant Collection from Each Copper-Cobalt Hill								Total
	Kwatebala	Kabwelunono	Shimbidi	Goma E	Goma W	Fungurume II	Fungurume III	Fungurume VI	
7-28/06/1997	>42	>7	0	0	0	>13	0	>18	> 80
15/09-8./10/1997	53	44	43	36	40	45	28	46	335
5-27/12/1997	69	59	45	45	52	51	66	62	449
27/02-19/03/1998	97	66	71	79	73	60	50	79	575
05-06/1998	36	29	41	20	22	35	33	36	252
Total	**297**	**205**	**200**	**180**	**187**	**204**	**177**	**241**	**1,691**

Table 2 Dikumbwa, Kisimba and Muzinga Collection at the Belgian National Botanic Gardens

Date (Day, Month, Year)	Number of Plant Collection from Each Copper-Cobalt Hill								Total
	Kwatebala	Kabwelunono	Shimbidi	Goma E	Goma W	Fungurume II	Fungurume III	Fungurume VI	
7-28/06/1997	2	0	0	0	0	2	0	1	5
15/09-8/10/1997	45	26	25	21	17	14	1	27	176
5-27/12/1997	28	8	5	12	16	8	28	5	110
27/02-19/03/1998	3	27	2	6	7	1	1	2	49
05-06/1998	34	20	30	13	13	9	13	19	151
Total	**112**	**81**	**62**	**52**	**53**	**34**	**43**	**54**	**491**

ATTACHMENT 5

VEGETATION UNITS MAP

Figure 1 Vegetation Units Identified in Kwatebala

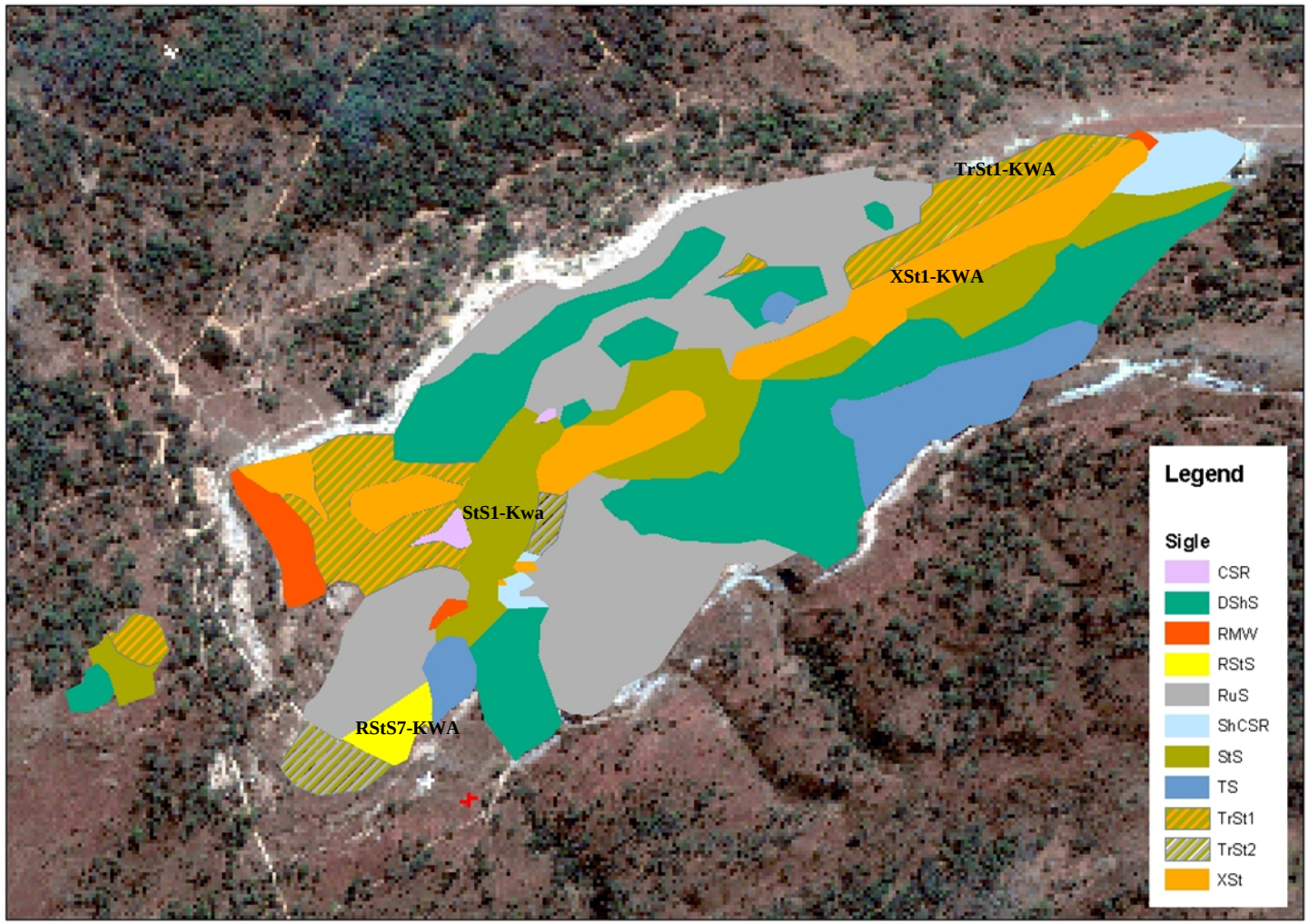
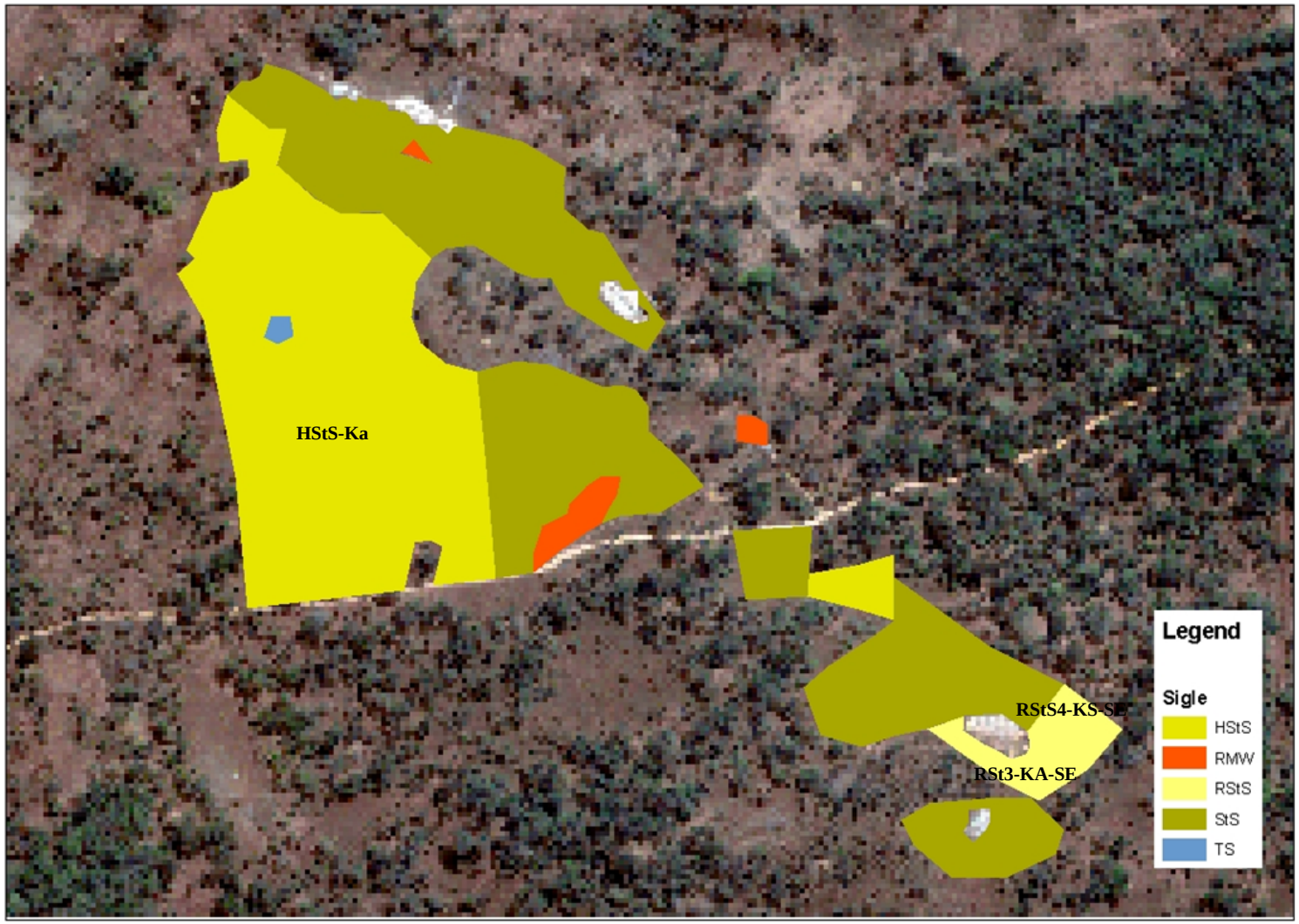


Figure 2 Vegetation Units Identified in Kavifwafwaulu



ATTACHMENT 6

SPECIES LISTS FROM NOVEMBER 2006 FIELD WORK

Table 1 Goma Central (1519 m, 10.59828 E, 26.13794 S)

Plant Diversity: 52 Taxa
Acalypha cupricola
Adenodolichos rhomboideus
Aeollanthus homblei
Anisopappus hoffmanianus
Ascolepis étoile
Ascolepis metallorum
Becium sp.
Becium fleur violaceae
Bracharia sp.
Buchnera violet
Bulbostylis cupricola
Bulbostylis filamentosa
Bulbostylis pseudoperennis
cf *Fimbristylis*
Crotalaria sp.
Cryptosepalum maraviense
Cyperus angolensis
Cyperus margaritatcheus
Dicoma anomala
Digitaria nitens
Diplolophium zambezianum
Dorstenia sp.
Droogmansia quarrei
Eragrostis sp.
Eriosema shirense
Eriospermum abyssinicum
Gladiolus sp.
Gladiolus sp 2
Haumaniastrum robertii
Helichrysum squamosifolium
Ipomoea sp.
Justicia cupricola
Mohria lepigera
Olax obtusifolia
Oxalis semiloba
Ozoroa reticulata
Pandiaka carsonii

Table 1 Goma Central (1519 m, 10.59828 E, 26.13794 S) (continued)

Plant Diversity: 52 Taxa
Pellea pectiniformis var. *nana*
Pentanisia schweinfurthiana
Poaceae 1
Poaceae 2
Rhytachne rottboelioides
Sacciolepis sp.
Scleria bulbifera
Sopubia neptunii
Thesium sp.
Thunbergia fleur violette
Triumfetta likasiensis
Triumfetta welwitchii var. *rogersii*
Vernonia pt capitule violet
Xerophyta (grand)

Table 2 Goma North-East (1511m, 10.59675 E, 26.13939 S)

Plant Diversity : 42 Taxa
Aeollanthus pt (rochers)
Aeschynomene pygmea
Anemia angolensis
Ascolepis étoile
Ascolepis metallorum
Becium var. obovatum
Bracharia
Buchnera violet
Bulbostylis filamentosa
cf *Pycreus*
Commelina
Crotalaria
Cryptosepalum maraviense
Cyanotis feuilles larges
Cyperus angolensis
Cyperus margaritatcheus
Digitaria nitens
Diplolophium zambezianum

Table 2 Goma North-East (1511m, 10.59675 E, 26.13939 S) (continued)

Plant Diversity : 42 Taxa
Dorstenia
Droogmansia quarrei
Eragrostis
Eriosema shirense
Eriospermum abyssinicum
Gladiolus
Haumaniastrum homblei
Haumaniastrum robertii
Hibiscus rhodanthus
Humularia
Indigofera rouge sombre
Lopholaena
Loudetia simplex
Monocymbium ceresiiforme
Ocimum vanderijstii
Olax obtusifolia
Poaceae
Rhytachne
Sacciolepis
Sopubia neptunii
Thesium
Tristachya bequaertii
Triumfetta welwitchii var. rogersii
Xerophyta (habituel)

Table 3 Kwatebala West

Plant Diversity : 70 Taxa
Acalypha cupricola
Actiniopteris pauciloba
Adenodolichos rhomboideus
Aeollanthus homblei
Aeollanthus sp.
Aeschynomene dressé
Alotheropsis semialata
Anisopappus hoffmanianus

Table 3 Kwatebala West (continued)

Plant Diversity : 70 Taxa
Antherotoma naudinii
Ascolepis metallorum
Aspilia kotschii
Becium kafupa
Becium var. obovatum
Bracharia
Buchnera sp
Buchnera violet
Bulbostylis filamentosa
cf *Pycreus*
Chamaecrista mimosoides
Commelina
Crotalaria cobalticola
Crotalaria cornetii
Crotalaria sp.
Cryptosepalum maraviense
Cyanotis longifolia
Cyanotis nana/cupricola
Cyperus angolensis
Cyperus margaritatcheus
Dicoma anomala
Diplolophium zambezianum
Droogmansia munamensis
Eragrostis
Eriosema englerianum
Eriosema shirense
Eriospermum abyssinicum
Gladiolus sp.
Haumaniastrum homblei
Haumaniastrum robertii
Haumaniastrum rosulatum
Helichrysum sèché
Hibiscus rhodanthus
Ipomoea alpina
Justicia cupricola
Littonia
Loudetia simplex

Table 3 Kwatebala West (continued)

Plant Diversity : 70 Taxa
Murdania
Ocimum vanderijstii
Olax obtusifolia
Ozoroa reticulata
Pandiaka carsonii
Pellea nana
Pentanisia schweinfurthii
Pleiotaxis
Poaceae
Rendlia cupricola
Rhytachne
Scleria bulbifera
Sopubia neptunei
Spermacoce dibrachiata
Sphenostylis?
Tephrosia grand
Thesium
Thunbergia violet
Tinnea coerulea var. obovata
Tristachya
Triumfetta likasiensis
Triumfetta welwitchii var. rogersii
Vernonia pt capitule violet
Xerophyta
Zonotryche decora

Table 4 Mambilima

Plant Diversity : 45 Taxa
Actiniopteris pauciloba
Aeollanthus sp.
Aeschynomene pygmea
Alotheropsis semialata
Anisopappus hoffmanianus
Ascolepis metallorum
Batopedina pulvinellata

Table 4 Mambilima (continued)

Plant Diversity : 45 Taxa
Becium
Begonia princae
Bulbostylis cupricola
Bulbostylis filamentosa
Bulbostylis pseudoperennis
Chlorophytum très fin
Cryptosepalum maraviense
Cyanotis nana/cupricola
Cyperus margaritatcheus
Cyphostema
Dorstenia jaune vert feuille étroite
Eragrostis
Eriosema shirense
Eriospermum abyssinicum
Gymnema
Haumaniastrum homblei
Haumaniastrum robertii
Indigofera
Ipomoea
Microchloa kunthii
Mohria lepigera
Monadenium lorifolium
Murdania
Nephrolepis undulata
Nephrolepis undulata
Oxalis semiloba
Pellea nana
Pellea pectiniformis
Phragmanthera cornetii
Rhytachne rottboelioides
Selaginella
Thelypteris
Thesium
Tristachya
Triumfetta welwitchii var. *rogersii*
Uapaca robynsii
Xerophyta

Table 5 Mwadikomba (1370 m, 10.59280 E, 26.19698 S)

Plant Diversity : 47 Taxa
Adenodolichos rhomboideus
Alotheropsis semialata
Aristolochya dressé
Aspilia kotschii
Asteraceae
Barleria lobeloides
Becium homblei
Becium kafupa
Bracharia
Buchnera violet
Bulbostylis filamentosa
Cassia
Cryptosepalum maraviense
Cyanotis feuilles larges
Cyperus margaritatcheus
Dorstenia jaune vert feuille étroite
Droogmansia quarrei
Eriosema englerianum
Eriosema jaune vert 825
Eriosema shirense
Gnidia
Hibiscus rhodanthus
Indigofera sutherlandoides
Littonia
Loudetia simplex
Murdania
Ocimum vanderijstii
Olax obtusifolia
Oxalis semiloba
Ozoroa reticulata
Pentanisia schweinfurthii
Pimpinella acutidentata
Poaceae
Poaceae
Rhytachne
Sacciolepis
Scleria bulbifera

Table 5 Mwadikomba (1370 m, 10.59280 E, 26.19698 S) (continued)

Plant Diversity : 47 Taxa
Temnocalyx fuchsioides
Tephrosia très fin
Thesium
Thunbergia crème
Thunbergia violet
Tristachya
Triumfetta likasiensis
Triumfetta welwitchii var. *rogersii*
Vernonia pt *capitule violet*
Xerophyta

Table 6 Pumpi XI

Plant Diversity : 38 Taxa
Acalypha cupricola
Actiniopteris
Adenodolichos
Albizzia
Alotheropsis semialata
Antherotoma
Becium
Bracharia
Bulbostylis pseudoperennis
Cheilanthes
Cheilanthes similis Ballard
Cryptosepalum maraviense
Cyperaceae
Cyperaceae
Cyperus margaritatcheus
Diplolophium zambezianum
Dissotis
Eragrostis
Faroa
Haumaniastrum robertii
Haumaniastrum timpermanii
Indigofera fleur rouge

Table 6 Pumpi XI (continued)

Ipomoea fleurs roses
Microchloa kunthii
Oxalis semiloba
Pandiaka carsonii
Pellea pectiniformis
Poaceae 1
Poaceae 2
Poaceae 3
Protea welwitchii
Sacciolepis
Strophanthus welwitchii
Thesium
Tinnea
Tristachya
Triumfetta likasiensis
Vernonia pte *fleur violette*

Table 7 Shadirandzoro Central (1340 m, 10.59407 E, 26.23440 S)

Plant Diversity : 35 Taxa
Aspilia kotschii
Asteraceae
Barleria lobeloides
Becium lilas
Chlorophytum
Crotalaria sp.
Cryptosepalum maraviense
Cryptosepalum maraviense
Cyanotis longifolia
Cyperaceae
Cyperaceae
Cyperus angolensis
Cyperus angolensis
Cyperus margaritaceus
Diplolophium zambezianum
Dorstenia
Dorstenia bernimiana

Table 7 Shadirandzoro Central (1340 m, 10.59407 E, 26.23440 S) (continued)

Plant Diversity : 35 Taxa
Droogmansia munamensis
Haumaniastrum homblei
Haumaniastrum robertii
Helychrisum squamosifolium
Hibiscus rhodanthus
Microchloa kunthii
Olax obtusifolia
Olax obtusifolia
Oxalis obliquifolia
Pentanisia schweinfurthii
Phyllanthus
Phyllanthus
Pimpinella acutidentata
Poaceae
Rhytachne rottbolioides
Tinnea coerulea var. *obovata*
Vernonia capitule violet
Xerophyta equisetoides

Table 8 Shadirandzoro West (1345 m, 10.59483 E, 26.23251 S)

Plant Diversity : 71 Taxa
Acalypha cupricola
Actiniopteris pauciloba
Aeschynomene dressé
Aeschynomene pygmea
Alotheropsis semialata
Anemia angolensis
Antherotoma naudinii
Arthopteris sp.
Ascolepis metallorum
Asparagus
Aspilia kotschii
Barleria lobeloides
Becium sp.

Table 8 Shadirandzoro West (1345 m, 10.59483 E, 26.23251 S) (continued)

Plant Diversity : 71 Taxa
Begonia princeae
Buchnera sp.
Bulbostylis filamentosa
Bulbostylis pseudoperennis
cf *Gladiolus*
Crotalaria sp.
Cryptosepalum maraviense
Cyanotis longifolia
Cyperus angolensis
Cyphia erecta
Diplolophium zambezianum
Droogmansia munamensis
Droogmansia quarrei
Eriosema shirense
Eriospermum abyssinicum
Gladiolus sp.
Haumaniastrum homblei
Haumaniastrum robertii
Haumaniastrum rosulatum
Hibiscus rhodanthus
Humularia
Indigofera fleur rouge
Indigofera sutherlandioides
Ipomoea alpina
Liliaceae?
Lopholaena
Loudetia simplex
Microchloa kunthii
Olax obtusifolia
Oxalis obliquifolia
Oxalis semiloba
Pandiaka carsonii
Pellea longipilosa
Pellea pectiniformis
Pentanisia schweinfurthii
Phyllanthus
Pimpinella acutidentata

Table 8 Shadirandzoro West (1345 m, 10.59483 E, 26.23251 S) (continued)

Plant Diversity : 71 Taxa
Poaceae 1
Poaceae 2
Poaceae 3
Poaceae 4
Poaceae 5
Poaceae 6
Rhytachne rottbolioides
Sacciolepis typhura
Scleria bulbifera
Thelypteris
Thesium habituel
Thunbergia crème
Thunbergia violet
Tinnea coerulea var. *obovata*
Tristachya
Triumfetta welwitchii var. *rogersii*
Uapaca robynsii
Vernonia capitule violet
Xerophyta equisetoides

Table 9 Shinkusu West (1464 m, 10.58583 E, 26.17804 S)

Plant Diversity : 66 Taxa
Acalypha cupricola
Actiniopteris pauciloba
Aeschynomene cf pygmea
Albizzia adianthifolia
Albizzia antunesiana
Alotheropsis semialata
Anemia angolensis
Antheroma naudinii
Ascolepis protea "étoile"
Aspilia kotschii
Asteraceae
Barleria lobeloides
Becium aureoviride

Table 9 Shinkusu West (1464 m, 10.58583 E, 26.17804 S) (continued)

Plant Diversity : 66 Taxa
Becium kafupa
Bracharia
Bulbostylis filamentosa
cf *Combretum platipetalum*
cf *Drimiopsis*
cf *Sporobolus*
Chlorophytum fleur blanche
Crotalaria
Crotalaria cornetii
Cryptosepalum maraviense
Cyperaceae
Cyperus
Cyperus angolensis
Cyperus margaritatcheus
Digitaria nitens
Diplolophium zambezianum
Droogmansia munamensis
Eragrostis
Eriosema englerianum
Eriosema shirense
Eriospermum abyssinicum
Haumaniastrum cf rosulatum
Haumaniastrum robertii
Hibiscus rhodanthus
Ipomoea alpina
Littonia lindernii
Mohria lepigera
Ocimum vanderijstii = Becium aureoviride
Olax obtusifolia
Oxalis semiloba
Ozoroa reticulata
Pandiaka carsonii
Pellea pectiniformis
Pellea pectiniformis var. *nana*
Pimpinella acutidentata
Poaceae
Protea cf. *welwitschii*

Table 9 Shinkusu West (1464 m, 10.58583 E, 26.17804 S) (continued)

Plant Diversity : 66 Taxa
Rhythachne rottbolioides
Sacciolepis
Scleria bulbifera
Sopubia neptunei
Stereocaulon (lichen)
Temnocalyx verdickii
Thesium cf pawlovskianum
Thesium habituel
Thunbergia crème
Tinnea coerulea var. *obovata*
Tristachya
Triumfetta welwitchii var. *rogersii*
Truimfetta likasiensis
Vernonia FII
Vernonia fleur violettes petites
Vernonia ptes fleurs violettes

Table 10 Zikule East (1362 m, 10.63690 E, 26.99216 S)

Plant Diversity : 49 Taxa
Acalypha cupricola
Adenodolichos rhomboideus
Aeschynomene pararubrofarinacea
Aeschynomene pygmea
Alotheropsis semialata
Alotheropsis semialata
Asparagus cf *africanus*
Aspilia kotchii
Becium
Becium obovatum
Bracharia
Bulbostylis filamentosa
cf *Pycreus*
Crotalaria sp.
Cryptosepalum maraviense
Cyperaceae

Table 10 Zikule East (1362 m, 10.63690 E, 26.99216 S) (continued)

Plant Diversity : 49 Taxa
Cyperus angolensis
Cyperus margaritatcheus
Drimiopsis
Eragrostis
Euphorbia zambeziana
Fadogia (discolore)
Gladiolus sp.
Haumaniastrum homblei
Haumaniastrum rosulatum
Hibiscus rhodanthus
Ipomoea
Justicia elegantula
Lamiaceae
Littonia
Loudetia simplex
Microchloa
Nephrolepis undulata
Ocimum vanderijstii
Olax obtusifolia
Pimpinella acutidentata
Protea welwitchii
Rhytachne
Sacciolepis typhura
Scleria bulbifera
Securidaca longepedunculata
Temnocalyx fushioides
Thesium habituel
Thunbergia fleur crème
Tinnea coerulea var. obovata
Triumfetta welwitschii
Uapaca robynsii
Uapaca robynsii
Vernonia pte *fleur violette*

Table 11 Zikule West (1362 m, 10.64213 E, 26.99067 S)

Plant Diversity : 11 Taxa
Ascolepis metallorum
Aspilia kotchii
Becium kafupa
Chlorophytum
Haumaniastrum robertii
Liliaceae
Littonia
Orchidaceae
Oxalis semiloba
Pimpinella acutidentata
Xerophyta

ATTACHMENT 7

HERBARIUM SPECIMENS COLLECTED DURING APRIL AND MAY 2006 FIELD SURVEYS

Table 1 Number of Herbarium Specimens Collected During Field Surveys at Kwatebala in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Site	Collection Number	Number of Herbarium Specimens	
		By Site	Total
Kwatebala Hill			
Kwatebala (principal)	1 – 33	33	
	34 – 54	21	
	107 – 120	14	
	182 – 183	2	
	299 – 305	7	
	121 – 125	5	
Kwatebala (west)	55 – 65	11	
	121 – 125	5	
Kwatebala Hill subtotal			*98*
Mwinansefu			
Mwinansefu (east)	66 – 68	3	
Mwinansefu (west)	126 – 145	20	
Mwinansefu subtotal			*23*
		Kwatebala area total	**121**

Table 2 Number of Herbarium Specimens Collected During Field Surveys at Goma in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Site	Collection Number	Number of Herbarium Specimens	
		By Site	Total
Goma south-west	226 - 261	45	
	306 - 318	13	
Goma south-west subtotal			*58*
Kabwelunono	319 - 349	31	
	355 - 388	34	
Kabwelunono subtotal			*65*
Shimbidi	350 - 354	5	5
Tenke est (= orthodoxe)	205 - 225	21	21
Kakavilondo (= apostolo)	389 - 415	27	
	465 - 466	2	
Kakavilondo subtotal			*29*
		Goma area total	**178**

Table 3 Number of Herbarium Specimens Collected During Field Surveys at Kavifwafwaulu in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Site	Collection Number	Number of Herbarium Specimens	
		By Site	Total
Kavifwafwaulu	146 - 181	36	
	184 - 204	21	
	263 - 298	36	
	444 – 464	21	
Kavifwafwaulu area total			**114**

Table 4 Number of Herbarium Specimens Collected During Field Surveys at Kazinyanga in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Site	Collection Number	Number of Herbarium Specimens	
		By Site	Total
Mambilima	98 - 105	8	8
Kazinyanga	69 - 97	23	
	480 - 494	15	
Kazinyanga subtotal			*38*
Kazinyanga area total			**46**

Table 5 Number of Herbarium Specimens Collected During Field Surveys at Fungurume in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Site	Collection Number	Number of Herbarium Specimens	
		By Site	Total
Fungurume V	436 - 441	6	
	527 - 542	16	
Fungurume V subtotal			*22*
Fungurume VI	543	1	1
Katufungurume XII	416 - 435	20	
	442 - 443	2	
Katufungurume XII subtotal			*23*
Fungurume area total			**46**

Table 6 Number of Herbarium Specimens Collected During Field Surveys at Buboya in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Site	Collection Number	Number of Herbarium Specimens	
		By Site	Total
Colline de Buboya	495 - 517	23	
Environs Buboya	518 - 527	10	
		Buboya area total	**33**

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad)

Sort Order	Family	Taxon
Kwatebala (surveyed April 24, 2006)		
1	Poaceae	*Monocymbium ceresiiforme*
2	Scrophulariaceae	*Sopubia neptunii*
3		*Cheilanthes* sp. nov.
4	Crassulaceae	*Crassula vaginata*
5	Scrophulariaceae	*Buchnera trilobata*
6	Fabaceae	*Crotalaria cobalticola*
7	Polygalaceae	*Polygala*
8	Asteraceae	*Anisopappus*
9	Polygalaceae	*Polygala*
10	Asteraceae	*Lopholaena*
11	Asteraceae	*Inula shirensis*
12	Scrophulariaceae	*Buchnera*
13	Apiaceae	
14	Apiaceae	
15	Campanulaceae	*Wahlembergia capitata*
16	Fabaceae	*Crotalaria*
17	Orchidaceae	*Polystachya*
18	Commelinaceae	*Cyanotis*
19	Asteraceae	
20	Scrophulariaceae	*Alectra*
21	Lamiaceae	*Plecthranthus*
22	Gentianaceae	*Faroa malaissei*
23	Campanulaceae	*WALHEMBERGIA*
24	Asteraceae	*Pleiotaxis*
25	Fabaceae	*Crotalaria*
26	Liliaceae	*Chlorophytum*
27	Commelinaceae	*Commelina*
28	Euphorbiaceae	*Phyllanthus*
29	Asteraceae	*Dicoma anomala*
30	Asteraceae	*Dicoma poggei ???*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
31	Iridaceae	*Gladiolus*
32	Commenilaceae	*Cyanotis cupricola*
33	Musci	
Kwatebala (surveyed April 25, 2006)		
34	Actiniopteridaceae	*Acinitinopteris pauciloba*
35	Rubiaceae	*Spermacoce*
36	Musci	
37	Musci	
38	Apiaceae	*Diplolophium zambesianum*
39	Malvaceae	*Hibiscus rhodanthus*
40		*Pellaea doniana*
41	Poaceae	*Ctenium concinuum*
42	Asteraceae	*Dicoma poggei*
43	Scrophulariaceae	*Buchnera inflata*
44	Lamaiaceae	*Aeollanthus*
45	Asteraceae	*Helichrysum keilii*
46	Asteraceae	*Vernonia*
47	Rubiaceae	*Spermacoce dibrachiata*
48	Asteraceae	*Inula shirensis*
49	Asteraceae	*Schistostephium artemisiaefolium*
50	Asteraceae	*Vernonia*
51	Poaceae	
52	Scrophulariaceae	*Sopubia*
53	Asteraceae	*Vernonia*
54	Fabaceae	*Eriosema*
Kwatebala West (surveyed April 25, 2006)		
55	Passifloraceae	*Basananthe kisimbae*
56		*? Becium*
57	Fabaceae	*Aeschynomene pygmaea*
58	Asteraceae	*Lopholaena*
59	Poaceae	*Zonotriche decora*
60	Scrophulariaceae	*Buchnera*
61	Convolvulaceae	*Ipomaea*
62	Polygalaceae	*Polygala*
63	Scrophulariaceae	*Sopubia*
64	Iridaceae	*Gladiolus*
65	?	
Mwinansefu East		
66	Fabaceae	*Aeschynomene*
67	Acanthaceae	*Blepharis quanzensis*
68	Scrophulariaceae	*Buchnera inflata*
Kazinyanga (surveyed April 25, 2006)		
69	Campanulaceae	*Wahlembergia capitata*
70	Poaceae	
71	Fabaceae	*Crotalaria*
72	Acanthaceae	

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
73	Santalaceae	*Thesium*
74	Fabaceae	*? Vigna*
75	Scrophulariaceae	*Buchnera*
76	Apiaceae	
77	Fabaceae	*Chamaecrista mimosoides*
78	Scrophulariaceae	*Striga asiatica*
79	Lamiaceae	*Haumaniastrum rosulatum*
80	Euphorbiaceae	*Uapaca robynsii*
81		*Mohria lepigera*
82	Fabaceae	*Indigofera*
83	Asteraceae	*Anisopappus*
84	Fabaceae	*Crotalaria*
85	Tiliaceae	*Triumfetta* var. *rogersii*
86	Amarantaceae	*Pandiaka carsonii*
87	Scrophulariaceae	*Buchnera*
88	Iridaceae	*Gladiolus*
89	Polygalaceae	*Polygala*
90	Fabaceae	*Crotalaria*
91	Lamiaceae	*Aeollanthus*
92		*Pellaea pectiniformis*
93	Convolvulaceae	*Ipomoea*
94	Commelianaceae	*Commelina*
95	Melastomataceae	*Antherotoma naudinii*
96	Rubiaceae	*Batopedina pulvinellata*
97	Anemiaceae	*Anemia angolensis*
Mambilima (surveyed April 26, 2006)		
98		*Cheilanthes*
99	Selaginellaceae	*Selaginella*
100	Gentianaceae	*Faroa malaissei*
101	Nephrolepidaceae	*Nephrolepis undulata*
102	Rubiaceae	
103		*Arthropteris ? annae*
104	Eupborbiaceae	*Monadenium*
105	Polygalaceae	*Polygala*
106		*Dasystachis*
Kwatebala (surveyed April 26, 2006)		
107	Poaceae	
108	Cyperaceae	*Ascolepis*
109	Cyperaceae	*Bulbostylis*
110	Cyperaceae	*Bulbostylis*
111	Cyperaceae	*Scleria*
112	Fabaceae	*Crotalaria*
113	Rubiaceae	*Virectaria*
114	Acanthacee	*Blepharis*
115	Caesalpiniaceae	*Cryptosepalum maraviense*
116	Commelianceae	*Cyanotis*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
117	Santalaceae	*Thesium*
118	Proteaceae	*Protea*
119	Melastomataceae	*Dissotis*
120	Liliaceae ?	
Kwatebala West (surveyed April 26, 2006)		
121	Polygalaceae	*Polygala*
122	Asteraceae	*Lopholaena*
123	Scrophulariaceae	*Buchnera trilobata*
124	Scrophulariaceae	*Buchnera*
125	?	
Mwinansefu West (surveyed April 26, 2006)		
126	Polygalaceae	*Polygala*
127	Fabaceae	*Crotalaria*
128	Scrophulariaceae	*Blepharis quanzensis*
129	Rubiaceae	
130	Iridaceae	
131		*Cheilanthes*
132	Melastomataceae	*Antherotoma naudinii*
133	Campanulaceae	*Wahlembergia*
134	Actiniopteridaceae	*Actiniopteris*
135	?	
136	Poaceae	
137	Euphorbiaceae	
138	Lamiaceae	*Aeollanthus*
139	Scrophulariaceae	*Sopubia neptunii*
140	Oxalidaceae	*Oxalis*
141	Cyperaceae	*Bulbostylis*
142	Acanthaceae	
143	Asteraceae	
144	Iridaceae	*Gladiolus*
145	Apiaceae	*Diplolophium zambesiacum*
Kavifwafwaulu (surveyed April 26, 2006)		
146	Rubiaceae	*Manostachya staelioides*
147	Cyperaceae	*Scleria*
148	Iridaceae	*Gladiolus*
149	Fabaceae	*Aeschynomene*
150	Fabaceae	*Vigna*
151	Asteraceae	*Inula shirensis*
152	Scrophulariaceae	*Buchnera robynsii*
153	Fabaceae	*Crotalaria*
154	Rubiaceae	*Spermacoce dibrachiata*
155	Commelinaceae	*Commelina*
156	Gentianaceae	
157	Poaceae	*Diheteropogon*
158	Lamiaceae	*Haumaniastrum rosulatum*
159	Santalaceae	*Thesium*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
160	Lamiaceae	*Haumaniastrum homblei*
161	Fabaceae	*Tephrosia*
162	Passifloraceae	*Basananthe kisimbae*
163	Poaceae	*Hyparrhenia*
164	Fabaceae	*Eriosema*
165	Acanthaceae	*Blepharis quanzensis*
166	Acanthaceae	*Blepharis*
167	Poaceae	
Kavifwafwaulu Southeast		
168	Acanthaceae	*Blepharis*
169	Asteraceae	
170	Lamiaceae	*Plecthrantus*
171	Campanulaceae	*Wahlenbergia*
172	Acanthaceae	*Barleria*
173	Lamiaceae	*Tinnea*
174	Asteraceae	*Dicoma*
175	Commelinaceae	*Cyanotis*
176	Acanthaceae	*Blepharis quanzensis*
177	Asteraceae	*Pleiotaxis*
178	Fabaceae	*Crotalaria*
179	Fabaceae	*Crotalaria*
180	Passifloraceae	*Basananthe kisimbae*
181	Scrophulariaceae	*Sopubia*
Kwatebala		
182	Poaceae	
183	?	
Kavifwafwaulu (surveyed April 27, 2006)		
184	Poaceae	
185	Fabaceae	*Rhynchosia*
186	Fabaceae	*Rhynchosia*
187	Santalaceae	*Thesium*
188	Commelinaceae	*Commelina*
189	Asteraceae	
190	?	
191	Rubiaceae	
192	Fabaceae	*Crotalaria*
193	Hepaticae	
194	Moraceae	*Dorstenia*
195	Fabaceae	*Sphenostlis*
196	Asteraceae	
197	Cyperaceae	
198	Santalaceae	*Thesium*
199	Scrophulariaceae	*Buchnera robynsii*
200	Ophioglossaceae	*Ophioglossum*
201	Fabaceae	*Tephrosia*
202	Melastomataceae	*Antherotoma naudinii*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
203	Fabaceae	*Crotalaria*
204	Fabaceae	*Crotalaria*
Tenke East (surveyed April 27, 2006)		
205	Asteraceae	*Dicoma poggei*
206	Poaceae	
207	Scrophulariaceae	*Buchnera*
208	Cyperaceae	*Bulbostylis cupricola*
209	Lamiaceae	*Becium homblei*
210	Cyperaceae	
211	Asteraceae	*Anisopappus*
212	Pogylaceae	*Polygala*
213	Apiaceae	*Diplolophium zambesianum*
214	Poaceae	*Zonoriche decora*
215	Asteraceae	*Pleiotaxis*
216	Iridaceae	*Gladiolus*
217	Fabaceae	*Aeschynomene*
218	Scrophulariaceae	*Buchnera trilobata*
219	Scrophulariaceae	*Blepharis quanzensis*
220	Asteraceae	*Vernonia*
221	Santalaceae	*Thesium*
222	Convolvulaceae	*Ipomoea*
223	Scrophulariaceae	*Sopubia neptunii*
224	Asteraceae	
225	Scrophulariaceae	*Buchnera*
Goma Southwest (surveyed April 27, 2006)		
226	Poaceae	*Zonotriche decora*
227	Poaceae	*Diheteropogon*
228	Caesalpiniaceae	*Cryptosepalum maraviense*
229	Santalaceae	*Thesium*
230	Asteraceae	*Vernonia*
231	Asteaceae	*Pleiotaxis*
232	Melastomataceae	*Antherotoma naudinii*
233		*Pellaea pectiniformis*
234	Rubiaceae	
235	Poaceae	*Tristachya*
236	Apiaceae	*Diplolophium zambesianum*
237	Commelinaceae	*Commelina*
238	Acanthaceae	*Blepharis*
239	Velloziaceae	*Xerophyta cf equisetoides*
240	Cyperaceae	*Bulbostylis*
241	Asteraceae	*Helichrysum*
242	Iridaceae	*Lapeyrousia welwitschii*
243	Melastomataceae	*Dissotis*
244	Asteraceae	*Dicoma anomala*
245	Convolvulaceae	*Ipomoea*
246	Commelinaceae	*Cyanotis cupricola*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
247	Lamiaceae	*Haumaniastrum robertii*
248	Scrophulariaceae	*Buchnera*
249	Fabaceae	*Aeschynomene*
250	Scrophulariaceae	*Buchnera trilobata*
251	Poaceae	*Ctenium concinuum*
252	Malvaceae	*Hibiscus rhodanthus*
253	Fabaceae	*Humularia*
254	Rubiaceae	
255	Acanthaceae	*Blepharis*
256	Anemiaceae	*Anemia angolensis*
257	Fabaceae	*Indigofera*
258	Poaceae	*Panicum*
259	Asteraceae	*Anisoppapus*
260	Asteraceae	*Dicoma poggei*
261	Lamiaceae	*Aeollanthus*
262	Dipsacaceae	*Cephalaria*
Kavifwafwaulu North (surveyed April 28, 2006)		
263	Fabaceae	*Crotalaria*
264	Lamiaceae	*Plecthranthus*
265	Liliaceae	*Dasistachys*
266	Actiniopteridaceae	*Actiniopteris pauciloba*
267	Rubiaceae	
268	Fabaceae	*Crotalaria*
269	Proteaceae	*Protea cf. welwitschii*
270	Fabaceae	*Tephrosia*
271	Acanthaceae	
272	Ophioglossaceae	*Ophioglossum*
273	Asteraceae	
274	Rubiaceae	
275	Fabaceae	*Vigna*
276	Asteraceae	*Vernonia*
277	Asteraceae	
278	Acanthaceae	*Blepharis*
279	Scrophulariaceae	*Buchnera*
Kavifwafwaulu Southeast		
280	Acanthaceae	*Barleria*
281	Comelinaceae	
282	Asteraceae	*Dicoma pogei*
283	Fabaceae	*Droogmansia poggei*
284	Fabaceae	*Adenodolichos rhomboideus*
285	Fabaceae	*Crotalaria cornetii*
286	Passifloraceae	*Basananthe kisimbae*
287	Rubiaceae	
288	Acanthaceae	
289	Commelinaceae	
290	Acanthaceae	*Blepharis quanzensis*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
291	Liliaceae	
292	Poaceae	
293	Campanulaceae	*Wahlenbergia*
294	Acanthaceae	
295	Scrophulariaceae	*Sopubia*
296	Commelinaceae	
297	Asteraceae	
298	Liliaceae	*Dasistachys*
Kwatebala (surveyed April 28, 2006)		
299	Liliaceae	*Dasistachys*
300	Acanthaceae	*Blepharis quanzensis*
301	Asteraceae	*Helichrysum*
302	Asteraceae	*Helichrysum*
303	Asteraceae	
304	Scrophulariaceae	*Buchnera inflata*
305	Musci	
Goma Southwest (surveyed April 29, 2006)		
306	Fabaceae	*Aeschynomene*
307	Poaceae	*Arthraxon micans*
308	Lichen	
309	Euphorbiaceae	*Acalypha cupricola*
310	Musci	
311	Fabaceae	*Eriosema*
312	Convolvulaceae	*Ipomoea*
313	Commelinaceae	*Commelina longifolia*
314	Campanulaceae	*Wahlenbergia capitata*
315	Asteraceae	
316	Apiaceae	
317	Dipsacaceae	
318	Anacardiaceae	*Heeria reticulata*
Kabwelunono (surveyed April 29, 2006)		
319	Asteraceae	
320	Scrophulariaceae	*Buchnera*
321	Amaranthaceae	*Pandiaka carsonii*
322	Santalaceae	*Thesium*
323	Commelinaceae	
324	Cyperaceae	*Bulbostylis cupricola*
325	Acanthaceae	*Blepharis quanzensis*
326	Scrophulariaceae	*Buchenra trilobata*
327	Commelinaceae	*Cyanotis “nana”*
328	Asteraceae	*Vernonia*
329	Lamiaceae	*Haumaniastrum timpermanii*
330	Asteraceae	*Dicoma anomala*
331	Liliaceae	
332	Scrophulariaceae	*Striga asiatica*
333	Gentianaceae	*Faroa acaulis* R.E.Fries

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
334	?	
335	?	
336	Acanthaceae	*Blepharis quanzensis*
337	Rubiaceae	*Manostachya*
338	Orchidaceae	*Habenaria*
339	Orchidaceae	*Habenaria*
340	Cyperaceae	*Bulbostylis*
341	Asteraceae	*Helichrysum cf. kirkii*
342	Acanthaceae	*Barleria lobelioides* Champluvier
343	Melastomataceae	*Antherotoma naudinii*
344	Scrophulartiaceae	*Alectra senegalensis*
345	Scrophularaceae	*Buchnera robynsii*
346	Lamiaceae	*Haumaniastrum robertii*
347	Lamiaceae	*Haumaniastrum katangense*
348	Apiaceae	*Diplolophium zambesianum*
349	Asteraceae	*Lopholaena*
Shimbidi (surveyed April 29, 2006)		
350	Poaceae	
351	Poaceae	
352	Poaceae	
353	Lamiaceae	*Plecthranthus esculentus*
354	Acanthaceae	*Berleria lobelioides*
Kabwelunono (surveyed April 30, 2006)		
355	Scrophulariaceae	*Buchnera*
356	Fabaceae	*Crotalaria*
357	Asteraceae	
358	Fabaceae	*Crotalaria*
359	Fabaceae	*Crotalaria*
360	Fabaceae	*Aeschynomene*
361	Scrophulariaeae	*Buchnera inflata*
362	Iridaceae	*Gladiolus*
363	Tiliaceae	*Triumfetta likasiensis*
364	?	
365	Fabaceae	*Droogmansia munamensis*
366	Gentianaceae	*Faroa acaulis*
367	Poaceae	
368	Scrophulariaceae	*Sopubia neptunii*
369	Rubiaceae	*Pentanisia*
370	Asteraceae	*Pleiotaxis*
371	Poaceae	
372	Amarantaceae	*Pandiaka carsonii*
373	Fabaceae	*Crotalaria corneti*
374	Nephrolepidaceae	*Nephrolepis undulata*
375	Convolvulaceae	*Ipomoea*
376	Iridaceae	*Gladiolus*
377	Liliaceae	*Dasistachys*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
378	Poaceae	*Microchloa kunthii*
379	Erisopermaceae	*Eriospermum abyssinicum*
380	Musci	
381	Acanthaceae	*Barleria lobelioides* Champluvier
382	Pteridophyta	
383	Passifloraceae	*Basananthe kisimbae*
384	Fabaceae	*Aeschynomene*
385	Asteraceae	*Helichrysum*
386	Fabaceae	*Droogmansia pteropus* var. *quarrei*
387	Liliaceae	*Dasistachys*
388	Commelinaceae	*Commelina*
Kakavilondo (surveyed April 30, 2006)		
389	Fabaceae	*Crotalaria*
390	Acanthaceae	*Blepharis quanzensis*
391	Fabaceae	
392	Polygalaceae	*Polygala*
393	Caesalpiniaceae	*Chamaecrista mimosoides*
394	Scrophulariaceae	*Buchnera inflata*
395	Fabaceae	*Crotalaria*
396	Scrophulariaceae	*Buchnera robynsii*
397	Fabaceae	*Aeschynomene*
398	Scrophulariaceae	*Buchenra*
399	Tiliaceae	*Triumfetta welwitschi* var. *rogersii*
400	Fabaceae	*Vigna*
401	Asteraceae	*Lopholaena*
402	Euphorbiaceae	*Uapaca robynsii*
403	Fabaceae	*Pseuderiosema*
404	Asteraceae	*Helichrysum cf. keilii*
405	Rubiaceae	*Spermacoce dibrachiata*
406	Rubiaceae	*Manostachya*
407	Asteraceae	*Pleiotaxis*
408	Fabaceae	
409	Cyperaceae	*Ascolepis*
410	Cyperaceae	
411	Fabaceae	*Crotalaria*
412	Poaceae	*Tristachya*
413	?	
414	Asteraceae	*Vernonia*
415	Lichen	
Katufungurume XII (surveyed May, 2006)		
416	Iridaceae	*Gladiolus*
417	Poaceae	*Digitaria*
418	Poaceae	*Diheteopogon*
419	Poaceae	*Monocymbium ceresiiforme*
420	Lamiaceae	*Haumaniastrum prealpum* var. *homblei*
421	Fabaceae	

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
422	Santalaceae	*Thesium*
423	Iridaceae	*Lapeyrousia welwitschii*
424	Apiaceae	*Diplolophium zambesianum*
425	Scrophulariaceae	*Buchnera trilobata*
426	Poaceae	*Loudetia simplex*
427	Asteraceae	*Pleiotaxis*
428	Convolvulaceae	*Ipomoea*
429	Asteraceae	*Anisopappus*
430	Lamiaceae	*Haumaniastrum robertii*
431	Oxalidaceae	*Oxalis semilobe*
432	Cyperaceae	*Bulbostylis cupricola*
433	Gentianaceae	*Chironia katangensis*
434	Euphorbiaceae	*Monadenium cupricola*
435	?	
Fungurume Hill V (surveyed May, 2006)		
436	Cyperaceae	*Bulbostylis*
437	Scrophulariaceae	*Sopubia*
438	Fabaceae	*Droogmansia pteropus var. quarrei*
439	Asteraceae	*Pleiotaxis*
440	Lamiaceae	*Aeollanthus saxatilis*
441	Acanthaceae	Barleria lobelioides
Katufungurume XII (surveyed May, 2006)		
442	?	
443	Scrophulariaceae	*Sopubia*
Kavifwafwaulu North (surveyed May, 2006)		
444	Asteraceae	
445	Polygalaceae	*Polygala*
446	Iridaceae	*Moraea*
447	Passifloraceae	*Basananthe kisimbae*
448	Polygalaceae	*Polygala*
449	Santalaceae	*Thesium*
450	Lamiaceae	*Haumaniastrum*
451	Poaceae	*Tristachya cf. bequeartii*
452	Fabaceae	
453	Orchidaceae	*Habenaria*
454	Fabaceae	*Alysicarpus*
455	Scrophulariaceae	*Buchnera*
456	Fabaceae	*Indigofera*
457	Acanthaceae	
458	Acanthaceae	*Blepharis quanzensis*
459	Rubiaceae	*Spermacoce dibrachiata*
460	Fabaceae	*Crotalaria*
461	Passifloraceae	*Basananthe kisimbae*
Kavifwafwaulu Southeast		
462	Acanthaceae	
463	Iridaceae	*Moraea*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
464	Acanthaceae	*Barleria lobelioides*
Kakavilondo		
465	Lichen	
466	Musci	
Kwatebala (surveyed May, 2006)		
467	Liliaceae	*Dasistachys*
468	Lamiaceae	Plectranthus esculentus
469	Rubiaceae	
470	Cyperaceae	
471	Iridaceae	*Gladiolus*
472	Asteraceae	*Inula shirensis*
473	Apiaceae	
474	Thelypteridaceae	*Thelipteris*
475	Aspleniaceae	*Asplenium*
476	Polygalaceae	*Polygala*
477	Scrophulariaceae	*Sopubia*
478	Iridaceae	*Gladiolus*
479	LICHEN	
Kazinyanga (surveyed May 2, 2006)		
480	Asteraceae	
481	Lamiaceae	*Haumaniastrum katangense*
482	Acanthaceae	
483	Cyperaceae	*Scleria*
484	Gentianaceae	*Chironia katangensis* De Wild.
485	Asteraceae	*Vernonia*
486	Euphorbiaceae	*Monadenium lorfolium* (Bally) Malaisse
487	?	
488	Rubiaceae	
489	Poaceae	
490	Fabaceae	*Crotalaria*
491	Poaceae	*Bracharia*
492	Scrophulariaceae	*Sopubia*
493	Fabaceae	*Eriosema*
494	Apiaceae	
Buyobia (surveyed May 3, 2006)		
495	Lamiaceae	*Tinaea*
496	Caesalpiniaceae	*Chamaecrista mimosoides*
497	Fabaceae	*Crotalaria*
498	Polygalaceae	*Polygala*
499	Polygalaceae	*Polygala*
500	Fabaceae	*Crotalaria*
501	Fabaceae	
502	Fabaceae	*Aeschynomene*
503	Apiaceae	
504	Fabaceae	*Crotalaria*
505	Scrophulariaceae	*Buchnera*

Table 7 List of Herbarium Specimens Collected During Field Surveys Conducted in April and May, 2006 (Collection by F. Malaisse, Kisimba K. and L. Saad) (continued)

Sort Order	Family	Taxon
506	Fabaceae	
507	?	
508	Santalaceae	*Thesium*
509	Commelinaceae	*Commelina*
510	Asteraceae	
511	Fabaceae	*Droogmansia*
512	Rubiaceae	
513	Fabaceae	*Crotalaria*
514	?	
515	Rubiaceae	
516	Thymelaeaceae	*Gnidia*
517	Cyperaceae	*Scleria*
518	Fabacedae	*Crotalaria*
519	Scrophulariaceae	*Buchnera*
520	Euphorbiaceae	*Monadenium*
521	Lamiaceae	*Haumaniastrum*
522	Asteraceae	*Pleiotaxis*
523	Gentianaceae	
524	Melastomataceae	
525	Acanthaceae	
Biano (surveyed May, 2006)		
526	Iridaceae	*Moraea*
Buyobia		
527	Ericaceae	*Philippia*
Fungurume Hill V (surveyed May, 2006)		
527 bis	Campanulaceae	*Cyphia erecta*
528	Fabaceae	*Pseudoeriosema*
529	Polygalaceae	*Polygala*
530	Scrophulariaceae	*Buchnera trilobata*
531	Scrophulariaceae	*Sopubia*
532	Gentianaceae	*Chironia katangensis*
533		*Pellaea pectiniformis*
534	Asteraceae	
535	Euphorbiaceae	*Monadenium cupricola*
536	Acanthaceae	
537	Actiniopteridaceae	*Actiniopteris pauciloba*
538	Acanthaceae	*Barleria lobeliides*
539	Euphorbiaceae	*Monadenium cupricola*
540	Gentianaceae	*Sebaea microphylla* (Edgew.) Knoblauch
541	Rubiaceae	
542	Ranunculaceae	*Clematis*
543	Fabaceae	*Droogmansia pteropus* var. *quarrei*

ATTACHMENT 8

MALAISSE, KISIMBA AND SAAD

COLLECTION FROM NOVEMBER 2006 SURVEYS

INTRODUCTION

A total of 475 vouchers were collected on 27 different "micro-sites" during the November mission. Of these, 264 were collected on the target sites and 211 on the new visited sites. All the vouchers are being conserved at the National Herbarium of Belgium (BR). Main collected families for the November mission are Poaceae (N = 73), Cyperaceae (N = 56), Lamiaceae (N = 36), Asteraceae (N = 35), Fabaceae (N = 29), Commelinaceae (N = 22), Euphorbiaceae (N = 20) and Acanthaceae (N = 20). These reflect either the phenology of the groups of plants or the difficulty of identification.

Every additional collection mission brings either new material suitable for progressing in the identification or new plants (Table 6 and 7).

Some of the collected species appeared as very special, even tremendous, and will need further studies. For example, Chlorophytum sp. 5 could be new for science. Dorstenia barnimiana var. barnimiana is a first collection for D.R. Congo. It has been observed on three copper sites in the TFM area during our November survey.

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD

N°	Site (Date)	Family	Taxon
544	**Kwatebala (14.xi.06)**	Sinoteridaceae	*Cheilanthes cupricola* Malaisse
545		Commelinaceae	*Cyanotis* "nana"
546		Anthericaceae	*Chlorophytum* sp. 5
547		Cyperaceae	*Ascolepis metallorum* P.A.Duvign. & A. Léonard
548		Velloziaceae	*Xerophyta equisetoides* Baker
549		Cyperaceae	*Fimbristylis*
550		Cyperaceae	*Pycreus*
551		Orchidaceae	*Eulophia cucculata* (Sw.) Steud.
552		Poaceae	*Rhytachne rottboelioides* Desv.
553		Poaceae	*Bracharia*
554		Hyacinthaceae	*Ledebouria* sp. 2.
555	**Kavifwafwaulu North**	Moraceae	*Dorstenia barnimiana* Schweinf.
556		Moraceae	*Dorstenia benguellensis* Welw.
557		Colchicaceae	*Littonia lindeni* Baker
558		Acanthaceae	*Thunbergia*
559		Convolvulaveae	*Ipomoea linosepala* Haller f. ssp. *alpina* (Rendle)
560		Moraceae	*Dorstenia* aff. *benguellensis*
561		Fabaceae	*Tephrosia*
562		Liliaceae	

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
563		Orchidaceae	*Eulophia cucullata*
564		Scrophulariaceae	*Buchnera*
565		Scrophulariaceae	*Sopubia*
566		Rubiaceae	*Pentanisia schweinfurthiana*
567		Asteraceae	*Aspilia kotschyi*
568		Lamiaceae	*Becium sp.*
569		Cyperaceae	*Scleria bulbifera*
570		Cyperaceae	*cf. Pycreus*
571			*Dryopteris cf. athamanthica*
572		Poaceae	*Alloteropsis semialata*
573		Poaceae	*Rhytachne roetboelioides*
574		Poaceae	
575		Poaceae	
576		Cyperaceae	*Ascolepis protea ???*
577		Hypoxidaceae	*Hypoxis subspicata*
578		Oxalidaceae	*Oxalis*
579		Moraceae	*Dorstenia*
580		Lamiaceae	*Ocimum vanderystii*
581		Santalaceae	*Thesium*
582		Thymelaeaceae	*Gnidia*
583		Asteraceae	*Vernonia*
584		Euphorbiaceae	*Acalypha cupricola*
585		Cyperaceae	
586		Adiantaceae	*Pellaea pectiniformis* var. *nana*
587		Cyperaceae	
588		Asteraceae	*Helichrysum*
589		Lamiaceae	*Becium*
590		Euphorbiaceae	*Acalypha*
591		Tiliaceae	*Triumfetta welwitschii var. rogersii*
592		Moraceae	*Dorstenia*
593		Fabaceae	*Aeschynomene pararubrofarinacea*
594		Rubiaceae	*Temnocalyx sp.*
595		Passifloraceae	*Basananthe kisimbae*
596		Commelinaceae	*Cyanotis*
597		Commelinaceae	*Cyanotis longifolia*
598		Liliaceae	
599		Lamiaceae	*Aeollanthus*
600		Moraceae	*Dorstenia*
601		Lamiaceae	*Becium*
602		Cyphiaceae	*Cyphia erecta*
603		Rubiaceae	

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
604	**Kwatebala** (site 7)	Commelinaceae	*Cyanotis*
605		Asteraceae	*Lopholaena*
606	near Kwatebala	Acanthaceae	*Thunbergia*
607	**Kwatebala** (site 7)	Poaceae	*Sacciolepis typhura*
608		Poaceae	*Bracharia*
609		Poaceae	*Rhytachne rottboelioides*
610		Fabaceae	*Aeschynomene pararubrofarinacea*
611		Cyperaceae	*Bulbostylis filamentosa*
612		Apiaceae	
613	**Kwatebala** (site 6)	Anthericaceae	*Chlorophytum*
614		Apiaceae	
615		Cyperaceae	*Cyperus*
616		Poaceae	*Tristachya*
617		Asteraceae	*Vernonia*
618		Acanthaceae	*Thunbergia*
619	**Kwatebala** (site 4)	MUSCI	
620		Asteraceae	*Lopholaena*
621		Rubiaceae	*Manostachya staelioides*
622		Asteraceae	*Helichrysum ceres*
623		Commelinaceae	*Cyanotis « nana »*
624		Cyperaceae	*Fimbristylis*
625		Poaceae	
626		Santalaceae	*Thesium*
627	**Mwinansefu West**	Moraceae	*Dorstenia*
628		Oxalidaceae	*Oxalis semiloba*
629		Asteraceae	*Helichrysum*
630		Poaceae	*Allopteropsis semialata*
631		Poaceae	*Sacciolepis typhura*
632		Tecophylaceae	*Walleria mackenzii*
633		Sinopteridaceae	*Cheilanthes*
634		Poaceae	
635		Asclepiadaceae	
636		Convolvulaceae	*Ipomoea*
637	**Shinkusu**	Asteraceae	*Vernonia*
638		Convolvulaceae	*Ipomoea*
639		Anthericaceae	*Chlorophytum*
640		Oxalidaceae	*Oxalis semiloba*
641		Poaceae	*Allopteropsis semialata*
642		Poaceae	
643		Acanthaceae	*Thunbergia*
644		Colchicaceae	*Littonia lindenii*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
645		Malvaceae	*Hibiscus rhodanthus*
646		Fabaceae	*Eriosema shirense*
647		Asteraceae	*Aspilia kotschyi*
648		Cyperaceae	
649		Euphorbiaceae	*Acalypha cupricola*
650		Cyperaceae	*Cyperus margaritaceus*
651		Cyperaceae	*Ascolepis protea*
652	**Kabwelunono**	Cyperaceae	*Cyperus cf. angolense*
653		Acanthaceae	*Thunbergia*
654		Cyperaceae	*Ascolepis*
655		Cyperaceae	*Bulbostylis*
656		Lamiaceae	*Becium*
657		Santalaceae	*Thesium*
658		Fabaceae	*Aeschynomene*
659		Lamiaceae	*Becium*
660		Euphorbiaceae	*Acalypha cupricola*
661		Poaceae	*Bracharia*
662		Poaceae	
663		Nephrolepidaceae	*Nephrolepis undulata*
664		Amaranthaceae	*Pandiaka carsonii*
665		Acanthaceae	*Blepharis cuanzensis*
666		Asteraceae	*Anisopappus chinensis*
667		Commelinaceae	*Cyanotis « nana »*
668		Asteraceae	*Vernonia*
669		Fabaceae	*Indigofera*
670		Hyacinthaceae	*Ledebouria*
671		Lamiaceae	*Haumaniastrum timpermanii*
672		Asteraceae	*Dicoma anomala*
673		Poaceae	*Microchloa kunthii*
674		Commelinaceae	*Cyanotis*
675		Anthericaceae	*Chlorophytum*
676	**Shimbidi**	Poaceae	
677		Fabaceae	*Indigofera*
678		Lamiaceae	*Becium*
679		Anthericaceae	*Chlorophytum*
680		Convolvulaceae	*Ipomoea*
681		Euphorbiaceae	*Acalyp^ha cupricola*
682		Santalaceae	*Thesium*
683	**Kakavilondo**	Poaceae	*Tristachya*
684		Cyperaceae	*Cyperus*
685		Euphorbiaceae	*Acalypha cupricola*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
686		Anthricaceae	*Chlorophytum*
687		Lamiaceae	*Becium*
688		Lamiaceae	*Becium*
689		Fabaceae	*Eriosema shirense*
690		Asteraceae	*Helichrysum*
691		Poaceae	*Zonotriche decora*
692		Cyperaceae	*Bulbostylis filamentosa*
693		Santalaceae	*Thesium*
694		Scrophulariaceae	*Buchnera*
695		Cyperaceae	*Ascolepis cf protea*
696		Santalaceae	*Thesium*
697		Poaceae	*Alloteropsis semialata*
698		Anacardiaceae	*Lannea edulis*
699		Rubiaceae	*Pentanisia schweinfurthii*
700		Thymeleaceae	*Gnidia*
701		Colchicaceae	*Littonia lindenii*
702		Asteraceae	*Lopholaena*
703		Oxalidaceae	*Oxalis semiloba*
704		Apiaceae	*Pimpinella acutidentata*
705		Lamiaceae	*Becium*
706		Tiliaceae	*Triumfetta welwitschii* var. *rogersii*
707		Euphorbiaceae	*Acalypha cupricola*
708		Commelinaceae	
709		Velloziaceae	*Xerophyta equisetoides*
710		Lamiaceae	*Ocimum vanderystii*
711		Asteraceae	*Vernonia adenocephala*
712		Cyperaceae	cf. *Pycreus*
713		Fabaceae	*Eriosema* sp. 2
714		Poaceae	
715		Acanthaceae	*Justicia elegantula*
716		Fabaceae	*Aeschynomene*
717		Olacaceae	*Olax obtusifolia*
718	**Mwinansefu East**	Acanthaceae	*Thunbergia*
719		Acanthaceae	*Thunbergia* (cream flower)
720		Malvaceae	*Hibiscus rhodanthus*
721		Fabaceae	*Erisoma* sp. 2
722		Oxalidaceae	*Oxalis semiloba*
723	**Goma South-West**	Euphorbiaceae	*Acalypha cupricola*
724		Asteraceae	*Helichrysum*
725		Asteraceae	*Vernonia*
726		Acanthaceae	*Thunbergia*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
727		Acanthaceae	*Thunbergia*
728		Velloziaceae	*Xerophyta equisetoides*
729		Hyacinthaceae	*Ledebouria*
730		Convolvulaceae	*Ipomoea alpina*
731		Euporibaceae	*Monadenium discoideum*
732		Anthericaceae	*Chlororphytum* aff. sp. 6
733	**Kabwelunono**	Passifloraceae	*Basananthe kisimbae*
734		Fabaceae	*Humularia*
735		Asteraceae	*Vernonia*
736		Poaceae	*Loudetia simplex*
737		Euphorbiaceae	*Monadenium discoideum*
738	Narrow stream fringe	Commelinaceae	*Murdannia*
739	**Goma central**	Velloziaceae	*Xerophyta equisetoides*
740		Acanthaceae	*Thunbergia*
741		Cyperaceae	*Cyperus margaritaceus*
742		Cyperaceae	*Ascolepis*
743		Poaceae	*Bracharia*
744		Cyperaceae	*Scleria bulbifera*
745		Poaceae	*Rytachne rottboelioides*
746		Asteraceae	*Aspilia kotschyi*
747		Poaceae	*Digitaria*
748		Lamiaceae	*Aeollanthus homblei*
749		Fabaceae	*Riosema shirense*
750		Moraceae	*Dorstenia*
751		Euphorbiaceae	*Acalypha cupricola*
752		Poaceae	*Sacciolepis typhura*
753		Poaceae	
754		Poaceae	
755		Lamiaceae	*Becium*
756		Scrophulariaceae	*Buchnera*
757		Asteraceae	*Helichrysum ceres*
758		Acanthaceae	*Justicia* cf. *metallorum*
759		Fabaceae	*Droogmansia quarrei*
760		Cyperaceae	*Fimbristylis*
761		Lamiaceae	*Becium*
762		Rubiaceae	*Pentanisia schweinfurthii*
763		Oxalidaceae	*Oxalis semiloba*
764		Convolculaceae	*Ipomoea*
765		Santalaceae	*Thesium*
766		Asteraceae	*Vernonia*
767		Cyperaceae	*Cyperus angolensis*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
768		CYANOPHYCEAE	
769		Asteraceae	*Dicoma anomala*
770		Amaranthaceae	*Pandiaka carsonii*
771		Eriospermaceae	*Eriospermum abyssinicum*
772	**Goma North-East**	Moraceae	*Dorstenia*
773		Poaceae	
774		Lamiaceae	*Becium*
775	**Kazinyanga**	Santalaceae	*Thesium*
776		Hypoxidaceae	*Hypoxis subspicata*
777		Taccaceae	*Tacca involucrata*
778		Euphorbiaceae	*Acalypha cupricola*
779		Asteraceae	*Aspilia kotschyi*
780		Apiaceae	*Pimpinella acutidentata*
781		Lamiaceae	*Becium*
781 bis		Rubiaceae	*Pentanisia schweinfurthii*
782		Colchicaceae	*Littonia lindeni*
783		Scrophulariaceae	*Sopubia*
784		Caesalpiniaceae	*Cryptosepalum maraviense*
785		Commelinaceae	
786		Tiliaceae	*Triumfetta welwitschii* var. *rogersii*
787		Fabaceae	*Aeschynomene*
788		Cyperaceae	*Cyperus margaritaceus*
789		Commelinaceae	*Cyanotis*
790		Poaceae	
791		Poaceae	*Rytachne roetbolioides*
792		Poaceae	
793		Olacaceae	*Olax obtusifolia*
794		Cyperaceae	cf. *Pycreus*
795		Moraceae	*Dorstenia barminiana* var. *barnimiana*
796		Acanthaceae	*Thunbergia*
797		Asteraceae	*Vernonia*
798		Fabaceae	*Indigofera*
799		Fabaceae	*Sphenostylis*
800		Commelinaceae	*Cyanotis*
801		Lamiaceae	*Becium*
802		Poaceae	*Microchloa kunthii*
803		Eriospermaceae	*Eriospermum abyssinicum*
804		Velloziaceae	*Xerophyta*
805		Cyperaceae	*Scleria bulbifera*
806		Fabaceae	*Crotalaria*
807		Lamiaceae	*Haumaniastrum*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
808		Fabaceae	*Eriosema shirense*
809		Euphorbiaceae	*Monadenium lorifolium*
810		Fabaceae	*Indigofera*
811		Commelinaceae	*Murdania*
812		Orchidaceae	*Eulophia cucculata*
813		Schizeaceae	*Mohria lepigera*
814		Cyperaceae	*Bulbostylis cupricola*
815		Loranthaceae	*Phragmanthera eminii*
816	**Mwadikomba**	Santalaceae	*Thesium*
817		Fabaceae	*Tephrosia*
818		Thymeleaceae	*Gnidia*
819		Velloziaceae	*Xerophyta equinervis*
820		Cyperaceae	*Bulbostylis filamentosa*
821		Poaceae	*Rytachne roetbolioides*
822		Lamiaceae	*Becium*
823		Acanthaceae	*Thunbergia*
824		Cochicaceae	*Littonia lindeni*
825		Fabaceae	*Eriosema*
826		Oxalidaceae	*Oxalis semiloba*
827		Poaceae	*Bracharia*
828		Acanthaceae	*Thunbergia* (cream flower)
829		Asteraceae	
830		Caesalpiniaceae	*Chamaecrista mimosoides*
831		Poaceae	
832		Poaceae	
833		Lamiaceae	*Becium*
834		Cyperaceae	*Cyperus margaritaceus*
835		Scrophulariaceae	*Buchnera*
836		Aristolochiaceae	*Aristolochia*
837	**Kwatebala West**	Commelinaceae	*Cyanotis* “nana”
838		Cyperaceae	*Ascolepis metallorum*
839		Cyperaceae	*Cyperus margaritaceus*
840		Velloziaceae	*Xerophyta equisetoides*
841		Poaceae	*Tristachya*
842		Fabaceae	*Aeschynomene*
843		Cyperaceae	cf. *Pycreus*
844		Lamiaceae	*Becium* « kafupa »
845		Acanthaceae	*Justicia elegantula*
846		Rubiaceae	*Pentanisia schweinfurthii*
847		Euphorbiaceae	*Acalypha cupricola*
848		Asteraceae	*Aspilia kotschyi*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
849		Scrophulariaceae	*Buchnera*
850		Lamiaceae	*Aeollanthus homblei*
851		Rubiaceae	*Soermacoce dibrachiata*
852		Colchicaceae	*Littonia lindeni*
853		Amaranthaceae	*Pandiaka carsoni*
854		Eriospermaceae	*Eriospermum abyssinicum*
855		Fabaceae	*Eriosema shirense*
856		Convolvulaceae	*Ipomoea*
857		Cyperaceae	*Scleria bulbifera*
858		Poaceae	*Bracharia*
859		Poaceae	
860		LICHENS	
861	**Kwatebala** (site 7)	Commelinaceae	*Cyanotis*
862	**Pumpi XI**	Convolvulaceae	*Ipomoea*
863		Cyperaceae	*Bulbostylis pseudoperennis*
864		Adiantaceae	*Pellaea pectiniformis*
865		Sinopteridaceae	*Cheilanthes similis*
866		Amaranthaceae	*Pandiaka carsoni*
867		Tiliaceae	*Triumfetta likasiensis*
868		Melastomataceae	*Dissotis*
869		Sinopteridaceae	*Cheilanthes* sp. nov.
870		Asteraceae	*Vernonia*
871		Lamiaceae	*Haumaniastrum timpermanii*
872		Poaceae	*Eragrostis*
873		Actiniopteridaceae	*Actiniopteris pauciloba*
874		Adiantaceae	*Pellaea pectiniformis*
875		Sinopteridaceae	*Cheilanthes*
876		Euphorbiaceae	*Acalypha cupricola*
877		Poaceae	*Sacciolepis typhura*
878		Fabaceae	*Indigofera*
879		Poaceae	*Tristachya*
880		Poaceae	
881		Cyperaceae	*Bulbostylis pseudoperennis*
882		Gentianaceae	*Faroa*
883		Poaceae	
884		Poaceae	*B racharia*
885		Cyperaceae	*Cyperus margaritaceus*
886		Cyperaceae	
887		Poaceae	*Microchloa kunthii*
888		Poaceae	*Allopteropsis semialata*
889		Cyperaceae	

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
890		Lamiaceae	*Becium*
891		Poaceae	
892		Santalaceae	*Thesium*
893	**Mambilima**	Adiantaceae	*Pellaea pectiniformis*
894		Velloziaceae	*Xerophyta equisetoides*
895		Vitaceae	*Cyphostemma*
896		Selaginellaceae	*Selaginella*
897		Acanthaceae	
898		Schizeaceae	*Mohria lepigera*
899		Begoniaceae	*Begonia princae* var. *princae*
900		Lamiaceae	*Aeollanthus*
901		Fabaceae	*Indigofera*
902		Moraceae	*Dorstenia*
903		Commelinaceae	*Cyanotis*
904		Poaceae	*Eragrostis*
905		Nephrolepidaceae	*Nephrolepis undulata*
906		Thelypteridaceae	*Thelypteris*
907		Actiniopteridaceae	*Actinuiopteris pauciloba*
908		Cyperaceae	*Bulbostylis pseudoperennis*
909		Lamiaceae	*Becium*
910		Commelinaceae	*Cyanotis*
911		Cyperaceae	*Bulbostylis cupricola*
912		Anthericaceae	*Chlorophytum*
913		Convolvulaceae	*Ipomoea*
914		Adiantaceae	*Pellaea*
915		MUSCI	
916		Euphorbiaceae	*Monadenium lorifolium*
917		Cyperaceae	*Cyperus margaritaceus*
918		Poaceae	*Rytachne roetbolioides*
919		Poaceae	*Alloteropsis semialata*
920		Fabaceae	*Eriosema shirense*
921		Poaceae	*Tristachya*
922		Asclepiadaceae	*Gymnadenia*
923		Commelinaceae	*Murdania*
924		Oxalidaceae	*Oxalis semiloba*
925	**Kwatebala** (site 4)	Adiantaceae	*Pellaea pectiniformis*
926		Caryophyllaceae	
927		Lamiaceae	*Becium*
928	**Kazinyanga**	Tiliaceae	*Triumfetta welwitschii* var. *rogersii*
929		Commelinaceae	*Cyantois*
930		Poaceae	*Allopteroptis semialata*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
931		Cyphiaceae	*Cyphia erecta*
932		Poaceae	*Rytachne roetbolioides*
933		Cyperaceae	*Bulbostylis fusiformis*
934		Actiniopteridaceae	*Actiniopteris pauciloba*
935		Anthericaceae	*Chlorophytum*
936		Poaceae	
937		Cyperaceae	*Cyperus margaritaceus*
938		Poaceae	
939		Poaceae	*Microchloa kunthii*
940		Euphorbiaceae	*Monadenium lorifolium*
941		Anthericaceae	*Chlorophytum*
942		Oxalidaceae	*Oxalis semiloba*
943		Pimpinella acutidentata	
944		Convolvulaceae	*Ipomoea*
944 bis	**Kwatebala** (site 1)	Sinopteridaceae	*Cheilanthes* sp. nov.
945	**Mambilima**	Lamiaceae	*Becium*
946		?	
947	**Kwatebala**	Asteraceae	*Pseudognaphalium luteo-album*
948		Asteraceae	*Helichrysum*
949	**Shadirandzoro**	Poaceae	
950		Poaceae	
951		Poaceae	
952		Poaceae	
953		Velloziaceae	*Xerophyta equisetoides*
954		Euphorbiaceae	*Phyllanthus*
955		Poaceae	
956		Poaceae	
957		Oxalidaceae	*Oxalis semiloba*
958		Poaceae	*Bracharia*
959		Cyperaceae	*Cyperus margaritaceus*
960		Poaceae	*Microchloa kunthii*
961		Adiantaceae	*Pellaea longipilosa*
962		Convolvulaceae	*Ipomoea*
963		Tiliaceae	*Grewia*
064		Cyperaceae	
965		Commelinaceae	*Cyanotis*
966		Acanthaceae	*Thunbergia*
967		Lamiaceae	*Becium*
968		Oxalidaceae	*Oxalis*
969		???	
970		Acanthaceae	*Thunbergia* cream flower

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
971		Asteraceae	*Vernonia*
972		Fabaceae	*Humularia verdickii* var. *nummularia*
973		Asteraceae	
974		Adiantaceae	*Pellaea longipilosa*
975		Asclepiadacdeae	*Glossostelma*
976		Iridaceae	*Gladiolus*
977		Moraceae	*Dorstenia*
978		Asteraceae	
979		Anthericaceae	*Chlorophytum*
980		Asteraceae	*Vernonia adenocehala*
981		Poaceae	*Microchloa kunthii*
982		Cyperaceae	
983		Oxalidaceae	*Oxalis obliquifolia*
984		Apiaceae	*Pimpinella acutidentata*
985		Cyperaceae	
986		Poaceae	
987		Euphorbiaceae	*Phyllanthus virgulatus*
988		Nephrolepidaceae	*Arthropteris anniana*
989		Coclchicaceae	*Littonia lindeni*
990		Begoniaceae	*Begoinia princeae* var. *princeae*
991		Fabaceae	*Eriosema shirense*
992		Cyperaceae	
993		Cyperaceae	
994		Commelinaceae	*Commelina*
995		Euphorbiacdeae	*Acalypha cupricola*
996		Asteraceae	*Aspilia kotschyi*
997		Santalaceae	*Thesium cf.*
998		Poaceae	*Allopteropsis semialata*
999		Poaceae	*Sacciolepis typhura*
1000		Apiaceae	*Pimpinella acutidentata*
1001		Cyperaceae	*Cyperus*
1002		Cyperaceae	*Ascolepis*
1003		Cyperacae	
1004		Lamiaceae	*Becium*
1005		Amaranthaceae	*Pandiaka carsoni*
1006		Commelinaceae	*Cyanotis longifolia*
1007		Moraceae	*Dorstenia barnimiana* var. *barnimiana*
1008	**Zikule**	Asteraceae	*Vernonia*
1009		Lamiaceae	*Becium*
1010		Colchicaceae	*Littonia lindeni*
1011		Lamiaceae	*Becium*

Table 1 Collection François MALAISSE, KISIMBA Kibuye and Layla SAAD (continued)

N°	Site (Date)	Family	Taxon
1012		Cyperaceae	
1013		Lamiaceae	
1014		Orchidaceae	*Nervilia kotschyi*
1015		Lamiaceae	*Becium* “kafupa”
1016		Anthericaceae	*Chlorophytum*

ATTACHMENT 9

IUCN RANKING CATEGORIES

IUCN SPECIES

The key categories will be critically endangered, endangered, vulnerable, and near threatened. Definitions from the IUCN website:

http://www.iucnredlist.org/info/categories_criteria1994.html

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

LOWER RISK (LR)

A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

CONSERVATION DEPENDENT (CD)

Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation program targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.

NEAR THREATENED (NT)

Taxa which do not qualify for Conservation Dependent but which are close to qualifying for Vulnerable.

LEAST CONCERN (LC)

Taxa which do not qualify for Conservation Dependent or Near Threatened.

ATTACHMENT 10

COPPER COBALT PLANT DIVERSITY IN THE TFM AREA

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Acalypha cupricola	I - II 2006	M 16375	yes	no	no	21 sites
Acanthaceae MKS 271	IV - V 2006	MKS 271				
Acanthaceae MKS 72	IV - V 2006	MKS 72				
Acanthaceae MKS 462	IV - V 2006	MKS 462				
Acanthaceae MKS 482	IV - V 2006	MKS 482				
Acanthaceae fl. lilas pâle	IV - V 2006	MKS 536				
Actiniopteris MKS 266 cf. pauciloba	IV - V 2006	MKS 266				
Actiniopteris pauciloba	IV - V 2006	MKS 537	no	no	no	no
Adenodolichos rhomboideus	I - II 2006	M 16363	no	no	no	no
Aeollanthus saxatilis	I - II 2006	M-Gr 37	yes	no	no	5 sites
Aeollanthus subacaulis	IV - V 2006	MKS 44	no	no	no	no
Aeschynomene pararubrofarinacea	I - II 2006	MMK 8	?	?	?	?
Aeschynomene dressé	I - II 2006	M 16366				
Aeschynomene MKS 217	IV - V 2006	MKS 217				
Aeschynomene pygmaea	IV - V 2006	MKS 57	no	no	no	no
Alectra senegalensis	IV - V 2006	MKS 20	no	no	no	no
Allopteropsis semialata	I - II 2006	M 16409	no	no	no	no
Alysicarpus sp.	IV - V 2006	MKS 454				
Andropogon shirense	I - II 2006		no	no	no	no
Anemia angolensis	IV - V 2006	MKS 97				
Anisopappus MKS 8 cf. chinensis	IV - V 2006	MKS 8				
Anthericum sp.	IV - V 2006					
Antherotoma naudinii	IV - V 2006	MKS 95	no	no	no	no
Apiaceae MKS 14	IV - V 2006	MKS 14				
Apiaceae MKS 494	IV - V 2006	MKS 494				
Apiaceae MKS 316	IV - V 2006	MKS 316				
Apiaceae MKS 473	IV - V 2006	MKS 473				
Arthropteris cf. annae	IV - V 2006	MKS 101				
Arthraxon micans	IV - V 2006	MKS 307	no	no	no	no
Ascolepis (grand)?	I - II 2006	M 16335				
Ascolepis metallorum	I - II 2006	M 16376	yes	no	no	12 sites
Ascolepis protea	IV - V 2006	MKS 475	no	no	no	no
Asparagus africanus	I - II 2006	M 16420				
Asteraceae MKS 19	IV - V 2006	MKS 19				
Asteraceae MKS 224	IV - V 2006	MKS 224				

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Asteraceae cf lactuca MKS 273	IV - V 2006	MKS 273				
Asteraceae aff. launea MKS 277	IV - V 2006	MKS 277				
Asteraceae fe crassulescente	I - II 2006	MKK 57				
Barleria lobelioides	IV - V 2006	MKS 464	yes	no	no	7 sites
Basananthe kisimbae	IV - V 2006	MKS 55	yes	yes	yes	4 sites
Batopedina pulvinellata	IV - V 2006	MKS 96	no	no	no	no
Becium "kapufa"	IV - V 2006					
Becium homblei	IV - V 2006		no	no	no	no
Ocimum vanderystii	IV - V 2006		no	no	no	no
Becium MKS 56	IV - V 2006	MKS 56				
Becium sp.	IV - V 2006					
Becium sp. 2	IV - V 2006					
Becium sp. 3	IV - V 2006					
Begonia princeae var. princeae	I - II 2006	M 16422	no	no	no	no
Blepharis bleu MKS 278	IV - V 2006	MKS 278				
Blepharis quanzensis	IV - V 2006	MKS 67	no	no	no	no
Blepharis sp. 2	IV - V 2006	MKS 168				
Bracharia sp.	IV - V 2006					
Buchnera inflata	IV - V 2006	MK 43	no	no	no	no
Buchnera mauve	IV - V 2006	MKS 12				
Buchnera robynsii	IV - V 2006	MKS 142	no	no	no	7 sites
Buchnera trilobata	IV - V 2006	MKS 5	no	no	no	no
Bulbostylis cupricola	IV - V 2006	MKS 208	yes	no	no	21 sites
Bulbostylis filamentosa (Kis)	IV - V 2006	MKS 110				
Bulbostylis MKS 240	IV - V 2006	MKS 240				
Bulbostylis pseudoperennis	I - II 2006	M 16385	yes	no	no	16 sites
Bulbostylis aff. Macra	IV - V 2006	MKS 109				
Bulbostylis sp. 2	IV - V 2006					
Carex sp.	IV - V 2006					
Cephalaria katangensis	IV - V 2006	MKS 262	no	no	no	no
Chamaechrista mimosoides	IV - V 2006	MKS 77	no	no	no	no
Cheilantes sp. nov.	IV - V 2006	MKS 3	yes	yes	yes	1 site
Cheilanthes angustifrondosa	IV - V 2006	MKS 98				
Chironia katangensis	IV - V 2006	MKS 433	no	no	no	no
Commelina fruit orange	IV - V 2006					

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Commelina MKS 237	IV - V 2006	MKS 237				
Commelina reptans (Kis)	IV - V 2006					
Commelina zigzag	IV - V 2006	MKS 27	yes	??	??	??
Commelinaceae MKS 323	IV - V 2006	MKS 323				
Coreopsis oligoflora	IV - V 2006		no	no	no	no
Crassula vaginata	IV - V 2006	MKS 4	no	no	no	no
Crotalaria cobalticola	IV - V 2006	MKS 62	yes	no	no	9 sites
Crotalaria cornetii	IV - V 2006		no	no	no	no
Crotalaria fl. jaunes MKS 25	IV - V 2006	MKS 25				
Crotalaria cf. glauca	IV - V 2006	MKS 153				
Crotalaria MKS 263	IV - V 2006	MKS 263				
Crotalaria MKS 268	IV - V 2006	MKS 268				
Crotalaria MKS 421	IV - V 2006	MKS 421				
Crotalaria MKS 490	IV - V 2006	MKS 490				
Crotalaria MKS 71	IV - V 2006	MKS 71				
Crotalaria MKS 84	IV - V 2006	MKS 84				
Crotalaria MKS 90	IV - V 2006	MKS 90				
Crotalaria sp.	IV - V 2006					
Crotalaria sp. 2 cf argentea	IV - V 2006	MKS 16				
Crotalaria sp. 3	IV - V 2006					
Cryptosepalum maraviense	I - II 2006	M 16348	no	no	no	no
Ctenium concinnum	IV - V 2006	MKS 41	no	no	no	no
Cyanophyceae	I - II 2006	MKK 28				
Cyanotis aff. nana	IV - V 2006	MKS 32				
Cyanotis longifolia	IV - V 2006	MKS 175	no	no	no	no
Cyanotis sp.	IV - V 2006					
Cymbopogon densiflorus	I - II 2006	M 16451	no	no	no	no
Cyperaceae MKS 210	IV - V 2006	MKS 210				
Cyperus sp.	IV - V 2006					
Cyphia erecta	IV - V 2006	MKS 527	no	no	no	no
Cyphostemma sessilifolium	I - II 2006	M 16528	no	no	no	no
Dasistachys sp.	IV - V 2006	MKS 298				
Dicoma anomala	IV - V 2006	MKS 29	no	no	no	no
Dicoma cf poggei MKS 30	IV - V 2006	MKS 30				
Digitaria sp.	IV - V 2006	MKS 417				
Diheteropogon emarginatus	IV - V 2006	MKS 157	no	no	no	no
Dioscorea sp.	IV - V 2006					

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Diplolophium zambesianum	IV - V 2006	MKS 145	no	no	no	no
Disa sp.	I - II 2006	M 16454				
Dissotis MKS 243	IV - V 2006	MKS 243				
Dissotis sp.	IV - V 2006	MKS 119				
Dorstenia M 16501	I - II 2006	M 16501				
Dorstenia MKS 194	IV - V 2006	MKS 194				
Droogmansia munamensis	IV - V 2006	MKS 365	no	no	no	no
Droogmansia quarrei	IV - V 2006	MKS 386	no	no	no	no
Eragrostis racemosa	IV - V 2006					
Eriosema shirense	IV - V 2006	MKS 164	no	no	no	no
Eriospermum abyssinicum	IV - V 2006	MKS 379	no	no	no	no
Eulophia walleri	I - II 2006	M 16478	no	no	no	no
Euphorbia fanshawei	I - II 2006		no	no	no	3 sites
Faroa acaulis	IV - V 2006	MKS 66	no	no	no	no
Faroa malaissei	IV - V 2006	MKS 22	yes	yes	no	3 sites
Faroa sp.	IV - V 2006	MKS 100				
Gerbera sp.	IV - V 2006					
Gladiolus dalenii	I - II 2006	M 16345	no	no	no	no
Gladiolus gregarius	I - II 2006	M 16445	no	no	no	no
Gladiolus feuilles larges	IV - V 2006	MKS 64				
Gladiolus rose	IV - V 2006	MKS 216				
Gladiolus séché	IV - V 2006	MKS 471				
Gnidia cf. hockii	I - II 2006	M 16373				
Habenaria perpulchra	I - II 2006	M 16404	no	no	no	no
Habenaria weberiana	I - II 2006	M 16359	no	no	no	no
Habenaria sp. 1	IV - V 2006	MKS 338				
Habenaria sp. 2	IV - V 2006	MKS 453				
Haumaniastrum katangense	IV - V 2006	MKS 481	no	no	no	no
Haumaniastrum prealpum var. homblei	IV - V 2006	MKS 160	no	no	no	no
Haumaniastrum robertii	IV - V 2006	MKS 247	yes	no	no	21 sites
Haumaniastrum rosulatum	IV - V 2006	MKS 79	no	no	no	no
Haumaniastrum timpermanii	IV - V 2006	MKS 329	no	no	no	24 sites
Helichrysum argenté	IV - V 2006					
Helichrysum keilii	IV - V 2006	MKS 45	no	no	no	no
Helichrysum kirkii	IV - V 2006		no	no	no	no
Helichrysum MKS 302	IV - V 2006	MKS 302				

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Helichrysum MKS 385	IV - V 2006	MKS 385				
Hepaticae MKS 193	IV - V 2006	MKS 193				
Heteropogon sp.	IV - V 2006					
Hibiscus rhodanthus	IV - V 2006	MKS 39	no	no	no	no
Hymenocardia acida	I - II 2006		no	no	no	no
Humularia sp.	IV - V 2006	MKS 253				
Hyparrhenia cf diffusa (Kis)	IV - V 2006					
Hyparrhenia cf rufa (Kis)	IV - V 2006					
Hyparrhenia sp.	IV - V 2006	MKS 163				
Indigofera sutherlandoides	I - II 2006	M 16357	no	no	no	no
Indigofera sp.	IV - V 2006	MKS 82				
Inula shirensis	IV - V 2006	MKS 11	no	no	no	no
Ipomoea alpina	IV - V 2006	MKS 61	no	no	no	no
Ipomoea MKS 222	IV - V 2006	MKS 222				
Ipomoea sp. 2 (dressé)	IV - V 2006					
Iridaceae (Gladiolus récolté)	IV - V 2006					
Kotschya sp.	IV - V 2006					
Lapeyrousia welwitshii	IV - V 2006	MKS 242	no	no	no	no
Launea sp.	IV - V 2006					
Lichen sp. 1	IV - V 2006	MKS 308				
Lichen sp. 2 absinthe	IV - V 2006	MKS 415				
Lichen sp. 3	I - II 2006	M 16542				
Lichen sp. 4	I - II 2006	M 16543				
Lichen sp. 5	I - II 2006	M 16544				
Liparis nervosa	I - II 2006	MKK 51	no	no	no	no
Liliaceae inconnue	IV - V 2006	MKS 331				
Liliaceae inconnue 2	IV - V 2006					
Lopholaena sp.	IV - V 2006	MKS 10				
Loudetia simplex	IV - V 2006	MKS 426	no	no	no	no
Manostachya MKS 337	IV - V 2006	MKS 337				
Manostachya staeloides	IV - V 2006	MKS 146	no	no	no	no
Melinis sp. 1	I - II 2006	M 16415				
Microchloa kunthii	IV - V 2006	MKS 378	no	no	no	no
MKS 435	IV - V 2006	MKS 435				
MKS 442	IV - V 2006	MKS 442				
Mohria lepigera	IV - V 2006	MKS 81	no	no	no	no
Monademium lorifolium	IV - V 2006	MKS 486	no	no	no	yes

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Monadenium cupricola	IV - V 2006	MKS 434	yes	no	no	3 sites
Monechma sp. 1 cf. debile	IV - V 2006	MKS 457				
Monocymbium ceresiiforme	IV - V 2006	MKS 1	no	no	no	no
Monotes sp.	I - II 2006	M 16362				
Moraea cf. carsonii fl. bleue	I - II 2006	M 16382				
Moraea sp. 1	IV - V 2006	MKS 446				
Moraea sp. 2	IV - V 2006	MKS 463				
Musci sp. 1	IV - V 2006	MKS 33				
Musci sp. 2	IV - V 2006	MKS 36				
Musci sp. 3	IV - V 2006	MKS 37				
Musci sp. 4	IV - V 2006	MKS 310				
Musci sp. 5	IV - V 2006	MKS 380				
Musci sp. 6	IV - V 2006	MKS 465				
Nephrolepis undulata	IV - V 2006	MKS 101	no	no	no	no
Ochna schwenfurthiana	I - II 2006		no	no	no	no
Ocimum vanderystii	I - II 2006	M 16447	??			
Olax obtusifolia	IV - V 2006		no	no	no	no
Ophioglossum MKS 200	IV - V 2006	MKS 200				
Ophioglossum MKS 272	IV - V 2006	MKS 272				
Otiophora coerulea	I - II 2006	M 16365	no	no	no	
Oxalis obliquifolia	I - II 2006	M 16459	no	no	no	no
Oxalis semiloba	I - II 2006	M 16458	no	no	no	no
Ozoroa reticulata	IV - V 2006	MKS 318	no	no	no	no
Pandiaka carsonii	IV - V 2006	MKS 86	no	no	no	no
Panicum sp.	IV - V 2006	MKS 258				
Pellaea doniana	IV - V 2006	MKS 40	no	no	no	no
Pellaea longipilosa	I - II 2006	MMK 9	no	no	no	no
Pellaea pectiniformis	IV - V 2006	MKS 92	no	no	no	no
Pellaea pectiniformis var. nana	IV - V 2006	MKS 466	yes	yes	no	about 7 sites
Pentanisia cf. schweinfurthii	IV - V 2006	MKS 369				
Phyllanthus cf amara	IV - V 2006	MKS 28				
Phyllanthus sp. 1	I - II 2006	M 16367				
Pimpinella acutidentata	IV - V 2006		no	no	no	no
Plectranthus à fleurs bleues	IV - V 2006	MKS 21				
Plectranthus esculentus	IV - V 2006	MKS 353	no	no	no	no
Pleiotaxis fl. rouge MKS 24	IV - V 2006	MKS 24				

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Pleiotaxis MKS 231	IV - V 2006	MKS 231				
Pleotaxis davii	IV - V 2006					
Poaceae MKS 206	IV - V 2006	MKS 206				
Poaceae MKS 489	IV - V 2006	MKS 489				
Poaceae MKS 70	IV - V 2006	MKS 70				
Poaceae sp. 1	IV - V 2006	MKS 350				
Poaceae sp. 2	IV - V 2006	MKS 351				
Poaceae sp. 3	IV - V 2006	MKS 352				
Polygala à fleurs jaunes	IV - V 2006	MKS 7				
Polygala bleu MKS 62	IV - V 2006	MKS 62				
Polygala MKS 89	IV - V 2006	MKS 89				
Polygala petitiana	IV - V 2006		no	no	no	no
Polygala cf. usafuensis	IV - V 2006	MKS 448				
Polystachya sp.	I - II 2006	M 16542				
Protea MKS 269	IV - V 2006	MKS 269				
Protea sp,	IV - V 2006					
Pseudoeriosema sp.	IV - V 2006	MKS 403				
Pteris vittata	IV - V 2006		no	no	no	no
Rendlia altera	IV - V 2006		no	no	no	no
Rhynchosia sp. 1 MKS 185	IV - V 2006	MKS 185				
Rhynchosia sp. 2 MKS 186	IV - V 2006	MKS 186				
Rubiaceae inconnue	IV - V 2006					
Rubiaceae MKS 234	IV - V 2006	MKS 234				
Rubiaceae MKS 267	IV - V 2006	MKS 267				
Rubiaceae MKS 488	IV - V 2006	MKS 488				
Sacciolepis transbarbata	I - II 2006	M 16351	no	no	no	no
Schistostephium artemisaefolium	IV - V 2006	MKS 49	no	no	no	no
Scleria cf bulbifera	IV - V 2006	MKS 111				
Scleria MKS 483	IV - V 2006	MKS 483				
Scleria sp. 2	IV - V 2006					
Sebaea microphylla	IV - V 2006	MKS 540	no	no	no	no
Securidaca longepedunculata var. parvifolia	IV - V 2006		no	no	no	no
Selaginella sp.	IV - V 2006	MKS 99				
Sopubia cf metallorum	IV - V 2006					
Sopubia fin	IV - V 2006	MKS 52				
Sopubia MKS 443	IV - V 2006	MKS 443				

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Sopubia MKS 62	IV - V 2006	MKS 62				
Sopubia neptunii	IV - V 2006	MKS 2	no	no	no	12 sites
Sopubia sp. 3	IV - V 2006	MKS 181				
Spermacoce dibrachyata	IV - V 2006	MKS 47	no	no	no	no
Spermacoce cf. pusilla	IV - V 2006	MKS 35				
Sphenostylis MKS 195	IV - V 2006	MKS 195				
Sporobolus sp.	IV - V 2006					
Striga asiatica	IV - V 2006	MKS 78				
Strophanthus welwitschii	IV - V 2006		no	no	no	no
Temnocalyx cf verdickii MKS 274	IV - V 2006	MKS 274				
Tephrosia sp. 1	IV - V 2006	MKS 161				
Tephrosia MKS 201	IV - V 2006	MKS 201				
Tephrosia sp. 2	I - II 2006	M 16394				
Thelypteris sp.	IV - V 2006	MKS 474				
Thesium MKS 73	IV - V 2006	MKS 73	??	??	??	??
Thesium MKS 159	IV - V 2006	MKS 159				
Thesium MKS 187	IV - V 2006	MKS 187	??	??	??	??
Thesium MKS 221	IV - V 2006	MKS 221				
Thesium MKS 229	IV - V 2006	MKS 229				
Thesium MKS 322	IV - V 2006	MKS 322				
Thesium MKS 422	IV - V 2006	MKS 422				
Thesium sp.	IV - V 2006					
Thesium sp. 2	IV - V 2006					
Thunbergia oblongifolia	I - II 2006	M 16482	no	no	no	no
Tinnea coerulea var. obovata	IV - V 2006	MKS 173	yes	no	no	9 sites
Tristachya sp. cf bequaerti	IV - V 2006	MKS 451				
Tristachya sp.2	IV - V 2006	MKS 107				
Triumfetta likasiensis	IV - V 2006	MKS 363	no	no	no	no
Triumfetta welwitschii subsp. rogersii	IV - V 2006	MKS 85	no	no	no	no
Triumfetta welwitshii subsp. welwitschii	IV - V 2006		no	no	no	no
Uapaca robynsii	IV - V 2006	MKS 80	no	no	no	no
Vangueriopsis tomentosa	I - II 2006		no	no	no	no
Vernonia "grand"	IV - V 2006					
Vernonia cf. chloropappa	IV - V 2006					
Vernonia cf. melleri	IV - V 2006	MKS 480				

Table 10-1 Copper-Cobalt Plant Diversity in the TFM Area (continued)

Taxon	Date	Collection Number (if collected)	Copper Endemic	RSA Only	LSA Only	Number of Populations < 5
Vernonia feuilles lancéolées	IV - V 2006					
Vernonia fleurs blanches	IV - V 2006					
Vernonia fleurs violettes	IV - V 2006					
Vernonia MKS 270	IV - V 2006	MKS 270				
Vernonia MKS 276	IV - V 2006	MKS 276				
Vernonia MKS 328	IV - V 2006	MKS 328				
Vernonia MKS 485	IV - V 2006	MKS 485				
Vernonia sp.	IV - V 2006					
Vernonia sp. 2	IV - V 2006					
Vigna MKS 74	IV - V 2006	MKS 74				
Vigna sp.	IV - V 2006					
Virectaria major	IV - V 2006					
Wahlenbergia capitata	IV - V 2006	MKS 15	no	no	no	no
Wahlenbergia collomioides	IV - V 2006		no	no	no	no
Wahlenbergia verbascoides	1998	DKM 1906	no	no	no	3 sites
Wahlenbergia sp. 1	IV - V 2006	MKS 23				
Wahlenbergia sp. 2	IV - V 2006	MKS 133				
Wahlenbergia sp. 3	IV - V 2006	MKS 171				
Xerophyta cf. equisetoides	IV - V 2006	MKS 239				
Xerophyta cf. sp. nov. mauve	I - II 2006	M 16355	no	no	no	3 sites
Zonotriche decora	IV - V 2006	MKS 59	no	no	no	no
Zontriche superba	I - II 2006	MMK 14	no	no	no	no
?	IV - V 2006	MKS 65				
?	IV - V 2006	MKS 183				

ATTACHMENT 11

PRELIMINARY ASSESSMENT OF FLORISTIC DIVERSITY OF KWATEBALA COPPER HILL BASED ON HERBARIUM COLLECTION

Table 1 Floristic Diversity of Kwatebala Copper Hill

Sort Order	Family	Species	Collection Numbers by Collector and Date [(a),(b)]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
Lichens			10xxx	10xxx	11.xxx		14xxx		
1	Lecanoraceae	*Lecanora* sp.					X		
2	Parmeliaceae	*Xanthoparmelia* sp.					X		
3	Pertusariaceae	*Pertusaria* sp.					X		
4	Teloschistaceae	*Caloplaca* sp.					X		
		White-grey granular					14937†		
		Ocre to green-greyish, olive, bumpy					14938†		
		Tricolor, dark orange					14939†		
		Blackish, pustules marron					14940†		
		Idem					14941†		
		Orange pustules					14942†		
		Fruticulous lichen (cf. Stereocaulon)					14943†		
		Crustaceous lichen					14944†		
		several species					14945†		
		several species					14947†		
Pteridophyta & Magnoliophyta									
1	Acanthaceae	*Barleria descampsii* Lindau	10266			40		1909	
2		*Barleria lobelioides* Champluvier sp. nov.		10906		50			
3		*Blepharis cuanzensis* Welw. ex S.Moore var. *cuanzensis*		10923		37			
4		*Justicia* cf. *elegantula* S.Moore						399,400	

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [(a),(b)]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
5	Actiniopteridaceae	*Actiniopteris pauciloba* Pic.-Serm.						1069	
6	Amaranthaceae	*Pandiaka carsoni* (Bak.) C.B.Clarke	10268					388	107
7	Anemiaceae	*Anemia angolensis* Alston	10227					1062	
8		*Mohria lepigera* (Bak.) Bak.	10235			44		1066	97
9	Apiaceae	cf. *Diplolophium zambesianum* Hiern	10239			55		358, 1918,	
10		*Pimpinella acutidentata* Norman						718	
11	Apocynaceae	*Strophanthus welwitschii* (Baill.) K.Schum.			11842				
12		*Holarrhena* cf. *pubescens* (Buch.-Ham.) Wall. ex G.Don						697	
13	Aspleniaceae	*Asplenium buettneri* Hieron.						1065	
	Asteraceae	Taxa indeterm.	10242	10908, 912, 919	11845				91
14		*Dicoma* cf. *anomala* Sond.				51, 67			
15		*Helichrysum keilii* Moeser	10237			70			
16		*Helichrysum* sp.				52			81
17		*Inula shirensis* Oliv.						1892 †	
18		*Lopholaena deltombei* P.A.Duvign.		10917		58			
19		*Pleiotaxis rogersii* S.Moore		10909		57			
20		*Vernonia suprafastigiata* Klatt (= V. brachylaenoides)		10907	11845				
21		*Vernonia* sp.				69			93

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [a],[b]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
22		*Schistostephium artemisiaefolium* Bak.	10254	10919					
23	Caesalpiniaceae	*Chamaecrista mimosoides* (L.) E.Greene						1243 †	
24		*Cryptosepalum maraviense* Oliv.	X					366	
25	Campanulaceae	*Wahlembergia capitata* (Bak.) Thulin		10920		53			
26	Combretaceae	*Combretum platypetalum* Welw.						1908	
27	Commelinaceae	*Aneilema* sp.						cf 1017	
28		*Commelina* sp.	10230					371	94
29		*Commelina* zigzag P.A.Duvign. & Dewit		10928				cf 1696	
30		*Cyanotis longifolia* Benth.						228	
31	Convolvulaceae	*Ipomoea linosepala* Haller f. ssp. alpina (Rendle) Lejoly & Lisowski							105
32		*Ipomoea recta* DeWild.	10252						
33	Crassulaceae	*Crassula vaginata* Eckl. & Zeyh.	10260	10904				229	
34	Cyperaceae	*Ascolepis metallorum* P.A.Duvign. & A.Léonard	10234						
35		*Ascolepis* cf. *protea* Welw.							80, 89, 100
36		*Bulbostylis cupricola* Goetghebeur	10231						
37		*Bulbostylis pseudoperennis* Goetghebeur	10232						
38		*Bulbostylis* cf. *fusiformis* Goetghebeur						995	96

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [(a),(b)]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
39		*Cyperus pectinatus* Vahl	10261						
		Taxa indeterm.						389, 725, 727	
40	Eriospermaceae	*Eriospermum abyssinicum* Bak.						396	88
41	Euphorbiaceae	*Acalypha cupricola* Robyns	10245					386	78
42	Fabaceae	*Adenodolichos rhomboideus* (O.Hoffm.) Harms	10233						
43		*Aeschynomene* sp.	10229					369,687	
44		*Crotalaria cobalticola* P.A.Duvign. & Plancke		10910		59		1887	
45		*Crotalaria cornetii* Taub. & Dewèvre	10251			49		394	106
46		*Crotalaria* sp.	10225			68			
47		*Droogmansia munamensis* DeWild.	10253						79
48		*Eriosema shirensis* Bak.f.							85
49		*Indigofera sutherlandioides* Welw. ex Bak.						X	
50		*Pseudoeriosema* cf. *andongense* (Bak.) Hauman		10926					
		Taxa indeterm.	10256	10915				1890	
51	Gentianaceae	*Faroa malaissei* Bamps				43			
	Iridaceae	*Gladiolus* cf. *gracillimus* Bak.						voir 1155	
52		*Gladiolus gregarious* Welw. ex Bak.	10248						

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [(a),(b)]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
53		*Gladiolus ledoctei* P.A.Duvign. & van Bockstal		10902				371	
		Gladiolus robilliartianus P.A.Duvign. & van Bockstal						voir 1154	
54	Lamiaceae	*Aeolanthus subacaulis* (Bak.) Hua & Briq. var. linearis (Burkil) Ryding	10267						
55		*Becium aureoviride* P.A.Duvign.	10270						
56		*Becium* sp.				60			90, 95
57		*Haumaniastrum praealpum* (Briq.) P.A.Duvign. & Plancke var. homblei (DeWild.) A.J.Paton						X	
58		*Haumaniastrum robertii* (Robyns) P.A.Duvign. & Plancke	10243						
59		*Haumaniastrum* sp.	10247						
60		*Ocimum fimbriatum* Briq. var. fimbriatum		10916					
61		*Plectranthus esculentus* N.E.Br.						1900	
62		*Solenostemon shirensis* (Gürke) Morton						X	
63		*Tinnea coerulea* Gürke var. *obovata* (Robyns & Lebrun) Vollesen	10257					373	
64	Liliaceae	*Chlorophytum colubrinum* (Bak.) Engl.	10263	10903		71		1917	
65		*Chlorophytum stolzii* (Krause) Kativu							82
		Taxa indeterm.							

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [a],[b]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
66	Malvaceae	*Hibiscus rhodanthus* Gürke	10250					401	
	Melastomataceae	*Antherotoma naudini* Hook.f.						voir 1169	
67		*Dissotis* sp.	10228	10922				1913	
68	Nephrolepidaceae	*Arthropteris anniana* Lawalrée						1063	
69	Olacaceae	*Olax obtusifolia* DeWild.						365	
70	Passifloraceae	*Basananthe kisimbae* Malaisse & Bamps						720 †	
	Poaceae	*Andropogon* sp.						voir 1141	
71		*Arthraxon hispidus* (Thunb.) Makino var. hispidus						232	
		Ctenium concinuum Pilger						voir 1144	
72		*Eragrostis racemosa* (Thunb.) Steud.	10259					voir 1138	103
73		*Loudetia simplex* (Nees) Hubb.	10244			63			
74		*Monocymbium ceresiiforme* (Nees) Stapf						1213 †	
75		*Rhytachne* sp.							77
76		*Schizachyrium* exile (Hochst.) Pilger				62			
77		*Sporobolus congoensis* Franch.							76
		Themeda triandra Forsk						voir 1149	
78		*Trachypogon spicatus* (L.f.) Kuntze	10265						
79		*Tristachya* sp.				61, 73			
80		*Zonotriche decora* (Stapf) Phipps	10249						

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [(a),(b)]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
		Taxa indeterm.				65			75, 84, 87, 101
81	Polygalaceae	*Polygala albida* Schinz						1268 †	
82		*Polygala petitiana* A.Rich.						1912	
83		*Securidaca longepeduncuata* Fresen var. parvifolia Oliv.						X	
84	Proteaceae	*Protea welwitschii* Engl.	10246						
85	Pteridaceae	*Cheilanthes* aff. *perlanata* (Pic.Ser.) Kornaś		10927	11843				104
86		*Pellaea longipilosa* Bonap.	10236						98
87		*Pellaea doniana* J.Sm. ex Hook.							92
88		*Pellaea pectiniformis* Bak. var. cupricola inedit.							X
89		*Pellaea pectiniformis* Bak. var. pectiniformis						1061	
90		*Pteris* sp.		10925				332	
91	Rubiaceae	*Batopedina pulvinellata* Robbrecht subsp. pulvinellata						?	
		Manostachya staelioides (K.Schum.) Bremek.						385	86
92		*Otiophora villicaulis* Mildbr	10241						
93		*Pentanisia schweinfurthii* Hiern						376	
94		*Spermacoce dibrachiata* Oliv.	10240					1916	
95		*Tapiphyllum* cf. cinarescens (Hiern) Robyns	10264						
96	Santalaceae	*Thesium* sp.	10255	10929				362	

Table 1 Floristic Diversity of Kwatebala Copper Hill (continued)

Sort Order	Family	Species	Collection Numbers by Collector and Date [a],[b]						
			FM	FM	FM	MKM	FM	DKM	LLM
			Jan. 1980	May 1980	July 1981	June 1997	June 1997	1997-1998	Nov. 2001
97	Scrophulariaceae	*Alectra sessiliflora* (Vahl) Kuntze		10918					
98		*Buchnera inflata* (De Wild.) Skan		10905		31, 64			
99		*Buchnera randii* S.Moore		10913	846				
100		*Buchnera trilobata* Skan		10914	844	56			
101		*Buchnera* sp.			11894-6	66			
102		*Sopubia metallorum* P.A.Duvign.		10921					
103		*Sopubia neptunii* P.A.Duvign. & van Bockstal	10238	10911	864	34, 72		Ledocte	
104		*Striga* sp.						cf 1190	
105	Thymeleaceae	*Gnidia kraussiana* Meissn. var. kraussiana						393	
106	Tiliaceae	*Triumfetta likasiensis* De Wild.							102
107		*Triumfetta welwitschii* Mast. var. rogersii (N.E.Br.) Brumitt & Seyani		924		38		372	83
108	Velloziaceae	*Xerophyta* cf. *demeesmaekerana* P.A.Duvign. & Dewit	10269						

[a] Collectors: FM = François Malaisse; MKM = Malaisse-Kisimba-Muzinga; DKM = Dikumbwa-Kisimba-Muzinga; LLM = Lefèbvre-Leteinturier-Malaisse.

[b] X = Taxon observed but not collected; † = Material collected but presently destroyed or lost.

ATTACHMENT 12

PRELIMINARY ASSESSMENT OF FLORISTIC DIVERSITY OF FWAULU COPPER SITE BASED ON HERBARIUM COLLECTION

Table 1 Floristic Diversity of Fwaulu Copper Hill

Sort Order	Family	Species	Collection Numbers by Collector and Date [a]	
			MKM	LLM
			June 1997	Nov. 2001
1	Acanthaceae	*Blepharis cuanzensis* Welw. ex S.Moore var. *cuanzensis*	91	
2	Amaranthaceae	*Pandiaka carsonii* (Bak.) C.B.Clarke	74	
3	Apiaceae	*Pimpinella acutidentata* Norman		147
		???	98	
4	Asteraceae	*Inula shirensis* Oliv.	107	
5		*Vernonia* sp.	80	
6		À suivre	86	146
7		*Lopholaena* ?	94	
8	Commelinaceae	*Cyanotis longifolia* Benth.		153
9	Convolvulaceae	*Ipomoea linosepala* Haller f. ssp. alpina (Rendle) Lejoly & Lisowski		149
10	Cyperaceae	*Ascolepis* or *Fimbristylis*	88	
11		*Ascolepis protea* Welw.		140
12	Eriospermaceae	*Eriospermum abyssinicum* Bak.		152
13	Euphorbiaceae	*Acalypha cupricola* Robyns	81	
14	Fabaceae	*Adenodolichos rhomboideus* (O.Hoffm.) Harms		154
15		*Aeschynomene* sp.		141
16		*Crotalaria cobalticola* P.A.Duvign. & Plancke	84	
17		*Crotalaria cornetii* Taub. & Dewèvre		148
18		*Droogmansia munamenis* DeWild.	102	
19		*Droogmansia pteropus* (Baker) De Wild. var. *quarrei* (De Wild.) Verdc.	89	
20		*Kotschya* or *Aeschynomene*	101	
21	Iridaceae	*Gladiolus robiliartianus* P.A.Duvign.	99	
22	Lamiaceae	*Becium* 83, 85, 90, 95, 98	X	
23		*Becium aureoiviride* P.A.Duvign.	83	145
24		*Becium* cf. *obovatum*		143
25		*Haumaniastrum rosulatum* (DeWild.) P.A.Duvign. & Plancke	X	
26		*Haumaniastrum praealpum*(Briq.) Duvign. & Plancke var. homblei (De Wild.) A.J.Paton	96	
27		*Ocimum vandersystii* (DeWild.) A.J.Paton		X
28	Moraceae	*Dorstenia* sp.		144
29	Orchidaceae	*Habenaria* sp.	93	
30	Oxalidaceae	*Oxalis* sp.		137
31	Poaceae	to be completed	75,76,77,78	
34	Pteridaceae	*Pellaea pectiniformis* Bak. var. cupricola inedit.		150
35	Rubiaceae	*Pentanisia schweinfurthiana* Hiern		151
36		*Spermacoce dibrachiata* Oliv.	104	
		Pentanisia feuille large	92	
37	Santalaceae	*Thesium* sp.	97,100	
38	Scrophulariaceae	*Buchnera robynsii* Mielcarek		139
39		*Buchnera trilobata* Skan	87	
40		*Buchnera* sp.	105, 106	
41	Tiliaceae	*Triumfetta likasiensis* De Wild.	103	142
42		*Triumfetta welwitschii* Mast. var. *rogersii* (De Wild.) Brummit & Seyani	82	138

[a] Collectors: MKM = Malaisse-Kisimba-Muzinga; LLM = Lefèbvre-Leteinturier-Malaisse.

ATTACHMENT 13

LIST OF SPECIES PER SITE

Species diversity at Kwatebala is presented in Table 1. The potential total taxa diversity increased from 93 (April), to 106 (August), to 147* (November) while the diversity of identified taxa increased from 49 (April), to 62 (August), to 86 (November).

Table 1 Floristic Diversity at the Kwatebala Site

Sort Order	Species
1	*Acalypha cupricola*
2	*Actiniopteris pauciloba*
3	*Adenodolichos rhomboideus*
4	*Aechynomene* sp.
5	*Aeollanthus homblei*
6	*Aeollanthus subacaulis*
7	*Aeschynomene pygmaea var. hebecarpa*
8	*Alotheropsis semialata*
9	*Andropogon shirense*
10	*Anisopappus*
11	*Apiaceae*
12	*Asclepiadaceae*
13	*Ascolepis metallorum*
14	*Aspilia kotschii*
15	*Barleria descampsii*
16	*Basananthe kisimbae*
17	*Becium fleur lilas*
18	*Becium grandiflorum var. vanderystii*
19	*Becium kafupa*
20	*Becium* MKS 56
21	*Blepharis quansensis*
22	*Bracharia*
23	*Buchnera fleur jaune*
24	*Buchnera fleurs mauves*
25	*Buchnera inflata*
26	*Buchnera trilobata*
27	*Bulbostylis cupricola*
28	*Bulbostylis filamentosa*
29	*Bulbostylis fusiforme*
30	*Bulbostylis pseudoperennis*

*This figure reflects both the new plants that flower in November (and were not present in April-August) and the increase in the exploration effort at Kwatebala West.

Table 1 Floristic Diversity at the Kwatebala Site (continued)

Sort Order	Species
31	*Caryophyllaceae* pte
32	cf *Drimiopsis*
33	cf *Fimbristylis*
34	cf *Pycreus*
35	*Cheilanthes* sp. nov
36	*Chlorophytum*
37	*Chlorophytum fleur blanche*
38	*Chlorophytum* lg & fin
39	*Chlorophytum* sp. 5
40	*Combretum platipetalum*
41	*Commelina reptans* (Kis)
42	*Commelina zigzag*
43	*Crassula vaginata*
44	*Crotalaria cobalticola*
45	*Crotalaria cornetii*
46	*Crotalaria* fl. Jaunes MKS 25
47	*Crotalaria* sp. 2 cf *argentea*
48	*Crotalaria* sp. 3
49	*Cryptosepalum maraviense*
50	*Cyanotis cf cupricla fleurs balnches*
51	*Cyanotis longifolia*
52	*Cyanotis nana*
53	*Cyperus angolensis*
54	*Cyperus margaritatcheus*
55	*Cyperus sanguineo*
56	*Cyphia erecta*
57	*Dalbergia nitidula*
58	*Dasistachys*
59	*Dicoma anomala*
60	*Dicoma* cf *poggei* MKS 30
61	*Digitaria* sp.
62	*Diheteropogon* sp.
63	*Dioscorea* sp.
64	*Dipcaci viride*
65	*Diplolophium* sp.
66	*Diplolophium zambesianum*
67	*Dorstenia* sp.
68	*Droogmansia munamensis*

Table 1 Floristic Diversity at the Kwatebala Site (continued)

Sort Order	Species
69	*Droogmansia quarrei*
70	*Eragrostis racemosa*
71	*Eriosema englerianum*
72	*Eriosema shirense*
73	*Eriospermum abyssinicum*
74	*Eulophia cuculata*
75	*Gerbera* sp. (?)
76	*Gladiolus feuille* large
77	*Gladiolus robiliasanus* (kis) sèché
78	Gladiolus rose
79	*Haumaniastrum prealpum var. hombl*ei
80	*Haumaniastrum robertii*
81	*Haumaniastrum rosulatum*
82	*Helichrysum* sp.
83	*Helichrysum keilii*
84	*Helichrysum squamosifolium*
85	*Heteropogon* sp.
86	*Hibiscus rhodanthus*
87	*Humularia* sp.
88	*Hyparrhenia* cf rufa (Kis)
89	*Inula shirensis*
90	*Ipomoea*
91	*Ipomoea alpina*
92	*Iridaceae* (gladiolus récolté)
93	*Justicia cupricola*
94	*Kotschya* sp.
95	*Laggera* sp.
96	*Littonia lindernii*
97	*Lopholaena deltombei*
98	*Loudetia simplex*
99	*Manostachys staelioides*
100	*Microchloa kunthii*
101	*Mohria lepigera*
102	*Monadenium lorifolium*
103	*Monocymbium ceresiiforme*
104	*Orchidaceae*?
105	*Oxalis semiloba*
106	*Pandiaka carsonii*

Table 1 Floristic Diversity at the Kwatebala Site (continued)

Sort Order	Species
107	*Panicum* sp.
108	*Pellea pectiniformis*
109	*Pellea pectiniformis f. nana*
110	*Pentanisia schweinfurthiana*
111	*Peucedanum* sp.
112	*Pimpinella acutidentata*
113	*Plectranthus ecsulentus*
114	*Pleiotaxis dewevrei* MKS 24
115	*Poaceae*
116	*Polygala à fleurs jaunes*
117	*Polygala bleu* MKS
118	*Protea* MKS 118
119	*Pseudognapholium luteo-album*
120	*Rhytachne rottboelioides*
121	*Sacciolepis* sp.
122	*Schistostophium artemisaefolium*
123	*Scleria cf bulbifera*
124	*Scleria* sp. 2
125	*Sopubia cf metallorum*
126	*Sopubia* MKS 62
127	*Sopubia neptunii*
128	*Spermacoce dibrachiata*
129	*Sporobolus* sp.
130	*Thesium cf quarrei*
131	*Thesium linesii*
132	*Thunbergia violette*
133	*Tinnea coerulea*
134	*Tristachya*
135	*Tristachya* sp.2
136	*Triumfetta likasiensis*
137	*Triumfetta welwitshii var. rogersii*
138	*Vernonia cf. chloropappa*
139	*Vernonia feuilles lancéolées*
140	*Vernonia fleurs violettes*
141	*Vernonia pte fleur violette*
142	*Vigna* sp.
143	*Virecta major* MKS 113
144	*Wahlenbergia capitata*

Table 1 Floristic Diversity at the Kwatebala Site (continued)

Sort Order	Species
145	*Waleria?*
146	*Xerophyta*
147	*Zonotriche decora*

Species diversity at Kavifwafwaulu is presented in Table 2. The potential total taxa diversity increased from 81 (April), to 95 (August), to 138 (November) while the diversity of identified taxa increased from 39 (April), to 48 (August), to 63 (November).

Table 2 Floristic Diversity at the Kavifwafwaulu Site

Sort Order	Species
1	*Aeschynomene dressé*
2	*Acalypha cupricola*
3	*Acalypha fleur rouge*
4	*Acanthaceae* MKS 271
5	*Actiniopteris* MKS 266
6	*Adenodolichos romboideus*
7	*Aeollanthus*
8	*Aeschynomene pararubrofarinaceae*
9	*Aeschynomene pygmaea*
10	*Alotheropsis semialata*
11	*Andropogon shirense*
12	*Andropogon* sp.
13	*Anthericum* sp.
14	*Antherotoma nandinii*
15	*Ascolepis* sp. (large)
16	*Aspilia kotschii*?
17	*Asteraceae cf. lactuca* MKS 273
18	*Asteraceae voisine launea* MKS 277
19	*Axolis*
20	*Basananthe kisimbae*
21	*Becium aureoviride*
22	*Becium fleur blanche*
23	*Becium fleur rose*
24	*Becium* sp.

Table 2 Floristic Diversity at the Kavifwafwaulu Site (continued)

Sort Order	Species
25	*Becium* sp. 2
26	*Blepharis bleu* MKS 278
27	*Blepharis quansensis*
28	*Blepharis* sp. 1 (gdes fleurs jaunes)
29	*Blepharis* sp. 2
30	*Blepharis glumacea*
31	*Boreria dibrachiata*
32	*Bracharia*
33	*Buchnera robynsii*
34	*Buchnera* sp. (violet)
35	*Buchnera trilobata*
36	*Bulbostylis filamentosa* (Kis)
37	cf *Dryopteris*
38	cf *Pycreus*
39	*Chamaechrista mimosoides*
40	*Chlorophytum* sp.
41	*Combretum platipetalum*
42	*Commelina fruit orange*
43	*Commelina reptans*
44	*Crotalaria cornetii*
45	*Crotalaria* MKS 268
46	*Crotalaria* sp. 2 cf argentea
47	*Cryptosepalum maraviense*
48	*Cyanotis feuille larges*
49	*Cyanotis longifolia*
50	*Cyanotis* sp.
51	*Cyperus angolensis*
52	*Cyperus étoile*
53	*Cyperus margaritaceus.*
54	*Cyperus sanguineo*
55	*Cyphia erecta*
56	*Dasistachys* sp.
57	*Digitaria* sp.
58	*Diheteropogon* sp.
59	*Dipcaci viride*
60	*Diplolophium zambesianum*

Table 2 Floristic Diversity at the Kavifwafwaulu Site (continued)

Sort Order	Species
61	*Dolichos* sp.
62	*Dorstenia cf benguellensis*
63	*Dorstenia* MKS 194
64	*Dorstenia soleil*
65	*Droogmansia munamensis*
66	*Droogmansia quarrei*
67	*Eragrostis racemosa*
68	*Eriosema shirense*
69	*Eulophia cuculata*
70	*Eulophianum* sp.
71	*Gentianaceae jaune fine*
72	*Gladiolus feuilles larges*
73	*Gladiolus rose*
74	*Gnidia* sp.
75	*Haumaniastrum prealpum var. homblei*
76	*Haumaniastrum rosulatum*
77	*Helichrysum fleur jaune*
78	*Hepaticae* MKS 193
79	*Heteropogon* sp.
80	*Hyparrhenia cf rufa* (Kis)
81	*Hypoxis*
82	*Ipomoea dressée fleur blanche*
83	*Ipomoea* sp. 2 (dressé)
84	*Justicia cupricola*
85	*Lapeyrousia welwitshii*
86	*Liliaceae*
87	*Liliaceae feuille cordiforme*
88	*Littonia lindernii*
89	*Lopholaena* sp.
90	*Loudetia simplex*
91	*Microchloa kunthii*
92	*Monadenium discoideum*
93	*Monocymbium ceresiiforme*
94	*Monostachya staeloides*
95	*Ocimum ericoides*
96	*Olax obtusifolia*

Table 2 Floristic Diversity at the Kavifwafwaulu Site (continued)

Sort Order	Species
97	*Ophioglossum* MKS 200
98	*Ophioglossum* MKS 272
99	*Oxalis semiloba*
100	*Pellea pectiniformis var. nana*
101	*Pentanisia schweinfurthiana*
102	*Peucedanum*
103	*Plectranthus fleur bleue* MKS 264
104	*Poaceae*
105	*Poaceae*
106	*Poaceae*
107	*Polygala petitiana*
108	*Protea* MKS 269
109	*Rhynchosia* sp. 1 MKS 185
110	*Rhynchosia* sp. 2 MKS 186
111	*Rhytachne rottboelioides*
112	*Rubiaceae*
113	*Rubiaceae inconnue* MKS 191
114	*Rubiaceae* MKS 267
115	*Scleria cf bulbifera*
116	*Scleria* sp. 2
117	*Securidaca longepedunculata*
118	*Siphia*
119	*Sopubia une dent*
120	*Spermacoce dibrachyata*
121	*Sphenostylis* MKS 195
122	*Strobilanthopsis linifolia*
123	*Temnocalyx cf verdickii* MKS 274
124	*Temnocalyx* sp.
125	*Tephrosia* MKS 201
126	*Thesium lynesii*
127	*Thesium* sp.
128	*Thesium* sp. 1
129	*Thesium* sp. 2 MKS 187
130	*Thunbergia kirkii*
131	*Tristachya* sp. cf *bequaerti*
132	*Triumfetta likasiensis*

Table 2 Floristic Diversity at the Kavifwafwaulu Site (continued)

Sort Order	Species
133	*Triumfetta welwitshii var. rogersii*
134	*Vernonia* cf. *chloropappa*
135	*Vernonia fleurs violettes*
136	*Vernonia* MKS 276
137	*Vigna* sp.
138	*Zonotriche decora*

Species diversity at the Goma West, Central and Northeast sites is presented in Table 3. The potential total taxa diversity increased from 31 (April), to 39 (August), to 65 (November) while the diversity of identified taxa increased from 20 (April), to 24 (August), to 37 (November).

Table 3 Floristic Diversity at the Goma West, Central and Northeast Sites

Sort Order	Species
1	*Acalypha cupricola*
2	*Adenodolichos rhomboideus*
3	*Aeollanthus homblei*
4	*Aeschynomene*
5	*Antherotoma nandinii*
6	*Ascolepis étoile*
7	*Aspilia kotschii*
8	*Becium* sp.
9	*Becium fleur violacée*
10	*Blepharis quanzensis*
11	*Bracharia* sp.
12	*Buchnera trilobata*
13	*Bulbostylis MKS 240*
14	*cf Fimbristylis*
15	*Chlorophytum* sp.
16	*Combretum platipetalum*
17	*Commelina MKS 237*
18	*Cryptosepalum maraviense*
19	*Ctenium concium*
20	*Cyanotis cupricola*
21	*Cyanotis longifolia*

Table 3 Floristic Diversity at the Goma West, Central and Northeast Sites (continued)

Sort Order	Species
22	*Cyperus cf angolensis*
23	*Cyperus margaritatcheus*
24	*Dicoma anomala*
25	*Digitaria cf nitens*
26	*Diheteropogon* sp.
27	*Diplolophium zambesiacum*
28	*Dissotis MKS 243*
29	*Dorstenia*
30	*Drimiopsis?*
31	*Droogmansia quarrei*
32	*Eragrostis racemosa*
33	*Eriosema shirense*
34	*Eriospermum abyssinicum*
35	*Eulophia* sp.
36	*Haumaniastrum robertii*
37	*Helichrysum ceres*
38	*Humularia kapiriensis* var. *nummularia*
39	*Hypoestes* sp.
40	*Ipomoea sp. 2 (dressé)*
41	*Justicia cf metallorum*
42	*Lapeyrousia welwitshii*
43	*Liliaceae inconnue 2*
44	*Loudetia simplex*
45	*Monocymbium ceresiiforme*
46	*Oxalis semiloba*
47	*Pandiaka carsonii*
48	*Pellaea pectiniformis*
49	*Pentanisia schweinfurthiana*
50	*Plectranthus esculentus*
51	*Pleiotaxis MKS 231*
52	Poaceae
53	Poaceae
54	*Rhytachne rottboelioides*
55	*Rubiaceae MKS 234*
56	*Sacciolepis*
57	*Scleria cf bulbifera*

Table 3 Floristic Diversity at the Goma West, Central and Northeast Sites (continued)

Sort Order	Species
58	*Temnocalyx fuchioides*
59	*Thesium MKS 229*
60	*Thunbergia fleur violette*
61	*Tristachya* sp. *cf bequaerti*
62	*Vernonia* sp. *2 MKS 230*
63	*Vernonia violet*
64	*Xerophyta cf. equisetoides*
65	*Zonotriche decora*

Species diversity at Kabweluno is presented in Table 4. The potential total taxa diversity increased from 64 (April), to 65 (August), to 89 (November) while the diversity of identified taxa increased from 33 (April), to 34 (August), to 43 (November).

Table 4 Floristic Diversity at the Kabweluno Site

Sort Order	Species
1	*Acalypha cupricola*
2	*Aeschynomene dressé*
3	*Aeschynomene pygmea*
4	*Alotheropsis semialata*
5	*Andropogon* sp.
6	*Anisopappus* 8 MKS
7	*Antherotoma fleur rose*
8	*Ascolepis cf protea*
9	*Ascolepis metallorum*
10	*Asteraceae capitule violet*
11	*Basananthe kisimbae*
12	*Becium "kapufa"*
13	*Becium fleur blanc rosé*
14	*Becium* sp. 3
15	*Becium var obovatum*
16	*Blepharis quansensis*

Table 4 Floristic Diversity at the Kabweluno Site (continued)

Sort Order	Species
17	*Blepharis sp. 1 (gdes fleurs jaunes)*
18	*Bracharia* sp.
19	*Buchnera mauve*
20	*Buchnera trilobata*
21	*Bulbostylis cupricola*
22	*Bulbostylis filamentosa*
23	*Bulbostylis* sp. 2 MKS 340
24	*Carex* sp.
25	*Chlorophytum fleur blanche*
26	*Commelina reptans*
27	*Commelinaceae* MKS 323
28	*Crotalaria cobalticola*
29	*Crotalaria* sp. 2 cf *argentea*
30	*Cryptosepalum maraviense*
31	*Ctenium concium*
32	*Cyanotis cupricola*
33	*Cyanotis feuille larges*
34	*Cyanotis petit*
35	*Cyperus angolensis*
36	*Cyperus margaritaceus*
37	*Dicoma anomala*
38	*Digitaria* sp.
39	*Diheteropogon* sp.
40	*Diplolophium zambesianum*
41	*Drimiopsis* sp.
42	*Droogmansia munamensis*
43	*Eragrostis racemosa*
44	*Eriospermum abyssinicum*
45	*Eulophianum* sp.
46	*Gladiolus feuilles larges*
47	*Habenaria* sp. MKS 338
48	*Haumaniastrum rosulatum*
49	*Haumaniastrum timpermanii*
50	*Helichrysum kirkii*
51	*Humularia* sp.
52	*Hyparrhenia cf rufa (Kis)*
53	*Indigofera* sp.

Table 4 Floristic Diversity at the Kabweluno Site (continued)

Sort Order	Species
54	*Ipomoea* sp. 2 (*dressé*)
55	*Justicia* sp.
56	*Launea* sp.
57	*Ledeboria cooperi*
58	*Loudetia simplex*
59	*Manostachya* MKS 337
60	*Microchloa kunthii*
61	*Monadenium discoideum*
62	*Monocymbium ceresiiforme*
63	*Nephrolepis undulata*
64	*Olax obtusifolia*
65	*Pandiaka carsonii*
66	*Panicum* sp.
67	*Peucedanum* sp.
68	*Pimpinella* sp.
69	*Pleotaxus davii*
70	*Poaceae*
71	*Rhytachne rottboelioides*
72	*Sacciolepis* sp.
73	*Scleria* sp. 2
74	*Sopubia neptunii*
75	*Striga asiatica*
76	*Strophanthus welwitchii*
77	*Thesium* MKS 322
78	*Thesium* sp.
79	*Thunbergia fleur violette*
80	*Thunbergia oblongifolia*
81	*Tristachya* sp. cf *bequaerti*
82	*Tristachya* sp.2
83	*Triumfetta likasiensis*
84	*Triumfetta welwitshii*
85	*Vernonia fleurs blanches*
86	*Vernonia fleurs violettes*
87	*Vernonia* MKS 328
88	*Wahlenbergia* sp. MKS 333
89	*Zonotriche decora*

Species diversity at Shimbidi is presented in Table 5. The potential total taxa diversity increased from 27 (April), to 40 (November) while the diversity of identified taxa increased from 19 (April), to 32 (November).

Table 5 Floristic Diversity at the Shimbidi Site

Sort Order	Species
1	*Acalypha cupricola*
2	*Alotheropsis* sp.
3	*Andropogon* sp.
4	*Becium fleur mauve pale + pourpre*
5	*Bracharia* sp.
6	*Bulbostylis filamentosa*
7	*Carex* sp.
8	cf *chloris*
9	*Chlorophytum une feuille*
10	*Combretum platipetalum*
11	*Cryptosepalum maraviense*
12	*Ctenium concium*
13	*Cyanotis cupricola*
14	*Cyanotis longifolia*
15	*Dicoma anomala*
16	*Diheteropogon* sp.
17	*Diplolophium zambezianum*
18	*Dissotis* sp.
19	*Helichrysum keilii*
20	*Hibiscus rhodanthus*
21	*Indigofera sutherlandoides*
22	*Ipomoea* sp. 2 (*dressé*)
23	*Lapeyrousia welwitshii*
24	*Liffia coerulea*
25	*Liliaceae chlorophytum très fin*
26	*Loudetia simplex*
27	*Monocymbium ceresiiforme*
28	*Olax obtusifolia*
29	*Plectranthus esculentus*
30	*Poaceae*
31	*Rhytachne rottboelioides*
32	*Rubiaceae*
33	*Sporobolus* sp.

Table 5 Floristic Diversity at the Shimbidi Site (continued)

Sort Order	Species
34	*Strophanthus welwitchii*
35	*Thesium* sp.
36	*Tristachya* sp. cf *bequaerti*
37	*Triumfetta rogersii*
38	*Vernonia fleurs violettes = feuilles larges*
39	*Xerophyta* cf. *equisetoides*
40	*Zonotriche decora*

Species diversity at Apostolo (Kakavilondo) is presented in Table 6. The potential total taxa diversity increased from 58 (April), to 61 (August), to 73 (November) while the diversity of identified taxa increased from 28 (April), to 31 (August), to 37 (November).

Table 6 Floristic Diversity at the Apostolo (Kakavilondo) Site

Sort Order	Species
1	*Acalypha cupricola*
2	*Aeschynomene dressé*
3	*Aeschynomene pygmaea*
4	*Alotheropsis* sp.
5	*Andropogon* sp.
6	*Anthericum* sp.
7	*Antherotoma fleur rose*
8	*Ascolepis protea*
9	*Becium* sp.
10	*Becium* sp. 3
11	*Becium var. obovatum*
12	*Blepharis* sp. 1 (*gdes fleurs jaunes*)
13	*Bracharia* sp;
14	*Buchnera inflata*
15	*Buchnera mauve*
16	*Buchnera robynsii*
17	*Buchnera trilobata*
18	*Bulbostylis filamentosa (Kis)*
19	cf *chloris*
20	*Chamaecrista* sp.
21	*Chlorophytum* sp.
22	*Commelina reptans* (Kis)
23	*Crotalaria glauca*
24	*Crotalaria* sp.
25	*Crotalaria* sp. 2 cf *argentea*
26	*Cryptosepalum maraviense*
27	*Cyanotis cupricola*
28	*Cyanotis longifolia*
29	*Cyperus angolensis*
30	*Cyperus sanguineo grand*
31	*Cyperus margaritaceus*
32	*Digitaria cf. nitens*
33	*Diheteropogon* sp.
34	*Diplolophium zambesianum*
35	*Disa* sp.
36	*Droogmansia munamensis*
37	*Eragrostis racemosa*

Table 6 Floristic Diversity at the Apostolo (Kakavilondo) Site (continued)

Sort Order	Species
38	*Eriosema engleriana*
39	*Eulophia* sp.
40	*Gerbera* sp.
41	*Gladiolus feuilles larges*
42	*Habenosia* sp.
43	*Haumaniastrum prealpum var. homblei*
44	*Haumaniastrum rosulatum*
45	*Helichrysum argenté*
46	*Helichrysum keilii*
47	*Heteropogon* sp.
48	*Hibiscus rhodanthus*
49	*Hyparrhenia* cf *diffusa* (Kis)
50	*Ipomoea* sp. 2 (*dressé*)
51	*Justicia cupricola*
52	*Lopholaena* sp.
53	*Loudetia simplex*
54	*Monocymbium ceresiiforme*
55	*Panicum* sp.
56	*Pentanisia schweinfurthii*
57	*Poaceae*
58	*Polygala petitiana*
59	*Rhytachne rottboelioides*
60	*Rubiaceae inconnue*
61	*Scleria cf bulbifera*
62	*Sporobolus* sp.
63	*Striga asiatica*
64	*Thesium* sp.
65	*Tinnea coerulea*
66	*Tristachya* sp. cf *bequaerti*
67	*Triumfetta likasiensis*
68	*Triumfetta rogersii*
69	*Triumfetta welwitshii*
70	*Vernonia fleurs blanches*
71	*Vernonia fleurs violettes*
72	*Vigna* sp.
73	*Zonotriche decora*

Species diversity at Kazinyanga is presented in Table 7. The potential total taxa diversity increased from 70 (April), to 74 (August), to 103 (November) while the diversity of identified taxa increased from 37 (April), to 41 (August), to 55 (November).

Table 7 Floristic Diversity at the Kazinyanga Site

Sort Order	Species	Collection Number
1	?	M-Kis-Sa 487
2	*Acalypha cupricola*	
3	*Acanthaceae*	M-Kis-SA 72
4	*Acanthaceae fl. blanche*	M-Kis-SA 482
5	*Actiniopteris* sp.	
6	*Aeollanthus* sp.	M-Kis-Sa 91
7	*Aeschynomene pygmea*	
8	*Anemia angolensis*	M-Kis-Sa 97
9	*Anisopappus* sp. (*hofmannianus*)	M-Kis-Sa 83 ; SWT
10	*Antherotoma naudinii*	M-Kis-Sa 95
11	*Apiaceae*	M-Kis-Sa 494
12	*Aspilia kotschii*	
13	*Batopedina pulvinellata*	M-Kis-Sa 96
14	*Bracharia* sp.	M-Kis-Sa 491
15	*Buchnera* (fl. *violette*)	M-Kis-Sa 75
16	*Buchnera trilobata*	
17	*Bulbostylis* cf. *filamentosa*	
18	*Bulbostylis cupricola*	
19	*Bulbostylis pseudoperennis*	
20	cf *Pycreus*	
21	*Chamaecrista mimosoides*	M-Kis-Sa 77
22	*Chironia katangensis*	M-Kis-Sa 484
23	*Chlorophytum* 2 *feuilles*	
24	*Chlorophytum long fin*	
25	*Chlorophytum* sp.	Let-M 228
26	Commelina sp.	M-Kis-Sa 94
27	*Crotalaria* sp. 1 *port dressé*	M-Kis-Sa 490
28	*Crotalaria* sp. 2 cf. *glauca*	
29	*Crotalaria* sp. 3	M-Kis-Sa 71
30	*Crtalaria* sp. 4	M-Kis-Sa 90
31	*Cryptosepalum maraviense*	
32	*Cyanotis feuilles larges*	
33	*Cyanotis longifolia*	
34	*Cyperus margaritaceus*	

Table 7 Floristic Diversity at the Kazinyanga Site (continued)

Sort Order	Species	Collection Number
35	*Cyphia erecta*	
36	*Dasystachys* sp. (*pulchella*)	Sh-W-Th
37	*Digitaria* sp.	
38	*Diheteropogon emarginatus*	
39	*Dorstenia barminiana*	
40	*Eragrostis cilianensis*	Sh-W-Th
41	*Eragrostis racemosa*	
42	*Eriosema* sp.	M-Kis-Sa 493
43	*Eriospermum abyssinicum*	
44	*Eulophia cuculata*	
45	*Gladiolus* fl. *rose*	
46	*Haumaniastrum prealpum homblei*	
47	*Haumaniastrum robertii*	
48	*Haumaniastrum rosulatum*	M-Kis-Sa 79
49	*Hibiscus rodanthus*	
50	*Hypoxis subspicata*	
51	*Indigofera fleurs rouges*	
52	*Indigofera* sp.	M-Kis-Sa 82
53	*Indigofera sutherlandoides*	
54	*Ipomoea dressé*	M-Kis-Sa 93
55	*Lactuca* sp.	
56	*Lapeyrousia welwitschii*	
57	*Littonia lindenii*	
58	*Loudetia simplex*	
59	*Microchloa kunthii*	
60	*Mohria lepigera*	M-Kis-Sa 81
61	*Mohria lepigera*	
62	*Monadenium lorifolium*	M-Kis-Sa 486
63	*Monocymbium ceresiiforme*	
64	*Murdania* sp.	
65	*Nephrolepis undulata*	
66	*Ocimum (becium) dressé*	
67	*Olax obtusifolia*	
68	*Olax obtusifolia*	
69	*Oxalis semiloba*	
70	*Pandiaka carsonii*	
71	*Pellaea pectiniformis*	M-Kis-Sa 92
72	*Pentanisia schweinfurthiana*	

Table 7 Floristic Diversity at the Kazinyanga Site (continued)

Sort Order	Species	Collection Number
73	*Phragmanthera eminii*	
74	*Pimpinella acutidentata*	M-Kis-Sa 76
75	*Poaceae*	M-Kis-Sa 70
76	*Poaceae*	M-Kis-Sa 489
77	*Poaceae*	
78	*Poaceae*	
79	*Polygala* (fl. *jaunâtre*)	
80	*Pseudoeriosema* sp.	
81	*Rhytachne rottboelioides*	
82	*Scleria cf bulbifera*	
83	*Scleria* sp.	M-Kis-Sa 483
84	*Sopubia fe. fine*	M-Kis-Sa 492
85	*Sphenostylis*	
86	*Sporobolus rangei*	Sh-W-Th
87	*Striga asiatica*	M-Kis-Sa 78
88	*Tacca leontopetaloides*	
89	*Temnocalyx* sp.	M-Kis-Sa 488
90	*Thesium (habituel)*	
91	*Thesium (rectiligne, fin)*	M-Kis-Sa 73
92	*Thesium quarrei*	
93	*Thunbergia* sp.	
94	*Tinnaea coerulea*	
95	*Triumfetta welwishii* var. *rogersii*	
96	*Uapaca robynsii*	M-Kis-Sa 80
97	*Vernonia* cf. *melleri*	M-Kis-Sa 480
98	*Vernonia eremanthifolia*	Sh-W-Th
99	*Vernonia grand dressé*	M-Kis-Sa 485
100	*Vigna* sp.	M-Kis-Sa 74
101	*Wahlenbergia capitata*	M-Kis-Sa 69
102	*Xerophyta equisetoides*	
103	*Zonotriche superba*	Sh-W-Th

ATTACHMENT 14

FACT SHEETS FOR VEGETATION UNITS

Attachment 14.1: Description of Vegetation Unit - Siliceous Foliated Rocks (Ecological Niche) - Xst1i-KWA

Species Composition

- Characteristic species: *Cheilanthes* sp. nov.
- Global species diversity: 18
- Local species diversity (1 square meter): /
- List of taxa:
  - Identified specimens: 15
  - Specimens to be identified: 3

Bulbostylis cupricola
Bulbostylis pseudoperennis
Cheilanthes sp. nov.
Commelina zigzag
Crassula vaginata
Crotalaria cobalticola
Cyanotis cupricola
Dasistachys sp.
Eragrostis racemosa
Eriospermum abyssinicum
Gladiolus sp.
Haumaniastrum robertii
Ipomea alpina
Monocymbium ceresiiforme
Moria lepigera
Pellea pectiniformis f. nana
Sopubia neptunii
Xerophyta equisetoides

Environmental Conditions

Not assessed

Attachment 14.2: Description of Vegetation Unit - Rocky Substratum Derived From Mining Works - RMW-KWA

Species Composition

- Dominant species: Haumaniastrum robertii, Crotalaria cobalticola, Bulbostylis pseudoperennis
- Global species diversity: 6
- Local species diversity (1 square meter): 3
- List of taxa:
  - Identified specimens: 4
  - Specimens to be identified: 2

Andropogon sp.
Anisopappus sp.
Bulbostylis pseudoperennis
Crotalaria cobalticola
Eragrostis racemosa
Haumaniastrum robertii

Environmental Conditions

Not assessed

Attachment 14.3: Description of Vegetation Unit - Xerophyta Equisetoides Steppe - XSt1-KWA

Species Composition

- Characteristic species: INDVAL: Bulbostylis pseudoperennis, Sopubia neptunii, Haumaniastrum roberti; OTHER: Xerophyta equisetoides
- Global species diversity: 18
- Local species diversity (1square meter): 7.6
- List of taxa:
  - Identified specimens: 14
  - Specimens to be identified: 4

Andropogon sp.
Anisopappus sp.
Ascolepis metallorum
Bulbostylis cupricola
Bulbostylis pseudoperennis
Commelina zigzag
Crotalaria cobalticola
Cyanotis cupricola
Diplolophium zambesianum
Eragrostis racemosa
Eriospermum abyssinicum
Gladiolus sp.
Haumaniastrum robertii
Ipomoea alpina
Liliaceae
Monocymbium ceresiiforme
Sopubia neptunii
Xerophyta equisetoides

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	Height (cm)	Cu	Pb	Zn	Co	Cd	pH
XSt1-KWA	45 (37)	47 (13)	46 (9)	6066.7	14.5	5.1	136.7	0.4	6.0

Attachment 14.4: Description of Vegetation Unit - Gladiolus sp. Steppe on Rocky Substratum - TrSt1-KWA

Species Composition

- Characteristic species: INDVAL: Monocymbium ceresiiform (probability undetermined)
- Global species diversity
- Local species diversity (1 square meter)
- List of taxa:
  - Identified specimens: 22
  - Specimens to be identified: 14

Acalypha cupricola
Andropogon sp.
Anisopappus sp.
Ascolepis metallorum
Becium sp.
Buchnera sp.
Buchnera trilobata
Bulbostylis cupricola
Bulbostylis filamentosa
Bulbostylis pseudoperennis
Bulbostylis sp.
Commelina zigzag
Crotalaria cobalticola
Crotalaria sp. MKS 25
Cryptosepalum maraviense
Cyanotis cupricola
Cyanotis longifolia
Dicoma anomala
Dicoma cf poggei MKS 30
Digitaria sp.
Diheteropogon emarginatus.
Diplolophium zambesianum
Droogmansia munamensis
Eragrostis racemosa
Gladiolus sp. (pink)
Haumaniastrum prealpum var. *homblei*
Inula shirensis
Lopholaena sp.
Loudetia simplex

Monocymbium ceresiiforme
Pleiotaxis sp. MKS 24 (red)
Polygala sp. (yellow)
Sopubia neptunii
Tristachya sp.(cf bequaerti)
Triumfetta likasiensis
Vernonia sp.

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
TrSt1-KWA-1	0	77 (22)	102 (40)	2571.7	1.6	1.3	3.5	0.0	5.6

Attachment 14.5: Description of Vegetation Unit - Small Valley Steppe Savanna - Sts1-KWA

Species Composition

- Characteristic species: INDVAL : Droogmansia quarrei, Virectaria major (probability undetermined)
- Global species diversity: 39
- Local species diversity (1 square meter): 12.6
- List of taxa:
  - Identified specimens: 19
  - Specimens to be identified: 20

Aeollanthus subacaulis
Aeschynomene pygmaea
Andropogon shirense.
Ascolepis metallorum
Becium sp.
Blepharis sp.
Bracharia sp.
Buchnera inflata
Buchnera sp. (violet)
Bulbostylis filamentosa
Commelina zigzag
Crotalaria sp. 2 cf argentea
Crotalaria sp. 3
Cryptosepalum maraviense
Cyanotis longifolia
Dioscorea sp.
Droogmansia quarrei
Eragrostis racemosa
Eriosema shirense
Gladiolus sp. (pink)
Haumaniastrum prealpum var. *homblei*
Humularia sp.
Hyparrhenia cf rufa
Iridaceae
Kotschya sp.
Loudetia simplex
Microchloa kunthii
Monocymbium ceresiiforme

Panicum sp.
Protea sp.
Sacciolepis transbarbata
Scleria cf bulbifera
Sopubia cf metallorum
Thesium sp.
Tristachya sp. cf bequaerti
Vernonia sp. (violet)
Vigna sp.
Virectaria major
Zonotriche decora

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
StS1-KWA	0	96 (5)	98 (37)	720.0	1.8	1.1	12.8	0.0	5.4

Attachment 14.6: Description of Vegetation Unit - Rocky Steppe Savanna – RStS7-KWA

Species Composition

- Characteristic species: INDVAL : Bulbostylis filamentosa, Tristachya sp. cf bequaerti
- Global species diversity: 33
- Local species diversity (1 square meter): 14
- List of taxa:
  - Identified specimens: 19
  - Specimens to be identified: 14

Blepharis quansensis
Buchnera inflata
Buchnera sp. (violet)
Bulbostylis filamentosa
Commelina reptans
Crotalaria cornetii
Crotalaria sp. 2 cf argentea
Cryptosepalum maraviense
Cyanotis longifolia
Cyperus sp.
Dasistachys sp.
Digitaria sp.
Diheteropogon sp.
Diplolophium zambesianum
Droogmansia munamensis
Eriosema shirense
Eriospermum abyssinicum
Haumaniastrum prealpum var. homblei
Helichrysum keilii
Heteropogon sp.
Hibiscus rhodanthus
Loudetia simplex
Scleria sp. 2
Sopubia neptunii
Sporobolus sp.
Thesium sp.
Tinnea coerulea
Tristachya sp. cf bequaerti

Tristachya sp.2
Triumfetta welwitshii
Vernonia cf. chloropappa
Vernonia (lanceolated leaves)
Zonotriche decora

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
RStS7-KWA	24 (15)	90 (22)	34 (11)	48.0	1.9	0.9	19.7	0.0	5.4

Attachment 14.7: Description of Vegetation Unit - Rocky Steppe Savanna - RStS1-KWA-W

Species Composition

- Characteristic species: INDVAL: not assesed
- Global species diversity: 30
- Local species diversity (1 square meter): /
- List of taxa:
  - Identified specimens: 20
  - Specimens to be identified: 10

Aeschynomene pygmaea
Andropogon shirense
Anisopappus sp.
Basananthe kisimbae
Becium sp.
Buchnera sp. (violet)
Buchnera sp. (yellow)
Buchnera trilobata
Bulbostylis cupricola
Crotalaria cobalticola
Cryptosepalum maraviense
Diplolophium sp.
Droogmansia munamensis
Eragrostis racemosa
Gladiolus sp. (large leaves)
Gladiolus sp. (pink)
Haumaniastrum homblei
Haumaniastrum robertii
Ipomoea alpina
Lopholaena sp.
Loudetia simplex
4Monocymbium ceresiiforme
Polygala sp. (blue)
Schistostophium artemisaefolium
Sopubia neptunii
Sopubia sp.
Tinnea coerulea
Triumfetta rogersii
Wahlenbergia capitata
Zonotriche decora

Environmental Conditions

Not assessed

Attachment 14.8: Description of Vegetation Unit - Rocky Steppe Savanna - RStS2-MW

Species Composition

- Characteristic species: INDVAL: not assessed
- Global species diversity: 40
- Local species diversity (1 square meter): /
- List of taxa:
  - Identified specimens: 30
  - Specimens to be identified: 10

Actiniopteris pauciloba
Adenodolichos rhomboideus
Aeollanthus sp.
Alectra senegalensis
Andropogon shirense
Anemia angolensis
Anisopappus sp.
Antherotoma nandii
Becuim sp.
Begonia princeae var. princeae
Blepharis quanzensis
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis cupricola
Cheilanthes (dwarf)
Crotalaria cobalticola
Cryptosepalum maraviense
Cyanotis cupricola
Diplolophium zambesianum
Droogmansia munamensis
Eragrostis racemosa
Gladiolus sp. (Pink)
Haumaniastrum prealpum var. homblei
Haumaniastrum robertii
Ipomoea alpina
Lapeyrousia welwishii
Lopholaena sp.
Loudetia simplex
Mohria lepigera

Monocymbium ceresiiforme
Olax obtusifolia
Oxalis obliquifolia
Pellea pectiniformis
Phyllanthus cf amora
Polygala petitiana
Polygala usofuensis
Sopubia neptunii
Thesium sp1
Tinnea antiscorbutica
Tristachya cf bequaerti

Environmental Conditions

Not assessed

Attachment 14.9: Description of Vegetation Unit - Steppe Savanna On Temporary Fresh Humiferous Copper Soil - Hsts-KA

Species Composition

- Characteristic species: INDVAL: Droogmansia munamensis, Aeschynomene pygmaea, Crotalaria sp. 2 cf argentea
- Global species diversity: 53
- Local species diversity (1 square meter): 13.4
- List of taxa:
  - Identified specimens: 27
  - Specimens to be identified: 26

Aeschynomene pygmaea
Andropogon shirense.
Antherotoma nandinii
Basananthe kisimbae
Becium sp.
Becium sp. 2
Blepharis quansensis
Blepharis sp. 1 (yellow)
Blepharis sp. 2
Buchnera robynsii
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis filamentosa
Chamaechrista mimosoides
Commelina reptans
Commelina sp. (orange fruit)
Crotalaria cornetii
Crotalaria sp. 2 cf argentea
Cryptosepalum maraviense
Cyperus sp.
Digitaria sp.
Dihétéropogon emarginatus
Diplolophium zambesianum
Dorstenia sp.
Droogmansia munamensis
Eriosema shirense
Gladiolus sp. (large leaves)
Haumaniastrum prealpum var. homblei

Haumaniastrum rosulatum
Hepaticae sp.
Heteropogon sp.
Hyparrhenia cf rufa
Lopholaena sp.
Loudetia simplex
Monocymbium ceresiiforme
Monostachya staeloides
Ophioglossum sp.
Oxalis semiloba
Poaceae
Rhynchosia sp. 1
Rhynchosia sp. 2
Rubiaceae
Scleria sp. 2
Sebaea microphylla
Spermacoce dibrachyata
Sphenostylis sp.
Tephrosia sp.
Thesium sp. 1
Thesium sp. 2
Tristachya sp. cf bequaerti
Triumfetta likasiensis
Triumfetta welwitshii
Vigna sp.

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
HStS-KA	0	100 (0)	116 (32)	366.7	5.8	3.5	17.7	0.1	5.8

Attachment 14.10: Description of Vegetation Unit - Steppe Savanna Developed On Flag Stony Substratum - RStS3-KA-SE

Species Composition

- Characteristic species: INDVAL: Buchnera sp. (violet)
- Global species diversity: 20
- Local species diversity (1 square meter): 8.8
- List of taxa:
  - Identified specimens: 11
  - Specimens to be identified: 9

Andropogon shirense.
Buchnera sp. (violet)
Bulbostylis filamentosa
Crotalaria sp. 2 cf argentea
Cryptosepalum maraviense
Cyanotis longifolia
Cyanotis sp.
Digitaria sp.
Diplolophium zambesianum
Droogmansia munamensis
Eragrostis racemosa
Gladiolus sp. (pink)
Haumaniastrum prealpum var. homblei
Ipomoea sp. 2
Lapeyrousia welwitshii
Loudetia simplex
Monocymbium ceresiiforme
Thesium sp.
Tristachya sp. cf bequaerti
Vernonia sp.

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
RStS3-KA-SE	30	58 (26)	96 (35)	226.7	1.2	0.9	18.2	0.0	5.3

Attachment 14.11: Description of Vegetation Unit - Gently Sloping Steppe Savanna - RStS4-KA-SE

Species Composition

- Characteristic species: Adenodolichos romboideus, Cyanotis longifolia
- Global species diversity: 22
- Local species diversity (1 square meter): 11
- List of taxa:
  - Identified specimens: 13
  - Specimens to be identified: 9

Adenodolichos romboideus
Andropogon sp.
Buchnera sp. (violet)
Bulbostylis filamentosa
Commelina reptans
Cryptosepalum maraviense
Cyanotis longifolia
Cyanotis sp.
Cyperus sp.
Digitaria sp.
Diheteropogon emarginatus
Diplolophium zambesianum
Ipomoea sp. 2
Loudetia simplex
Monocymbium ceresiiforme
Olax obtusifolia
Plectranthus sp. (blue)
Spermacoce dibrachyata
Tristachya sp. cf bequaerti
Triumfetta likasiensis
Vernonia cf. chloropappa
Zonotriche decora

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
RStS4-KA-SE	0	68 (16)	80 (12)	47.3	1.6	0.9	24.3	0.0	5.5

Attachment 14.12: Description of Vegetation Unit - Droogmansia Quarrei Steppe Savanna - RStS5-KA-SE

Species Composition

- Characteristic species: INDVAL: not assessed
- Global species diversity: 33
- Local species diversity (1 square meter): /
- List of taxa:
  - Identified specimens: 12
  - Specimens to be identified: 21

Acanthaceae
Actiniopteris sp.
Andropogon shirense
Ascolepis sp. (large)
Asteraceae cf. Lactuca
Asteraceae cf. Launea
Blepharis sp. (blue)
Buchnera sp. (violet)
Buchnera trilobata
Chamaecrista mimosoides
Commelina reptans
Crotalaria sp.1
Crotalaria sp.2
Cryptosepalum maraviense
Dasistachys sp.
Digitaria sp.
Droogmansia quarrei
Gladiolus sp. (large leaves)
Haumaniastrum prealpum var. homblei
Lopholaena sp.
Ophioglossum sp.
Oxalis semiloba
Plectranthus sp. (blue)
Polygala petitiana
Protea sp.
Rubiaceae
Securidaca longepedunculata
Temnocalyx cf verdickii
Tephrosia sp.

Triumfetta rogersii
Vernonia sp.
Vigna sp.
Zonotriche decora

Environmental Conditions

Not assessed

Attachment 14.13: Description of Vegetation Unit - Steppe Savanna on Rocky Slope - RStS6-GO

Species Composition

- Characteristic species: INDVAL: Liliaceae unknown
- Global species diversity: 31
- Local species diversity (1 square meter): 8.8
- List of taxa:
  - Identified specimens: 20
  - Specimens to be identified: 11

Aeschynomene sp.
Antherotoma nandinii
Blepharis quanzensis
Buchnera trilobata
Bulbostylis sp.
Commelina sp.
Cryptosepalum maraviense
Ctenium concium
Cyanotis cupricola
Cyanotis longifolia
Dicoma anomala
Diheteropogon emarginatus
Diplolophium zambesiacum
Dissotis sp.
Eragrostis racemosa
Eriospermum abyssinicum
Haumaniastrum robertii
Ipomoea sp. 2
Lapeyrousia welwitshii
Liliaceae unknown
Loudetia simplex
Monocymbium ceresiiforme
Pellaea pectiniformis
Plectranthus esculentus

Pleiotaxis sp.
Rubiaceae
Thesium sp.
Tristachya sp. cf bequaerti
Vernonia sp. 2
Xerophyta equisetoides
Zonotriche decora

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
RStS6-GO	38 (21)	56 (13)	82 (13)	348.3	2.0	1.1	50.0	0.0	5.6

Attachment 14.14: Description of Vegetation Unit - Poisoning Dembo Steppe Savanna - StS2-KAB

Species Composition

- Characteristic species: Aeschynomene sp. 2, Becium "kapufa", Acalypha cupricola.
- Global species diversity: 35
- Local species diversity (1 square meter): 14.2
- List of taxa:
  - Identified specimens: 17
  - Specimens to be identified: 18

Acalypha cupricola
Aeschynomene sp. 2
Andropogon shirense
Becium "kapufa"
Becium sp. 3
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis filamentosa)
Bulbostylis sp. 2
Carex sp.
Commelina reptans
Crotalaria sp. 2 cf argentea
Cryptosepalum maraviense
Cyperus sp.
Digitaria sp.
Diheteropogon emarginatus
Droogmansia munamensis
Eriospermum abyssinicum
Gladiolus sp. (large leaves)
Habenaria sp.
Haumaniastrum rosulatum
Helichrysum kirkii
Hyparrhenia sp. cf rufa
Launea sp.
Loudetia simplex
Manostachya sp.
Monocymbium ceresiiforme
Olax obtusifolia

Pimpinella sp.
Scleria sp. 2
Striga asiatica
Thunbergia oblongifolia
Tristachya sp. cf bequaerti
Triumfetta welwitshii
Wahlenbergia sp.

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
StS2-KAB	0	98 (4)	66 (21)	392.7	2.7	1.7	5.4	0.0	5.4

Attachment 14.15: Description of Vegetation Unit - Plecthrantus Esculentus Steppe Savanna - StS3-SHI

Species Composition

- Characteristic species : INDVAL : Plectranthus esculentus, Ctenium concium
- Global species diversity: 27
- Local species diversity (1 square meter): 10.8
- List of taxa:
  - Identified specimens: 20
  - Specimens to be identified: 7

Acalypha cupricola
Andropogon shirense.
Carex sp.
Cryptosepalum maraviense
Ctenium concium
Cyanotis longifolia
Dicoma anomala
Diheteropogon emarginatus
Diplolophium zambezianum
Dissotis sp.
Helichrysum keilii
Hibiscus rhodanthus
Indigofera sutherlandoides
Ipomoea sp. 2
Lapeyrousia welwitshii
Liffia coerulea
Loudetia simplex
Monocymbium ceresiiforme
Olax obtusifolia
Plectranthus esculentus
Rubiaceae
Sporobolus sp.
Strophanthus welwitchii
Tristachya sp. cf bequaerti
Triumfetta rogersii
Vernonia sp. (violet)
Xerophyta equisetoides

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
StS3-SHI	52 (14)	60 (33)	88 (13)	62.0	1.7	1.0	5.1	0.0	5.2

Attachment 14.16: Description of Vegetation Unit - Xerophyta Equisetoides Slope Steppe - XSt2-KAB

Species Composition

- Characteristic species: INDVAL: Crotalaria cobalticola, Eragrostis racemosa
- Global species diversity: 17
- Local species diversity (1 square meter): 6.8
- List of taxa:
  - Identified specimens: 11
  - Specimens to be identified: 6

Andropogon shirense.
Anisopappus sp.
Ascolepis metallorum
Blepharis quansensis
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis cupricola
Commelinaceae
Crotalaria cobalticola
Cyanotis cupricola
Digitaria sp.
Eragrostis racemosa
Monocymbium ceresiiforme
Pandiaka carsonii
Sopubia neptunii
Thesium sp.
Vernonia sp.

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
XSt2-KAB	50 (0)	40 (0)	25 (0)	-	-	-	-	-	-

Attachment 14.17: Description of Vegetation Unit - Steppe Savanna on Slope (Near Pass) - StS4-KAB

Species composition

- Characteristic species: INDVAL: Pleotaxus davii, Diplolophium zambesianum, Haumaniastrum rosulatum
- Global species diversity: 35
- Local species diversity (1 square meter): 16
- List of taxa:
  - Identified specimens: 20
  - Specimens to be identified: 15

Aeschynomene pygmaea
Andropogon shirense
Antherotoma naudinii
Becium sp. 3
Blepharis sp. 1 (yellow)
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis filamentosa
Commelina reptans
Crotalaria sp. 2 cf argentea
Cryptosepalum maraviense
Ctenium concium
Cyperus sp.
Dicoma anomala
Digitaria sp.
Diheteropogon emarginatus
Diplolophium zambesianum
Haumaniastrum rosulatum
Ipomoea sp. 2
Loudetia simplex
Olax obtusifolia
Panicum sp.
Pleotaxus davii
Poaceae
Scleria sp. 2
Striga asiatica
Strophanthus welwitchii
Thesium sp.

Tristachya sp. cf bequaerti
Tristachya sp.2
Triumfetta likasiensis
Triumfetta welwitshii
Vernonia sp. (white)
Vernonia sp. 2 (violet)
Zonotriche decora

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
StS4-KAB	8 (8)	74 (11)	20 (0)	272.3	4.9	1.3	10.6	0.0	5.5

Attachment 14.18: Description of Vegetation Unit - Pseudoeriosema sp. Poisoning Dembo Steppe Savanna - StS5-KAK

Species Composition

- Characteristic species: Haumaniastrum prealpum var. homblei
- Global species diversity: 58
- Local species diversity (1 square meter): 14.6
- List of taxa:
  - Identified specimens: 29
  - Specimens to be identified: 29

Acalypha cupricola
Aeschynomene sp.
Aeschynomene pygmaea
Andropogon shirense
Anthericum sp.
Antherotoma sp. (pink)
Ascolepis protea
Becium sp. 3
Blepharis sp. 1 (yellow)
Buchnera inflata
Buchnera sp. (violet)
Buchnera robynsii
Buchnera trilobata
Bulbostylis filamentosa
Chamaecrista mimosoides
Commelina reptans
Crotalaria glauca
Crotalaria sp.
Crotalaria sp. 2 cf argentea
Cryptosepalum maraviense
Cyanotis cupricola
Cyanotis longifolia
Cyperus sp.
Digitaria sp. cf. nitens
Diheteropogon emarginatus
Diplolophium zambesianum
Disa sp.
Droogmansia munamensis
Gerbera sp.

Gladiolus sp. (large leaves)
Habenosia sp.
Haumaniastrum prealpum var. homblei
Haumaniastrum rosulatum
Helichrysum sp. (silver)
Helichrysum keilii
Heteropogon sp.
Hibiscus rhodanthus
Hyparrhenia sp. Cf diffusa
Ipomoea sp. 2
Lopholaena sp.
Loudetia simplex
Monocymbium ceresiiforme
Panicum sp.
Poaceae sp.
Polygala petitiana
Pseudoeriosema sp.
Rubiaceae
Sporobolus sp.
Striga asiatica
Thesium sp.
Tinnea coerulea
Tristachya sp. cf bequaerti
Triumfetta likasiensis
Triumfetta rogersii
Triumfetta welwitshii
Vernonia sp. (white)
Vernonia sp. (violet)
Vigna sp.

Environmental Conditions

	Structure			**Soil Heavy Metals Concentrations (mg/Kg) and pH.**					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
StS5-KAK	0	94 (8)	32 (4)	229.3	1.8	1.1	6.3	0.0	5.4

Attachment 14.19: Description of Vegetation Unit - Steppe Savanna - StS6-TEN

Species Composition

- Characteristic species: INDVAL: not assessed
- Global species diversity: 20
- Local species diversity (1square meter): /
- List of taxa:
  - Identified specimens: 9
  - Specimens to be identified: 11

Aeschynomene sp.
Anisopappus sp.
Asteraceae
Becium homblei
Blepharis quanzensis
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis cupricola
Cyperaceae
Dicoma poggei
Diplolophium zambesianum
Gladiolus sp. (pink)
Ipomoea sp.
Pleiotaxis sp.
Poaceae
Polygala petitiana
Sopubia neptunii
Thesium sp.
Vernonia sp.
Zonotriche decora

Environmental Conditions

Not assessed

Attachment 14.20: Description of Vegetation Unit - Rendlia Altera Lawn - LW-FUN

Species Composition

- Characteristic species: INDVAL: Rendlia altera, Coreopsis oligoflora
- Global species diversity: 6
- Local species diversity (1 square meter): 3
- List of taxa:
  - Identified specimens: 5
  - Specimens to be identified: 1

Bulbostylis cupricola
Coreopsis oligoflora
Eragrostis racemosa
Haumaniastrum robertii
Rendlia altera
Thesium sp.

Environmental Conditions

	Structure			Soil Heavy Metals Concentrations (mg/Kg) and pH.					
vegetation unit	%rock	%herb	height (cm)	Cu	Pb	Zn	Co	Cd	pH
LW-FUN	0	96 (5)	70 (0)	2365.0	16.0	4.3	163.7	0.1	6.5

Attachment 14.21: Description of Vegetation Unit - Monadenium Cupricola Steppe Savanna - StS7-KAT

Species Composition

- Characteristic species: INDVAL; not assessed
- Global species diversity: 30
- Local species diversity (1 square meter): /
- List of taxa:
  - Identified specimens: 17
  - Specimens to be identified: 13

Andropogon shirense
Anisopappus sp.
Becium katangense
Becium sp 2
Buchnera trilobata
Bulbostylis cupricola
Chironia katangensis
Crotalaria sp.
Cryptosepalum maraviense
Digitaria sp.
Diheteropogon emarginatus
Diplolophium zambesianum
Eragrostis racemosa
Gladiolus sp. (pink)
Haumaniastrum prealpum var. homblei
Haumaniastrum robertii
Ipomoea sp.
Lapeyrousia erythranta
Loudetia simplex
MKS 435
MKS 442
Monadenium cupricola
Monocymbium ceresiiforme
Napaca robynsii
Oxalis semiloba
Pleiotaxis sp. (red)
Pseudoeriosema sp.
Sopubia sp.
Thesium sp.
Vernonia sp.

Environmental Conditions

Not assessed

Attachment 14.22: Description of Vegetation Unit - Poisoning Dembo Steppe Savanna - StS8-KAZ

Species Composition

- Characteristic species: INDVAL: not assessed
- Global species diversity: 58
- Local species diversity (1 square meter): /
- List of taxa:
  - Identified specimens: 31
  - Specimens to be identified: 27

Acanthaceae
Aeollanthus sp.
Aeschynomene sp.
Anemia angolensis
Anisopappus sp.
Antherotoma nandinii
Apiaceae
Batopedina pulvinellata
Becium sp.
Bracharia sp.
Buchnera sp. (violet)
Buchnera trilobata
Bulbostylis cupricola
Bulbostylis filamentosa
Bulbostylis pseudoperennis
Chamaecrista mimosoides
Chironia katangensis
Commelina reptans
Crotalaria glauca
Crotalaria MKS 490
Crotalaria MKS 71
Crotalaria MKS 84
Crotalaria MKS 90
Dasistachys sp.
Diheteropogon emarginatus
Eragrostis racemosa
Gladiolus sp. (pink)
Haumaniastrum prealpum var. homblei
Haumaniastrum robertii

Haumaniastrum rosulatum
Indigofera sp.
Ipomoea sp.
Ipomoea sp.2
Lapeyrousia welwitschii
Loudetia simplex
Mohria lepigera
Monademium cf pseudoracemosum MKS 486
Monocymbium ceresiiforme
Nephrolepis undulata
Olax obtusifolia
Pandiaka carsonii
Pellea pectiniformis
Pimpinella sp.
Poaceae MKS 489
Poaceae MKS 70
Polygala MKS 89
Pseudoeriosema
Rubiaceae MKS 488
Scleria sp.
Sopubia sp.
Striga asiatice
Tinnea coerulea
Triumfetta rogersii
Uapaca robynsii
Vernonia sp.
Vigna sp.
Wahlembergia capitata
Xerophyta equisetoides

Environmental Conditions

Not assessed

ATTACHMENT 15

PHOTO PLATES

PHOTO PLATES

A The Copper/Cobalt Hills of TFM Area

1A Fungurume Hill I
2A Fungurume Hill II
3A Fungurume Hills V North, V South-West and VI.
4A Fungurume Hill V North (Central Part of Photo)
5A Fungurume Hill V (Crest of Siliceous Cellular Rocks)
6A Fungurume Hill V (Western Slope)
7A Fungurume Hill V South-West
8A Fungurume Hill V South-West
9A Fungurume Hill VI
10A Fungurume Hill VI
11A Goma South-West (1997)
12A Goma South-West (2006)
13A Goma North-East (Upper Crest
14A Goma South-East (Mine Workings)
15A Goma Central
16A Goma North-East
17A Kabwelunono (1997)
18A Kabwelunono (2006)
19A Kakavilondo (= Apostolo)
20A Katufungurume XII
21A Kavifwafwaulu North (Rainy Season 2001)
22A Kavifwafwaulu North (Dry Season 1997)
23A Kavifwafwaulu South-East (April 2006)
24A Kazinyanga (April 2006)
25A Kazinyana (April 2006)
26A Kwatebala (Dry Season 1997)
27A Kwatebala (Summit Crest, February 2006)
28A Kwatebala (“Small Valley”)
29A Kwatebala (View from Kwatebala West)
30A Kwatebala West (View from Kwatebala “Curve”)
31A Mambilima
32A Mambilima (Summit)
33A Mwadikomba I
34A Mwadikomba II
35A Mwinansefu East
36A Shimpidi
37A Tenke East
38A Zikule

B Some Plants Observed in the TFM Area

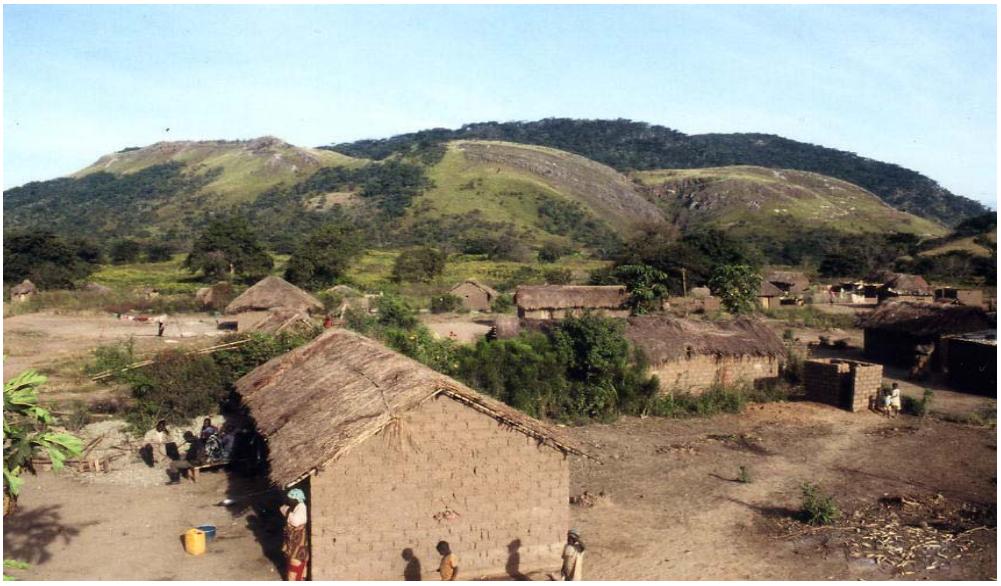
1B *Plectranthus esculentus*
2B *Uapaca robynsii*
3B *Wahlenbergia collomioides*
4B *Adenodolichos rhomboideus*
5B *Alectra sessisiliflora*
6B *Ascolepis metallorum*
7B *Bulbostylis cupricola*
8B *Bulbostylis pseudoperennis*
9B *Chamaecrista mimosoides*
10B *Cryptosepalum maraviense*
11B *Cyphostemma sessilifolium*
12B *Diheteropogon grandiflorus*
13B *Haumaniastrum katangense*
14B *Haumaniastrum prealtum*
15B *Justicia elegantula*
16B *Lelya prostrata*
17B *Ophioglossum lancifolium*
18B *Oxalis obliquifolia*
19B *Oxalis semiloba*
20B *Pandiaka carsonii*
21B *Pimpinella acutidentata*
22B *Rendlia altera*
23B *Securidaca longepedunculata var. parvifolia*
24B *Wahlenbergia capitata*

C Plant Species of Interest

1C . *Cheilanthes* sp. nov.
2C *Aeollanthus saxatilis*
3C *Faroa malaissei*
4C *Basananthe kisimbae*
5C *Barleria lobelioides sp. nov.*
6C *Wahlenbergia verbascoides*
7C *Monadenium cupricola*
8C *Euphorbia fanshawei*
9C *Sopubia neptunii*
10C *Haumaniastrum robertii*
11C *Triumfetta likasienis*
12C *Pellaea pectiniformis var. nana*

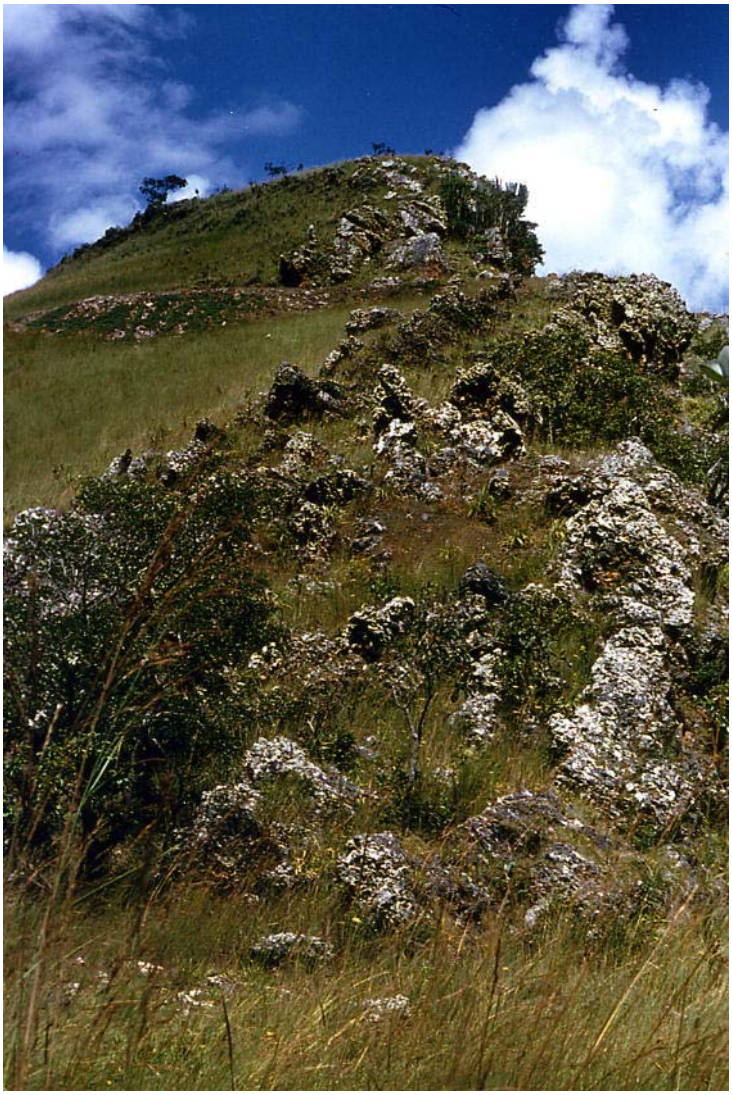
Photograph 1A Fungurume Hill I

Photograph 2A Fungurume Hill II

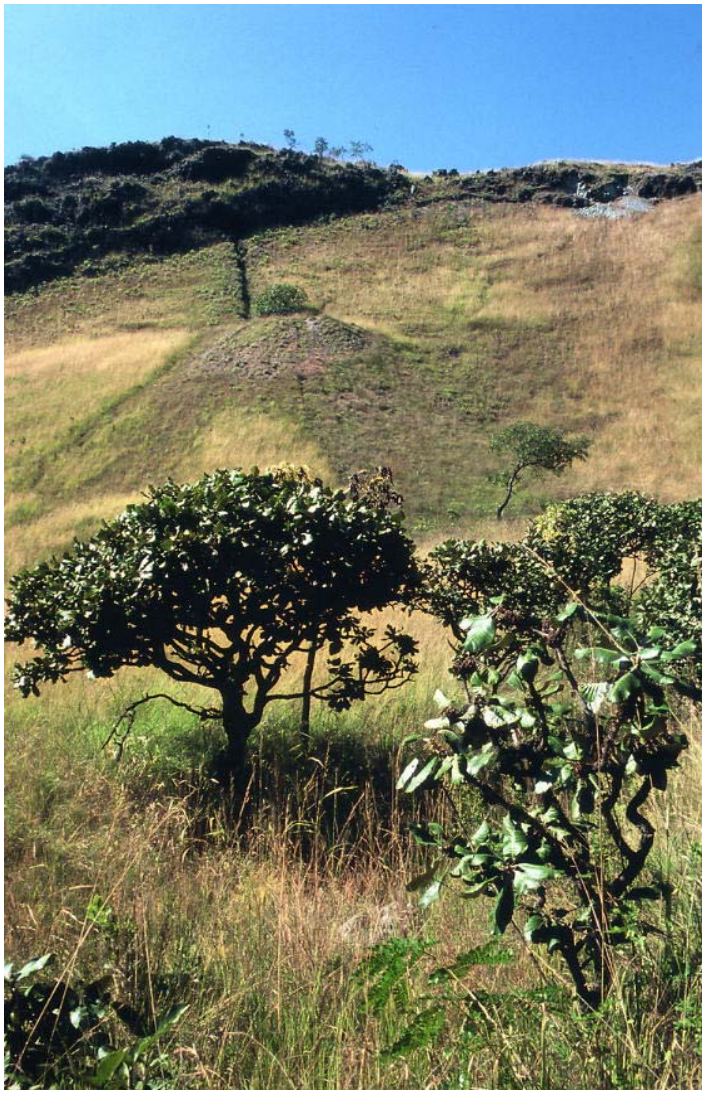


Photograph 3A **Fungurume Hills VI, V Southwest and V North (From Left to Right)**

Photograph 4A **Fungurume Hill V North (Central Part of Photo)**



Photograph 5A Fungurume Hill V North (Crest of Siliceous Cellular Rocks)



Photograph 6A Fungurume Hill V North (Western Slope)

Photograph 7A Fungurume Hill V Southwest

Photograph 8A Fungurume Hill V Southwest (View from Hill V North)

Photograph 9A Fungurume Hill VI

Photograph 10A Fungurume Hill VI (View from Hill V Southwest)

Photograph 11A Goma Southwest (1997)

Photograph 12A Goma Southwest (2006)

Photograph 13A Goma Southeast (Upper Crest)

Photograph 14A Goma Southeast (Mine Workings)

Photograph 15A Goma Central

Photograph 16A Goma Northeast

Photograph 17A Kabwelunono (1997)

Photograph 18A Kabwelunono (2006)

Photograph 19A Kakavilondo (= Apostolo)

Photograph 20A Katufungurume XII

Photograph 21A Kavifwafwaulu North (Rainy Season 2001)

Photograph 22A Kavifwfwaulu North (Dry Season 1997)

Photograph 23A Kavifwafwaulu Southeast (April 2006)

Photograph 24A Kazinyanga (April 2006)

Photograph 25A Kazinyanga (April 2006)

Photograph 26A Kwatebala (Dry Season 1997)

Photograph 27A Kwatebala (Summit Crest, February 2006)

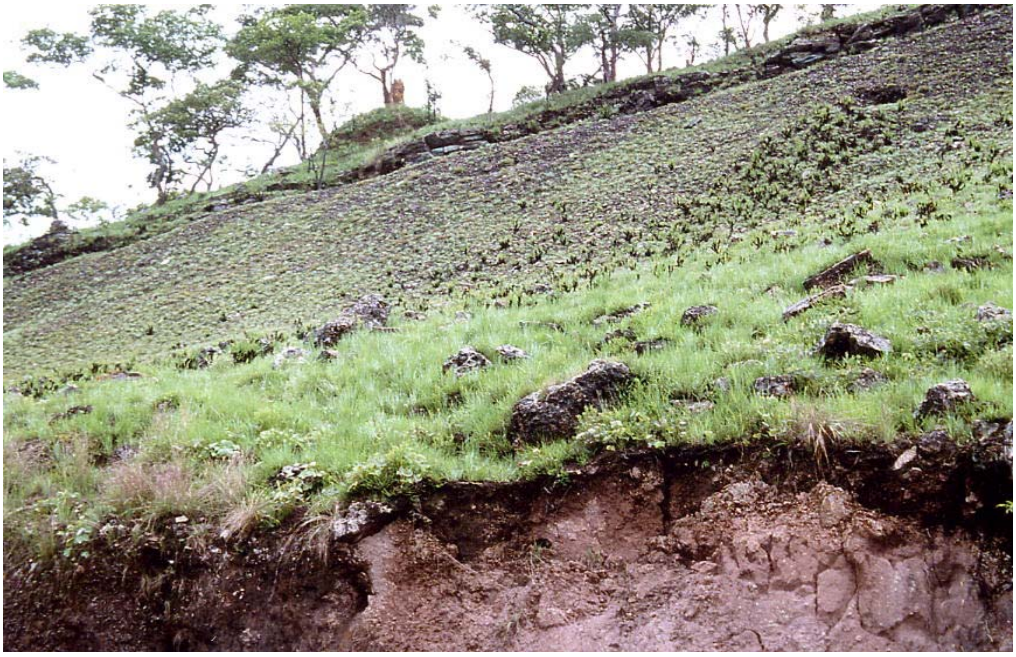
Photograph 28A Kwatebala (Small Valley 2006)

Photograph 29A Kwatebala (View from Kwatebala West)

Photograph 30A Kwatebala West (View from Kwatebala "Curve")

Photograph 31A Mambilima

Photograph 32A Mambilima (Summit)



Photograph 33A Mwadikomba I

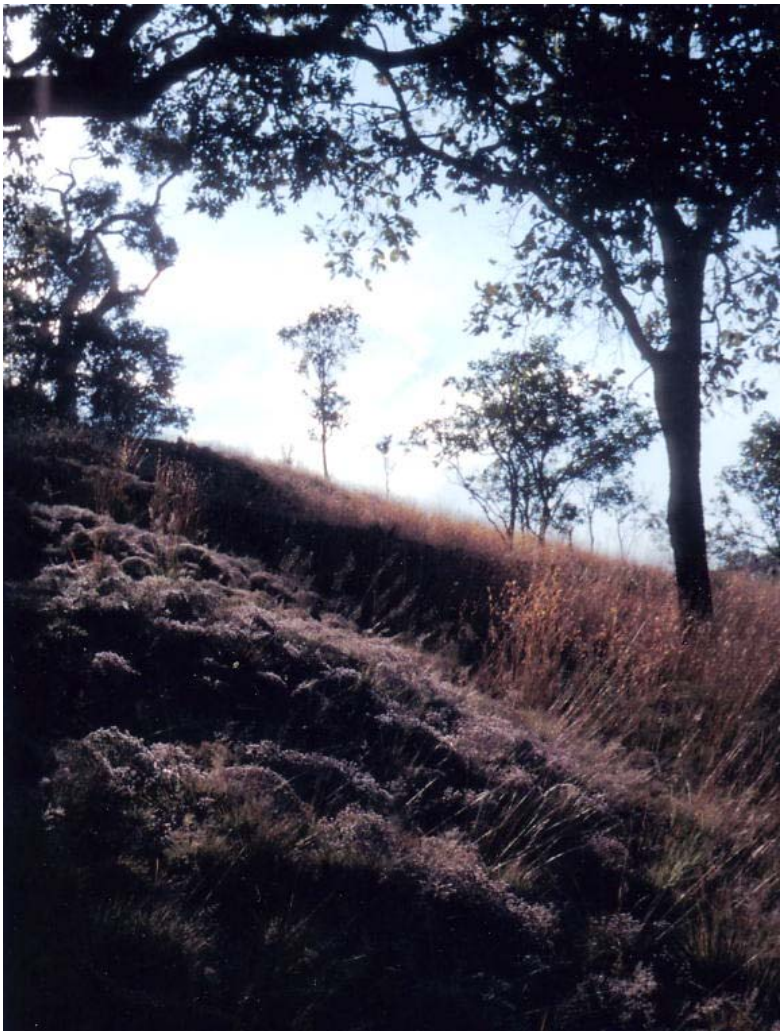
Photograph 34A Mwadikomba II

Photograph 35A Mwinansefu East (Detail)

Photograph 36A Shimbidi

Photograph 37A Tenke East (Front)

Photograph 37A Tenke East (Front)



Photograph 38A Zikule

Photograph 1B ***Plectranthus esculentus***

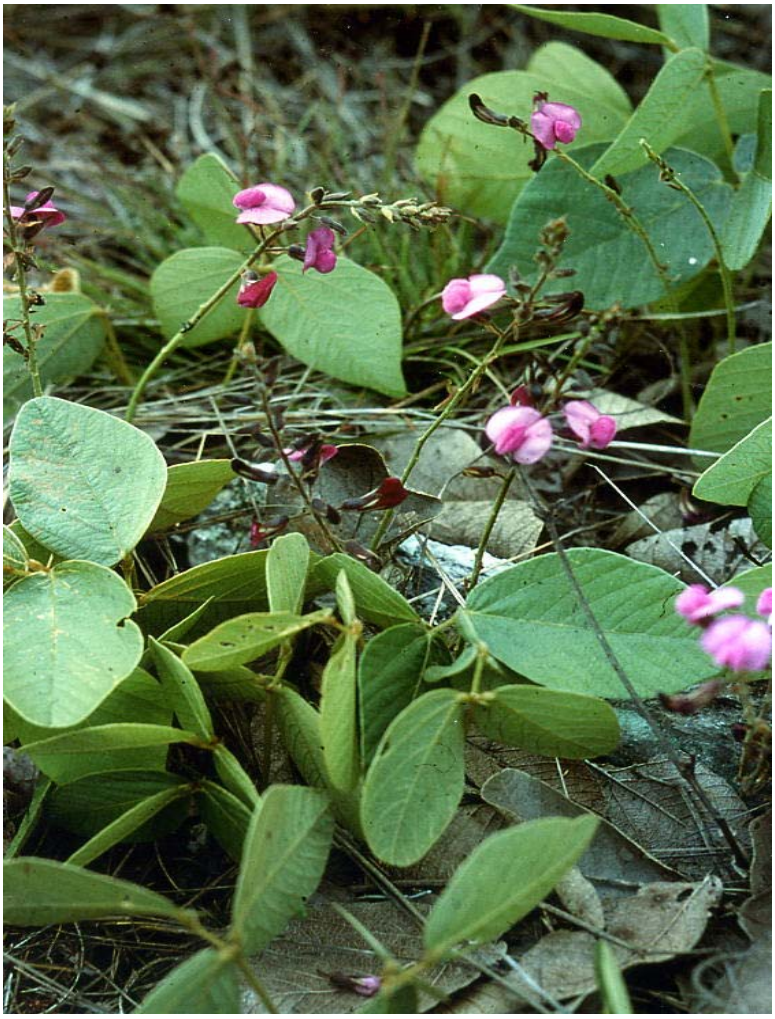
The plant is frequent in the steppe savanna of Shimpidi hill.

Photograph 2B ***Uapaca robynsii***

This shrub is the main component of the *Uapaca* belt (*Uapaca* shrub savanna).

Photograph 3B ***Wahlenbergia collomioides***

The plant is observed in copper steppe savanna. Not to confuse with *Wahlenbergia capitata.*



Photograph 4B ***Adenodolichos rhomboideus***

Photograph 5B ***Alectra sessisiliflora***

Photograph 6B ***Ascolepis metallorum***

Photograph 7B ***Bulbostylis cupricola***

Photograph 8B ***Bulbostylis pseudoperennis***

Photograph 9B ***Chamaecrista mimosoides***

Photograph 10B ***Cryptosepalum maraviense***

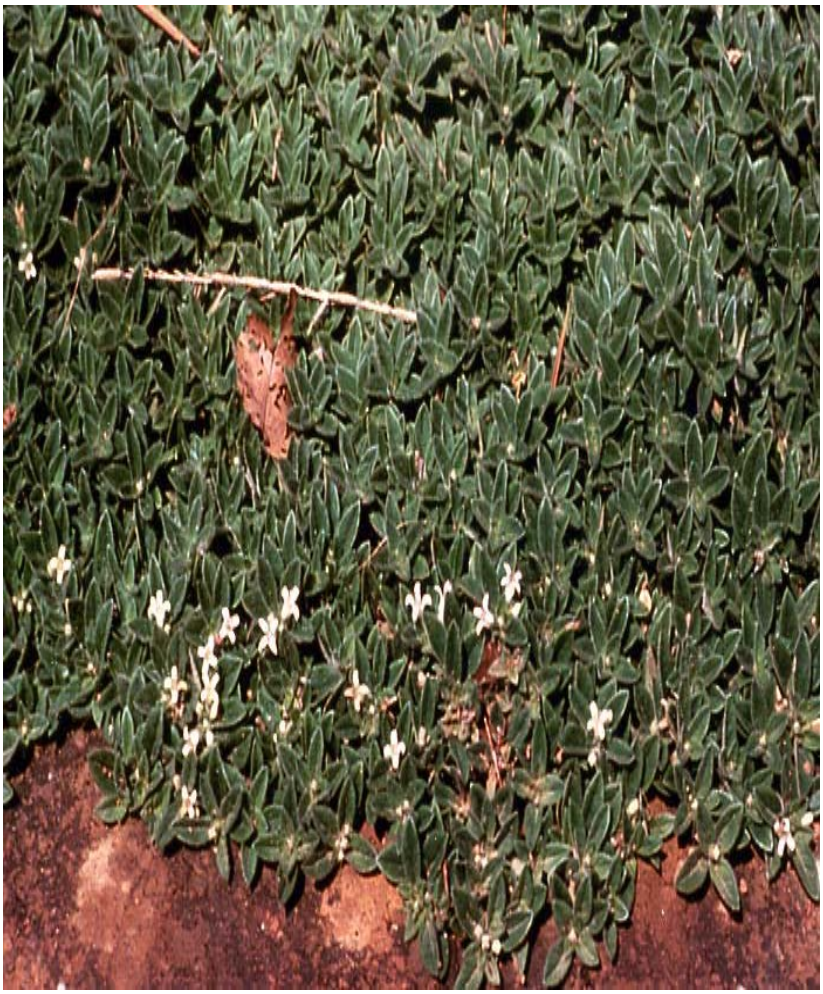
Photograph 11B ***Cyphostemma sessilifolium***

Photograph 12B ***Diheteropogon grandiflorus***

Photograph 13B ***Haumaniastrum katangense***

Photograph 14B ***Haumaniastrum prealtum***

Photograph 15B ***Justicia elegantula***



Photograph 16B ***Lelya prostrata***

Photograph 17B ***Ophioglossum lancifolium***

Photograph 18B ***Oxalis obliquifolia***

Photograph 19B ***Oxalis semiloba***

Photograph 20B ***Pandiaka carsonii***

Photograph 21B ***Pimpinella acutidentata***

Photograph 22B ***Rendlia altera***

Photograph 23B ***Securidaca longepedunculata var. parvifolia***

Photograph 24B ***Wahlenbergia capitata***

Photograph 1C ***Cheilanthes*** **sp. nov**

Photograph 2C ***Aeollanthus saxatilis***

Photograph 3C ***Faroa malaissei***

Photograph 4C ***Basananthe kisimbae***

Photograph 5C ***Barleria lobelioides* sp. nov.**

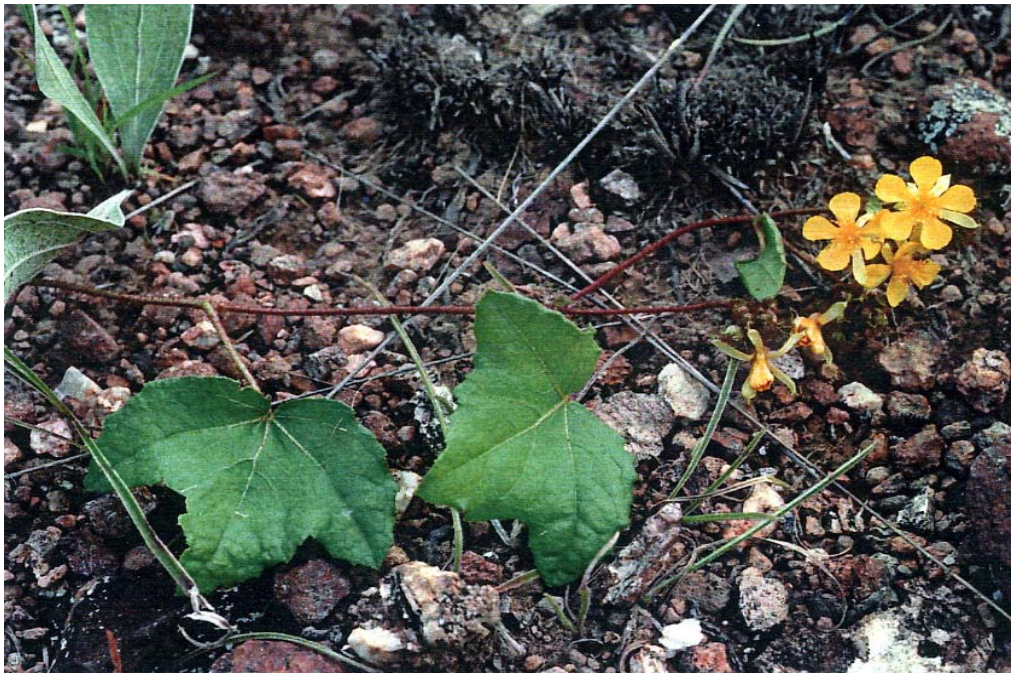
Photograph 6C ***Wahlenbergia verbascoides***

Photograph 7C ***Monadenium cupricola*** **(habit, top, cyathium, seed)**

Photograph 8C ***Euphorbia fanshawei***

Photograph 9C ***Sopubia neptunii***

Photograph 10C ***Haumaniastrum robertii***



Photograph 11C ***Triumfetta likasienis***

Photograph 12C ***Pellaea pectiniformis*** **var. nana**

APPENDIX B3.2-I

CLASSIFICATION OF VEGETATION FOR FAUNA HABITAT STUDY

1 A BROAD-SCALE STRUCTURAL CLASSIFICATION OF VEGETATION FOR PRACTICAL PURPOSES

Table 1 Tabular Key to Structural Groups and Formation Classes (Edwards 1983)

Dominant Height Class	Total Plant Cover >0.1%				Total Plant Cover <0.1%
	Total tree cover >0.1% shrub cover <10% if >1 m high **A. Forest and Woodland** ***Total tree cover***				**F. Desert woodland Trees dominant**
	100-75% 0-0.1ǿ	**75-10% 0.1-2 ǿ**	**10-1% 2-8.5ǿ**	**1-0.1% 8.5-30ǿ**	
trees >20 m	high forest	high closed woodland	high open woodland	high sparse woodland	high desert woodland
trees 10-20 m	tall forest	tall closed woodland	tall open woodland	tall sparse woodland	tail desert woodland
trees 5-10 m	short forest	short closed woodland	short open woodland	short sparse woodland	short desert woodland
trees 2-5 m	low forest	low closed woodland	low open woodland	low sparse woodland	low desert woodland
	Total tree cover >1% shrub cover >10% and >1 m high **B. Thicket and Bushland** ***Total tree cover***				
	100—10% 0—2 ǿ		***10—1% 2—8.5 ǿ***		
trees 5-10 m and shrubs 2-5 m	short thicket		short bushland		
trees 2-5 m and shrubs 1-5 m	low thicket		low bushland		
	Total tree cover <0,1% shrub cover >0.1% ***or tree cover up to 1%* and *shrub cover >10% and >1 m high (closed shrublands)*** **Shrubland** ***Total shrub cover***				**Desert shrubland Shrubs dominant**
	100—10% 0—2 ǿ	***10—1% 2—8,5 ǿ***	***1—0.1% 8,5—30 ǿ***		
shrubs 2-5 m	high closed shrubland	high open shrubland	high sparse shrubland		high desert shrubland
shrubs 1-2 m	tall closed shrubland	tall open shrubland	tall sparse shrubland		tall desert shrubland
shrubs 0.5-1 m	short closed shrubland	short open shrubland	short sparse shrubland		short desert shrubland

Table 1 Tabular Key To Structural Groups and Formation Classes (Edwards 1983) (continued)

Dominant Height Class	**Total Plant Cover >0.1%**			**Total Plant Cover <0.1%**
shrubs <0.5-1 m	low closed shrubland	low open shrubland	low sparse shrubland	low desert shrubland
	Total free cover <0,1% shrub cover <0.1% grass cover dominant and >0.1% **Grassland** ***Total grass cover***			**Desert grassland Grasses dominant**
	100—10% 0—2 ø	***10—1% 2—8.5 ø***	***1—0.1% 8.5—30 ø***	
grasses >2 m	high closed grassland	high open grassland	high sparse grassland	high desert grassland
grasses 1-2 m	tall closed grassland	tall open grassland	tall sparse grassland	tall desert
grasses 0.5-1 m	short closed grassland	short open grassland	short sparse grassland	short desert
grasses <0.5 m	low closed grassland	low open grassland	low sparse grassland	low desert grassland
	Total free cover <0.1% shrub cover <0.1% herb cover dominant and >0.1% **Herbland** ***Total herb cover***			**Desert herbland Herbs dominant**
	100—10% 0—1 ø	***10—1% 2—8.5 ø***	***1—0.1% 8.5—30 ø***	
herbs >2 m	high closed herbland	high open herbland	high sparse herbland	high desert herbland
herbs 1-2 m	tall closed herbland	tall open herbland	tail sparse herbland	tall desert herbland
herbs 0.5-1 m	short closed herbland	short open herbland	short sparse herbland	short desert herbland
herbs <0.5 m	low closed herbland	low open herbland	low sparse herbland	low desert herbland

(1) % cover refers to projected crown cover as percentage.

(2) ø refers to mean crown: gap ratio as mean number of crown diameters apart.

(3) Where straddling of height classes occurs this may be indicated by */*.

(4) Where mosaics of classes are found this may he indicated by *//* e.g. High closed // open woodland.

(5) Where there is a high substratal cover of shrubs (excluding thicket and bushland as defined), grasses, or herbs, this may be indicated *by* terms such as “shrubby”, “grassy” and “herby”.

Miombo Hill Crests, MidSlopes and Foot Slopes

Miombo Hill Crest

Soils: Shallow loamy soil with scattered rocks and protruding bedrock (Photograph 1). Ample small, live termite mounds scattered on the surface. Only single larger termitaria present (Photograph E3.2-4).

Vegetation: Tall closed woodland (Edwards 1983; Appendix E3.1-1): Fairly open broadleaved woodland (compared with the mid- and foot slopes) (Photograph 2).

Large tree cover: medium dense (Photograph 3)
Medium and small trees: absent
Shrubs: medium dense
Grass: 70 percent cover at knee height

Slope: 2 to 15 degrees

Other Aspects: Limited removal of trees by local population; no agriculture – soil too shallow and stony. No wetlands present.

Photograph 1 Protruding Bedrock

Photograph 2 Fairly Open Broadleaved Woodland

Photograph 3 Larger Tree Cover

Photograph 4 Termite Mound (Termitaria)

Miombo - Mid-slope

Soils: Deeper loamy soil with scattered bedrock protrusions (Photograph 6) and some live termitaria.

Vegetation: High closed woodland (Edwards 1983; Appendix E3.1-1): Fairly dense broadleaved woodland (Photograph 5).

Large tree cover: dense (Photograph 5)
Medium and small trees: absent
Shrubs: absent
Grass: 90 percent cover at knee height

Slope: 35 to 45 degrees

Other Aspects: Limited removal of trees by local population. No wetlands present.

Photograph 5 **The Fairly Dense Broadleaved Woodland with Large Trees.**

Photograph 6 Scattered Bedrock Protrusions

Miombo - Foot-slope

Soils: Deep loamy soil, with limited rocky substrate and few live termitaria.

Vegetation: High closed woodland (Edwards 1983; Appendix E3.1-1): Fairly dense broadleaved woodland (Photograph 7).

Large tree cover: dense
Medium and small trees: absent
Shrubs: absent
Grass: 85 percent cover at knee height

Slope: 15 degrees

Other Aspects: Some removal of trees by local population. No wetlands present.

Photograph 7 Fairly Dense Broadleaved Woodland

Miombo – Corridors in Developed Areas

Corridors of miombo woodland often remain in various states of use between areas developed by the local communities for their agricultural needs.

Soils: Deeper loamy soil and some live termitaria.

Vegetation: High closed woodland (Edwards 1983; Appendix E3.1-1): Fairly dense broadleaved woodland (Photograph 8).

Large tree cover: fairly dense
Medium and small trees: absent
Shrubs: absent
Grass: 90 percent cover at hip height

Slope: 2 to 35 degrees

Photograph 8 Fairly Dense Broadleaved Woodland

Other Aspects: Increased removal of trees by local population (Photograph 9). Corridors of miombo woodland often remain in various states of utilization between areas developed by the local communities for their agricultural needs.

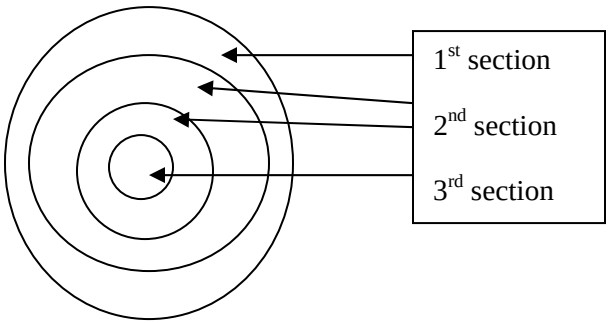
Wetlands (marshland and vleis) ploughed for agricultural reasons.

Valley Bottom

The areas situated in the valleys are the most commonly used for cultivation by the local population. The lower lying areas are also the position in the landscape that support most of the wetland habitats. The wetlands are generally inhabited by hydrophylic grasses and therefore rarely have muddy edges or bare patches around them.

Photograph 9 Cleared Forest

Pan wetland: This specific habitat was the only pan identified within the area of influence of the proposed mining infrastructure in the Kwatebala area. Due to the morphology of the pan, it was divided using four concentric bands into different habitat types as described below:



Soils: Deep sandy-loam soil, with a few live termitaria.

First Section:

Outer terrestrial band (20 meters wide).

Vegetation: Fairly dense grass cover; tall closed woodland (Edwards 1983; Appendix E3.1 1).

Large tree cover: fairly dense (Photograph 10)
Medium and small trees: sparse
Shrubs: sparse
Grass: 90 percent cover at hip height

Slope: 2 degrees

Second Section (Photograph E3.2-11a):

Dry wetland band (15 meters wide).

Vegetation: Fairly dense grass cover; Low closed grassland (Edwards, 1983; Appendix E3.2-1).

Large tree cover: absent (Photograph 11)
Medium and small trees: absent
Shrubs: absent
Grass: 70 percent cover at knee height

Slope: two degrees

Third Section (Photograph 11b):

Soggy marshland band inundated (50 meters wide).

Vegetation: Fairly dense hydrophilic grass cover.

Large tree cover: absent (Photograph 11)
Medium and small trees: absent
Shrubs: absent
Grass: 80 percent cover at knee height

Slope: one degree

Photograph 10 **Pan Surrounded by Fairly Dense Woodland.**

Fourth Section (Photograph 11c):

Semi-permanent central pond with inundated hydrophylic grass (30 meters wide).

Vegetation: Moderate hydrophilic grass cover.

Large tree cover: absent (Photograph 11)
Medium and small trees: absent
Shrubs: absent
Grass: 60 percent cover at shoulder height

Slope: one degree

Photograph 11 The Different Sections of the Pan

Marsh Wetland

Soils: Deep sandy soils. Crater-like depressions with surface water (Photograph 13) in lower areas (perhaps dug by humans); grassy edges and inundated grass.

Vegetation: Dense hydrophilic grass cover: Tall closed grassland (Edwards 1983; Appendix E3.2-1).

Large tree cover: absent (Photograph 12), trees on margin of biotope
Medium and small trees: absent
Shrubs: absent
Grass: 100 percent cover at head height

Slope: two degrees

Photograph 12 Tall Grass Wetland Surrounded by Trees

Photograph 13 Crater-Like Depressions With Surface Water Riparian

Soils: Compacted loamy soils with sandy pockets.

Vegetation: Tall forest (Edwards 1983; Appendix E3.2-1): Dense herbaceous cover.

Large tree cover: very dense riparian forest (Photograph 14)
Medium and small trees: present, though inhibited by light penetration through canopy
Shrubs: limited
Grass: 90 percent cover at hip height

Slope: 10 to 15 degrees

Other Aspects: Sedimentation due to erosion from agricultural activities and removal of the riparian zone by the local population are some of the main impacts on this linear habitat.

Wetland: Relative small perennial flowing aquatic habitats with bedrock rapids, cobble riffles, runs and pools (Photograph 15).

Photograph 14 Very Dense Riparian Forest

Photograph 15 In-Stream Habitats

Copper-Cobalt

Copper-Cobalt Crest

Soils: Very stony, with scattered rocks and protruding bedrock (Photograph 17); few live termitaria.

Vegetation: Low closed grassland (Edwards, 1983; Appendix E3.2-1): Fairly dense grass cover with 10 percent rocky cover (Photograph 16).

Large tree cover: absent
Medium and small trees: sparse
Shrubs: limited to *Xerophyta*
Grass : 55 percent cover at ankle height

Slope: 2 to 30 degrees

Other Aspects: Informal mining activities by local population. No wetlands present.

Photograph 16 Fairly Dense Grass Cover

Photograph 17 Scattered Rocks and Protruding Bedrock

Copper-Cobalt mid-slope

Soils: Stony, with scattered rocks and protruding bedrock (Photograph 18).

Vegetation: Low closed grassland (Edwards, 1983; Appendix E3.2-1): Fairly dense grass cover with five percent rocky cover (Photograph 19).

Large tree cover: open; with few trees present but scattered (Photograph E3.2-18)
Medium and small trees: sparse
Shrubs: limited to *Xerophyta*.
Grass : 75 percent cover at knee height

Slope:20 to 45 degrees

Other Aspects: Some informal mining activities by local population. No wetlands present.

Photograph 18 **Fairly Dense Grass Cover with Scattered Rocks and Protruding Bedrock**

Photograph 19 Fairly Dense Grass Cover with Scattered Rocks and Protruding Bedrock

Human-Impacted Areas

These areas include the following commonly found changed landscapes in the study area:

- Woodland thinned out by selective wood cutting, grass cover denser and taller due to increased penetration of sunlight (Photograph 20).
- Areas with dead trees remaining in the pasture or fallow land (Photograph 21); grass cover dense and tall due to increased sunlight.
- Fallow lands with grass cover dense and tall due to increased sunlight (Photograph 22).
- Cultivated fields planted with crops (beans, maize and cassava) (Photograph 23).
- Human habitation (villages).

Photograph 20 Thinned-Out Woodland with Tall Grass

Photograph 21 Dead Trees in Fallow Land

Photograph 22 Fallow Lands with Dense Grass Cover

Photograph 23 Agricultural Fields Planted with Beans and Maize

APPENDIX B3.2-II

FROGS: AVAILABLE HABITAT, EXPECTED OCCURRENCE AND OBSERVED PRESENCE DURING THE SURVEY

Table 1 Frog Occurrence by Biotope[(a)]

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	Power's rain frog (*Breviceps poweri*) (1.2; 1.3; 1.4)	**Bushveld rain frog** (*Breviceps adspersus*) (1.1; 1.3)	**Shovel-footed Squeaker** (*Arthroleptis stenodactylus)* (1.4)	Sooty toad (*Bufo fuliginatus*) (1.3)	**Eastern Olive toad** (*Bufo garmani*) (2.2; 2.3)	Lemaire's toad (*Bufo lemairii*) (2.1)	Plain squeaker (*Schoutedenella xenochirus*) (3.2)	Udzungwa ridged frog (*Ptychadena uzungwensis)* (3.2)		
					Beira toad (*Bufo beiranus*) (2.2)	Painted reed frog (*Hyperolius marmoratus alborufus)* (2.1; 2.3)	**Guttural toad** (*Bufo gutturalis*) (2.1; 2.2)			
					Red toad (*Schismaderma carens)*	Five-striped reed frog (*Hyperolius quinquevittatus)* (2.1)	**Flat backed toad** (*Bufo maculatus*) (2.1; 2.2)			
					Guinea snout-burrower (*Hemisus guineensis)*	De Witte's clicking frog (*Kassinula wittei)* (2.1)	Dark-sided toad (*Bufo melanopleura*) (1.1; 1.2; 1.3)			
					Bocage's reed frog (*Hyperolius bocagei)*	Kuvangu kassina (*Kassina kuvangensis*) (2.1)	Mottled shovel-nosed frog (*Hemisus marmoratus)* (2.1)			
					Long reed frog (*Hyperolius nasutus)* (2.3)	Webbed puddle frog (*Phrynobatrachus perpalmatus*) (2.1)	Cinnamon-bellied reed frog (*Hyperolius cinnamomeoventris)*			
					Bubbling kassina (*Kassina senegalensis*) (2.2)	Sharp-nosed grass frog (*Ptychadena oxyrhynchus)* (2.1)	Kachalola reed frog (*Hyperolius kachalolae)*			
					De Witte's Spiny Reed Frog (*Afrixalus wittei)* (2.2)	Guibe's ridged frog (*Ptychadena guibei)* (2.1)	**Kivu reed frog** (*Hyperolius kivuensis)* (2.1)			
					Cinnamon Tree Frog (*Leptopelis cynnamomeus)* (1.1; 1.2; 1.3; 2.3)	Grandison's ridged frog (*Ptychadena grandisonae)* (2.1)	Greater reed frog (*Hyperolius major)*			
					Cryptic Tree Frog (*Leptopelis parbocagii)* (1.1; 1.2; 1.3; 2.3)	Dark ridged frog (*Ptychadena obscura)* (2.1)	Angolan reed frog (*Hyperolius angolensis)*			
					Bocage's Tree Frog (*Leptopelis bocagii)* (1.1; 1.2; 1.3; 2.3)	Upemba ridged frog (*Ptychadena upembae)* (2.1)	Variable reed frog (*Hyperolius pictus)* (2.1; 2.2)			
					Dwarf puddle frog (*Phrynobatrachus mababiensis)* (2.2; 2.3)	Keiling's ridged frog (*Ptychadena keilingi)* (2.1)	Steindachner's reed frog (*Hyperolius steindacheri)*frog (2.1; 2.2)			
					Snoring puddle frog (*Phrynobatrachus natalensis*) (2.2)	Striped grass frog (*Ptychadena porosissima*) (2.1; 2.3)	Peter's Platanna *(Xenopus petersii)* (2.1)			
					Spotted ridged frog (*Ptychadena subpunctata)*		**Plain grass frog** (*Ptychadena anchietae*) (2.1; 2.2)			
					Small ridged frog (*Ptychadena taenioscelis)*		Mascarene ridged frog (*Ptychadena mascareniensis)* (2.1; 2.2)			
					Grey Tree Frog (*Chiromantis xerampelina)* (2.2; 2.3)		Common river frog (*Afrana angolensis*)			
							Darling's white-lipped frog (*Amnirana darlingi*)			
							Lemaire's white-lipped frog (*Amnirana lemairii*)			

Table 1 Frog Occurrence by Biotope[a](continued)

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
species per preferred biotope[b]	1	1	1	1	17	13	18	1	0	0
percent of overall total[c]	2	2	2	2	33.3	25.4	35.2	2	0	0
totals/ all habitats used (including habitats in brackets)[d]	5	5	5	2	39	24	27	1	2	0
percent of total	4.5	4.5	4.5	1.8	35.4	21.8	24.5	0.9	1.8	0
number of frogs specific to the relevant habitat[e]	0	0	0	0	5	0	7	0	0	0

(a) The expected frog assemblages (56 species) in the study area grouped into the preferred biotopes (obtained from Appendix E3.2-2) in which they are most likely to be found and which is essential for their existence – i.e., to shelter, breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Frog names in **bold** are the frogs that were encountered during the current survey.
(b) Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.
(c) Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the study area.
(d) Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).
(e) Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

Source: Channing 2001 Minter et. al. 2004

APPENDIX B3.2-III

REPTILES: AVAILABLE HABITAT, EXPECTED OCCURRENCE AND OBSERVED PRESENCE DURING THE SURVEY

Table 1 Reptile Occurrence by Biotope[a]

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	Spotted wolf snake (*Lycophidion multimaculatum)* (1.2; 1.3; 1.4)	Delalande's blind snake *(Rhinotyphlops lalandei)* (1.1; 1.3; 1.4; 3.1; 3.2)	Bell's hinged tortoise(*Kinixys belliana belliana*) (1.4; 4)	Speke's hinged-back tortoise (*Kinixys belliana spekii*) (1.3; 4)	Pan hinged terrapin (*Pelusios subniger*) (2.2)	Gray-bellied grass-snake *(Psammophylax variabilis variabilis)* (1.4; 2.1)	Marsh terrapin (*Pelomedusa subrufa)* (2.1; 2.2)	Brown house snake *(Lamprophis fuliginosus)* (3.2)	Rhombic egg eater *(Dasypeltis scabra)* (1.1; 1.2; 1.3; 1.4; 3.1; 4)	Leopard tortoise (*Geochelone pardalis*)* (1.3; 1.4)
	Cape centipede-eater *(Aparallactus capensis)* (1.2; 1.3; 1.4; 2.1; 3.1; 3.2; 4)	Cape wolf snake *(Lycophidion capense capense)* (1.1; 1.3; 1.4)	Eastern Congo burrowing asp (*Atractaspis congica*) (1.4; 4)	Dwarf sand snake (*Psammophis angolensis*) (1.3; 2.1; 4)	Bicolored quill-nosed snake *(Xenocalamus bicolor machadoi* (1.4; 4)	Herald snake *(Crotaphopeltis hotamboeia)* (1.1; 1.2; 1.3; 2.1; 2.3; 3.1; 3.2; 4)	Common African python (*Python sebae natalensis*) (1.3; 2.2)	**Puff adder** *(Bitis arietans)* (1.1; 1.2; 1.3; 1.4; 3.1; 3.2; 4)		
	Flap-necked chameleon (*Chamaeleo dilepis dilepis*) (1.2; 1.3; 1.4; 2.3)	**Blotched wolf snake** *(Lycophidion capense multimaculatum)* (1.1; 1.3; 1.4)	**Common purple-glossed snake** (*Amblyodipsas polylepis polylepis*) (1.4; 2.1; 4)	Reticulated centipede-eater *(Aparallactus lunulatus lunulatus)* (1.3; 2.1; 4)	Elongate quill-snouted snake (*Xenocalamus mechowii inoratus*) (1.4; 4)		Lined olympic snake (*Dromophis lineatus*)	**Variable skink** *(Trachylepis varia)* (1.1; 1.2; 1.3; 2.1; 2.3; 3.2; 4)		
		Forest marsh snake (*Natriciteres variegata biposstocularis*) (1.1; 1.3; 2.3)	Gerard's black-and-yellow burrowing snake (*Chilorhinophis gerardi*)	Spotted bush snake *(Philothamnus semivariegatus semivariegatus)* (1.1; 1.2; 1.3; 2.1; 2.2; 2.3; 3.2; 4)			Angolan green snake *(Philothamnus angolensis)*	Transvaal grass lizard *(Chamaesaura aenea tenuior)* (3.2)		
		Boomslang (*Dispholidus typus punctatus*) (1.1; 1.3; 1.4; 2.3)	**Eastern tiger snake** (*Telescopus semiannulatus semiannulatus*) (1.1; 1.2; 1.4)	Black mamba (*Dendroaspis polylepis*) (1.1; 1.2; 1.3; 3.2; 4)			Oate's vine snake (*Thelotornis capensis oatesii*) (1.1; 1.2; 1.3)			
		Rock monitor *(Varanus albigularis exanthematicus)** (1.1; 1.3; 3.2; 4)	Gaboon adder (*Bitis gabonica*)* (1.2)	Black-lined plated lizard (*Gerrhosaurus nigrolineatus*) (3.2; 4)			Anchieta's cobra (*Naja haje anchietae*)			
		Cape gecko *(Pachydactylus capensis)* (1.1; 1.3; 1.4)	**O'Shaughnessy's thicktoed gecko** (*Pachydactylus oshaughnessyi*) (1.1; 1.3)	Ground agama *(Agama aculeata)* (1.3; 4)			Forest cobra (*Naja melanoleuca)*			
							Water monitor *(Varanus niloticus niloticus)**			
species per preferred biotope[b]	3	7	6	7	3	2	8	4	1	1
percent of overall total[c]	7	16	14	16	7	4	19	9	2	2
totals/ all habitats used (including habitats in brackets)[d]	19	20	26	26	13	10	15	8	11	21
percent of total[e]	11	11	15	15	7	5	8	4	6	12
number of reptiles specific to the relevant habitat*	0	0	0	0	0	0	5	0	0	0

[a] The expected reptile assemblages (42 species) in the study area grouped into the preferred habitat types (obtained from Appendix E3.2-3) in which they are most likely to be found and which is essential for their existence – i.e., to breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Reptiles with names in **bold** were found during the current survey.

[b] Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.

[c] Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the study area.

[d] Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).

[e] Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

Source: current survey data.

APPENDIX B3.2-IV

BIRDS: AVAILABLE HABITAT, EXPECTED OCCURRENCE AND OBSERVED PRESENCE DURING THE SURVEY

Table 1 Bird Occurrence by Biotope[(a)] (In Study Area)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
Yellowfronted Tinker Barbet (1.2; 1.3; 1.4; 2.3; 3.1; 3.2; 4)	**Lizard Buzzard** (1.1; 1.2; 1.4)	African Mourning Dove (1.1; 1.2; 1.4; 2.3)	**Red-Necked Spurfowl** (4)	Glossy Ibis (2.2)	Little Egret	Reed Cormorant	Little Swift (3.2)	**Flappet Lark** (1.4; 3.1; 4)	Blackheaded Heron (2.2)
Goldentailed Woodpecker (1.2; 1.3; 1.4)	Barn Owl (1.1; 1.3; 1.4; 4)	**Emerald-Spotted Wood-Dove** (1.4; 2.3; 4)	Helmeted Guineafowl (3.2; 4)	African Jacana (2.2)	Great White Egret (2.3)	Gray Heron (2.1;2.2)	**Familiar Chat** (3.2)	**Croaking Cisticola** (3.1)	Cattle Egret
Black Saw-Wing Swallow (1.2; 1.3; 1.4; 3.2; 4)	Fierynecked Nightjar (1.1; 1.3; 1.4)	**Meyer's Parrot** (1.1; 1.2; 1.4; 2.1; 2.3; 4)	Laughing Dove	Knobbilled Duck (2.2)	Purple Heron (2.3)	Squacco Heron	Mountain Pipit (3.2)		Black-Shouldered Kite (3.1; 3.2)
Kurrichane Thrush (1.2; 1.3; 1.4)	**Cardinal Woodpecker** (1.1; 1.3; 1.4)	**Spotted Eagle Owl** (1.1; 1.2; 1.4; 2.3; 4)	Cape Turtle Dove (3.1; 3.2; 4)	Redbilled Teal	African Spoonbill (2.3; 2.1)	Greenbacked Heron			Kurrichane Buttonquail
Eastern Olive Sunbird (1.2; 1.3; 1.4)	**Square-Tailed Drongo** (1.1; 1.3; 1.4)	Redbilled Woodhoopoe (1.1; 1.2; 1.4; 4)	**Schalow's Turaco** (1.1; 1.2; 1.3; 2.3; 4)	Hottentot Teal	Hadeda Ibis (2.1)	African Black Duck			Spotted Thick-Knee
Rock Bunting (1.2; 1.3; 1.4; 3.1; 3.2)	**Blackheaded Oriole** (1.1; 1.3; 1.4; 2.3; 4)	Crested Barbet (1.1; 1.2; 1.4; 4)	African Scops-Owl (4)	Common Moorhen (2.2; 2.3)	Whitefaced Duck	Hamerkop			**Striped Kingfisher** (1.3; 1.4; 3.2)
	Yellow-Breasted Apalis (1.1; 1.3; 1.4; 2.3)	Chinspot Batis (1.1; 1.2; 1.4)	Pearl-Spotted Owlet (3.2; 4)	Fan-Tailed Cisticola (2.2)	Purple Gallinule (2.1; 2.3)	Gymnogene (1.1; 1.2; 1.3)			Little Bee-Eater (1.4; 3.1; 3.2)
	Graybacked Warbler (1.1; 1.3; 1.4)	**Woodland Pipit** (1.4)	African Hoopoe (3.1; 3.2; 4)	**Tawny-Flanked Prinia** (2.2)	**White-Browed Coucal** (2.1; 2.3)	Gabar Goshawk (1.1; 1.2; 1.3)			Pied Crow (3.1; 3.2)
	Yellow-Bellied Eremomela (1.1; 1.3; 1.4)	Brubru (1.1; 1.2; 1.4)	Bearded Woodpecker (1.1; 1.2; 1.3)	Southern Black Flycatcher (1.1; 1.2; 1.3; 1.4)	Marsh Owl	African Goshawk			Redfaced Cisticola (1.4; 2.1; 2.2)

Table 1 Bird Occurrence by Biotype[(a)] (In Study Area) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	Pale Flycatcher (1.1; 1.3; 1.4)	**Threestreaked Tchagra** (1.1; 1.2; 1.4)	**Forktailed Drongo** (1.1; 1.2; 1.3; 2.3; 3.1; 3.2; 4)	**Pintailed Whydah** (2.2; 4)	**Moustached Grass-Warbler** (1.4; 2.1)	Black Crake (2.2)			**Rattling Cisticola** (1.4)
	Black-Backed Puffback (1.1; 1.3; 1.4)	**African Yellow White-Eye** (1.1; 1.2; 1.4)	**Blackeyed Bulbul** (1.1; 1.2; 1.3; 3.1; 3.2; 4)		Red-Shouldered Widowbird (2.1; 3.1;3.2; 4)	Threebanded Plover			Grassveld Pipit
	Retz's Helmet-Shrike (1.1; 1.3; 1.4)	**Yellowthroated Sparrow** (1.1; 1.2; 1.4)	**Groundscraper Thrush** (4)		Yellow-Mantled Widowbird (2.1; 4)	Water Dikkop			Fiscal Shrike
	Green-Winged Pytilia (1.4)	**Red-Headed Weaver** (1.1; 1.2; 1.4)	Natal Robin		White-Winged Widowbird (2.1; 4)	**Redeyed Dove** (1.2; 1.3)			House Sparrow
		Bronze Mannikin (1.4)	White-Browed Scrub-Robin (1.3; 4)		**Southern Red Bishop** (2.1; 4)	**Speckled Mousebird** (1.3; 1.4; 4)			Northern Gray-Headed Sparrow
		Golden-Breasted Bunting (1.4)	Trilling Cisticola (1.1; 1.2; 1.3)		Yellow-Rumped, Cape Widow (2.1; 4)	Malachite Kingfisher			**Red-Collared Widowbird** (1.4; 2.1; 2.2; 3.2)
			Neddicky (3.1; 3.2)		**Yellow Bishop**	Pied Kingfisher			African Quailfinch (2.1; 2.2)
			Short-Winged Cisticola (1.3; 4)			**Giant Kingfisher**			**Common Waxbill** (2.3)
			Blue-Gray Flycatcher (2.3)			**Blackcollared Barbet** (1.1; 1.2; 1.3; 1.3)			
			Blackcrowned Tchagra (1.1; 1.2; 1.3)			**Heuglin's Robin-Chat**			
			Gray-Headed Bush-Shrike			**Tropical Boubou** (1.1; 1.2; 1.3)			

Table 1 Bird Occurrence by Biotype[(a)] (In Study Area) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
			Black Sunbird (1.1; 1.2; 1.3)			Orange-Breasted Bush-Shrike			
			Scarlet-Chested Sunbird (1.1; 1.2; 1.3; 2.3)			Greater Blue-Eared Starling (1.1; 1.2; 1.3; 1.4)			
			Yelloweyed Canary (2.3)			**Collared Sunbird**			
						Spectacled Weaver (1.4)			
						Spotted-Backed Weaver			
						Red-Billed Firefinch (1.1; 1.2; 1.3; 1.4)			
						Bluebilled Firefinch (1.4)			
Cinnamon Dove (1.2; 1.3; 2.3)	**Dark Chanting Goshawk** (1.1; 1.3; 1.4)	Tawny Eagle (1.4)	**Bateleur** (3.1; 3.2; 4; 1.3)	Whitebacked Duck (2.2)	African Rail (2.1; 2.3)	Western Banded Snake-Eagle (3.1; 3.2)	Augur Buzzard (3.2)	Freckled Nightjar (1.1; 1.2; 1.3; 3.1)	Red-Capped Lark (2.1; 3.1;3.2)
Pennant-Winged Nightjar (1.2; 1.3)	African Hawk-Eagle (1.1; 1.3; 2.3)	Southern White-Faced Scops-Owl (1.4; 2.3)	Little Banded Goshawk (1.1; 1.2; 1.3; 2.3)	**Redchested Flufftail** (2.2)	African Crake (2.1)	Woolynecked Stork (2.2)	Rock Kestrel (3.2; 4)	Lazy Cisticola (3.1)	Buffy Pipit
Souza's Shrike (1.2; 1.3; 1.4)	Gray-Headed Parrot (1.1; 1.3; 1.4; 2.3)	African Barred Owlet (1.1; 1.2; 2.3)	Martial Eagle (1.1; 1.2; 1.3; 2.3)	Orange-Breasted Waxbill (2.2; 4)	Lesser Gallinule (2.1)	Little Sparrowhawk (1.1; 1.2 ;1.3)	**Sooty Chat** (3.2)	Short-Tailed Pipit (3.1)	Splendid Glossy Starling
Miombo Blue-Eared Starling (1.2; 1.3; 1.4)	African Broadbill (1.1; 1.3; 2.3)	Pale-Billed Hornbill (1.1; 1.2; 1.4)	Gray Kestrel (3.2; 4)		Long-Toed Lapwing	Black Sparrowhawk	Black-Chinned Quailfinch (3.2)		Red-Cheeked Gordonbleu

Table 1 Bird Occurrence by Biotype[(a)] (In Study Area) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	Yellow-Rumped Tinkerbird (1.1; 1.3; 1.4)	Anchieta's Barbet (1.1; 1.2; 1.4; 2.3)	Coqui Francolin (1.3 ; 3.2 ; 4)		Coppery-Tailed Coucal	African Crowned Eagle			Fawn-Breasted Waxbill
	Eastern Least Honeyguide (1.1; 1.3; 1.4; 2.3)	Least Honeyguide (1.1; 1.2; 1.4; 2.3)	**Bohm's Spinetail** (1.1; 1.2; 1.3; 2.3; 4)		Swamp Nightjar	Buff-Spotted Flufftail			Orange-Cheeked Waxbill (1.3; 1.4)
	Bennett's Woodpecker (1.1; 1.3; 1.4)	Slender-Billed Honeyguide (1.1; 1.2; 1.4)	**Blackbacked Barbet** (1.3; 3.2; 4)		Yellow Warbler (2.1; 2.3)	Giant Eagle Owl (1.3; 1.4)			Broad-Tailed Paradise-Whydah (1.1; 1.2; 1.3; 1.4)
	White-Breasted Cuckooshrike (1.1; 1.3; 2.3)	Sharp-Billed Honeyguide (1.1; 1.2; 1.4)	**Greater Honeyguide** (1.1; 1.2; 1.3)		African Sedge Warbler (2.1)	African Wood-Owl (1.1; 1.2; 1.3)			
	Little Greenbul (1.1; 1.3; 1.4; 2.3)	**Yellow-Bellied Greenbul** (1.1; 1.2; 1.4; 2.3)	Lesser Honeyguide (1.1; 1.2; 1.3; 2.3; 4)		Dambo Cisticola (2.1)	Narina Trogon (1.1; 1.2; 1.3)			
	Rufous-Bellied Tit (1.1; 1.3; 1.4)	Spotted Creeper (1.1; 1.2; 1.4)	White-Winged Black Tit (1.3)		Pale-Crowned Cisticola (1.4, 2.2)	Little Spotted Woodpecker (1.1; 1.2; 1.3; 1.4)			
	Black-Necked Eremomela (1.1; 1.3; 1.4)	Gray Penduline-Tit (1.1; 1.2; 1.4)	African Thrush (1.1; 1.2; 1.3; 2.3)		Marsh Widowbird (2.1; 4)	Olive Woodpecker			
	Red-Capped Crombec (1.1; 1.3; 1.4)	**Miombo Tit** (1.1; 1.2; 1.4)	Whistling Cisticola (3.1; 3.2)		Fire-Crowned Bishop (2.1; 4)	Mosque Swallow			
	Yellow-Bellied Hyliota (1.1; 1.3; 1.4)	Miombo Rock-Thrush (1.1; 1.2;)	Long-Tailed (Tabora) Cisticola (1.3;2.3)			Yellow-Throated Leaf-Love (1.1; 1.2; 1.3; 1.4)			
	Red-Bellied (Black-Headed) Paradise Flycatcher (1.1; 1.3)	**Arnott's Chat** (1.1; 1.2; 1.4)	Tinkling Cisticola (1.1; 1.2; 1.3)			Cabanis's Greenbul			

Table 1 Bird Occurrence by Biotype[(a)] (In Study Area) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	Collared Flycatcher (1.1; 1.3; 1.4)	Miombo Scrub-Robin (1.4; 4)	Miombo Double-Collared Sunbird (1.1; 1.2; 1.3)			Hartlaub's Babbler (3.2)			
	Chestnut-Winged Starling (1.1; 1.3; 2.3)	Green-Capped Eremomela (1.1; 1.2; 1.4)	Yellow-Bellied Sunbird (1.1; 1.2; 1.3)			Arrowmarked Babbler (1.3; 1.4)			
	Western Violet-Backed Sunbird (1.1; 1.3; 1.4)	Laura's Woodland-Warbler (1.1; 1.2; 1.4)	Black-Bellied Seedcracker (1.3)			Chirping Cisticola			
	Purple-Banded Sunbird (1.1; 1.3; 1.4)	Green-Headed Sunbird (1.1; 1.2; 1.4)	**Black-Eared Seedeater** (1.1; 1.2; 1.3)			White-Tailed Blue Flycatcher (1.1; 1.2; 1.3; 1.4)			
	Orange-Winged Pytilia (1.1; 1.3; 1.4)	Coppery Sunbird (1.1; 1.2; 1.4)	Black-Faced Canary (1.3; 4)			Blue-Mantled Crested Flycatcher			
		Green Twinspot (1.1; 1.2; 2.3)				Black-Throated Wattle-Eye			
		Cabanis's Bunting (1.1; 1.2; 1.4)				Cassin's (Gray) Flycatcher			
						Fantailed Flycatcher			
						African Pied Wagtail			
						Mountain Wagtail			
						Black-Fronted Bush-Shrike (1.1; 1.2; 1.3)			
						Perrin's Bush-Shrike (1.1; 1.2; 1.3)			

Table 1 Bird Occurrence by Biotype[(a)] (In Study Area) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
						Bannerman's Sunbird (1.1; 1.2; 1.3; 1.4)			
						Golden Weaver (1.4)			
						Forest Weaver			
						Bully Canary (4)			
African Cuckoo Hawk (1.2; 1.3)	Racket-Tailed Roller (1.1; 1.3)	Bat Hawk (1.1; 1.2; 1.4)	Ovambo Sparrowhawk (1.3)	Black-And-Rufous Swallow (2.2; 3.1; 3.2; 4)	Anchieta's Tchagra (2.1; 4)	African Pitta			Southern Ground-Hornbill (1.4; 3.2)
Bőhms Flycatcher (1.2, 1.3; 1.4)	Purple-Throated Cuckooshrike (1.1; 1.3; 1.4; 2.3)	Pale Wren-Warbler (1.1; 1.2; 1.4)				Ross's Turaco (1.1; 1.2; 1.3)			White-Headed Saw-Wing (1.1; 1.2; 1.3)
	Sharp-Tailed Starling (1.1; 1.3; 1.4)					Thick-Billed Cuckoo (1.1; 1.2; 1.3)			
						Scaly-Throated Honeyguide (1.1; 1.2; 1.3)			
						Evergreen Forest Warbler (1.4)			
						African Dusky Flycatcher			
						Gray Waxbill (1.3; 1.4)			
Bird Distribution Marginal To The Study Area:									
Black-Tailed (Slender-Tailed) Cisticola (1.2; 1.3; 1.4)	Buff-Throated Apalis (1.1; 1.3; 1.4)	Crested Guineafowl (1.1; 1.2)	Red-Faced Mousebird (1.3)		Grimwood's Longclaw	Shining-Blue Kingfisher	Rufousnaped Lark (3.2)		

Table 1 Bird Occurrence by Biotype[(a)] (In Study Area) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
Striped Pipit (1.2; 1.3; 1.4)	Southern (Mashona) Hyliota (1.1; 1.3; 1.4)	African Gray Hornbill (1.1; 1.2; 1.4)	Longbilled Crombec (1.1; 1.2; 1.3)			Local And Uncommon (2.2)	Angola Swallow (3.2)		
Green-Throated Sunbird (1.2; 1.3; 1.4; 2.3)	Anchieta's (Red-And-Blue) Sunbird (1.1; 1.3; 1.4)	Bar-Winged Weaver (1.1; 1.2; 1.4; 2.3)	**Whitebellied Sunbird** (1.1; 1.2; 1.3)			Vanga Flycatcher			
	Bate's Sunbird (1.1; 1.3; 1.4)		Jameson's Firefinch (1.3; 2.3)			Chestnut Wattle-Eye			
			Red-Headed Bluebill (1.3; 2.3)			Thick-Billed Weaver			
						Red-Throated Twinspot (1.4)			
						Brown Firefinch			
						Black Widow-Finch			

Legend for block shading: Common | Uncommon | Rare

(a) The expected bird assemblages (364 species) in the study area grouped into the preferred habitat types (obtained from Appendix E3.2-44) in which they are most likely to be found and which is essential for their existence – i.e., to shelter, breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Bird names in bold are the species.

(b) Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.

(c) Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the LSA.

(d) Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).

(e) Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

Sources: Gibbons 1997; Harrison et. al. 1997; Sinclair 2003 and current survey data.

Table 2 Bird Occurrence by Biotype[(a)] (Birds Nomadic to the Study Area)

Miombo Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	White-Crested Helmet-Shrike (1.1; 1.3; 1.4)	**Brown Snake Eagle** (1.4; 3.2; 4)	**Lilac-Breasted Roller** (3.2; 4)		Black Egret (2.1)	**African Green Pigeon**	African Stonechat (3.2)		Plainbacked Pipit (1.4;3.2)
		Crowned Hornbill (1.1; 1.2; 1.4; 2.3)			Yellowbilled Egret (2.1)				
		Black Cuckooshrike (1.1; 1.2; 1.4; 2.3)			Redbilled Quelea (1.3; 1.4; 2.1; 3.2; 4)				
	Blue-Spotted Wood-Dove (1.1; 1.3; 1.4; 2.3)		Swallow-Tailed Bee-Eater		Baillon's Crake (2.1; 2.3)	Trumpeter Hornbill (1.1; 1.2; 1.3; 1.4)			Blue Quail (2.1; 2.2)
	Tambourine Dove (1.1; 1.3; 1.4; 2.3)		Black-Throated Canary (2.3)		Pearl-Breasted Swallow (1.4; 2.2; 4)				Capped Wheatear (3.1; 3.2)
					Broad-Tailed Warbler (2.1; 3.1; 3.2)				
			Long-Crested Eagle (1.1; 1.2; 1.3; 2.3; 4)		Striped Crake (2.1)	Painted Snipe			Black-Rumped Buttonquail (2.1; 2.2)
Bird Distribution Marginal To The Study Area:									
					Senegal Coucal				

Legend for block shading: Common | Uncommon | Rare

(a) The expected bird assemblages (364 species) in the study area grouped into the preferred habitat types (obtained from Appendix E3.2-4) in which they are most likely to be found and which is essential for their existence – i.e., to shelter, breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Bird names in bold are the species

(b) Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.

(c) Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the LSA.

(d) Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).

(e) Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

Sources: Gibbons 1997; Harrison et al. 1997; Sinclair 2003 and current survey data. Species in bold were found in current survey.

Table 3 Bird Occurrence by Biotype[(a)] (Intra African Migrants)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	African Cuckoo (1.1; 1.3; 1.4; 3.2; 4)	Diederik Cuckoo (1.4; 4)	Yellowbilled Kite (1.1; 1.2; 1.3; 4)		Lesser Moorhen (2.1)	**Wahlberg's Eagle** (1.3; 1.4)	**Black-Breasted Snake-Eagle** (1.4; 3.2; 4)	Rufous-Cheeked Nightjar (1.4; 4)	Abdim's Stork
		Brownhooded Kingfisher (1.1; 1.2; 1.4; 2.3)	**Jacobin Cuckoo** (1.1; 1.2; 1.3)		African Marsh Warbler (2.1)	Redchested Cuckoo (1.1; 1.2; 1.3)	Whiterumped Swift (1.1; 1.2; 1.3; 1.4; 2.1; 2.2; 2.3; 3.2; 4)	**Greater Striped Swallow** (1.4; 4)	Common Quail
		Plumcolored Starling (1.1; 1.2; 1.4)	**Klaas's Cuckoo** (1.1; 1.2; 1.3; 3.2; 4)			Wire-Tailed Swallow			Harlequin Quail (1.4)
			Woodland Kingfisher (1.1; 1.2; 1.3; 3.2)			**African Paradise Flycatcher** (1.1; 1.2; 1.3; 1.4)			Lesser Striped Swallow (1.4)
	African Golden Oriole (1.1; 1.3; 1.4; 3.2)	Bronze-Winged Courser (1.3; 3.1; 3.2)	African Pygmy-Kingfisher (4)			**Broad-Billed Roller** (1.4)			
			Purple Roller (1.1; 1.2; 1.3)						
		Grayhooded Kingfisher (1.1; 1.2; 1.4)	**Dwarf Bittern** (2.1)		Streaky-Breasted Flufftail (2.1)	African Striped Cuckoo (1.1; 1.2; 1.3; 1.4)			Temminck's Courser (2.1; 2.2; 3.1; 3.2)
						African Emerald Cuckoo (1.1; 1.2; 1.3; 1.4)			**Dusky Lark** (3.1; 3.2)
									Banded Martin (3.1; 3.2)
									Gray-Rumped Swallow (2.1; 3.1; 3.2)

Table 3 Bird Occurrence by Biotype[(a)] (Intra African Migrants) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
Bird Distribution Marginal to the Study Area:									
		Ayres's Hawk-Eagle (1.1; 1.2; 1.4; 2.3)			Cuckoo Finch (4)	Black Cuckoo			Black Coucal (2.1; 2.2)

Legend for block shading: Common | Uncommon | Rare

(a) The expected bird assemblages (364 species) in the study area grouped into the preferred habitat types (obtained from Appendix E3.2-4) in which they are most likely to be found and which is essential for their existence – i.e., to shelter, breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Bird names in bold are the species.

(b) Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.

(c) Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the LSA.

(d) Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).

(e) Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

Sources: Gibbons, 1997; Harrison et. al. 1997; Sinclair 2003; Current survey data. Species in bold were found in current survey.

Table 4 Bird Occurrence by Biotype[(a)] (Palaearctic Migrants)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
			European Roller (3.1; 3.2; 4)	Wood Sandpiper (2.1; 2.3)	Common Snipe (2.1)		**Common Swift** (1.1; 1.2; 1.3; 1.4; 2.1; 2.2; 2.3; 3.2; 4)	Steppe Buzzard (1.3; 1.4; 3.1; 4)	Western Red-Footed Falcon
			Willow Warbler (1.1; 1.2; 1.3; 2.3)		European Sedge Warbler (1.2)			**European Swallow** (1.1; 1.2; 1.3; 1.4; 2.1; 2.2; 2.3; 4; 3.1)	**European Bee-Eater** (1.1; 1.2; 1.3; 1.4; 2.1; 2.2; 2.3; 3.2; 3.1)
			Spotted Flycatcher		Marsh Warbler (2.1; 2.3)				
					Great Reed Warbler (2.1)				
					Lesser Swamp-Warbler (2.1)				
					Garden Warbler				
		European Honey-Buzzard (1.1; 1.2; 1.4)	Tree Pipit (3.1; 3.2)		Little Bittern (2.1)	Eurasian Golden Oriole (1.1; 1.2; 1.3; 1.4)	European Wheatear (3.2)		Lesser Kestrel
		Common Cuckoo (1.4; 4)			Eurasian Bittern (2.1)				**Common House-Martin**
					Pallid Harrier (4)				
					Sand Martin (2.1; 3.1; 3.2; 4)				
					Eurasian Reed-Warbler (2.1; 2.3)				
			Lesser Spotted Eagle (1.1; 1.2; 1.3; 4)		Corn Crake (1.4; 2.1; 2.3; 4)				
			Steppe Eagle (1.1; 1.2; 1.3)		Spotted Crake (2.1)				

Table 4 Bird Occurrence by Biotype[(a)] (Palaearctic Migrants) (continued)

Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
					Great Snipe (2.1)				
Bird Distribution Marginal to the Study Area:									
		European Nightjar (1.1; 1.2; 1.4)							

Legend for block shading: Common | Uncommon | Rare

(a) The expected bird assemblages (364 species) in the study area grouped into the preferred habitat types (obtained from Appendix E3.2-4) in which they are most likely to be found and which is essential for their existence – i.e., to shelter, breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Bird names in bold are the species.

(b) Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.

(c) Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the LSA.

(d) Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).

(e) Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

Sources: Gibbons 1997; Harrison et. al. 1997; Sinclair 2003; Current survey data. Species in bold were found in current survey.

Table 5 Summary of Bird Groups by Biotope (Total of 364 Bird Species)

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors In Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
birds resident to the area	12	35	38	42	14	28	64	7	5	26
nomadic birds in the area	0	3	3	4	0	7	3	1	0	4
intra-african migrants	0	2	5	8	0	3	7	2	2	7
palaearctic migrants	0	0	2	6	1	14	1	2	2	4
Total	**12**	**40**	**48**	**60**	**15**	**52**	**75**	**12**	**9**	**41**
percent of overall total	3 percent	13 percent	15 percent	19 percent	5 percent	16 percent	24 percent	3 percent	2 percent	13 percent
Totals: All Habitats Utilized	**161**	**162**	**198**	**226**	**71**	**82**	**151**	**56**	**58**	**117**
percent of total	13 percent	13 percent	16 percent	18 percent	6 percent	7 percent	12 percent	4 percent	4 percent	14 percent
number of birds specific to the relevant habitat	0	0	0	4	2	8	31	0	0	16
alien	0	0	0	0	0	0	0	0	0	0

Summary of bird groups in Table 5	# species	percent of total species
birds resident to the area	271	74
nomadic birds in the area	25	6
intra-African migrants	36	9
palaearctic migrants	32	9

Table 6 Bird Species and Numbers Encountered During the Survey

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Pan Wetland	Marsh Wetland	Riparian	Copper- Cobalt Crest
total length of transects (m)	1380	4370	2180	100	1180	680	1950
hectares covered	8.2	26.2	13.0	0.6	7.0	4.0	11.7
percent of area surveyed	7.3 percent	23.4 percent	11.9 percent	0.5 percent	6.2 percent	3.5 percent	10.4 percent
total number of individual birds observed	53	106	99	8	61	48	91
total number of bird species observed	23	42	35	5	25	22	17
number of birds observed per hectare	6.4	4.0	7.5	13.3	8.6	11.7	7.7

Table 7 Miombo-Corridors in Developed Areas and Biotopes in Human-Impacted Areas

	Miombo- Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Valley-Bottom	Wetlands
total length of transects (m)	960	1130	2380	900	340
hectares covered	5.7	6.7	14.2	5.4	2.0
percent of area surveyed	5.1 percent	6.0 percent	12.7 percent	4.8 percent	1.7 percent
total number of individual birds observed	19	31	72	56	29
total number of bird species observed	7	16	33	21	11
number of birds observed per hectare	**3.3**	**4.5**	**5.0**	**10.3**	**14.2**

APPENDIX B3.2-V

MAMMALS: AVAILABLE HABITAT, EXPECTED OCCURRENCE AND OBSERVED PRESENCE DURING THE SURVEY

Table 1 Mammal Occurrence by Biotope

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
	Mauritian tomb bat (*Taphozous mauritianus)* (1.2; 1.3; 1.4; 2.3)	Dobson's fruit bat (*Epomops dobsonii*) (1.1; 1.3 1.4; 2.3)	*Suncus Etruscus* (1.1; 1.2; 1.4; 2.1; 2.2; 4)	Angola free-tailed bat (*Tadarida condylura*) (1.1; 1.2; 1.3; 2.1; 2.2; 2.3; 3.1; 3.2; 4)	Short-snouted elephant-shrew (*Elephantulus brachyrhynchus*) (1.3; 1.4)	Swamp musk shrew (*Crocidura mariquensis)* (2.1; 2.3)	Otter shrew (Potamogale velox)	Oribi (*Ourebia ourebi*) (3.2)	Bushy-tailed mongoose (*Bdeogale crassicauda*) (1.3)	Banana bat (*Pipistrellus nanus*)
	Schreibers' long-fingered bat (*Miniopterus schreibersii*) (1.2; 1.3; 1.4; 2.3)	Bocage's fruit bat (*Rousettus angolensis*) (1.1; 1.3; 2.3)	Egyptian fruit bat (*Rousettus aegyptiacus*) (1.1; 1.2; 1.4; 2.2; 2.3; 3.2; 4)	Schlieffen's bat (*Nycticeius schlieffenii*) (1.1; 1.2; 1.3)	Rendall's serotine bat *(Eptesicus rendalli*) (1.1; 1.2; 1.3; 1.4;)	Greater gray-brown musk shrew (*Crocidura luna*) (1.3; 2.3; 4)	Lesser red musk shrew (*Crocidura hirta*) (2.2)	Klipspringer (*Oreotragus oreotragus*) (3.2)	Dwarf mongoose (*Helogale parvula*) (1.3; 1.4; 3.1; 4)	Springhare **(***Pedetes capensis***)** (1.4; 2.1)
	Greater long-fingered bat (*Miniopterus inflatus*) (1.2; 1.3; 1.4; 2.1; 2.2; 2.3; 3.1; 3.2; 4)	*Tadarida (Mops) Niveiventer* (1.1; 1.3 1.4)	Nigerian free-tailed bat (*Tadarida (Chaerephon) nigeriae*) (1.1; 1.2; 1.4)	Egyptian Slit-Faced Bat (*Nycteris thebaica*) (1.3)	Yellow-winged bat (*Lavia frons*) (2.2; 2.3)	Temminck's hairy bat (*Myotis tricolor*)	Four-toed elephant-shrew (*Petrodromus tetradactylus*) (1.1; 1.2; 1.3)	Spiny mouse (*Acomys spinosissimus*) (3.2)	Broad-headed mouse (*Zelotomys hildegardeae)* (3.1; 4)	**Common Molerat** *(Cryptomys hottentotus)* (2.1; 2.2; 2.3; 3.1; 3.2)
	Hildebrandt's horseshoe bat (*Rhinolophus hildebrandti*) (1.2; 1.3; 1.4; 3.1; 3.2)	Butterfly bat (*Glauconyceris variegata*) (1.1; 1.3; 2.3)	Welwitsch's hairy bat (*Myotis welwitschii*) (1.1; 1.2; 1.4)	**Lesser Bushbaby** (*Galago senegalensis*) (1.3)	Chesnut Climbing Mouse *(Dendromus mystacalis)* (1.3; 1.4; 2.2)	Kuhl's bat (*Pipistrellus kuhlii*)	Wahlberg's fruit bat (*Epomophorus wahlbergi*) (1.1; 1.2; 1.3 1.4)	**Namaqua Rock Mouse** *(Aethomys namaquensis)* (3.2)	**Scrub hare** (*Lepus saxatilis*) (1.3; 1.4; 3.1; 3.2)	Grey Pigmy Climbing Mouse *(Dendromus melanotis)* (2.2; 3.2)
	Darling's horseshoe bat (*Rhinolophus darlingi*) (1.2; 1.3; 1.4; 3.1; 3.2)	Rufous hairy bat (*Myotis bocagei*) (1.1; 1.3 1.4; 2.3)	Temminck's hairy bat (*Myotis tricolor*) (1.1; 1.2; 1.4; 3.1; 3.2)	African wild cat (*Felis lybica*) (1.1; 1.2; 1.3; 2.1; 2.2; 2.3; 3.1; 3.2; 4)	**Pouched mouse** (*Saccostomus campestris*) (1.3; 1.4; 2.2; 3.1; 3.2; 4)	Side-striped jackal (*Canis adustus*) (1.4; 2.1; 2.3)	Peter's fruit bat (*Epomophorus crypturus*) (1.1; 1.2; 1.3 1.4)			**Fat mouse** (*Steatomys pratensis*) (1.3; 1.4; 2.1; 2.2)
	Yellow baboon (*Papio cynocephorus*) (1.2; 1.3; 1.4)	De Winton's long-eared bat (Laephotis wintoni) (1.1; 1.3 1.4)	Cape serotine bat *(Eptesicus capensis*) (1.1; 1.2; 1.4)	Striped polecat (*Ictonyx striatus*) (1.1; 1.2; 1.3; 2.1; 2.2; 2.3; 3.1; 3.2; 4)	Red Veld Rat *(Aethomys chrysophilus)* (1.3; 1.4; 2.2)	Meller's mongoose (*Rhynchogale melleri*) (2.1; 2.3; 3.1; 3.2)	Gambian epauletted fruit bat (*Epomophorus gambianus*) (1.1; 1.2; 1.3 1.4)			Single-striped Mouse *(Lemniscomys rosalia)* (1.4; 3.1; 3.2)
	Vervet monkey (*Cercopithecus aethiops*) (1.2; 1.3; 1.4; 2.3)	Hairy slit-faced bat (*Nycteris hispida*) (1.1; 1.3; 1.4; 2.1; 2.2; 2.3; 3.1; 3.2; 4)	**Yellow house bat** (*Scotophilus dinganii*) (1.1; 1.2; 1.4)	Honey badger (*Mellivora capensis*) (1.3; 2.1; 2.2; 2.3)	Groove-toothed mouse (*Pelomys fallax*) (2.2; 2.3; 4)	White-tailed mongoose (*Ichneumia albicauda*) (1.3; 1.3; 2.1; 2.3)	Straw-Colored Fruit Bat (*Eidolon helvum*) (1.1; 1.2; 1.3 1.4)			Multimammate Mouse *(Mastomys natalensis)* (1.4)
	Tree dassie (*Dendrohyrax arboreus*) (1.2; 1.3; 1.4; 2.3)	Greater slit-faced bat (*Nycteris macrotis*) (1.1; 1.3 1.4; 2.3)	Ruppels horseshoe bat (*Rhinolophus fumigatus*) (1.4)	Large-spotted genet (*Genetta tigrina*) (1.3; 2.1; 2.2;)		Lesser Canerat *(Thryonomys gregorianus)* (2.1; 2.3; 4)	Egyptian tomb bat (*Taphozous perforatus)* (1.1; 1.2; 1.3 1.4)			Black (house) Rat *(Rattus rattus)*
	Sun squirrel (*Heliosciurus rufobrachium*) (1.2; 1.3; 1.4)	Commerson's leaf-nosed bat (*Hipposideros commersoni*) (1.1; 1.3 1.4; 2.3)	Geoffroy's horseshoe bat (*Rhinolophus clivosus*) (1.4)	*Cephalophus monticola (*1.3*)*		Greater Canerat *(Thryonomys swinderianus)* (2.3; 4)	Rupple's bat (*Pipistrellus rueppellii*) (2.1; 2.2)			House Mouse *(Mus musculus)*
	Steatomys minutus (1.2; 1.3; 1.4; 2.1; 2.2; 3.1; 3.2; 4)	Samango Monkey (*Cercopithecus mitis*) (1.1; 1.3 1.4; 2.3)	Sundevall's leaf-nosed bat (*Hipposideros caffer*) (1.1; 1.2; 1.4; 3.1; 3.2)	Pangolin (*Manis temminckii*) (4)		Brants' Climbing Mouse *(Dendromus mesomelas)* (2.1; 2.3)	Botswana long-eared bat (*Laephotis botswanae*)			Cape hare (*Lepus capensis*) (1.4; 3.1; 3.2; 4)
	Steatomys loveridgei (1.2; 1.3; 1.4; 2.1; 2.2; 3.1; 3.2; 4)	*Cercopithecus pygerythrus* (1.1; 1.3 1.4)	Short-eared trident bat (*Cloeotis percivali*) (1.1; 1.2; 1.4; 3.1; 3.2)	Cape Porcupine *(Hystrix africaeaustralis)* (1.3; 2.1; 2.2; 3.1; 3.1; 4)		Velvet rat (*Colomys goslingi*) (2.1; 2.3)	Lesser yellow house bat (*Scotophilus viridis*)			
		Two-spotted palm civet (*Nandinia binotata)* (1.1; 1.3 1.4; 2.3)	Small-Spotted Genet (*Genetta genetta*) (1.1; 1.2; 1.4)	**Tree squirrel** (*Paraxerus cepapi*) (1.1; 1.2; 1.3)		Brant's climbing mouse (*Dendromus mesomelas*) (2.1; 2.3)	Lesser wooly bat (*Kerivoula lanosa*) (2.1; 2.3)			
		Gray Duiker (*Sylvicapra grimmia*) (1.1; 1.3 1.4; 2.3)	Slender mongoose (*Galerella sanguinea*) (1.1; 1.2; 1.4)	Giant rat (*Cricetomys gambiensis*) (1.1; 1.2; 1.3; 4)		Water Rat *(Dasymys incomtus)* (2.1; 2.3)	Damara wooly bat (*Kerivoula argentata*) (2.1; 2.3)			
		Yellow-backed duiker (*Cephalophus sylvicultor*) (1.1; 1.3 1.4)	Banded Mongoose (*Mungos mungo*) (1.1; 1.2; 1.4; 2.3; 4)	Bushveld gerbil (*Tatera leucogaster*) (1.3; 2.1)		Shortridge's Mouse (*Mastomys shortridgei*) (2.1; 2.3)	Damara wooly bat (*Kerivoula argentata*) (2.1; 2.3)			
		Sharpe's grysbok (*Raphicerus shapei)* (1.1; 1.3 2.3)	Aardvark (*Orycteropus afer*) (1.4; 3.2; 4)			**Gray-Bellied Pygmy Mouse** *(Mus triton)* (2.1)	Lander's horseshoe bat (*Rhinolophus landeri*) (2.1; 2.3; 3.1; 3.2)			

Table 1 Mammal Occurrence by Biotope (continued)

	Miombo - Crest	Miombo - Mid-Slope	Miombo - Foot-Slope	Miombo – Corridors in Developed Areas	Pan Wetland	Marsh Wetland	Riparian	Copper-Cobalt Crest	Copper-Cobalt Mid-Slope	Human-Impacted Areas
		Tree pangolin (*Manis tricuspis*) (1.1; 1.3 2.3)	Sun squirrel (*Heliosciurus rufobrachium*) (1.1; 1.2; 1.4; 2.3)			Pygmy Mouse *(Mus triton)* (1.4; 2.1; 2.3; 4)	Thick-tailed bush baby (*Otolemur crassicaudatus*)			
		Silky blesmol (*Heliophobius argenteocinereus*) (1.1; 1.3; 3.1; 3.2)	*Thamnomys dolichurus* (1.1; 1.2; 1.4)			Rudd's mouse (*Uranomys ruddi*) (2.3)	Cape clawless otter (*Aonyx capensis*)			
		Aethomys nyikae (1.1; 1.3 1.4)	Woodland mouse (*Grammomys dolichurus*) (1.1; 1.2; 2.3)				Spotted-necked otter (*Lutra maculicollis*)			
		Aethomys kaiseri (1.1; 1.3 1.4)	Woodland Dormouse *(Graphiurus murinus)* (1.1; 1.2; 1.4)				African civet (*Civettictis civetta*) (1.3; 1.4; 2.1; 2.2)			
							Water Mongoose (*Atilax paludinosus*) (2.2)			
							Large Gray Mongoose (*Herpestes ichneumon*) (2.2)			
							Bushpig (*Potamochoerus porcus*)			
							Blue duiker (*Cephalophus monticola*) (1.1; 1.2; 1.3)			
							Bushbuck (T*ragelaphus scriptus*)			
							Lord Derby's Flying squirrel (*Anomalurus derbianus*) (1.1; 1.2; 1.3)			
							Gray Pigmy Climbing Mouse *(Dendromus melanotis)* (2.1; 2.2; 3.1; 3.2; 4)			
							Water Rat *(Dasymys incomtus)* (2.1; 2.3)			
	11	19	19	14	7	17	26	3	3	10
species per preferred biotope*	8	14	14	10	5	13	20	2	2	7
percent of overall total*	61	59	81	82	44	48	71	28	33	35
totals/ all habitats utilized (including habitats in brackets)*	11	11	15	15	8	8	13	5	6	6
percent of total	0	0	0	0	0	0	8	0	0	3
number of mammals specific to the relevant habitat*										

(a) The expected mammal assemblages (129 species) in the study area grouped into the preferred habitat types (obtained from Appendix E3.2-5) in which they are most likely to be found and which is essential for their existence – i.e., to breed and feed. The numbers in brackets are alternative habitats (refer to the numbering in the headings of this table), in which they may also be found. Mammal names in bold are the mammals that have been encountered during the current survey.

(b) Species per preferred biotope: The number of species per biotope that prefer the specific biotope as the optimal habitat.

(c) Percent of overall total: Species per preferred biotope as a percentage of the total number of expected species in the study area.

(d) Totals - all habitats used: This number represents the total animals that frequent this biotope, although it might not be the optimal habitat (see additional habitat choice in brackets behind the animal name).

(e) Number of species specific to the relevant habitat: Species restricted to the preferred optimal biotope due to their narrow tolerance range of other biotopes. Fauna with a wide choice of habitats have a better chance of survival than those with narrow ranges.

APPENDIX B3.2-VI

RED LISTED FAUNA SPECIES OF THE DEMOCRATIC REPUBLIC OF THE CONGO

Table 1 Red Listed Species of the Democratic Republic of the Congo

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[a]
Acinonyx jubatus	cheetah, hunting leopard	Guépard	VU
Aepyceros melampus	impala		LR/cd
Afropavo congensis	Congo peafowl		VU
Alcelaphus buselaphus	common hartebeest, hartebeest		LR/cd
Alcelaphus lichtensteinii	Lichtenstein's hartebeest		LR/cd
Allenopithecus nigroviridis	Allen's swamp monkey	Cercopithèque De Allen	LR/nt
Anceya terebriformis			EN
Aonyx congicus	Cameroon clawless otter, Congo clawless otter, small-clawed otter, small-toothed clawless otter, Zaire clawless otter	Loutre À Joues Blanches Du Cameroun, Paraonyx Tacheté	DD
Apalis argentea	Kungwe apalis		EN
Apalis kaboboensis	Kabobo apalis		DD
Arctocebus aureus	golden angwantibo, golden potto		LR/nt
Ardeola idae	Madagascar pond-heron		EN
Balaeniceps rex	shoebill	Baléniceps Rois, Bec-En-Sabot	VU
Bathanalia howesi			EN
Bellamya contracta			EN
Bellamya crawshayi			EN
Bellamya leopoldvillensis			EN
Bellamya mweruensis			EN
Bellamya pagodiformis			EN
Bellamya rubicunda			EN
Bradypterus graueri	Grauer's scrub-warbler		EN
Bulinus canescens			LR/nt
Caecobarbus geertsi	African blind barb fish, Congo blind barb	Barbu Aveugle, Poisson Cavernicole D'afrique	VU
Caprimulgus prigoginei	Itombwe nightjar		EN
Carcharhinus limbatus	blacktip shark		LR/nt
Carcharhinus plumbeus	sandbar shark		LR/nt
Carcharodon carcharias	great white shark		VU
Casinycteris argynnis	short-palated fruit bat		NT
Cephalophus callipygus	Peter's duiker, Peters' duiker		LR/nt
Cephalophus dorsalis	bay duiker	Céphalophe Bai, Céphalophe À Bande Dorsale Noire	LR/nt
Cephalophus leucogaster	white-bellied duiker		LR/nt
Cephalophus nigrifrons	black-fronted duiker		LR/nt
Cephalophus rufilatus	red-flanked duiker		LR/cd
Cephalophus silvicultor	yellow-backed duiker	Céphalophe Géant, Céphalophe À Dos Jaune	LR/nt
Cephalophus weynsi	Weyn's duiker		LR/nt

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Ceratotherium simum	square-lipped rhinoceros, white rhinoceros		NT
Cercopithecus dryas	dryad monkey, dryas guenon, dryas monkey, salonga guenon		DD
Cercopithecus hamlyni	owl-faced guenon, owl-faced monkey	Cercopithèque D'hamlyn	LR/nt
Cercopithecus lhoesti	l'hoest's guenon, l'hoest's monkey, mountain monkey	Cercopithèque De L'hoest	LR/nt
Chaerephon aloysiisabaudiae	Duke of Abruzzi's free-tailed bat		NT
Chaerephon chapini	Chapin's free-tailed bat		DD
Chaerephon gallagheri	Gallagher's free-tailed bat		CR
Chaerephon russata	russet free-tailed bat		NT
Chelonia mydas	green turtle	Tortue Comestible, Tortue Franche, Tortue Verte	EN
Chlorocichla prigoginei	Prigogine's greenbul		EN
Chloropeta gracilirostris	papyrus yellow warbler		VU
Circus macrourus	pallid harrier	Busard Pâle	NT
Cloeotis percivali	Percival's trident bat		VU
Columba albinucha	white-naped pigeon		NT
Congosorex polli	Poll's shrew		DD
Congothemis longistyla			DD
Coracina graueri	Grauer's cuckoo-shrike		NT
Cossypha heinrichi	white-headed robin-chat		VU
Crex crex	corncrake	Râle Des Genêts	NT
Crocidura kivuana	kivu shrew		VU
Crocidura lanosa	lemara shrew		VU
Crocidura stenocephala	narrow-headed shrew		VU
Crocidura polia	fuscous shrew		DD
Crocidura zimmeri	Zimmer's shrew		DD
Crocodylus cataphractus	African sharp-nosed crocodile, African slender-snouted crocodile, long-snouted crocodile	Crocodile À Museau Allongé D'afrique, Crocodile À Museau Étroit, Faux-Gavial D'afrique	DD
Crocuta crocuta	spotted hyaena		LR/cd
Cryptomys bocagei	Bocage's mole rat		DD
Cryptomys ochraceocinereus	ochre mole rat		DD
Cryptospiza shelleyi	Shelley's crimson-wing		VU
Damaliscus lunatus	tsessebe	Damalisque, Hirola, Korrigum, Sassaby, Topi	LR/cd
Dasymys montanus	montane shaggy rat		VU
Delanymys brooksi	Delany's mouse, Delany's swamp mouse		EN

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Dendromus kahuziensis	Mt. Kahuzi climbing mouse		CR
Dermochelys coriacea	leatherback, leathery turtle, luth, trunkback turtle	Tortue Luth	CR
Egretta vinaceigula	slaty egret		VU
Epinephelus marginatus	dusky grouper	Merou Brun	EN
Eremomela turneri	turner's eremomela		EN
Erikssonia acraeina			VU
Estrilda nigriloris	black-lored waxbill		DD
Euoticus elegantulus	elegant galago, southern needle-clawed galago, western needle-clawed bushbaby, western needle-clawed galago	Galago Élégant	LR/nt
Falco naumanni	lesser kestrel	Faucon Crécerellette	VU
Francolinus nahani	Nahan's francolin		EN
Funisciurus anerythrus	Thomas's rope squirrel		DD
Funisciurus bayonii	lunda rope squirrel		DD
Funisciurus lemniscatus	ribboned rope squirrel		DD
Galago matschiei	eastern needle-clawed bushbaby, eastern needle-clawed galago, lesser needle-clawed galago, Matschie's galago, spectacled galago, spectacled lesser galago	Galago Du Congo	LR/nt
Gallinago media	great snipe		NT
Giraffa camelopardalis	giraffe		LR/cd
Glareola nordmanni	black-winged pratincole	Glaréole À Ailes Noires	NT
Glaucidium albertinum	albertine owlet	Chevêchette Du Graben	VU
Gorilla gorilla	gorilla, western gorilla	Gorille	EN
Grammomys dryas	forest thicket rat		NT
Graphium aurivilliusi			DD
Graphiurus christyi	Christy's dormouse		DD
Graphiurus monardi	Monard's dormouse		DD
Graphiurus surdus	silent dormouse		DD
Grus carunculatus	wattled crane	Grue Caronculée	VU
Gyps coprotheres	cape griffon	Vautour Chassefiente	VU
Hippopotamus amphibius	common hippopotamus, hippopotamus, large hippo	Hippopotame	VU
Hipposideros abae	aba roundleaf bat		NT
Hipposideros camerunensis	greater roundleaf bat		DD
Hipposideros fuliginosus	sooty roundleaf bat		NT
Hippotragus equinus	roan antelope	Antilope Chevaline, Antilope Rouane, Hippotrague	LR/cd
Hippotragus niger	sable antelope		LR/cd
Hirthia littorina			EN

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Hirundo atrocaerulea	blue swallow		VU
Hybomys lunaris	moon striped mouse, Ruwenzori hybomys		VU
Hyemoschus aquaticus	water chevrotain	Chevrotain Aquatique	DD
Idiurus zenkeri	pygmy scaly-tailed flying squirrel		DD
Indicator pumilio	dwarf honeyguide		NT
Kerivoula cuprosa	copper woolly bat		NT
Kerivoula phalaena	Spurrell's woolly bat		NT
Kinixys erosa	common tortoise, forest hinged tortoise, Schweigger's tortoise, serrated hinge-back tortoise, serrated hinge-backed tortoise, serrated tortoise	Kinixys Rongée, Tortue Articulée D'afrique	DD
Kinixys homeana	home's hinge-back tortoise, home's hinged tortoise, home's hinged-backed tortoise	Kinixys De Home	VU
Kobus leche	lechwe	Cobe Lechwe, Lechwe	LR/cd
Kobus ellipsiprymnus	waterbuck		LR/cd
Kobus kob	kob		LR/cd
Kobus vardonii	puku		LR/cd
Kupeornis chapini	Chapin’s mountain-babbler		NT
Kupeornis rufocinctus	red-collared mountain-babbler		NT
Laephotis angolensis	Angolan long-eared bats		NT
Lagenodelphis hosei	Fraser’s dolphin, sarawak dolphin	Dauphin De Fraser	DD
Laniarius mufumbiri	papyrus gonolek		NT
Lanistes bicarinatus			VU
Lanistes elliptus			LR/nt
Lanistes graueri			DD
Lanistes intortus			VU
Lanistes neavei			VU
Lophocebus aterrimus	black crested mangabey, black mangabey		LR/nt
Lophuromys cinereus	gray brush-furred rat		DD
Lophuromys medicaudatus	medium-tailed brush-furred rat		NT
Lophuromys rahmi	Rahm's brush-furred rat		NT
Loxodonta africana	African elephant	Éléphant Africain, Éléphant D'afrique	VU
Lycaon pictus	African wild dog, cape hunting dog, painted hunting dog, wild dog	Cynhyene, Loup-Peint, Lycaon	EN
Macronyx grimwoodi	Grimwood's longclaw		DD
Malaconotus lagdeni	Lagden's bush-shrike		NT

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Manis temminckii	cape pangolin, ground pangolin, scaly anteater, south African pangolin, Temminck's ground pangolin	Pangolin De Temminck, Pangolin Terrestre Du Cap	LR/nt
Martelia tanganyicensis			EN
Megaptera novaeangliae	bunch, hump whale, humpback whale, hunchbacked whale	Baleine À Bosse, Baleine À Taquet, Jubarte, Mégaptère, Rorqual Du Cap, Rorqual À Bosse	VU
Micropotamogale ruwenzorii	Ruwenzori otter shrew	Le Micropotamogle Du Mont Ruwenzori	NT
Micropteropus intermedius	Hayman's dwarf epauletted fruit bat, Hayman's epauletted fruit bat		DD
Miniopterus minor	least long-fingered bat		NT
Mops congicus	medje free-tailed bat		NT
Mops demonstrator	mongalla free-tailed bat		NT
Mops niangarae	niangara free-tailed bat		DD
Mops trevori	Trevor's free-tailed bat		VU
Morus capensis	cape gannet		VU
Mus callewaerti	Callewaert's mouse		DD
Mus neavei	Neave's mouse		DD
Muscicapa lendu	Chapin's flycatcher		VU
Mycteroperca rubra	mottled grouper		DD
Myopterus daubentonii	Daubenton's free-tailed bat		NT
Myosorex schalleri	Schaller's mouse shrew		DD
Nectarinia rockefelleri	Rockefeller's sunbird		VU
Neotragus batesi	Bates' pygmy antelope, dwarf antelope		LR/nt
Nycteris intermedia	intermediate slit-faced bat		NT
Nycteris major	ja slit-faced bat		VU
Okapia johnstoni	okapi		LR/nt
Oreotragus oreotragus	klipspringer		LR/cd
Osbornictis piscivora	aquatic genet		DD
Osteolaemus tetraspis	African dwarf crocodile, west African dwarf crocodile	Crocodile Nain Africain, Crocodile À Front Large, Crocodile À Nuque Cuirassée	VU
Otomops martiensseni	large-eared free-tailed bat		NT
Otomys denti	Dent's vlei rat		NT
Ourebia ourebi	oribi		LR/cd
Pan paniscus	bonobo, dwarf chimpanzee, gracile chimpanzee, pygmy chimpanzee	Bonobo, Chimpanzé Nain, Chimpanzé Pygmée	EN
Pan troglodytes	chimpanzee, common chimpanzee, robust chimpanzee	Chimpanzé	EN

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Panthera leo	African lion, lion	Lion D'afrique	VU
Papilio antimachus	African giant swallowtail		DD
Paracrocidura graueri	Grauer's shrew		DD
Paracrocidura maxima	greater shrew		NT
Pelusios upembae	Upemba mud turtle		DD
Pheidole neokohli			VU
Phodilus prigoginei	Congo bay-owl	Phodile De Prigogine	EN
Phoenicopterus minor	lesser flamingo	Flamant Nain, Petit Flamant	NT
Phyllastrephus lorenzi	Sassi's greenbul		NT
Plerotes anchietae	d'Anchieta's fruit bat		DD
Ploceus aureonucha	golden-naped weaver		EN
Ploceus ruweti	Lake Lufira weaver		DD
Ploceus subpersonatus	Loango weaver		VU
Praomys minor	least praomys, least soft-furred mouse		DD
Praomys mutoni	Muton's soft-furred mouse, riverine praomys		NT
Prionops alberti	yellow-crested helmet-shrike		VU
Pristis pectinata	smalltooth, wide sawfish	Poisson-Scie	CR
Pristis pristis	common sawfish		CR
Profelis aurata	African golden cat, golden cat	Chat Doré	VU
Pseudocalyptomena graueri	African green broadbill		VU
Raphicerus sharpei	Sharpe's grysbok		LR/cd
Redunca arundinum	southern reedbuck		LR/cd
Redunca redunca	bohar reedbuck		LR/cd
Reymondia pyramidalis			DD
Rhincodon typus	whale shark	Requin Baleine	VU
Rhinolophus blasii	Blasius's horseshoe bat		NT
Rhynchocyon cirnei	checkered elephant shrew, checkered sengi		NT
Ruwenzorisorex suncoides	Ruwenzori shrew		VU
Saccolaimus peli	Pel's pouched bat		NT
Schoutedenapus schoutedeni	Schouteden's swift		VU
Scotoecus albofuscus	light-winged lesser house bat		DD
Scotoecus hirundo	dark-winged lesser house bat		DD
Scotonycteris zenkeri	Zenker's fruit bat		NT
Scotophilus nigrita	Schreber's yellow bat		NT
Serrastruma inquilina			VU
Stanleya neritinoides			EN
Sterna balaenarum	damara tern		NT
Sylvisorex oriundus	mountain shrew		DD

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Syncerus caffer	African buffalo		LR/cd
Tadarida ventralis	African giant free-tailed bat		NT
Tanganyicia rufofilosa			NT
Terpsiphone bedfordi	Bedford's paradise-flycatcher		NT
Thamnomys venustus	charming thicket rat		NT
Thamnomys kempi	Kemp's thicket rat		VU
Thunnus alalunga	albacore tuna		DD
Thunnus obesus	bigeye tuna		VU
Tragelaphus eurycerus	bongo	Bongo	LR/nt
Tragelaphus spekii	marshbuck, sitatunga	Guib D'eau, Sitatunga	LR/nt
Tragelaphus strepsiceros	greater kudu		LR/cd
Tragelaphus oryx	common eland, eland		LR/cd
Trichechus senegalensis	African manatee, seacow, west African manatee	Lamantin D'afrique, Lamantin Du Sénégal	VU
Tropodiaptomus palustris			DD
Tropodiaptomus simplex			VU
Tropodiaptomus worthingtoni			DD
Zoothera guttata	spotted ground-thrush		EN
Zoothera oberlaenderi	forest ground-thrush		NT
Zoothera tanganjicae	kivu ground-thrush		NT
Zoothera crossleyi	Crossley's ground-thrush		NT
Ocotea kenyensis			VU
Khaya grandifoliola	African mahogany, benin mahogany, large-leaved mahogany, senegal mahogany	Acajou	VU
Guarea thompsonii	black guarea, dark bossé		VU
Guarea cedrata	light bossé, scented guarea		VU
Khaya anthotheca	African mahogany, white mahogany	Acajou Blanc, Acajou D'afrique	VU
Entandrophragma utile			VU
Dalbergia melanoxylon	African blackwood, Mozambique ebony		LR/nt
Isolona congolana			LR/nt
Isolona dewevrei			VU
Cordia mukuensis			VU
Maerua elegans			VU
Cleistanthus evrardii			VU
Beilschmiedia ambigua			VU
Beilschmiedia bracteata			VU
Beilschmiedia giorgii			VU
Beilschmiedia mayumbensis			VU

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Beilschmiedia vermoesenii			VU
Didelotia unifoliolata			LR/nt
Deinbollia longiacuminata			LR/cd
Placodiscus paniculatus			VU
Hannoa kitombetombe			VU
Peddiea kivuensis			LR/cd
Allophylus agbala			VU
Afzelia africana	afzelia	Savanna Doussié	VU
Afzelia bipindensis			VU
Afzelia pachyloba	white afzelia		VU
Albizia ferruginea	albizia		VU
Antrocaryon micraster	antrocaryon		VU
Baillonella toxisperma	African pearwood, djave nut, moabi		VU
Diospyros crassiflora	ebony		EN
Entandrophragma angolense			VU
Entandrophragma candollei	cedar kokoti		VU
Entandrophragma cylindricum	sapele		VU
Gossweilerodendron balsamiferum			EN
Irvingia gabonensis			LR/nt
Lophira alata	azobe	Azobé	VU
Lovoa trichilioides	African walnut, congowood, tigerwood		VU
Nauclea diderrichii			VU
Pterygota bequaertii			VU
Swartzia fistuloides			EN
Turraeanthus africanus			VU
Pterocarpus angolensis	bleedwood tree, kiaat, mukwa		LR/nt
Pericopsis elata	African teak, afromosia, afrormosia		EN
Juniperus procera	African pencil cedar, east African cedarwood		LR/nt
Rhodognaphalon breviscupe			VU
Millettia laurentii			EN
Dialium excelsum			EN
Prunus africana	red stinkwood		VU
Milicia excelsa			LR/nt
Hallea stipulosa			VU
Hallea ledermannii			VU

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Lovoa swynnertonii	brown mahogany, Kilimanjaro mahogany		EN
Anthonotha lebrunii			VU
Vepris mandangoa			VU
Breviea sericea			LR/nt
Pouteria altissima			LR/cd
Garcinia kola			VU
Brazzeia longipedicellata			EN
Oricia suaveolens			LR/nt
Guarea mayombensis			VU
Memecylon bequaertii			VU
Millettia lacus-alberti			VU
Pavetta intermedia			VU
Hemandradenia mannii			LR/nt
Anthonotha nigerica			VU
Balthasaria schliebenii			LR/nt
Embelia upembensis			VU
Vitellaria paradoxa	shea butter tree		VU
Beilschmiedia ugandensis			VU
Leptocharias smithii	barbeled houndshark		LR/nt
Galeorhinus galeus	liver-oil shark, miller's dog, oil shark, penny dog, rig, school shark, snapper shark, soupfin, soupie, southern tope, sweet William, tiburon, tope shark, toper, tope, vitamin shark, whithound	Cagnot, Canicule, Chien De Mer, Haut, Milandré, Palloun, Requin-Hâ, Tchi, Touille	VU
Carcharhinus leucas	bull shark		LR/nt
Carcharhinus longimanus	oceanic whitetip shark, white-tipped shark, whitetip oceanic shark, whitetip shark	Requin Océanique	VU
Prionace glauca	blue shark		LR/nt
Sphyrna lewini	scalloped hammerhead		LR/nt
Raja clavata	thornback skate		LR/nt
Aetobatus narinari	bonnetray, maylan, spotted eagle ray		NT
Tylophora cameroonica			LR/nt
Gorilla beringei	eastern gorilla, mountain gorilla		EN
Neotis denhami	Stanley's bustard		NT
Balearica pavonina	black crowned-crane		NT
Rynchops flavirostris	African skimmer	Bec-En-Ciseaux D'afrique	NT
Torgos tracheliotos	lappet-faced vulture		VU
Campephaga oriolina	eastern wattled cuckoo-shrike		DD
Muscicapa tessmanni	tessmann's flycatcher		DD

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Pseudochelidon eurystomina	African river-martin		DD
Phedina brazzae	Brazza's martin		DD
Ploceus flavipes	yellow-legged weaver		VU
Calcochloris leucorhinus	Congo golden mole		DD
Crocidura planiceps	flat-headed shrew		DD
Crocidura tarella	Ugandan shrew		VU
Myosorex babaulti	Babault's mouse shrew		VU
Squalus megalops	cosmopolitan spurdog, piked spurdog, shortnose spurdog	Aiguillat Nez Court	DD
Centrophorus squamosus	deepwater spiny dogfish, leafscale gulper shark, nilson's deepsea dogfish	Squale-Chagrin De L'atlantique	VU
Encephalartos schaijesii			VU
Encephalartos ituriensis	ituri forest cycad		NT
Encephalartos marunguensis	marungu cycad		NT
Encephalartos schmitzii	Schmitz's cycad		NT
Encephalartos laurentianus	kwango giant cycad		DD
Encephalartos septentrionalis	nile cycad		DD
Elephantulus fuscipes	dusky-footed elephant shrew, dusky-footed sengi		DD
Tragelaphus derbianus	giant eland		LR/nt
Bridouxia smithiana			DD
Lavigera coronata			NT
Spekia coheni			NT
Melanoides admirabilis			NT
Potamonautes didieri			VU
Potamonautes gerdalensis			VU
Potamonautes gonocristatus			EN
Potamonautes idjiwiensis			EN
Hipposideros marungensis			NT
Chaerephon shortridgei			NT
Rhinolophus ruwenzorii	Ruwenzori horseshoe bat		VU
Glauconycteris alboguttata	Allen's striped bat		DD
Glauconycteris beatrix	Beatrix's bat		NT
Glauconycteris curryae	Curry's bat		DD
Glauconycteris humeralis	Allen's spotted bat		DD
Glauconycteris superba	pied bat		VU
Hypsugo eisentrauti	Eisentraut's pipistrelle		DD
Hypsugo musciculus	mouselike pipistrelle		DD
Miniopterus natalensis	Natal long-fingered bat		NT

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Neoromicia brunneus	dark-brown serotine		NT
Neoromicia melckorum	Melck's house bat		DD
Lophuromys huttereri	Hutterer's brush-furred mouse, Hutterer's brush-furred rat		DD
Thamnomys schoutedeni			DD
Praomys verschureni	Verschuren's swamp rat		NT
Uvariopsis vanderystii			EN
Secamone racemosa			VU
Crassocephalum bauchiense			VU
Mikaniopsis vitalba			VU
Momordica enneaphylla			VU
Tiliacora lehmbachii			EN
Triclisia lanceolata			EN
Cassipourea acuminata			EN
Calycosiphonia macrochlamys			VU
Aneilema silvaticum			VU
Cisticola melanurus	black-tailed cisticola		DD
Coracias garrulus	European roller		NT
Bubo shelleyi	Shelley's eagle-owl		NT
Jubula lettii	maned owl		DD
Limosa limosa	black-tailed godwit		NT
Falco vespertinus	red-footed falcon		NT
Arthroleptis discodactyla			DD
Arthroleptis hematogaster			DD
Arthroleptis loveridgei			DD
Arthroleptis phrynoides			DD
Arthroleptis pyrrhoscelis			NT
Arthroleptis spinalis			DD
Arthroleptis tuberosus			DD
Arthroleptis vercammeni			DD
Cardioglossa cyaneospila			DD
Bufo buchneri			DD
Bufo schmidti			DD
Laurentophryne parkeri			DD
Hemisus perreti	Perret's snout-burrower		DD
Hemisus wittei	De Witte's snout-burrower		DD
Afrixalus orophilus			VU
Afrixalus upembae			DD
Callixalus pictus			VU

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Chrysobatrachus cupreonitens			DD
Cryptothylax minutus			DD
Hyperolius atrigularis			DD
Hyperolius castaneus			VU
Hyperolius chrysogaster			VU
Hyperolius cinereus			DD
Hyperolius diaphanus			DD
Hyperolius discodactylus			VU
Hyperolius ferrugineus			DD
Hyperolius frontalis			VU
Hyperolius ghesquieri			DD
Hyperolius hutsebauti			DD
Hyperolius inornatus			DD
Hyperolius kibarae			DD
Hyperolius leleupi			EN
Hyperolius leucotaenius			EN
Hyperolius obscurus			DD
Hyperolius polli			DD
Hyperolius polystictus			VU
Hyperolius pustulifer			DD
Hyperolius robustus			DD
Hyperolius sankuruensis			DD
Hyperolius vilhenai			DD
Hyperolius viridis			DD
Hyperolius xenorhinus			DD
Kassina mertensi			DD
Leptopelis fenestratus			DD
Leptopelis fiziensis			DD
Leptopelis karissimbensis			EN
Leptopelis kivuensis			NT
Leptopelis lebeaui			DD
Leptopelis parvus			DD
Cacosternum leleupi	katanga caco, katanga metal frog		DD
Phrynobatrachus acutirostris			VU
Phrynobatrachus albomarginatus			DD
Phrynobatrachus anotis			DD
Phrynobatrachus asper			DD
Phrynobatrachus bequaerti			VU

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Phrynobatrachus congicus			DD
Phrynobatrachus cryptotis			DD
Phrynobatrachus dalcqi			DD
Phrynobatrachus gastoni			DD
Phrynobatrachus giorgii			DD
Phrynobatrachus versicolor			VU
Hymenochirus boulengeri			DD
Xenopus ruwenzoriensis	Uganda clawed frog		DD
Afrana amieti			DD
Afrana desaegeri			DD
Afrana ruwenzorica			DD
Ptychadena christyi			DD
Ptychadena ingeri			DD
Aethiothemis basilewskyi			DD
Allocnemis mitwabae			DD
Congothemis apicalis			DD
Elattoneura cellularis			DD
Chlorocnemis pauli	orange-tipped threadtail		NT
Chlorocypha jacksoni			VU
Chlorocypha molindica			EN
Chlorocypha schmidti			EN
Chlorocypha victoriae			DD
Gynacantha immaculifrons			DD
Neurogomphus pinheyi			DD
Paragomphus lacustris			DD
Platycypha pinheyi			CR
Tetrathemis denticauda			CR
Gymnura micrura	smooth butterfly ray	Raie-Papillon Glabre	DD
Neoharriotta pinnata	sicklefin chimaera	Chimère Faucillée	DD
Rhynchobatus luebberti	African wedgefish, guitarra, lubbert's guitarfish, spikenose wedgefish	Guitare A Tachés	EN
Carcharhinus signatus	night shark		VU
Scyliorhinus cervigoni	west African catshark	Roussette Thalassa	DD
Etmopterus polli	African lanternshark	Sagre À Menton Lisse	DD
Callochromis stappersii			DD
Cyprichromis microlepidotus			DD
Xenotilapia melanogenys			DD
Eretmodus cyanostictus	Tanganyika clown fish		NT
Haplochromis labiatus			NT
Lamprologus finalimus			DD

Table 1 Red Listed Species of the Democratic Republic of the Congo (continued)

Species Scientific Name	Species Common Name (English)	Species Common Name (French)	IUCN Red List Class[(a)]
Lepidiolamprologus attenuatus			NT
Neolamprologus wauthioni			DD
Neolamprologus olivaceous			DD
Neolamprologus buescheri			DD
Neolamprologus christyi			VU
Petrochromis macrognathus			DD
Simochromis marginatus			VU
Trematocara zebra			DD
Tropheus polli			VU
Tropheus duboisi			VU
Xenochromis hecqui			DD
Xenotilapia nasus			DD
Xenotilapia spilopterus			DD
Xenotilapia burtoni			VU
Barbus huloti			VU
Brycinus jacksonii	Victoria robber fish		EN
Dinotopterus cunningtoni			NT
Synodontis nigrita			DD
Lates angustifrons	Tanganyika lates		EN
Lates macrophthalmus	albert lates		EN
Lates mariae	bigeye lates		VU
Lates microlepis	forktail lates		EN
Barbus lufukiensis			NT
Squatina oculata	monkfish, smoothback angel shark	Ange De Mer De Bonaparte, Ange De Mer Jaune, Ange De Mer Ocellé	EN

[(a)] Legend: EX - extinct; EW - extinct in wild; CR - Criticaly Endangered; EN - Endangered; VU - Vulnerable; LR/cd - Lower Risk / conservation dependent; LR/nt or NT: Near Threatened; DD - Data Deficient; LR/lc or LC - Least Concern.

APPENDIX B3.2-VII

FIXED POINT PHOTOGRAPHS FOR FAUNA HABITAT

Legend for Fixed-point Photographs – Kwatabala area.

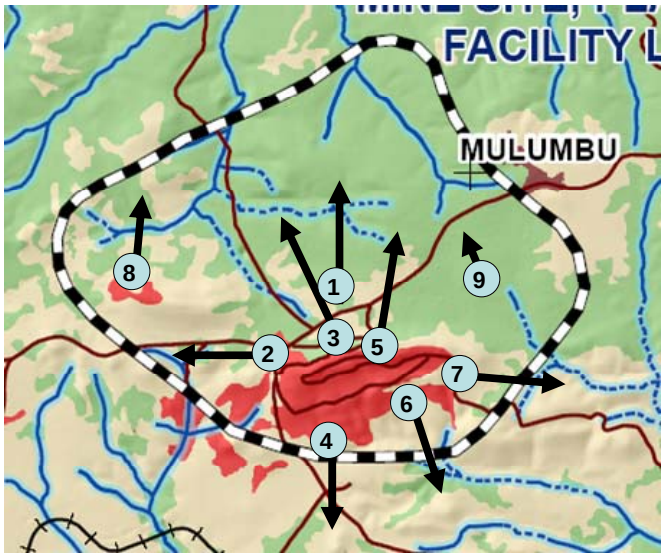


Photo point 1: 10 34 40 S
26 11 00 E

Photo point 2: 10 34 44 S
26 10 57 E

Photo point 3: 10 34 44 S
26 11 01 E

Photo point 4: 10 34 45 S
26 11 04 E

Photo point 5: 10 34 37 S
26 11 04 E

Photo point 6: 10 34 38 S
26 11 33 E

Photo point 7: 10 34 36 S
26 11 36 E

Photo point 8: 10 34 21 S
26 10 20 E

Photo point 9: 10 34 09 S
26 11 41 E

Photo point 1: 10 34 40 S 26 11 00 E

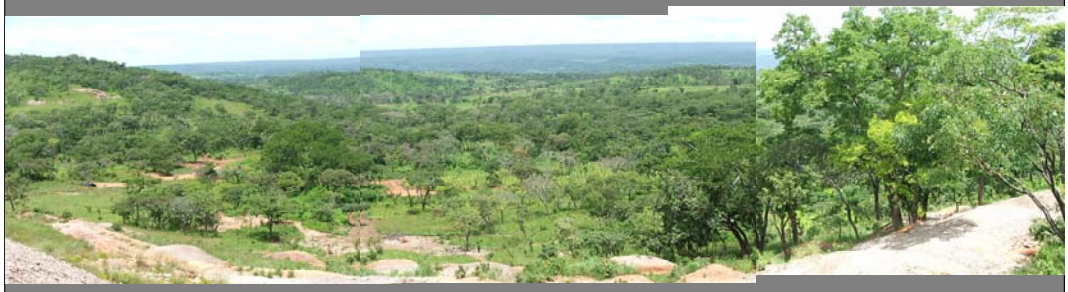


Photo point 2: 10 34 44 S 26 10 57 E

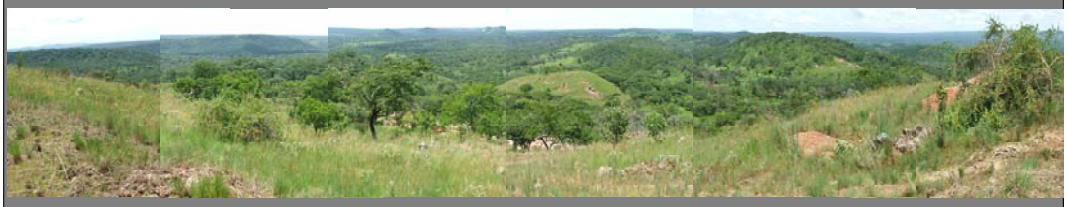


Photo point 3: 10 34 44 S 26 11 01 E

Photo point 4: 10 34 45 S 26 11 04 E

Photo point 5: 10 34 37 S 26 11 04 E

Photo point 6: 10 34 38 S 26 11 33 E

Photo point 7: 10 34 36 S 26 11 36 E

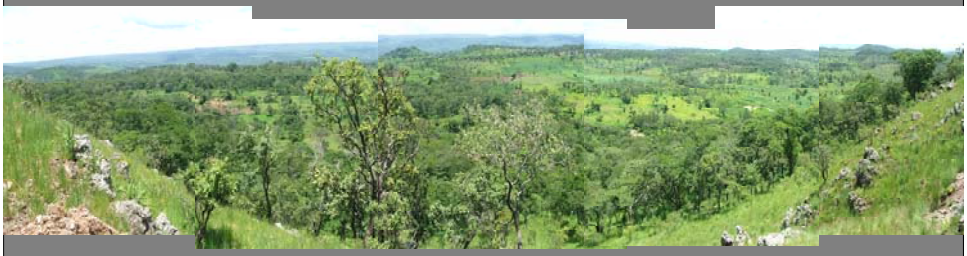
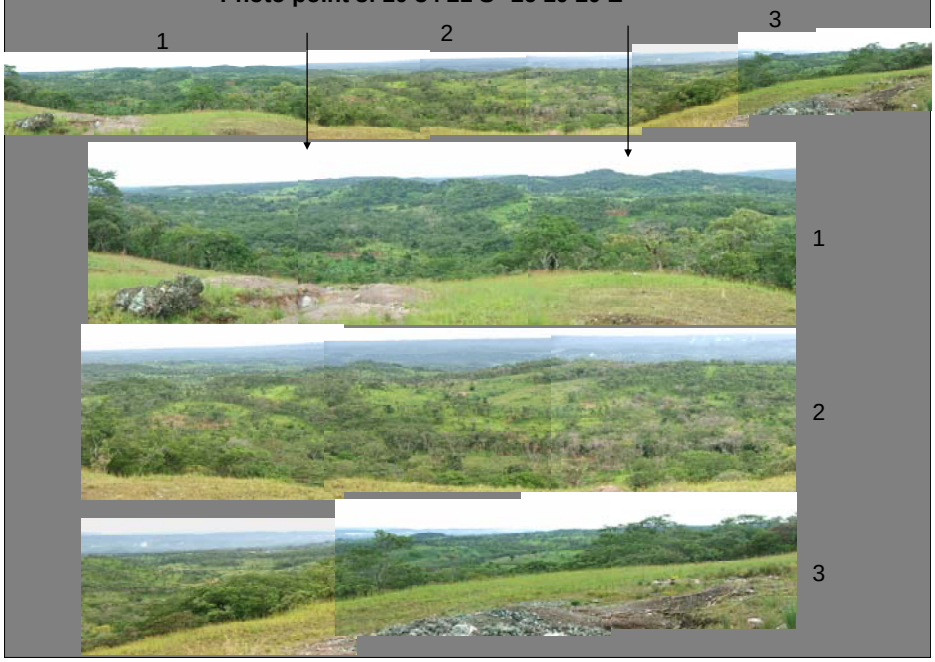


Photo point 9: 10 34 09 S 26 11 41 E

Photo point 8: 10 34 21 S 26 10 20 E



APPENDIX B3.3-I

PHOTOGRAPHS OF FISH AND AQUATIC HABITAT SAMPLING SITES

Photograph 1 DT1 (Downstream)

Photograph 2 DT1 (Upstream)

Photograph 3 DT1 (Right bank)

Photograph 4 DT1 (Left bank)

Photograph 5 DT2 (Downstream)

Photograph 6 DT2 (Regional)

Photograph 7 KONKA US (Downstream)

Photograph 8 KONKA US (Upstream)

Photograph 9 KONKA US (Right Bank)

Photograph 10 KONKA US (Left Bank)

Photograph 11 KONKA US (Regional)

Photograph 12 KZ1 (Downstream)

Photograph 13 KZ1 (Right Bank)

Photograph 14 KZ1 (Left Bank)

Photograph 15 KZ1 (Regional)

Photograph 16 KZ2 (Downstream)

Photograph 17 KZ2 (Upstream)

Photograph 18 KZ2 (Right Bank)

Photograph 19 KZ2 (Left Bank)

Photograph 20 KZ2 (Regional)

Photograph 21 MF1 (Downstream)

Photograph 22 MF1 (Upstream)

Photograph 23 MF1 (Right Bank)

Photograph 24 MF1 (Left Bank)

Photograph 25 SH1 (Downstream)

Photograph 26 SH1 (Upstream)

Photograph 27 SH1 (Right Bank)

Photograph 28 SH1 (Left Bank)

Photograph 29 SK1 (Downstream)

Photograph 30 SK1 (Upstream)

APPENDIX B3.3-II

LIST OF FISH SPECIES PREVIOUSLY RECORDED OR POSSIBLY OCCURRING WITHIN THE STUDY AREA

Table 1 Fish Species List for the Haut-Lualaba Basin (Malaisse 1997)

Family	*Species*
Polypteridae	*Polypterus ornatipinnis* Boulenger
Mormyridae	*Brienomyrus tavernei* Poll (E)
	Campylomomyrus elephas Boulenger
	Campylomomyrus rynchophorus Boulenger
	Hippopotamyrus discorynchus Peters
	Marcusenius macrolepidotus angolensis Boulenger
	Mormyrops deliciosus Leach
	Mormyrus caballus asinus Boulenger
	Pollimyrus isidori fasciaticeps Boulenger
	Pollimyrus stappersii kapangae David
	Pollimyrus stappersii stappersii Boulenger
	Pollimyrus tumifrons Boulenger
Kneriidae	*Kneria katangae* Poll
	Kneria wittei Poll
	Parakneria kissi Poll (E)
	Parakneria lufirae Poll (E)
Characidae	*Alestes lateralis* Boulenger
	Alastes macrolepidotus (Valenciennes)
	Alastes macrophtalmus Gunther
	Hydrocynus vittatus Castelnau
	Micralestes acutidens Peters
	Micralestes stormsi Boulenger
Distichodontidae	*Distichodus fasciolatus* Boulenger
	Distichodus lusosso Schilthus
	Distichodus sexfasciatus Boulenger
	Nannocharax brevis Boulenger
	Nannocharax luapukae Boulenger
Citharinidae	*Citharinus gibbosus* Boulenger
Cyprinidae	*Barbus caudovittatus* Boulenger
	Barbus eutaenia Boulenger 1
	Barbus haasianus David
	Barbus janssensi Poll
	Barbus kamalondoensis Poll
	Barbus lineomaculatus Boulenger
	Barbus miolepis miolepis Boulenger
	Barbus motebensis kamaiae David & Poll
	Barbus multilineatus Worthington
	Barbus neefi Greenwood 1
	Barbus paludinosus Peters

Table 1 Fish Species List for the Haut-Lualaba Basin (Malaisse 1997) (continued)

Family	*Species*
	Barbus taeniopleura Boulenger
	Barbus trachypterus Boulenger
	Barbus trimaculatus Peters
	Chelaetiops katangae Poll
	Labeo kibimbi Poll
	Labeo lineatus Boulenger
	Labeo macrostoma Boulenger
	Labeo velifer Boulenger
	Labeo weeksii Boulenger
	Opsaridium ubangense (Pellegrin)
	Varicorhinus altipinnis Banister & Poll
	Varicorhinus iphthimostoma Banister & Poll
	Varicorhinus wittei Banister & Poll (E)
Bagridae	*Bagrus ubangensis* Boulenger
	Chrysichthys macropterus Boulenger 2
Amphiliidae	*Belonoglanis tenuis* Boulenger 2
Clariidae	*Clarias dumerilii* Steindachner
	Clarias ngamensis Castelnau
	Clarias stappersii Boulenger
	Clarias theodorae Weber
Mochokidae	*Chiloglanis lufirae* Poll (E)
	Chiloglanis microps Matthes (E)
	Euchilichthys royauxi Boulenger
	Synodontis decorus Boulenger
	Synodontis lufirae Poll (E)
	Synodontis pleurops Boulenger
Order: **Athriniformes**	
Cyprinodontidae	*Aplocheilichthys johnstoni (*Günther)
	Aplocheilichthys katangae (Boulenger) (3)
	Aplocheilichthys lualabaensis (Poll)
	Aplocheilichthys lululae (Fowler)
Order: **Perciformes**	
Cichlidae	*Haplochromis polyacanthus* (Boulenger)
	Haplochromis torrenticola Thys van den Aundenaerde (3)
	Lamprologus symoensi Poll (3) (E)

Table 1 Fish Species List Recorded in the Lower Dipeta River, 1998

Characidae	*Hydrocynus vittatus* Castelnau
Cyprinidae	*Barbus eutaenia* Boulenger 1
	Barbus neefi Greenwood 1
	Barbus paludinosus Peters
	Labeo annectens Boulenger
Cyprinodontidae	*Nothobranchius affbriene* Poll
Cichlidae	*Tilapia rendalii* Boulenger
Anabantidae	*Ctenopoma multipinis* Peters
Bagridae	*Leptoglanis brevis*
Clariidae	*Clarius stappersii*
Estilidae	*Astild locustelle*
Mocokidae	*Synodontis nigromaculatus* Boulenger
Shilbeidae	*Schilbe sp.*
Mastacembelidae	*Mastacembelus sp.*

APPENDIX B3.3-III

AQUATIC HABITAT CHARACTERIZATION

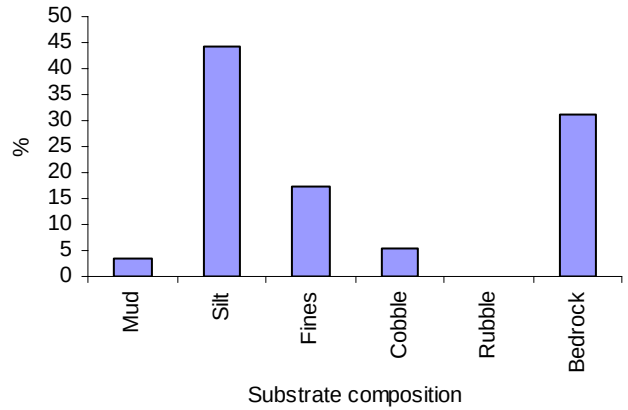
Table 1 Habitat Characteristics of the Sample Site

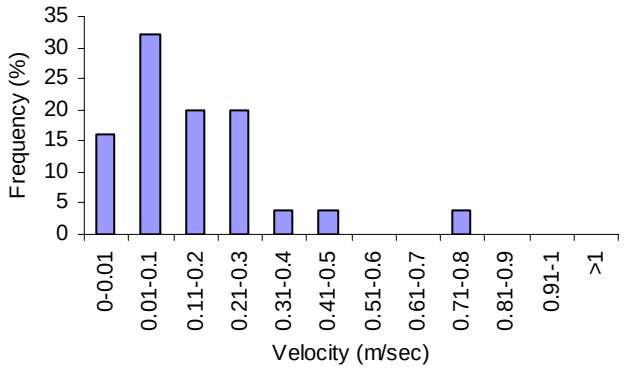
Site Code	Wetted Channel Width (meters)	Water Depth (meters)	Water Velocity (meters per second)	Channel Type	Turbidity (Sechi Disk Reading)	Bank Characteristics	
	Mean (min-max)	Mean (max)	Mean (max)			Stability	Veg Cover
DT1	3.13 (4.8 – 1.9)	0.38 (0.9)	0.11 (0.78)	singular meandering	moderate	Bank stable; evidence of erosion or bank failure absent or minimal; little potential for further problems (<5% of bank affected).	70 – 90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent, more than one half of the potential plants upper height remaining.
KONKA US	6.21 (2.63 – 9.37)	0.30 (0.77)	0.45 (0.82)	singular meandering	moderate (34cm)	Moderately stable, infrequent small areas of erosion mostly healed over. 5 – 30% of bank in reach has areas of erosion.	70 – 90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent, more than one half of the potential plants upper height remaining.
KZ1	1.05(0.74 – 1.4)	0.74 (1.98)	0.15 (0.37)	singular meandering	clear	Bank stable; evidence of erosion or bank failure absent or minimal; little potential for further problems (<5% of bank affected).	More than 90% of the streambank surfaces covered by native vegetation including trees, understory shrubs, or nonwoody microphytes; vegetative disruption through grazing or plowing minimal or not evident; almost all plants allowed to grow naturally.

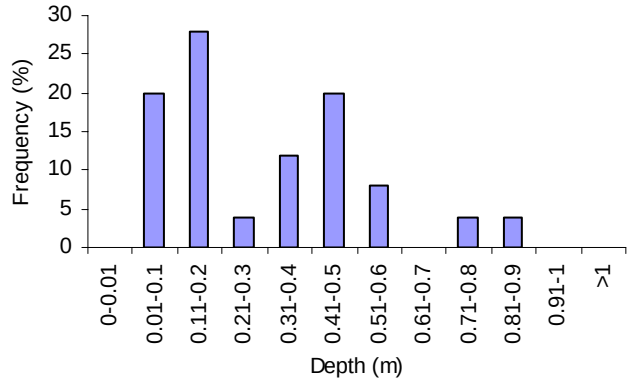
Table 1 Habitat Characteristics of the Sample Site (continued)

Site Code	Wetted Channel Width (meters)	Water Depth (meters)	Water Velocity (meters per second)	Channel Type	Turbidity (Sechi Disk Reading)	Bank Characteristics	
	Mean (min-max)	Mean (max)	Mean (max)			Stability	Veg Cover
KZ2	2.21(1.63 – 2.92)	0.16 (0.47)	0.40 (1.2)	singular meandering	clear	Bank stable; evidence of erosion or bank failure absent or minimal; little potential for further problems (<5% of bank affected).	More than 90% of the streambank surfaces covered by native vegetation including trees, understory shrubs, or nonwoody microphytes; vegetative disruption through grazing or plowing minimal or not evident; almost all plants allowed to grow naturally.
MF1	6.83 (4.3 – 9.1)	0.52 (1.28)	0.36 (1.27)	singular meandering	moderate (24 cm)	Moderately stable, infrequent small areas of erosion mostly healed over. 5 – 30% of bank in reach has areas of erosion.	90% of the streambank surfaces covered by native vegetation including trees, understory shrubs, or nonwoody microphytes; vegetative disruption through grazing or plowing minimal or not evident; almost all plants allowed to grow naturally.
SH1	1.84 (1.15 – 2.52)	0.13 (0.4)	0.10 (0.53)	singular meandering	clear	Not determined.	Not determined
SK1	1.96 (1.2 – 3)	0.18 (0.27)	0.20 (0.6)	singular meandering	clear	Bank stable; evidence of erosion or bank failure absent or minimal; little potential for further problems (<5% of bank affected).	70 – 90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent, more than one half of the potential plants upper height remaining.

Figure 1 Habitat Characteristics of the DT1 Riffle/Run Hydraulic Unit







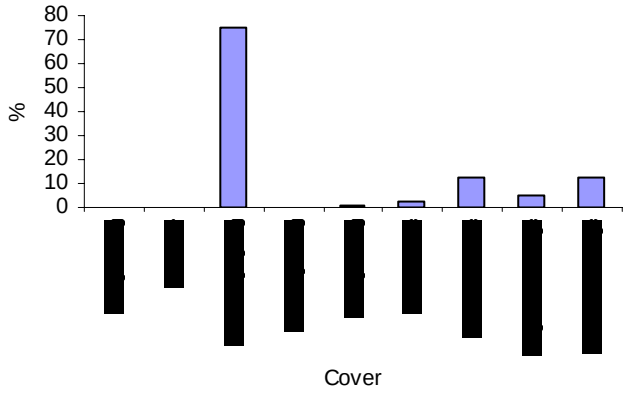
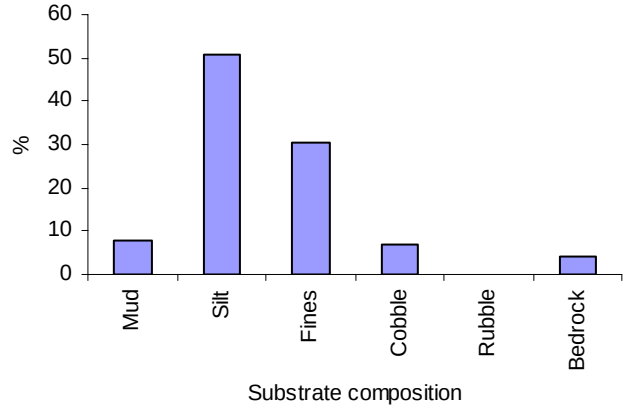
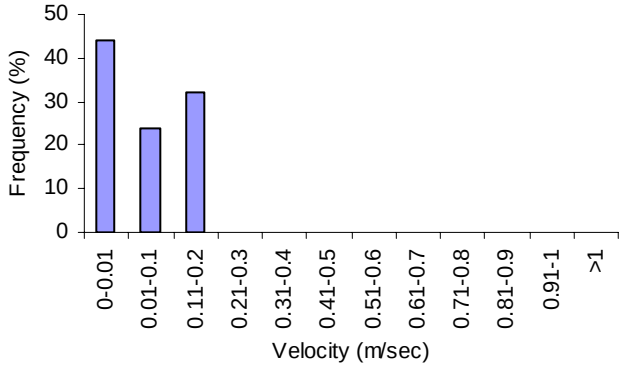
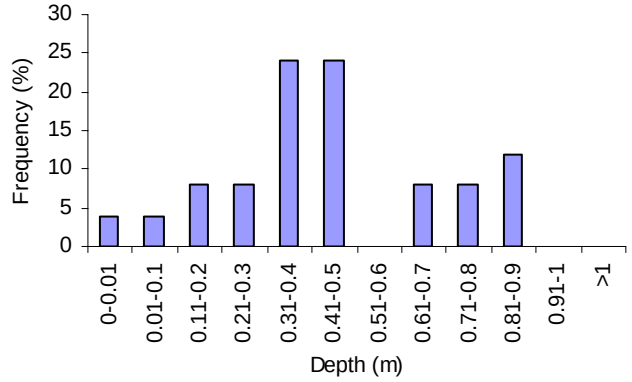


Figure 2 Habitat Characteristics of the DT1 Pool







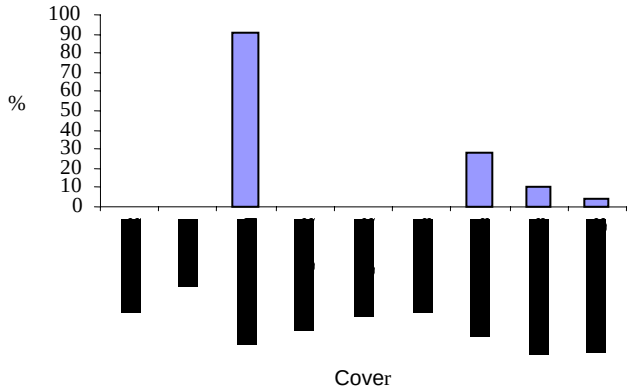
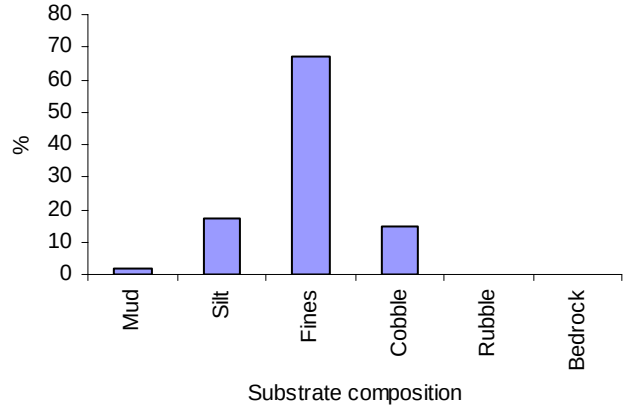
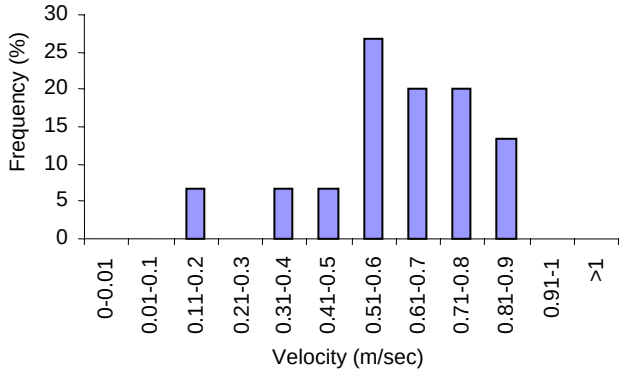
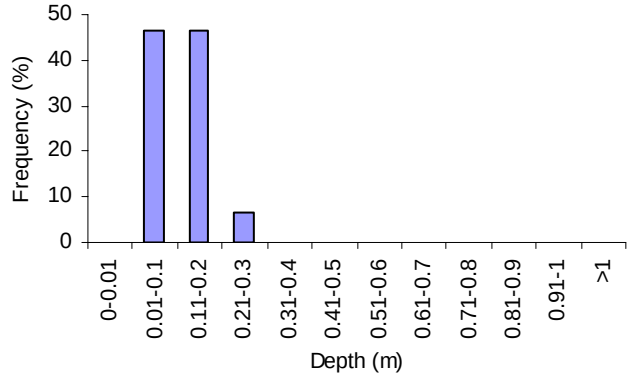


Figure 3 Habitat Characteristics of the KONKA US Riffle







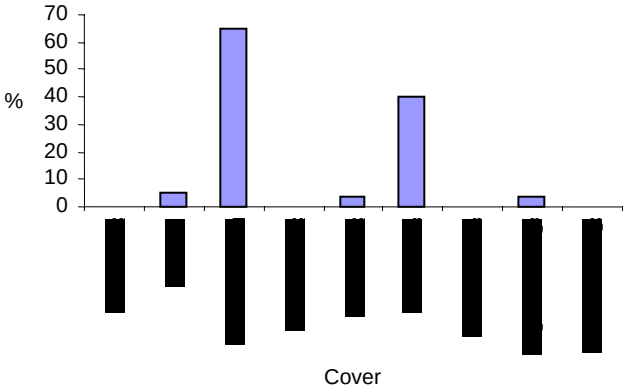
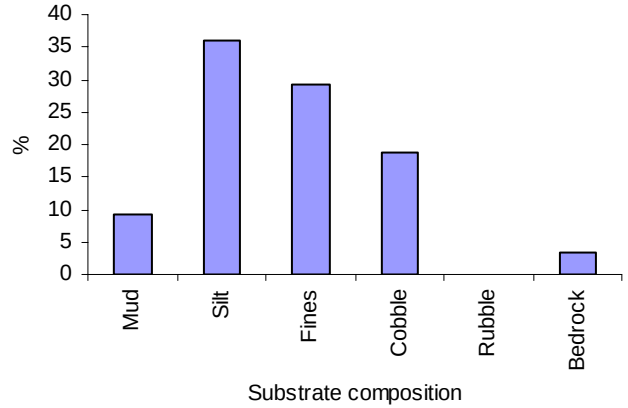
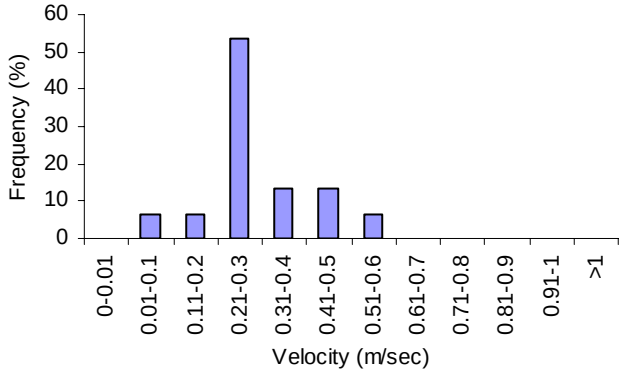
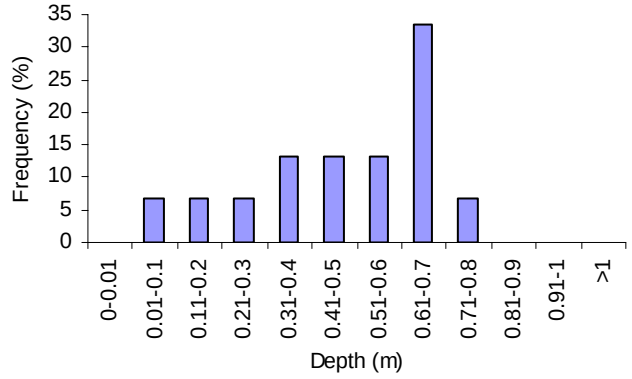


Figure 4 Habitat Characteristics of the KONKA US Pool







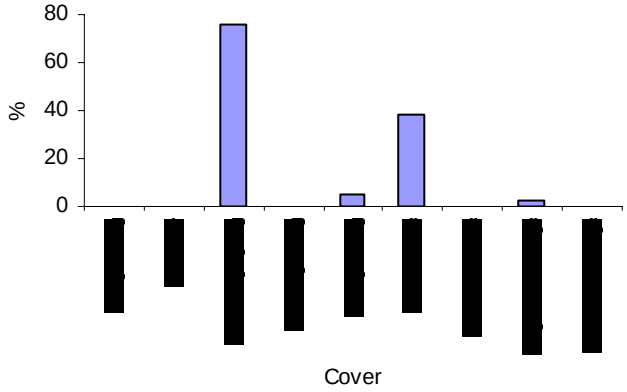


Figure 5 Habitat Characteristics of the KZ1 Riffle

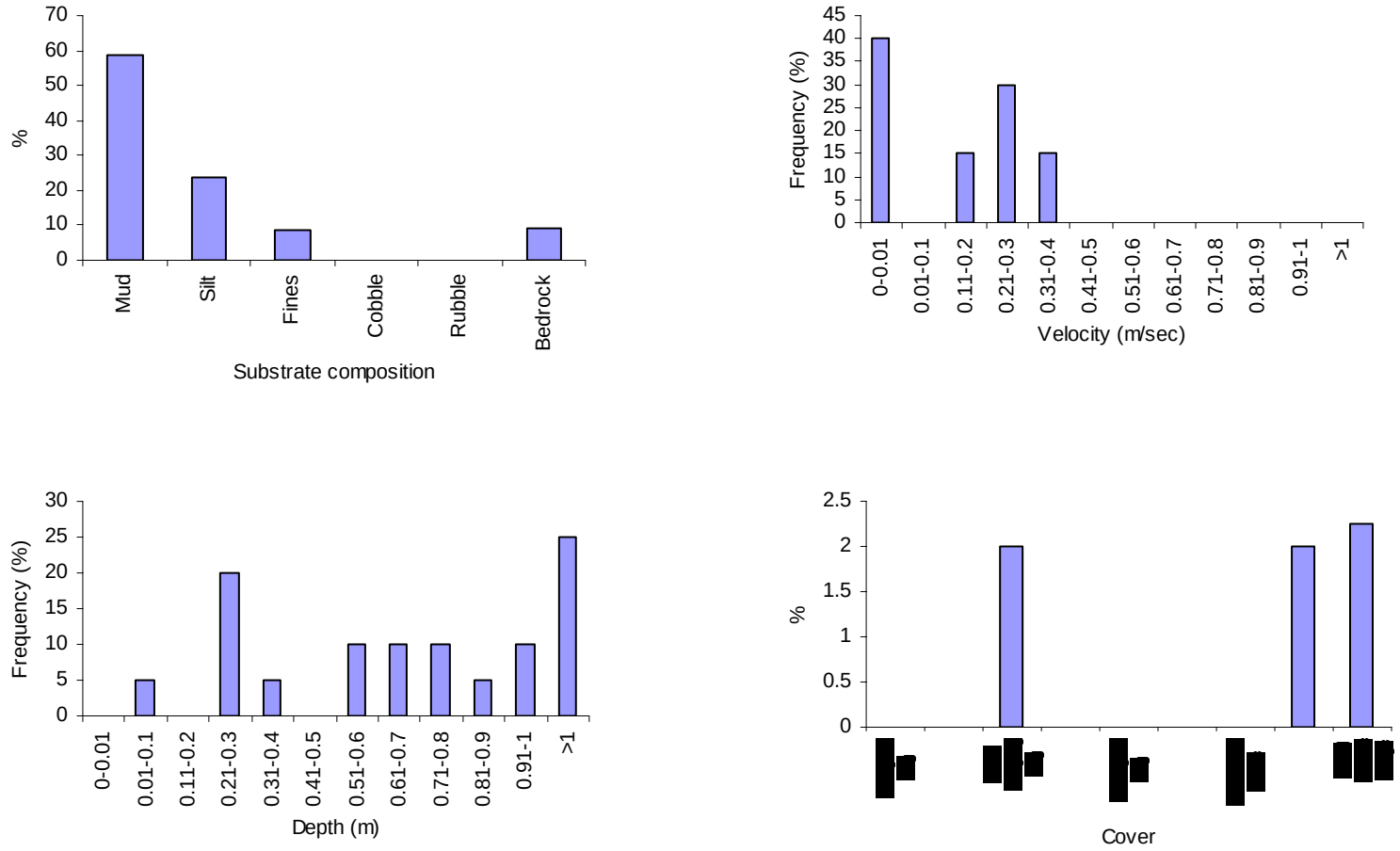
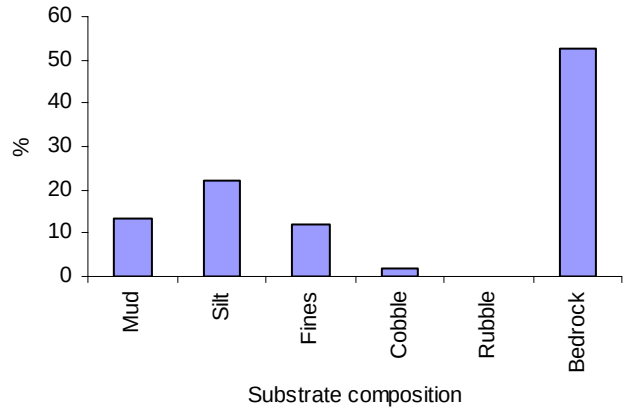
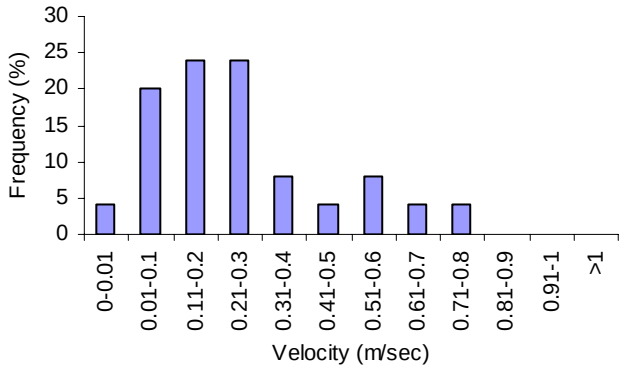
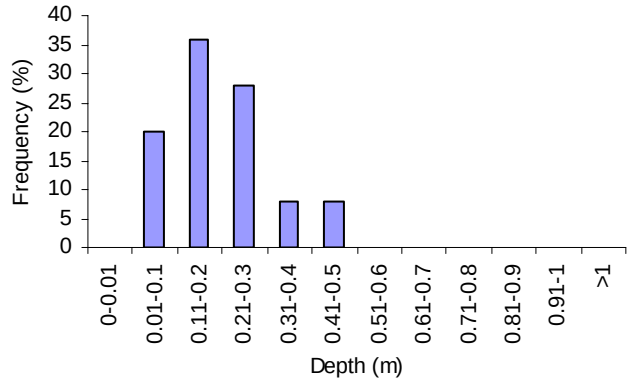


Figure 6 Habitat Characteristics of the KZ2 Riffle







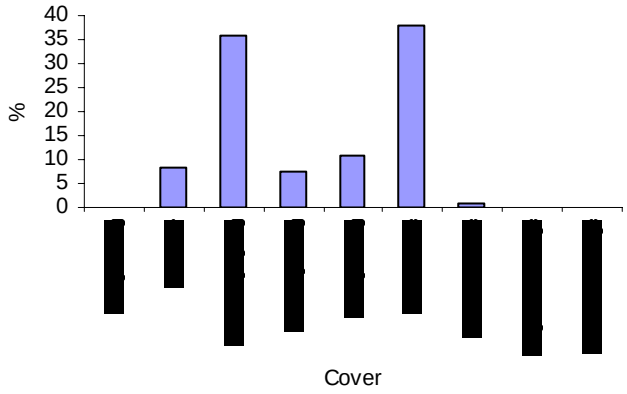
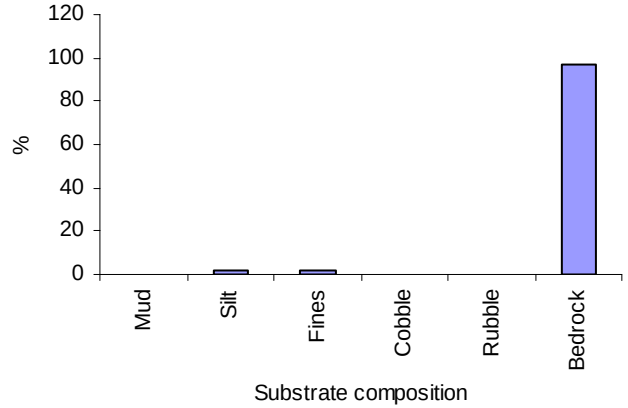
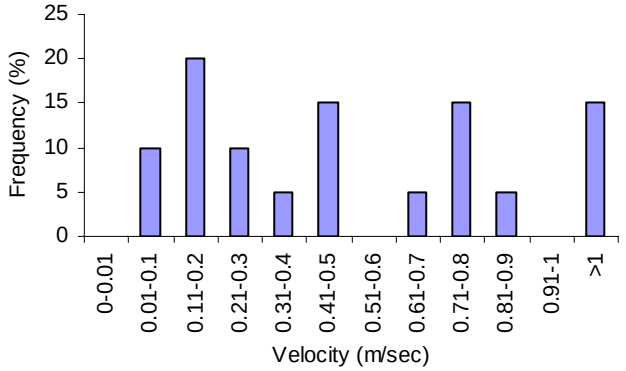
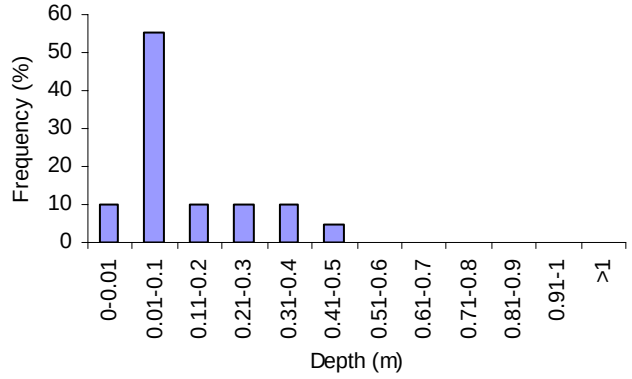


Figure 7 Habitat Characteristics of the KZ2 Rapid







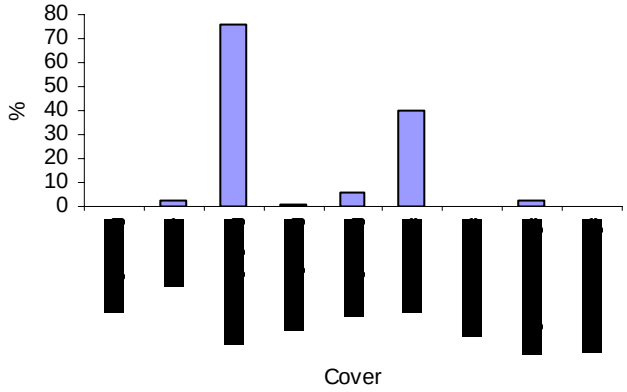
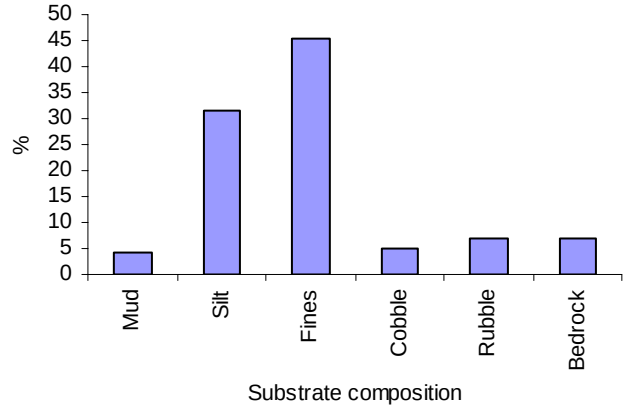
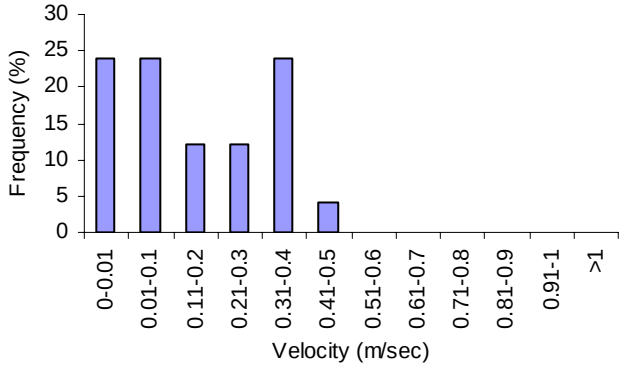
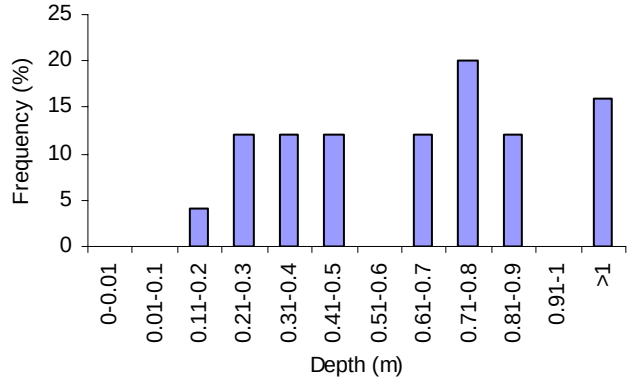


Figure 8 Habitat Characteristics of the MF1 Pool







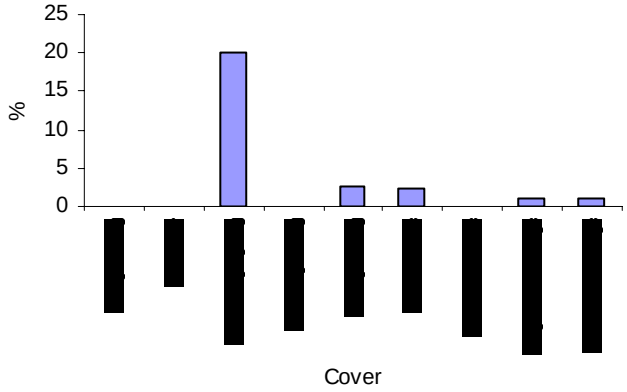
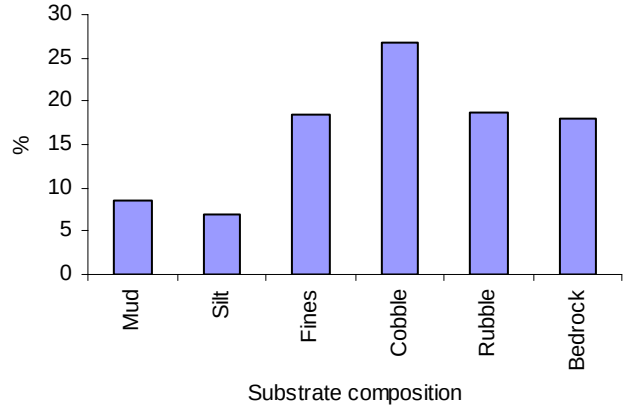
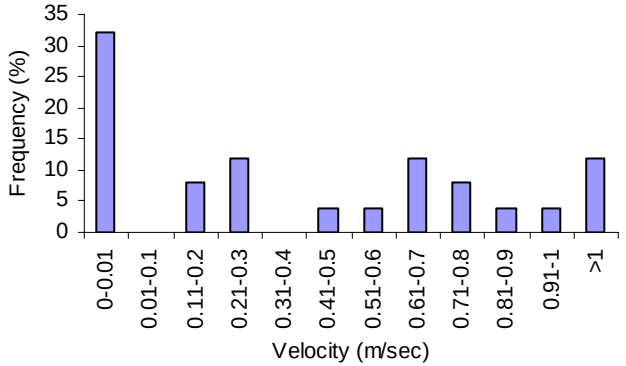
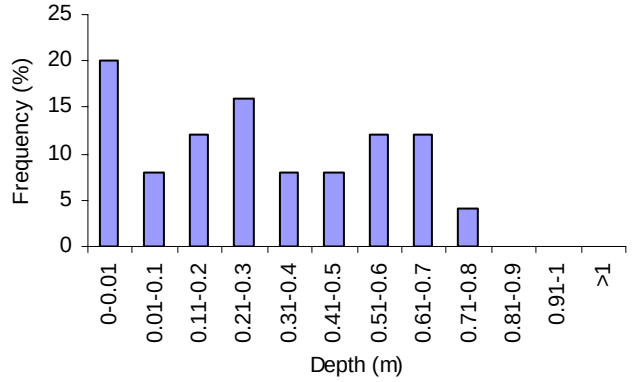


Figure 9 Habitat Characteristics of the MF1 Rapid







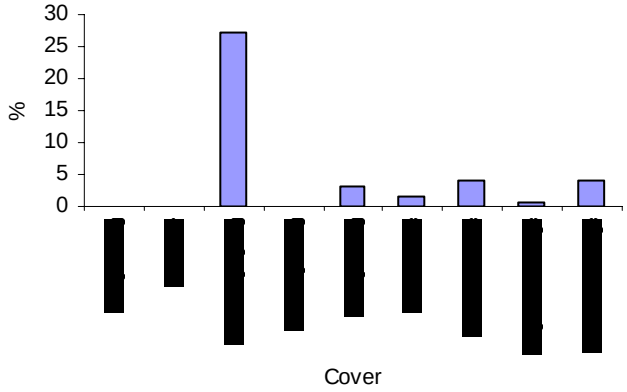
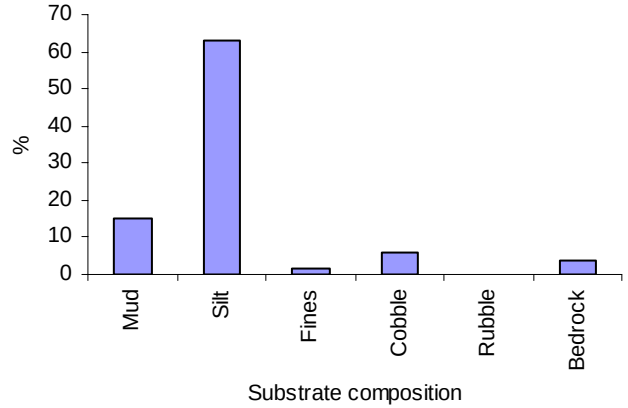
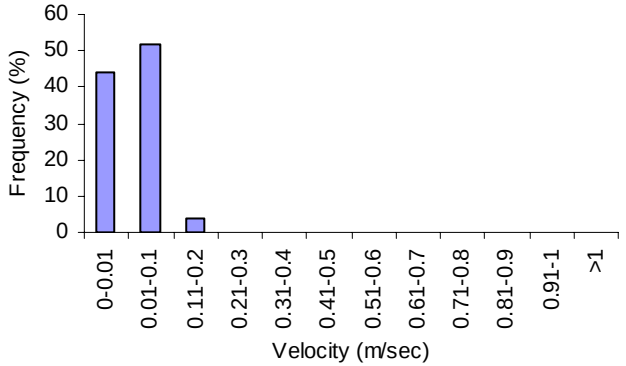
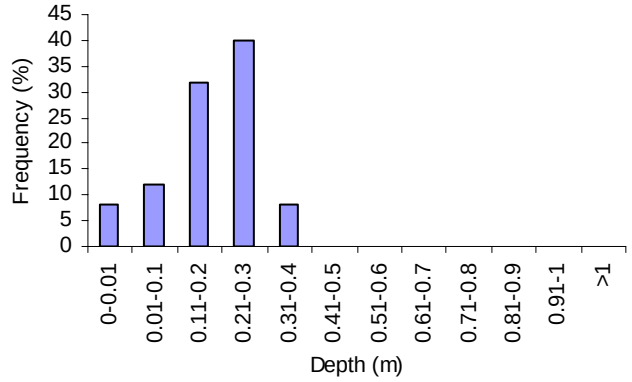


Figure 10 Habitat Characteristics of the SH1 Pool







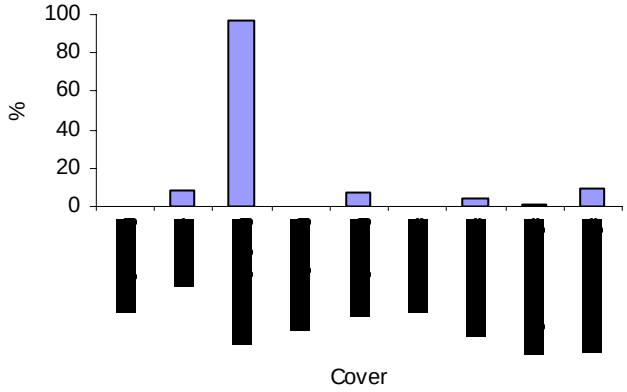
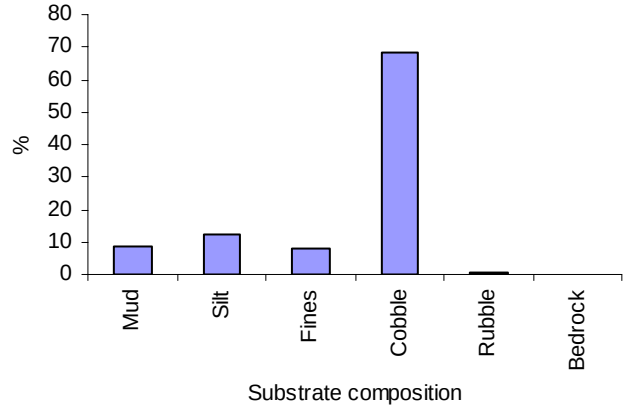
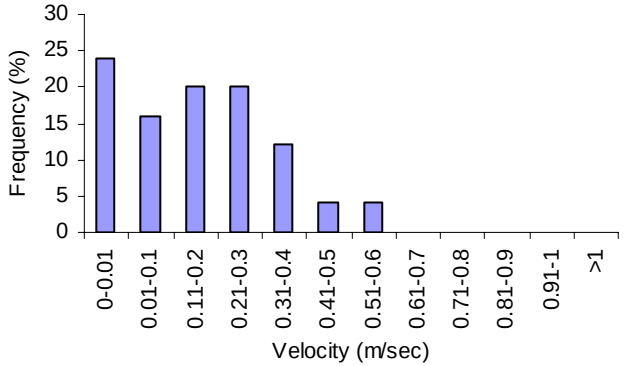
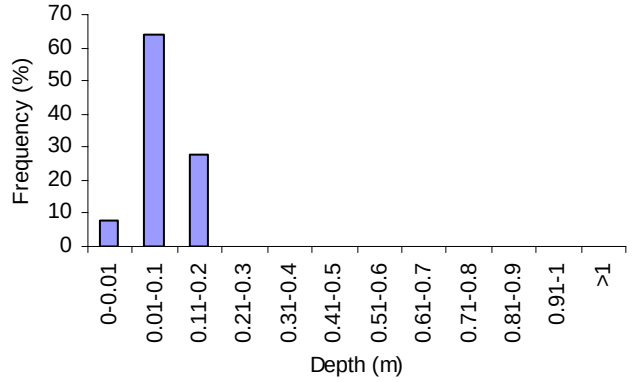


Figure 11 Habitat Characteristics of the SH1 Riffle







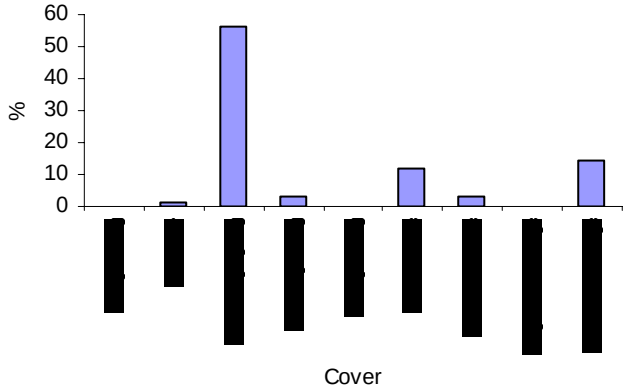
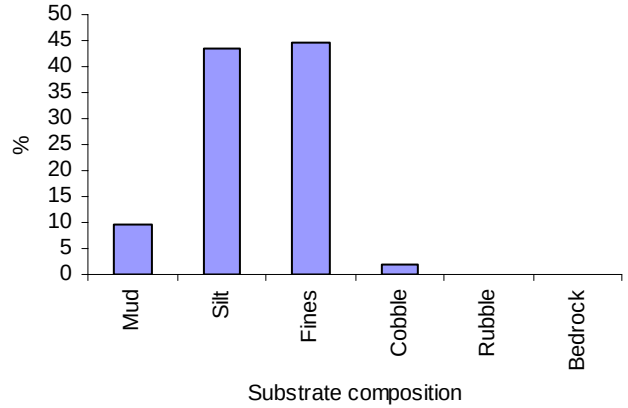
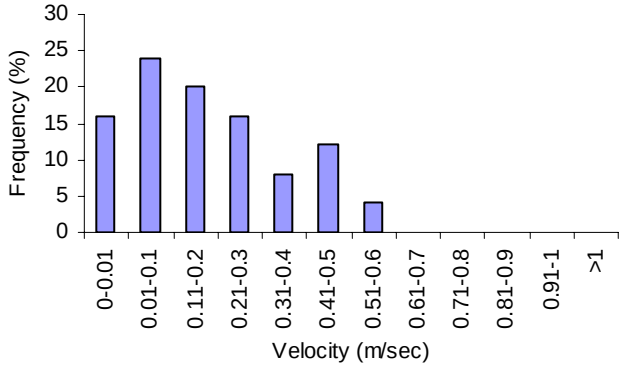
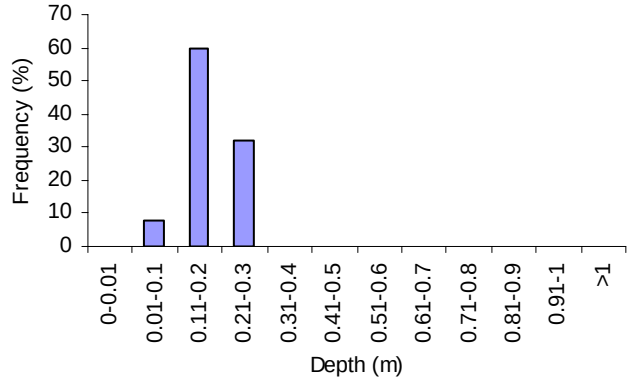


Figure 12 Habitat Characteristics of the SK1 Riffle







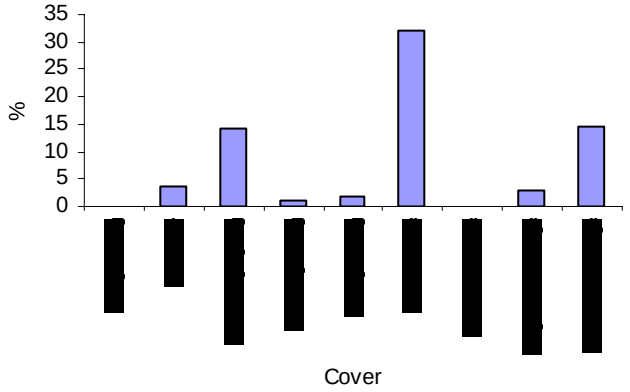
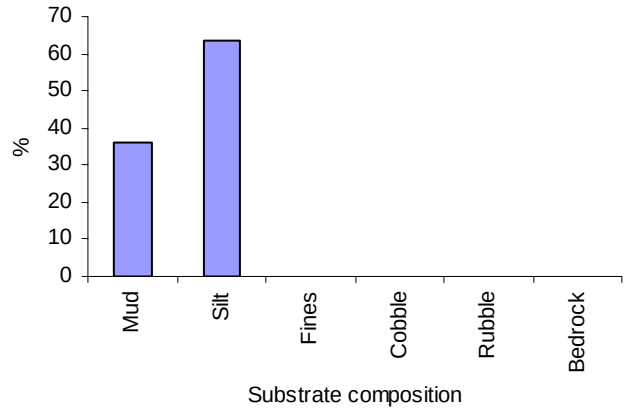
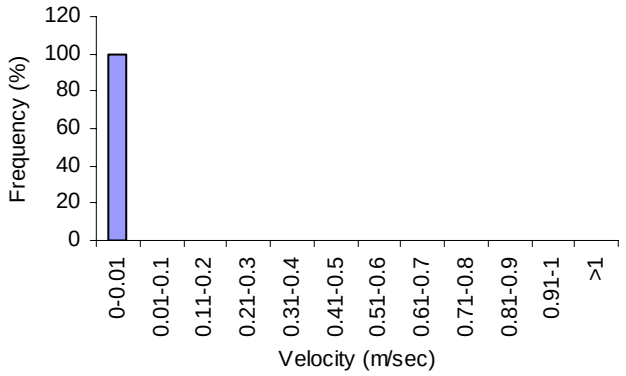
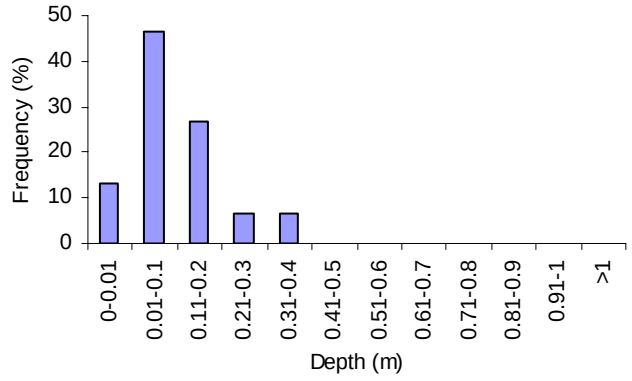
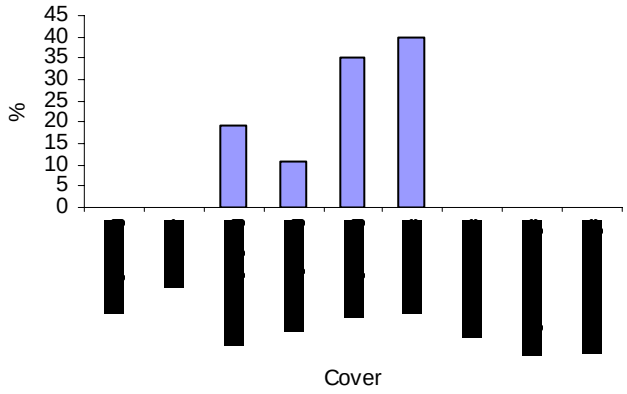


Figure 13 Habitat Characteristics of the Wetland









APPENDIX B3.3-IV

RELATIVE ABUNDANCES OF FISH PER SQUARE METER

Figure 1 Dipeta River Site DT1

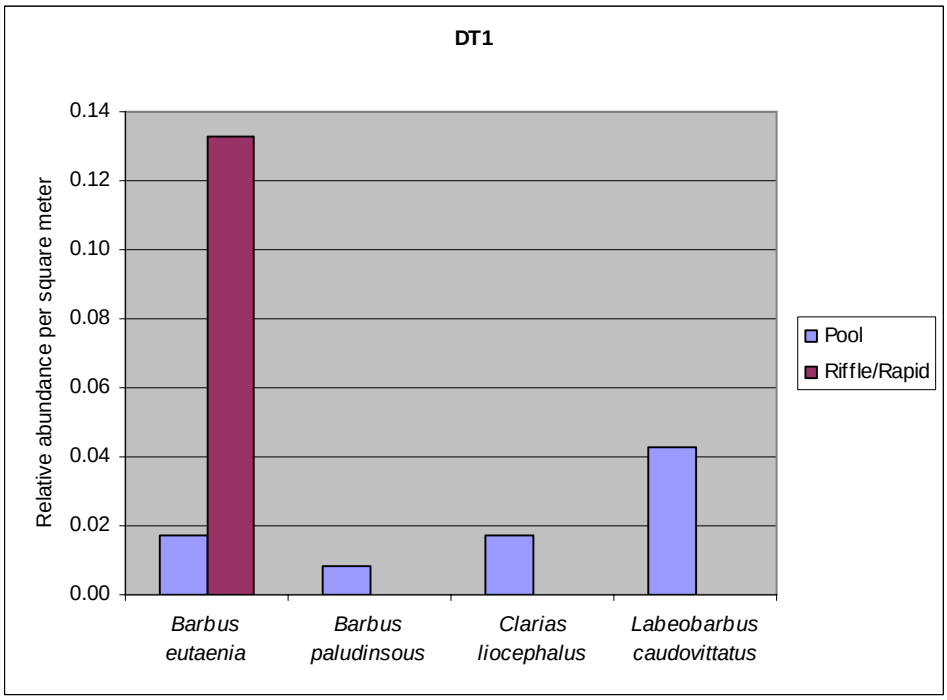


Figure 2 Konka River Upstream Site

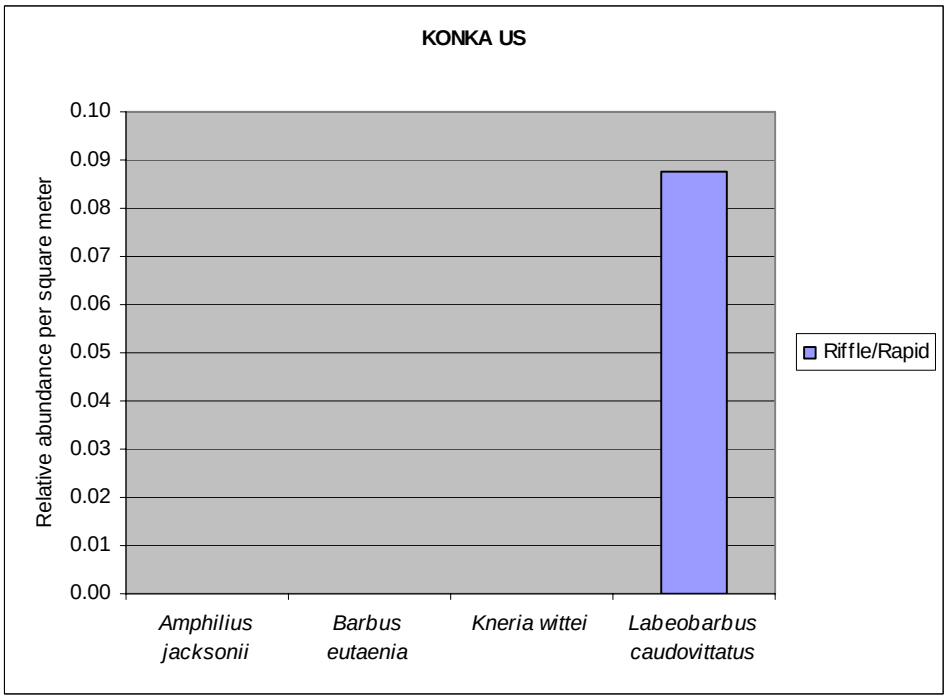


Figure 3 Kanzekenene River Site KZ1

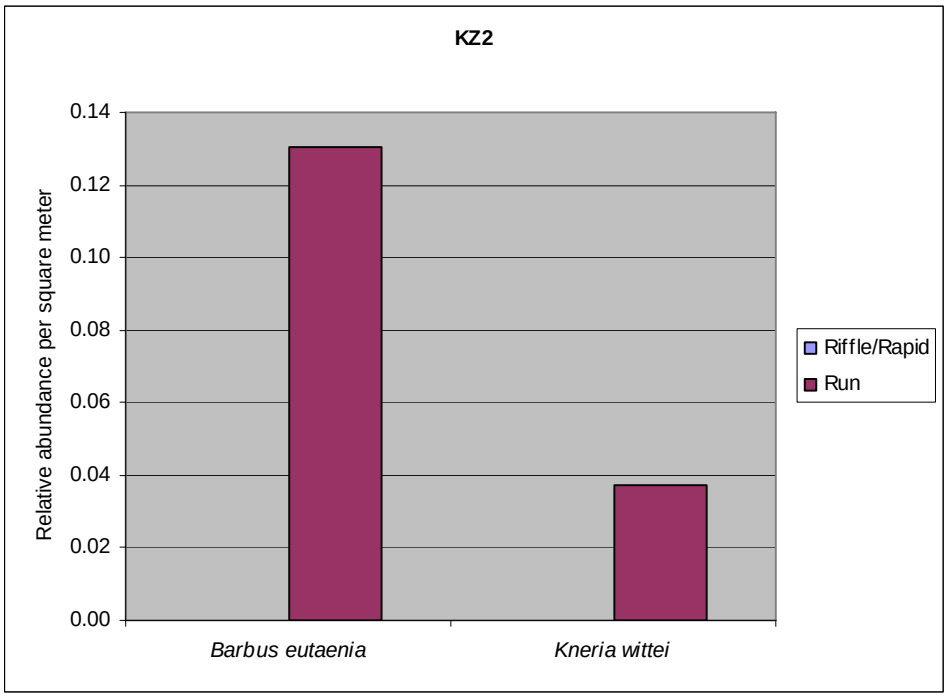


Figure 4 Sokalwela River Site SK1

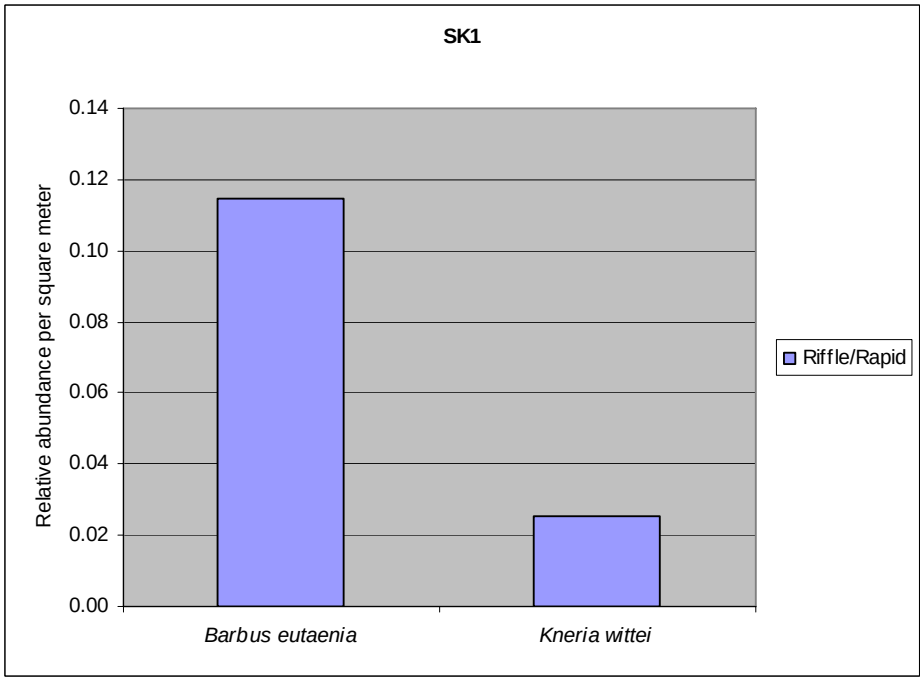


Figure 5 Mofia River Site MF1

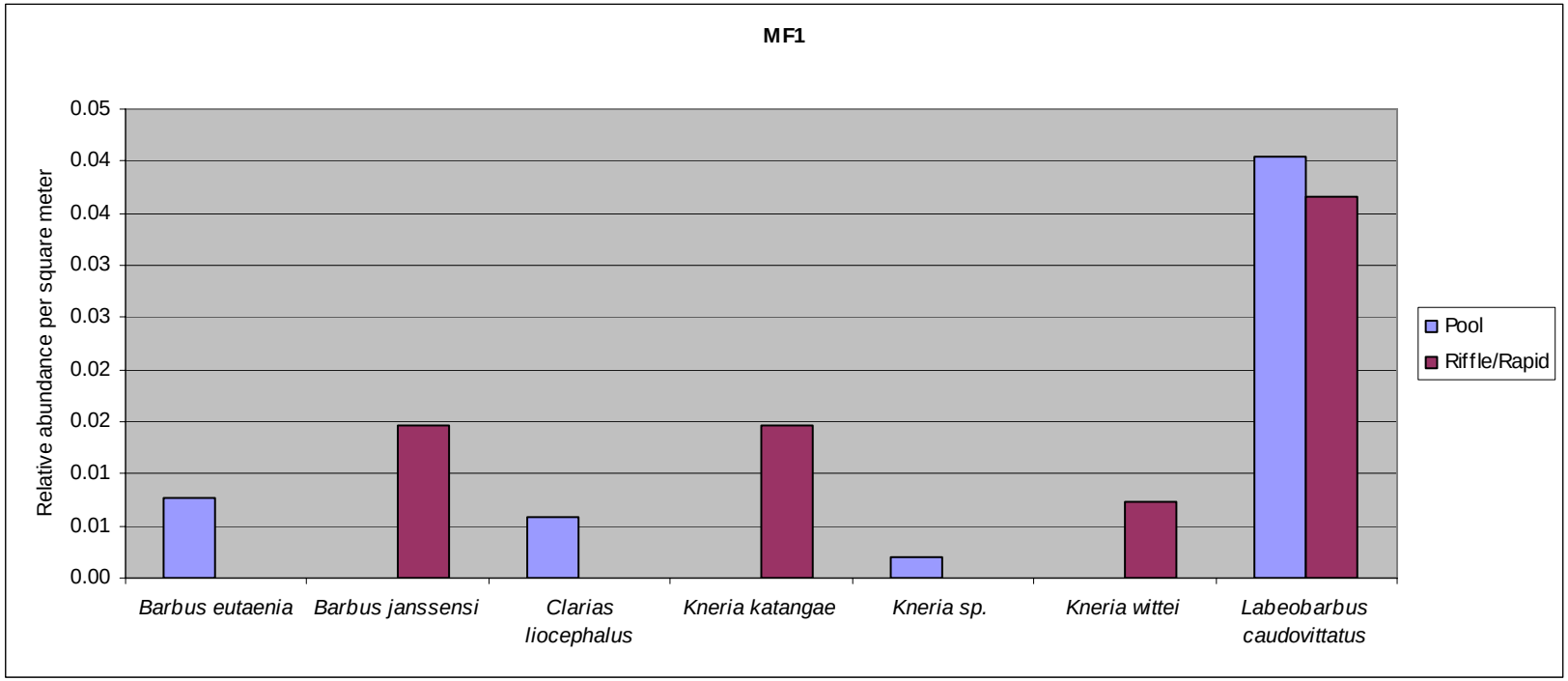
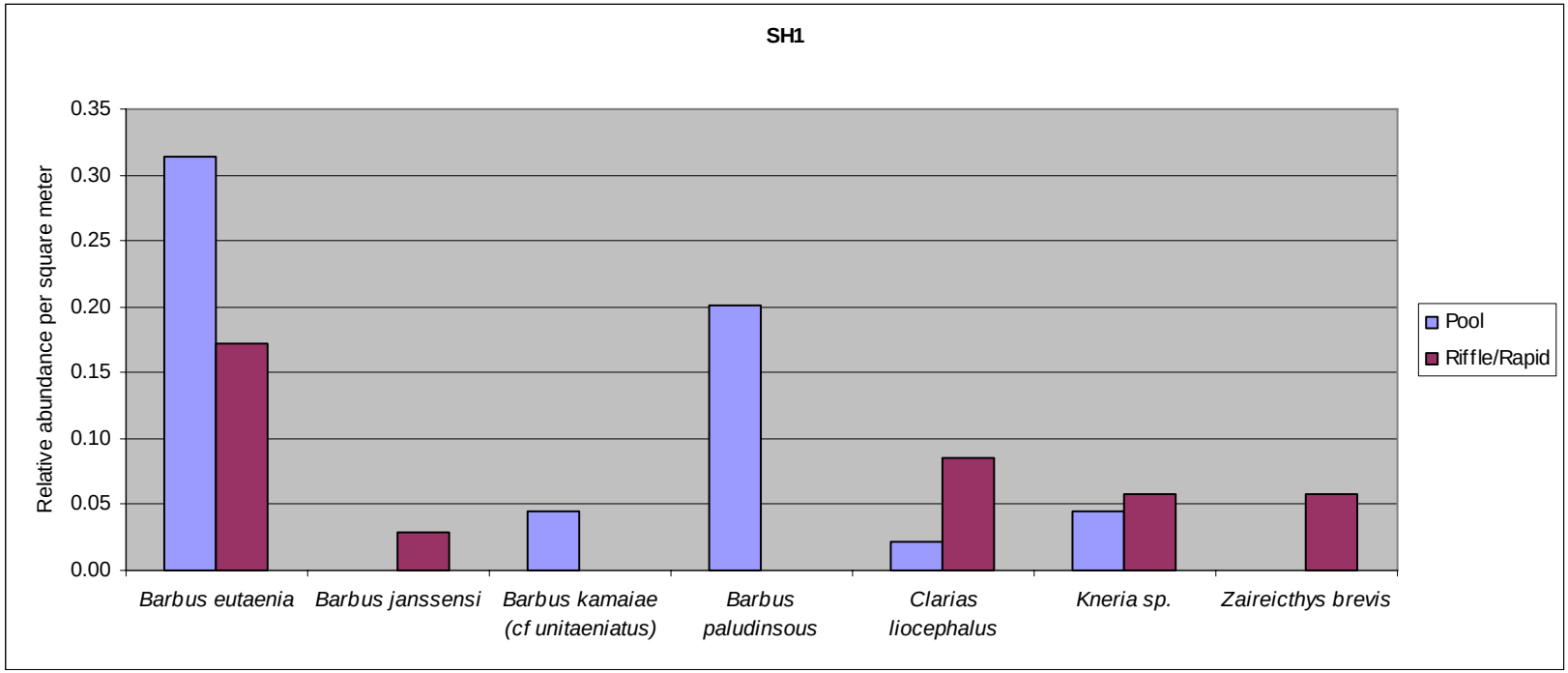


Figure 6 Shimpidi River Site SH1



APPENDIX B3.3-V

LENGTH FREQUENCY DISTRIBUTION OF FISH

Figure 1 Length Frequency Distribution for Site DT1

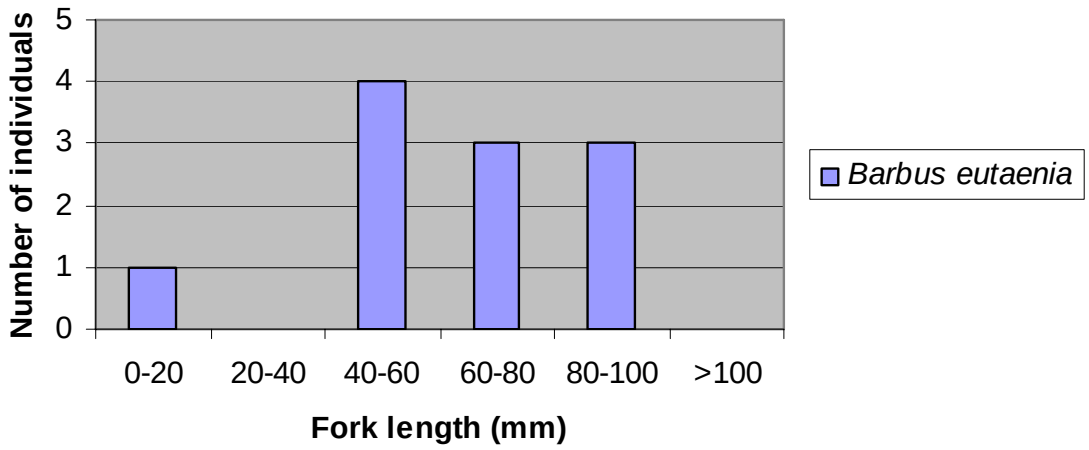


Figure 2 Length Frequency Distribution for Site DT2

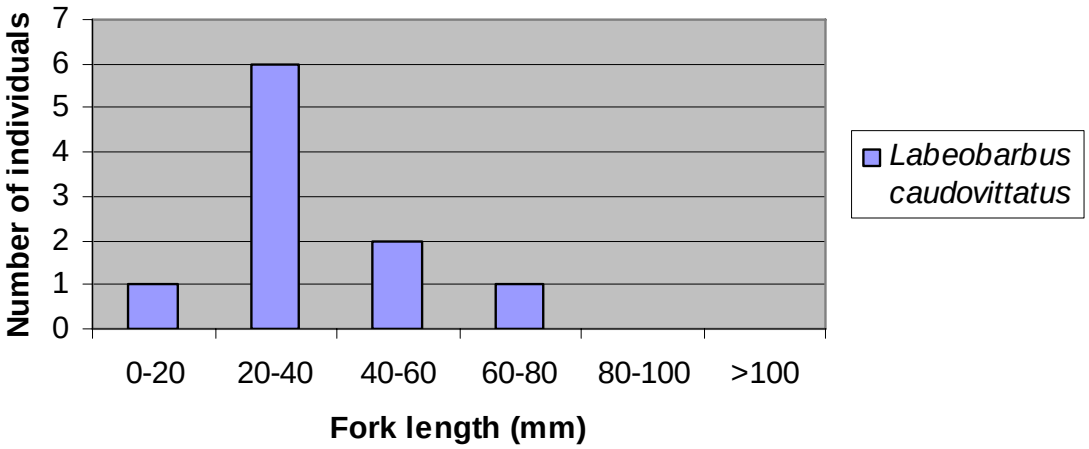


Figure 3 Length Frequency Distribution for Site KZ1

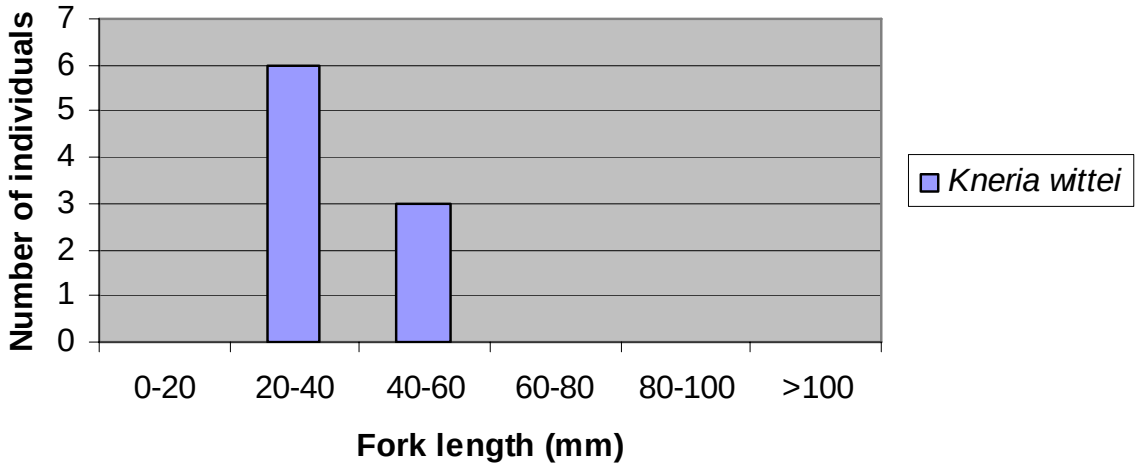


Figure 4 Length Frequency Distribution for Site KZ2

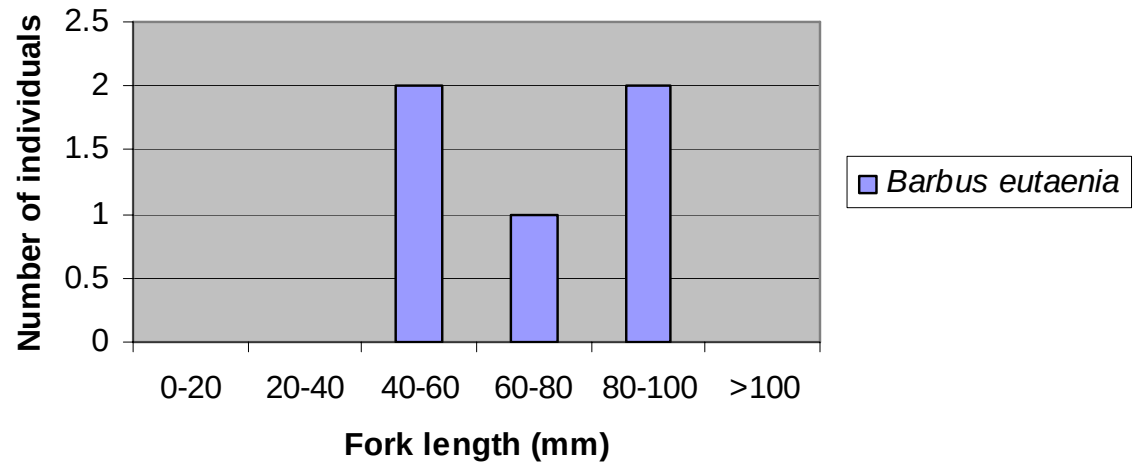


Figure 5 Length Frequency Distribution for Site MF1

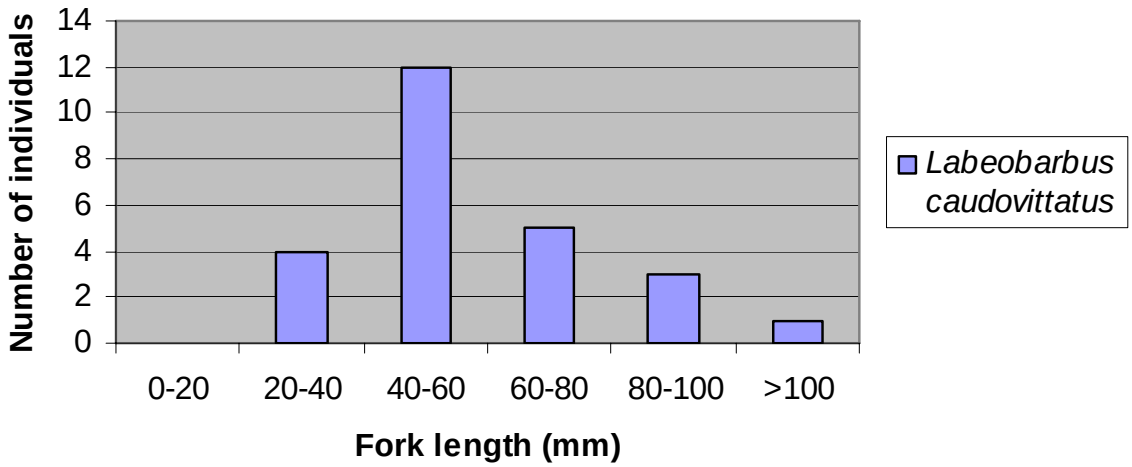


Figure 6 Length Frequency Distribution for Site SH1

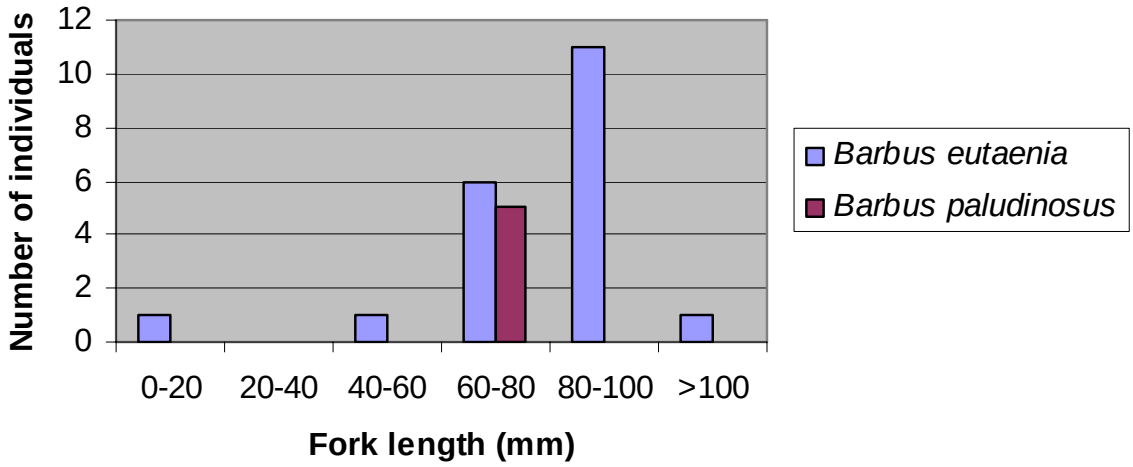


Figure 7 Length Frequency Distribution for Site SK1

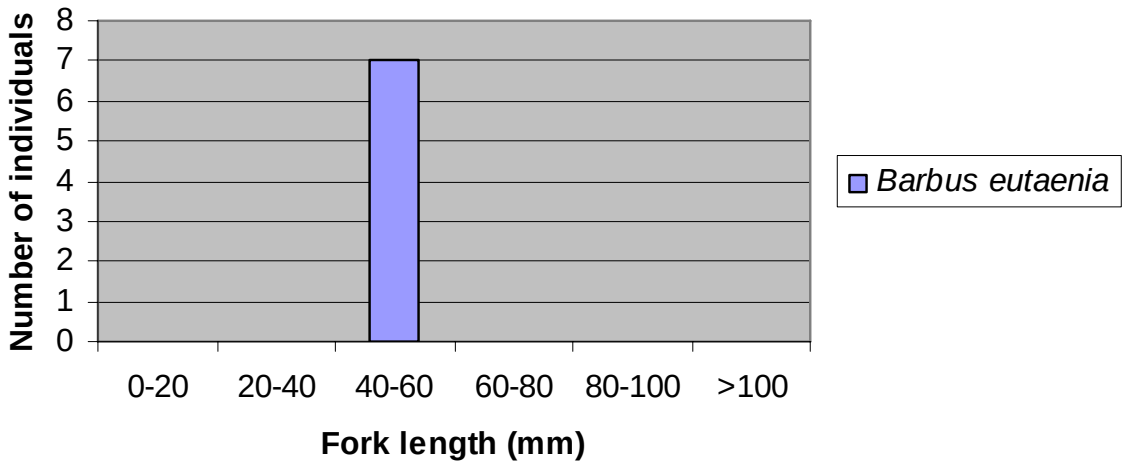
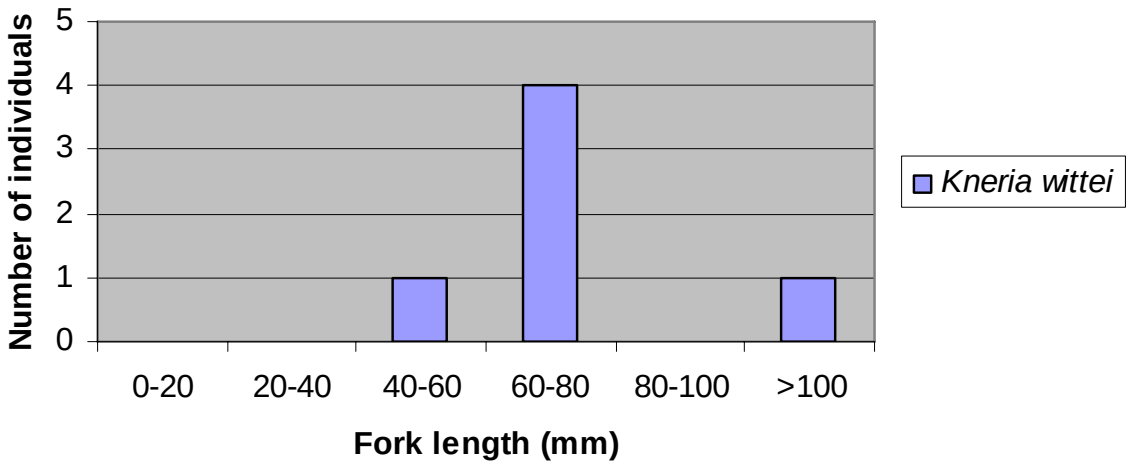


Figure 8 Length Frequency Distribution for Site KONKAUS



APPENDIX B3.3-VI

CALCULATED RISK-BASED GUIDELINE VALUES

Screening value = (oral reference dose x body weight) / consumption rate

Where:

- Oral reference dose = chemical specific, as provided by US EPA (2005) and RAIS (2006).
- Body weight = mean body weight, using the standard body weight of 70 kilograms.
- Consumption rate = mean daily consumption rate of fish tissue as designated for subsistence fishermen (142.4 grams per day).

Table 1 Risk-based Screening Values

	Oral Reference Dose (mg/kg/d)	Calculated Screening Value (mg/kg)
antimony	4.00E-04	0.197
arsenic	3.00E-04	0.147
barium	2.00E-01	98.315
beryllium	2.00E-03	0.983
boron	2.00E-01	98.315
cobalt	2.00E-02	9.831
copper	4.00E-02	19.663
iron	3.00E-01	147.472
lithium	2.00E-02	9.831
manganese	1.40E-01	68.820
mercury	1.00E-04	0.049
nickel	2.00E-02	9.831
phosphorus, white	2.00E-05	0.010
selenium	5.00E-03	2.458
silver	5.00E-03	2.458
stromtium, stable	6.00E-01	294.944
thallium	7.00E-05	0.034
tin	6.00E-01	294.944
titanium	4.00E+00	1,966.292
uranium, soluble salts	3.00E-03	1.475
vanadium	1.00E-03	0.492
zinc	3.00E-01	147

APPENDIX B3.3-VII

ANALYSIS OF FISH TISSUE

Project **Metals in Fish Tissue**

Client **Ecosun**

Date **28/02/2006**

Report No **16797** **Values in black : ug/l (liquid)**

Sample Series **1176-1181** **Values in red : mg/kg (dry solid)**

Analyses **ICP-MS Scan**

1:1
Perchloric:Nitric

Lab #	1176	1177	1178	1179	1180	1181	
Sample ID	Barbus 1	Barbus 2	Barbus 3	Barbus 4	Barbus 5	Barbus 6	
Sample Dry Mass	1.1441	1.0960	0.6414	1.0909	1.8155	2.1004	
Volume	100	100	100	100	100	100	
Mass (g/l) (ppb)	11.4410	10.9600	6.4140	10.9090	18.1550	21.0040	Mean value
Li (1)	23	39	26	12	41	109	41.60
Li	2.0	3.5	4.1	1.1	2.2	5.2	3.02
Be (1)	0	2	1	0	2	1	0.76
Be	0.0	0.1	0.1	0.0	0.1	0.0	0.06
B (100)	702	681	738	763	844	1005	788.76
B	61.3	62.1	115.1	69.9	46.5	47.8	67.14
Na (1)	58412	55392	44076	59404	106457	95621	69893.70
Na	5105.5	5054.0	6871.9	5445.4	5863.8	4552.5	5482.18
Mg (1)	30973	32202	20593	24037	52987	61807	37099.80
Mg	2707.2	2938.2	3210.6	2203.4	2918.6	2942.6	2820.09
Al (1)	7033	10267	6794	393	12105	46812	13900.67
Al	614.7	936.8	1059.2	36.0	666.7	2228.7	923.71
Si (100)	1725	2254	1783	976	2781	3458	2162.55
Si	150.8	205.6	278.0	89.4	153.2	164.6	173.59
P (100)	454877	401659	306487	401445	755277	658774	496419.98
P	39758.5	36647.7	47784.0	36799.5	41601.6	31364.2	38992.59
K (10)	154500	142227	96684	160996	265391	247312	177851.56
K	13504.0	12977.0	15073.8	14758.1	14618.1	11774.5	13784.25
Ca (10)	551715	472871	357177	478687	884801	723120	578061.79
Ca	48222.6	43145.2	55687.1	43880.0	48735.9	34427.7	45683.09
Sc (1)	7	7	7	5	9	15	8.29
Sc	0.6	0.6	1.0	0.5	0.5	0.7	0.66

Ti (1)	983	905	649	802	1620	1609	1094.49
Ti	85.9	82.5	101.2	73.5	89.2	76.6	84.83
V (1)	813	789	822	795	823	799	806.73
V	71.1	72.0	128.1	72.9	45.3	38.0	71.23
Cr (1)	81	75	55	65	109	135	86.69
Cr	7.1	6.9	8.6	5.9	6.0	6.4	6.82
Mn (1)	325	1572	527	138	774	7958	1882.39
Mn	28.4	143.5	82.1	12.6	42.6	378.9	114.70
Fe (1)	8254	12124	8244	367	14123	45392	14750.56
Fe	721.4	1106.2	1285.3	33.6	777.9	2161.1	1014.26
Co (1)	86	167	94	33	158	523	176.74
Co	7.5	15.2	14.6	3.0	8.7	24.9	12.32
Ni (1)	0	0	0	0	0	0	0.00
Ni	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Cu (1)	663	2388	922	145	2596	7586	2383.42
Cu	58.0	217.9	143.8	13.2	143.0	361.2	156.18
Zn (1)	2674	2384	2447	2251	3993	2569	2719.59
Zn	233.7	217.6	381.4	206.4	219.9	122.3	230.21
Ga (1)	9	9	7	6	11	18	9.92
Ga	0.7	0.8	1.1	0.6	0.6	0.9	0.77
Ge (1)	2	2	2	1	2	1	1.67
Ge	0.2	0.2	0.3	0.1	0.1	0.1	0.15
As (1)	311	265	303	316	300	242	289.55
As	27.2	24.1	47.3	29.0	16.5	11.5	25.94
Se (10)	8	13	5	13	26	19	14.03
Se	0.7	1.2	0.7	1.2	1.4	0.9	1.03
Br (100)	0	0	0	0	0	0	0.00
Br	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Rb (1)	145	115	91	123	196	238	151.31
Rb	12.6	10.5	14.2	11.2	10.8	11.4	11.79
Sr (1)	890	784	586	749	1449	1126	930.71
Sr	77.8	71.6	91.3	68.7	79.8	53.6	73.80
Y (1)	2	3	2	0	4	12	3.97
Y	0.2	0.3	0.4	0.0	0.2	0.6	0.27
Zr (1)	0	0	0	0	0	0	0.00
Zr	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Nb (1)	0	0	0	0	0	1	0.17
Nb	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Mo (1)	0	0	0	0	0	0	0.00
Mo	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Ru (1)	0	0	0	0	0	0	0.09

Ru	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Rh (1)	0	0	0	0	0	0	0.11
Rh	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Pd (1)	0	0	0	0	0	0	0.00
Pd	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Ag (1)	0	0	10	0	0	0	1.71
Ag	0.0	0.0	1.6	0.0	0.0	0.0	0.27
Cd (1)	0	0	0	0	0	0	0.00
Cd	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Sn (1)	1	1	1	1	1	2	1.18
Sn	0.1	0.1	0.2	0.1	0.1	0.1	0.10
Sb (1)	1	1	1	1	1	1	1.22
Sb	0.1	0.1	0.2	0.1	0.1	0.1	0.11
Te (1)	0	0	0	0	2	0	0.30
Te	0.0	0.0	0.0	0.0	0.1	0.0	0.02
I (100)	8	7	8	7	7	7	7.35
I	0.7	0.7	1.3	0.6	0.4	0.3	0.66
Cs (1)	3	3	2	2	4	7	3.86
Cs	0.3	0.3	0.4	0.2	0.2	0.3	0.29
Ba (1)	1540	1375	1375	1303	1937	2411	1656.75
Ba	134.6	125.4	214.4	119.4	106.7	114.8	135.88
La (1)	8	13	8	0	13	44	14.32
La	0.67	1.18	1.30	0.00	0.70	2.11	0.99
Ce (1)	19.04	30.40	17.69	0.00	23.20	99.61	31.66
Ce	1.66	2.77	2.76	0.00	1.28	4.74	2.20
Pr (1)	1.85	3.37	1.61	0.05	3.16	9.89	3.32
Pr	0.16	0.31	0.25	0.00	0.17	0.47	0.23
Nd (1)	7.02	12.13	6.63	0.00	11.97	38.22	12.66
Nd	0.61	1.11	1.03	0.00	0.66	1.82	0.87
Sm (1)	1.23	2.00	1.15	0.00	1.45	7.09	2.15
Sm	0.11	0.18	0.18	0.00	0.08	0.34	0.15
Eu (1)	0.60	0.53	0.43	0.35	0.96	1.67	0.76
Eu	0.05	0.05	0.07	0.03	0.05	0.08	0.06
Gd (1)	1.22	1.89	1.37	0.00	2.17	7.06	2.29
Gd	0.11	0.17	0.21	0.00	0.12	0.34	0.16
Tb (1)	0.15	0.29	0.14	0.00	0.30	0.91	0.30
Tb	0.01	0.03	0.02	0.00	0.02	0.04	0.02
Dy (1)	0.57	1.01	0.59	0.04	1.16	3.97	1.22
Dy	0.05	0.09	0.09	0.00	0.06	0.19	0.08
Ho (1)	0.14	0.18	0.18	0.01	0.24	0.79	0.26
Ho	0.01	0.02	0.03	0.00	0.01	0.04	0.02

Er (1)	0.20	0.01	0.11	0.00	0.43	1.38	0.36
Er	0.02	0.00	0.02	0.00	0.02	0.07	0.02
Tm (1)	0.05	0.06	0.05	0.00	0.09	0.25	0.08
Tm	0.00	0.01	0.01	0.00	0.00	0.01	0.01
Yb (1)	0.14	0.35	0.27	0.00	0.36	1.24	0.39
Yb	0.01	0.03	0.04	0.00	0.02	0.06	0.03
Lu (1)	0.04	0.09	0.05	0.00	0.08	0.17	0.07
Lu	0.00	0.01	0.01	0.00	0.00	0.01	0.01
Hf (1)	0.02	0.13	0.00	0.00	0.50	0.72	0.23
Hf	0.00	0.01	0.00	0.00	0.03	0.03	0.01
Ta (1)	0.02	0.00	0.00	0.00	0.00	0.05	0.01
Ta	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W (1)	0.00	0.08	0.00	0.00	0.00	0.00	0.01
W	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Re (1)	0.05	0.08	0.08	0.08	0.08	0.08	0.08
Re	0.00	0.01	0.01	0.01	0.00	0.00	0.01
Os (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Os	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ir (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pt (1)	1.96	1.18	1.70	1.64	1.18	0.84	1.42
Pt	0.17	0.11	0.27	0.15	0.06	0.04	0.13
Au (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Au	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hg (1)	0.78	0.00	0.00	0.93	0.34	0.00	0.34
Hg	0.07	0.00	0.00	0.09	0.02	0.00	0.03
Tl (1)	0.23	0.25	0.12	0.11	0.29	0.35	0.23
Tl	0.02	0.02	0.02	0.01	0.02	0.02	0.02
Pb (1)	30.50	27.99	27.30	20.38	25.23	38.73	28.36
Pb	2.67	2.55	4.26	1.87	1.39	1.84	2.43
Bi (1)	0.25	0.34	0.33	0.12	0.43	1.22	0.45
Bi	0.02	0.03	0.05	0.01	0.02	0.06	0.03
Th (1)	1.63	2.63	1.77	0.03	2.86	9.80	3.12
Th	0.14	0.24	0.28	0.00	0.16	0.47	0.21
U (1)	0.71	0.87	0.66	0.40	1.33	2.30	1.05
U	0.06	0.08	0.10	0.04	0.07	0.11	0.08

APPENDIX B3.3-VII

ANALYSIS OF FISH TISSUE

Project **Metals in Fish Tissue**

Client **Ecosun**

Date **28/02/2006**

Report No **16797** **Values in black : ug/l (liquid)**

Sample Series **1176-1181** **Values in red : mg/kg (dry solid)**

Analyses **ICP-MS Scan**

1:1
Perchloric:Nitric

Lab #	1176	1177	1178	1179	1180	1181	
Sample ID	Barbus 1	Barbus 2	Barbus 3	Barbus 4	Barbus 5	Barbus 6	
Sample Dry Mass	1.1441	1.0960	0.6414	1.0909	1.8155	2.1004	
Volume	100	100	100	100	100	100	
Mass (g/l) (ppb)	11.4410	10.9600	6.4140	10.9090	18.1550	21.0040	Mean value
Li (1)	23	39	26	12	41	109	41.60
Li	2.0	3.5	4.1	1.1	2.2	5.2	3.02
Be (1)	0	2	1	0	2	1	0.76
Be	0.0	0.1	0.1	0.0	0.1	0.0	0.06
B (100)	702	681	738	763	844	1005	788.76
B	61.3	62.1	115.1	69.9	46.5	47.8	67.14
Na (1)	58412	55392	44076	59404	106457	95621	69893.70
Na	5105.5	5054.0	6871.9	5445.4	5863.8	4552.5	5482.18
Mg (1)	30973	32202	20593	24037	52987	61807	37099.80
Mg	2707.2	2938.2	3210.6	2203.4	2918.6	2942.6	2820.09
Al (1)	7033	10267	6794	393	12105	46812	13900.67
Al	614.7	936.8	1059.2	36.0	666.7	2228.7	923.71
Si (100)	1725	2254	1783	976	2781	3458	2162.55
Si	150.8	205.6	278.0	89.4	153.2	164.6	173.59
P (100)	454877	401659	306487	401445	755277	658774	496419.98
P	39758.5	36647.7	47784.0	36799.5	41601.6	31364.2	38992.59
K (10)	154500	142227	96684	160996	265391	247312	177851.56
K	13504.0	12977.0	15073.8	14758.1	14618.1	11774.5	13784.25
Ca (10)	551715	472871	357177	478687	884801	723120	578061.79
Ca	48222.6	43145.2	55687.1	43880.0	48735.9	34427.7	45683.09
Sc (1)	7	7	7	5	9	15	8.29
Sc	0.6	0.6	1.0	0.5	0.5	0.7	0.66

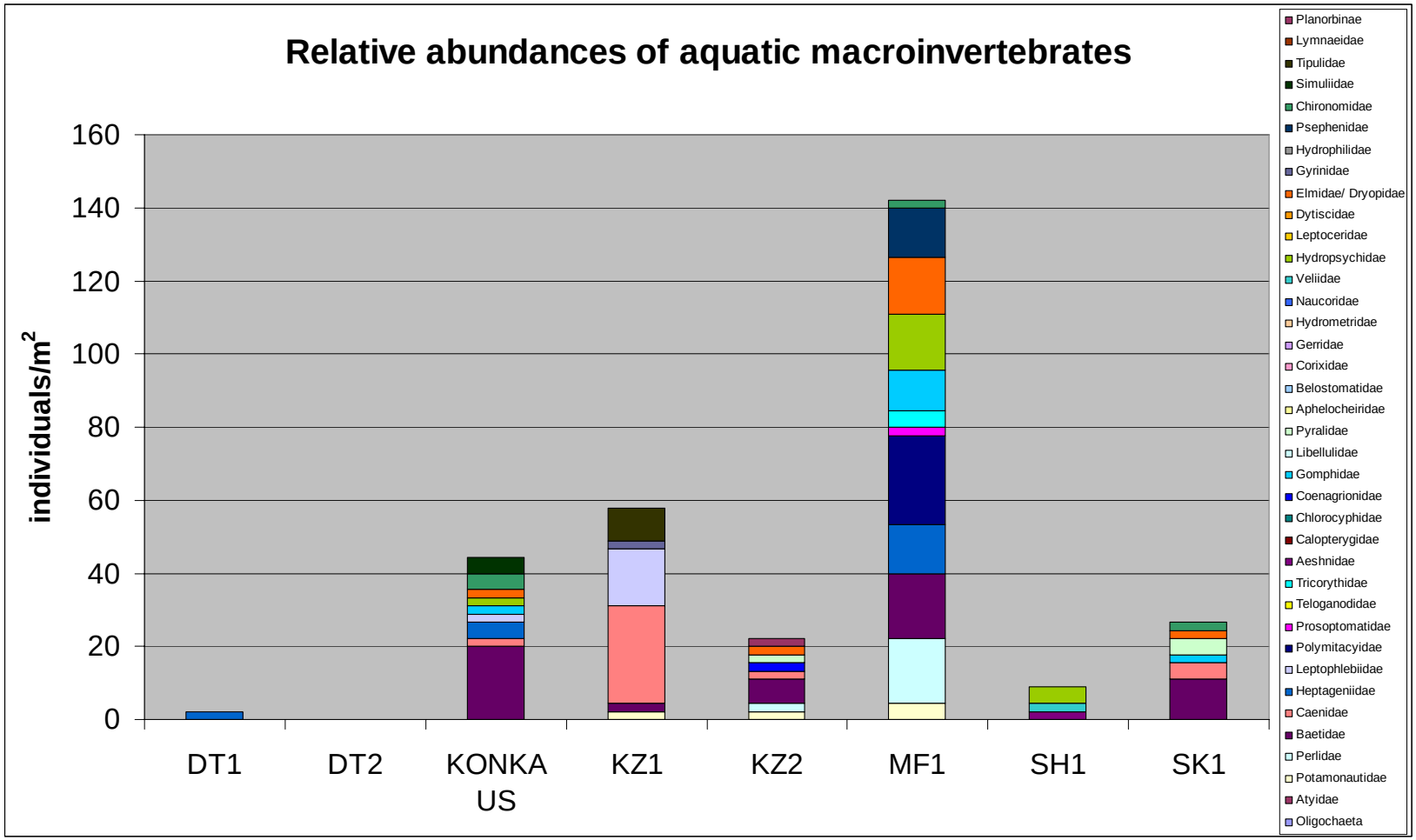
Ti (1)	983	905	649	802	1620	1609	1094.49
Ti	85.9	82.5	101.2	73.5	89.2	76.6	84.83
V (1)	813	789	822	795	823	799	806.73
V	71.1	72.0	128.1	72.9	45.3	38.0	71.23
Cr (1)	81	75	55	65	109	135	86.69
Cr	7.1	6.9	8.6	5.9	6.0	6.4	6.82
Mn (1)	325	1572	527	138	774	7958	1882.39
Mn	28.4	143.5	82.1	12.6	42.6	378.9	114.70
Fe (1)	8254	12124	8244	367	14123	45392	14750.56
Fe	721.4	1106.2	1285.3	33.6	777.9	2161.1	1014.26
Co (1)	86	167	94	33	158	523	176.74
Co	7.5	15.2	14.6	3.0	8.7	24.9	12.32
Ni (1)	0	0	0	0	0	0	0.00
Ni	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Cu (1)	663	2388	922	145	2596	7586	2383.42
Cu	58.0	217.9	143.8	13.2	143.0	361.2	156.18
Zn (1)	2674	2384	2447	2251	3993	2569	2719.59
Zn	233.7	217.6	381.4	206.4	219.9	122.3	230.21
Ga (1)	9	9	7	6	11	18	9.92
Ga	0.7	0.8	1.1	0.6	0.6	0.9	0.77
Ge (1)	2	2	2	1	2	1	1.67
Ge	0.2	0.2	0.3	0.1	0.1	0.1	0.15
As (1)	311	265	303	316	300	242	289.55
As	27.2	24.1	47.3	29.0	16.5	11.5	25.94
Se (10)	8	13	5	13	26	19	14.03
Se	0.7	1.2	0.7	1.2	1.4	0.9	1.03
Br (100)	0	0	0	0	0	0	0.00
Br	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Rb (1)	145	115	91	123	196	238	151.31
Rb	12.6	10.5	14.2	11.2	10.8	11.4	11.79
Sr (1)	890	784	586	749	1449	1126	930.71
Sr	77.8	71.6	91.3	68.7	79.8	53.6	73.80
Y (1)	2	3	2	0	4	12	3.97
Y	0.2	0.3	0.4	0.0	0.2	0.6	0.27
Zr (1)	0	0	0	0	0	0	0.00
Zr	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Nb (1)	0	0	0	0	0	1	0.17
Nb	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Mo (1)	0	0	0	0	0	0	0.00
Mo	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Ru (1)	0	0	0	0	0	0	0.09

Ru	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Rh (1)	0	0	0	0	0	0	0.11
Rh	0.0	0.0	0.0	0.0	0.0	0.0	0.01
Pd (1)	0	0	0	0	0	0	0.00
Pd	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Ag (1)	0	0	10	0	0	0	1.71
Ag	0.0	0.0	1.6	0.0	0.0	0.0	0.27
Cd (1)	0	0	0	0	0	0	0.00
Cd	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Sn (1)	1	1	1	1	1	2	1.18
Sn	0.1	0.1	0.2	0.1	0.1	0.1	0.10
Sb (1)	1	1	1	1	1	1	1.22
Sb	0.1	0.1	0.2	0.1	0.1	0.1	0.11
Te (1)	0	0	0	0	2	0	0.30
Te	0.0	0.0	0.0	0.0	0.1	0.0	0.02
I (100)	8	7	8	7	7	7	7.35
I	0.7	0.7	1.3	0.6	0.4	0.3	0.66
Cs (1)	3	3	2	2	4	7	3.86
Cs	0.3	0.3	0.4	0.2	0.2	0.3	0.29
Ba (1)	1540	1375	1375	1303	1937	2411	1656.75
Ba	134.6	125.4	214.4	119.4	106.7	114.8	135.88
La (1)	8	13	8	0	13	44	14.32
La	0.67	1.18	1.30	0.00	0.70	2.11	0.99
Ce (1)	19.04	30.40	17.69	0.00	23.20	99.61	31.66
Ce	1.66	2.77	2.76	0.00	1.28	4.74	2.20
Pr (1)	1.85	3.37	1.61	0.05	3.16	9.89	3.32
Pr	0.16	0.31	0.25	0.00	0.17	0.47	0.23
Nd (1)	7.02	12.13	6.63	0.00	11.97	38.22	12.66
Nd	0.61	1.11	1.03	0.00	0.66	1.82	0.87
Sm (1)	1.23	2.00	1.15	0.00	1.45	7.09	2.15
Sm	0.11	0.18	0.18	0.00	0.08	0.34	0.15
Eu (1)	0.60	0.53	0.43	0.35	0.96	1.67	0.76
Eu	0.05	0.05	0.07	0.03	0.05	0.08	0.06
Gd (1)	1.22	1.89	1.37	0.00	2.17	7.06	2.29
Gd	0.11	0.17	0.21	0.00	0.12	0.34	0.16
Tb (1)	0.15	0.29	0.14	0.00	0.30	0.91	0.30
Tb	0.01	0.03	0.02	0.00	0.02	0.04	0.02
Dy (1)	0.57	1.01	0.59	0.04	1.16	3.97	1.22
Dy	0.05	0.09	0.09	0.00	0.06	0.19	0.08
Ho (1)	0.14	0.18	0.18	0.01	0.24	0.79	0.26
Ho	0.01	0.02	0.03	0.00	0.01	0.04	0.02

Er (1)	0.20	0.01	0.11	0.00	0.43	1.38	0.36
Er	0.02	0.00	0.02	0.00	0.02	0.07	0.02
Tm (1)	0.05	0.06	0.05	0.00	0.09	0.25	0.08
Tm	0.00	0.01	0.01	0.00	0.00	0.01	0.01
Yb (1)	0.14	0.35	0.27	0.00	0.36	1.24	0.39
Yb	0.01	0.03	0.04	0.00	0.02	0.06	0.03
Lu (1)	0.04	0.09	0.05	0.00	0.08	0.17	0.07
Lu	0.00	0.01	0.01	0.00	0.00	0.01	0.01
Hf (1)	0.02	0.13	0.00	0.00	0.50	0.72	0.23
Hf	0.00	0.01	0.00	0.00	0.03	0.03	0.01
Ta (1)	0.02	0.00	0.00	0.00	0.00	0.05	0.01
Ta	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W (1)	0.00	0.08	0.00	0.00	0.00	0.00	0.01
W	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Re (1)	0.05	0.08	0.08	0.08	0.08	0.08	0.08
Re	0.00	0.01	0.01	0.01	0.00	0.00	0.01
Os (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Os	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ir (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ir	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pt (1)	1.96	1.18	1.70	1.64	1.18	0.84	1.42
Pt	0.17	0.11	0.27	0.15	0.06	0.04	0.13
Au (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Au	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hg (1)	0.78	0.00	0.00	0.93	0.34	0.00	0.34
Hg	0.07	0.00	0.00	0.09	0.02	0.00	0.03
Tl (1)	0.23	0.25	0.12	0.11	0.29	0.35	0.23
Tl	0.02	0.02	0.02	0.01	0.02	0.02	0.02
Pb (1)	30.50	27.99	27.30	20.38	25.23	38.73	28.36
Pb	2.67	2.55	4.26	1.87	1.39	1.84	2.43
Bi (1)	0.25	0.34	0.33	0.12	0.43	1.22	0.45
Bi	0.02	0.03	0.05	0.01	0.02	0.06	0.03
Th (1)	1.63	2.63	1.77	0.03	2.86	9.80	3.12
Th	0.14	0.24	0.28	0.00	0.16	0.47	0.21
U (1)	0.71	0.87	0.66	0.40	1.33	2.30	1.05
U	0.06	0.08	0.10	0.04	0.07	0.11	0.08

APPENDIX B3.3-VIII

AQUATIC MACROINVERTEBRATE TAXA ABUNDANCE


Relative abundances of aquatic macroinvertebrates
individuals/m2
160
140
120
100
80
60
40
20
0
DT1
DT2
KONKA US
KZ1
KZ2
MF1
SH1
SK1
Planorbinae
Lymnaeidae
Tipulidae
Simuliidae
Chironomidae
Psephenidae
Hydrophilidae
Gyrinidae
Elmidae/ Dryopidae
Dytiscidae
Leptoceridae
Hydropsychidae
Veliidae
Naucoridae
Hydrometridae
Gerridae
Corixidae
Belostomatidae
Aphelocheiridae
Pyralidae
Libellulidae
Gomphidae
Coenagrionidae
Chlorocyphidae
Calopterygidae
Aeshnidae
Tricorythidae
Teloganodidae
Prosoptomatidae
Polymitacyidae
Leptophlebiidae
Heptageniidae
Caenidae
Baetidae
Perlidae
Potamonautidae
Atyidae
Oligochaeta

APPENDIX B3.3-IX

ALGAL SPECIES LISTING

BACILLARIOPHYCEAE

Cell dimensions averaged from every frustule measured; size range given only if average cell size too variable.

Achnanthes minutissima Kutzing (10-22µm x 2-4µm)

Cocconeis cf *diminuta* Pantocsek (11µm x 6.6µm)

Cocconeis cf *placentula* Ehrenberg (28µm x 18µm)

Cymbella cf *turgida* (Gregory) Cleve (50-90µm x 9-12µm)

Fragilaria cf *virescens* Ralfs (19µm x 10µm)

Gyrosigma cf *scalproides* (Rabh.) Cleve (55µm x 9µm)

Gyrosigma cf w*ansbeckii* (Donkin) Cleve (104 - 121µm x 15-17µm)

Navicula cf *cincta* (Her) Kutzing (28-39µm x 6µm) NORMAL NAVICULA

Navicula dicephala (Ehren) Smith (21-42µm x 8-13µm)

Navicula cf *exilissima* Grun. (8µm x 2.5µm) TINY FRAG?NAV-dip

Navicula cf *lacustris* Gregory (34µm x 17µm) BROAD NAVI

Navicula lanceolata (Agard) Kutzing (30µm x 6µm)

Navicula cf *peregrina* (Ehr) Kutzing (99µm x 12µm) BIG

Nitzschia cf *amphibia* Grunow (44-55µm x 4µm) NORMAL

Nitzschia cf *navicularis* (De Brebisson) Grunow (48µm x 6µm too narrow) MOt

Nitzschia cf *parvula* Lewis (29µm x 4µm) KINKY SHIM

Rhopalodia gibba (Ehr) Muller (94µm x 23µm) motya

Stauroneis anceps Ehrenberg (35-46µm x 7-12µm) KNOBBED NAVICULA

Surirella ovata Kutzing (48µm x 19µm)

Synedra ulna (Nitzsch) Ehrenberg (72-220µm x 5-7µm)

CHLOROPHYCEAE

Cladophora sp. (fragmented branched filaments 4-12 cells in length, cells 22-43µm x 7- 14µm)

CYANOPHYCEAE

Cylindrospermopsis sp. 1 (no sheath, cells cylindrical 2µm x 7µm, terminal cell conical, scattered aerotopes)

Lyngbya sp. 1 (thick sheath, pointed apical cell, discoidal cells 9.6µm in diameter, clustered attached trichomes up to 400µm in length, numerous large akinetes found ensheathed and free-floating)

Lyngbya sp. 2 (firm sheath, rounded apical cell, discoidal cells 3.2-4.8µm in diameter)

Lyngbya sp 3. (ensheathed, discoidal cells 2.4µm in diameter, convex apical cell)

Pseudoanabaena sp. 1 (no sheath, cells tend to cuboidal, cell size 1.1-2.4µm, apical cell almost flat, no visible heterocytes or akinetes) SMALL OSCIL

Tychonema sp. 1 (no sheath, cells almost cuboidal, cell size 4.2µm, apical cell flat–to-lightly convex, cells containing large granules) = LARGE OSCILL

Phormidium sp. (sheath fine-absent, cells cuboidal-cylindrical, cell width 1.1µm, apical cell attenuated, may be finely granulated)

Planktothrix sp. (sheath absent, cells short cylindrical, 1.6-2.5µm, apical cell lightly convex, grey-transparent, scattered granulation)

APPENDIX B3.3-X

WHOLE EFFLUENT TOXICITY TESTING LABORATORY REPORT

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

Emergency number: 082 928 2344

Environmental Laboratory

CK 2001/011843/23

T0228

COVER PAGE

Client details

A1.1.1.1 Requested by:	**A1.1.1.2 Veronica Rall**
A1.1.1.3 Company Name	ECOSUN cc
A1.1.1.4 Address:	P.O. Box 2131, Florida Hills, 1716
A1.1.1.5 Telephone number:	(011) 672 0666
Fax number:	(011) 672 0008
Cell:	082 809 2210
E-mail:	veronica@ecosun.co.za

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

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A2

Analyses requested:	**Sample reference number(s):**
15 and 30 minute *Vibrio fischeri* bioluminescent screening test	06/44
72h *Selenastrum capricornutum* growth inhibition screening test	06/44
24 and 48h *Daphnia pulex* acute toxicity screening test	06/44
96h *Poecilia reticulata* acute toxicity screening test	06/44

Enclosed please find Test report number 2006/8. The results relate only to the sample(s) tested. ECOSUN Environmental Laboratory does not accept responsibility for any matters arising from the further use of the results. No part of the report may be quoted in isolation of the rest of the text without the written permission of ECOSUN Environmental Laboratory. This report supersedes results reported by telephone or fax.

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

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Please contact the laboratory if further information is required. We look forward to being of assistance to you.

Yours faithfully

Veronica Rall

(Quality Manager)

Date

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

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TEST REPORT

1. Introduction to tests requested

License number:	Unknown
License toxicity testing requirements:	Unknown
Plant name and /or location:	Unknown
Name of receiving water body(s) up and downstream of discharge:	Unknown

2. Sampling

2.1 Water sample

Sampling point(s):	***Sample reference name(s):***	***Sample reference number(s):***
	Congo water	06/44

Sampling technique: Grab

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South Africa

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Collection date and time of sample(s):	Unknown
Name of sampler(s):	J. Rall
Description of sample container(s):	1.5l plastic bottle
Date and time of sample receipt at testing laboratory:	3.02.2006, time Unknown
Comments:	The sample was older than 72hrs

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

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3. Methodology

3.1 Test conditions

All toxicity tests were conducted in environmental controlled rooms using standard techniques.

3.2 Quality assurance

The ECOSUN Environmental Laboratory's Policy and Quality Manual, intended to support and maintain all aspects of the Quality System, is based on the application of ISO/IEC 17025. The following Quality Assurance information would be made available on request: in-house reference toxicant test data and control charts, Proficiency Testing Scheme test data, additional lot and batch numbers and raw toxicity test data.

3.3 Toxicity units

The toxicity unit (TUa) for each test performed is calculated as 100% (full strength effluent expressed as percentage) divided by the effective concentration or LC50 expressed as percentage sample dilution (e.g. *Daphnia pulex* and *Poecilia reticulata* acute toxicity tests) and EC50 (e.g. *Vibrio fischeri* bioluminescent test and *Selenastrum capricornutum* growth inhibition test) (Tonkes & Baltus, 1997).

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

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3.4 *Vibrio fischeri* bioluminescent test, EN ISO 11348-3 (1998)

Test endpoint:	% growth inhibition relative to control and/or EC20 and EC50 values
Exposure period:	15 and 30 minutes
Deviation from reference method:	None
Test chamber type:	Polystyrene cuvettes for luminometer
Test sample volume:	500 ul
Number of replicates per sample:	2
Test temperature:	20-22°C
Test organism species name and source:	Lyophilized *Vibrio fischeri* luminescent bacteria (NRRL B-11177)
Luminescent measurement:	Luminoskan TL, Hygiene Monitoring System
Reagent batch number:	VF1303
Statistical methods used:	Bio Orbit software

3.5 Selenastrum capricornutum growth inhibition test, OECD Guideline 201 (1984)

Test endpoint:	% growth inhibition relative to control and/or EC20 and EC50 values
Exposure period:	72h
Deviation from reference method:	None
Test chamber type:	10 cm path length long cells
Test sample volume:	25 ml
Number of replicates per sample:	3
Test temperature:	21-25°C
Test organism species name and source:	*Selenastrum capricornutum,* Printz algae beads (CCAP 278/4 Cambridge, UK)
OD measurement:	Jenway 6300 Spectrophotometer
Test organism source:	CCAP 278/4 Cambridge, UK
Algal beads batch number:	SC 021003
Statistical methods used:	Regression analyses

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

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Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

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3.6 *Daphnia pulex* acute toxicity test, US EPA (1993)

Test endpoint:	% mortality and/or LC10 and LC50 values
Exposure period:	24 and 48h
Deviation from reference method:	None
Test chamber type:	50 ml disposable polystyrene cups
Test sample volume:	25 ml
Number of test organisms per chamber:	5
Number of replicates per sample:	4
Feeding frequency:	None
Test temperature:	21±2°C
Test organism species name, age and source:	*Daphnia pulex,* less than 24h old obtained from in-house cultures
Statistical methods used:	Probit software

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

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Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

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3.7 *Poecilia reticulata* acute toxicity test, US EPA (1996)

Test endpoint:	% mortality and/or LC10 and LC50 values
Exposure period:	96h
Deviation from reference method:	None
Test chamber type:	250 ml disposable polystyrene cups
Test sample volume:	200 ml
Number of test organisms per chamber:	5
Number of replicates per sample:	2
Feeding frequency:	None
Test temperature:	21±2°C
Test organism species name, age and source:	*Poecilia reticulata,* 7-21 days obtained from in-house cultures
Statistical methods used:	Probit software

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

Emergency number: 082 928 2344

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4. Results

Physical and chemical data		Method number	A2.1.1.1 Sample reference number(s) and description
			06/44
pH		"Not SANAS Accredited"	6.22
Total dissolved solids (ppm)			20
Dissolved oxygen concentration (mg/l)			4.04
Total residual chlorine (present✓/not present ×)			×
Temperature (˚C)			20
Toxicity test results			
15 minute *Vibrio fischeri* bioluminescent screening test (average % inhibition (-) or stimulation (+))		EN ISO, 1998 (11348-3)	-17
15 minute *Vibrio fischeri* bioluminescent definitive test (% sample concentration)	EC20 value	EN ISO, 1998 (11348-3)	NP
	EC50 value		
30 minute *Vibrio fischeri* bioluminescent screening test (average % inhibition (-) or stimulation (+))		EN ISO, 1998 (11348-3)	-14

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

Emergency number: 082 928 2344

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30 minute *Vibrio fischeri* bioluminescent definitive test (% sample concentration)	EC20 value EC50 value	EN ISO, 1998 (11348-3)	NP
30 minute *Vibrio fischeri* bioluminescent test toxicity unit (TUa)		EN ISO, 1998 (11348-3)	<1
72h *Selenastrum capricornutum* growth inhibition screening test (% growth inhibition (-) or growth stimulation (+))		OECD, 1984 (Guideline 201)	-7
72h *Selenastrum capricornutum* growth inhibition definitive test (% sample concentration)	EC20 value EC50 value	OECD, 1984 (Guideline 201)	NP
72h *Selenastrum capricornutum* growth inhibition test toxicity unit (TUa)		OECD, 1984 (Guideline 201)	<1

NP Analysis not performed due to limited toxicity in screening test.

Veronica Rall

(Quality Manager)

Date

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

Emergency number: 082 928 2344

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4. Results continue

Toxicity test results		Method number	**Sample reference number(s) and description**
			06/44
24h *Daphnia pulex* acute toxicity screening test (% mortality)		US EPA, 1993 (600/4-90/027F)	5
24h *Daphnia pulex* acute toxicity definitive test (% sample concentration)	LC10 value LC50 value	US EPA, 1993 (600/4-90/027F)	NP
48h *Daphnia pulex* acute toxicity screening test (% mortality)		US EPA, 1993 (600/4-90/027F)	5
48h *Daphnia pulex* acute toxicity definitive test (% sample concentration)	LC10 value LC50 value	US EPA, 1993 (600/4-90/027F)	NP

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South Africa

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48h *Daphnia pulex* acute toxicity test toxicity unit (TUa)		US EPA, 1993 (600/4-90/027F)	<1
96h *Poecilia reticulata* acute toxicity screening test (% mortality)		US EPA, 1996 (712-C-96-118)	0
96h *Poecilia reticulata* acute toxicity definitive test (% sample concentration)	LC10 value LC50 value	US EPA, 1996 (712-C-96-118)	NP
96h *Poecilia reticulata* acute toxicity test toxicity unit (TUa)		US EPA, 1996 (712-C-96-118)	<1

NP Analysis not performed due to limited toxicity in screening.

Veronica Rall

(Quality Manager)

Date

P O Box 2131, Florida Hills, 1716

25 Main Avenue, Florida, 1709

South Africa

Tel (011) 672-0666
Fax (011) 672-0008

e-mail: veronica@ecosun.co.za

Emergency number: 082 928 2344

Environmental Laboratory

CK 2001/011843/23

5. Additional requirements or comments:

None

Any queries regarding the results should be lodged with Veronica Rall within 14 days from the date of this report. The samples cannot be retained from the date of this report. If any queries relating to the results associated with these samples are received, then re-sampling will have to take place.

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APPENDIX B4.1-I

SOCIO-ECONOMIC BASELINE REPORT
TFM CONCESSION AREA

Groupe d'Étude des Populations Forestières Équatoriales
7 Quai Voltaire, 75007 PARIS - France
Tel. 33 1 40 79 34 24 ou 33 1 40 79 38 15 - Fax 33 1 40 79 38 15
e-mail bahuchet@mnhn.fr

TENKE – FUNGURUME MINING SARL (TFM)

Socio-Economic Baseline Report

TFM concession area

Tenke Fungurume

Democratic Republic of the Congo

A report by

Dr. George KOPPERT Ph.D.

In collaboration with

Linda HAVERS (Golder Associates)
Julienne KITOTO KATENDELA
Albert KIBILA KASSONGO
Florent SAHATO WA KALUMBA
Jerry KOLONJI WA MPOYO
Lydie NGOIE SOMWE
Frederic GIOVANNETTI

May 2006

CONTENTS

ABBREVIATIONS AND LOCAL TERMS USED

25x25	The standard measure for a plot of agricultural land is 25 x 25 m^2. People also often use hectares to describe the size of the land.
CdG	Chef de Groupement, Traditional authority who governs the village and land chiefs in almost the entire project area.
CdT	Chef de Terre, Land Chief, traditional keeper of the land.
Contract	In local terms, contracted labor, in agriculture for a 25 x 25 m^2 plot of land.
Croix rouge	Local people who have received some basic health training through the Red Cross.
DCA	Direct Concession Area (Initial planned project footprint).
DRC	Democratic Republic of the Congo
Fc	Franc congolais, Congolese francs. At the time of the study the rate varied between 430 and 450 Fc for a US dollar.
GP	Good Practice
IFC	International Finance Corporation, Washington, USA
Kapita	Chief of a hamlet, of a lower grade than a village chief or a land chief.
Kimbalama	Second (mid-rainy season) crop of usually beans.
Kinyanga	Marshland crops (cultures maraîchères).
Meka	Standard measure for cereals, beans and other agricultural products. Weighs approximately 2.6-2.8 kg.
PRA	Participatory Rural Appraisal
Q&A	Questions and Answers session
RDC	République Démocratique du Congo
SE	Socioeconomic (as in SE survey)
SMTF	Société Minière Tenke – Fungurume, predecessor of TFM
SNCC	Societé Nationale des Chemins de fer du Congo
STD/STI	Sexually Transmitted Diseases, Sexually Transmitted Infections
TFM	Tenke Fungurume Mining
Trabeco	Traverses en Béton du Congo: Concrete railway sleepers factory in Fungurume.

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1 INTRODUCTION

1.1 Scope of the Report

Baseline surveys are used to characterize existing socioeconomic conditions in the project area, setting the stage for the impact assessment and mitigation action planning phases of the Environmental and Social Impact Assessment (ESIA). Data are used to address the key issues identified in the scoping phase of the study and reflected in the Terms of Reference:

Issue No. 1: Physical displacement of TFM area residents from the active mining operations and required safety zones around the mine site

Issue No. 2: Loss of areas used for agriculture and gathering (e.g., wood collection or charcoal production) due to exclusion from active mining and safety zones at Kwatebala

Issue No. 3: Loss of other revenue sources, including those derived from illegal heterogenite mining, as exclusion zones are established and enforced around Kwatebala and other mineralized areas of interest

Issue No. 4: Effects from an influx of migrants to the TFM area, anticipated as a public response to perceived economic opportunity, leading to a number of issues including the following:

- Increased competition for agricultural land and other natural resources.
- Inflation and resulting social tension due to economic disparities.
- Increased social pathologies such as crime and prostitution.
- Decreased access to existing services and infrastructure.

Issue No. 5: Increased risk of sexually transmitted diseases (STDs) including HIV/AIDS as a result of increased movement through the project area, especially from truck traffic

Issue No. 6: Economic marginalization of resident population if skilled labor and professional positions are assigned to a better educated, healthier group of non-resident nationals

The baseline survey methodologies generally conform to the recommendations of the following regulatory and policy guidance documents:

- DRC Mining Regulations of 2003, Annex IX, Article 38
- International Finance Corporation's (IFC's) Performance Standards and supporting Good Practice (GP) documents.

The approach to the surveys was based on a multi-technique method: five different survey methods were used to collect the socio-economic baseline data targeted:

- Quantitative household survey (Subtask 1.1).
- Participatory rural appraisal (PRA) (Subtask 1.2).
- Focus group discussions (Subtask 1.3).
- Key-informant interviews (Subtask 1.4).
- Village profiles (Subtask 1.5).

Each method offers a distinct perspective on the socioeconomic conditions in the TFM project area.

Forty-one Villages and hamlets are found in the rural portions of the TFM concession and its immediate surroundings, which together with the three urban areas of Lukotola, Tenke and Fungurume collectively form the primary study area for the social sciences tasks and component baseline surveys (Figure 2).

1.2 Resources Used for the Surveys

The survey used the following resources:

- One expatriate anthropologist.
- Five university-trained Congolese enumerators with experience in village studies and trained in one or more of the following fields: social studies, agriculture, community development issues, linguistics, etc.
- Locally hired guides for each of the anthropologist and enumerators from the village communities who would introduce the enumerators but not sit in with the individual interviews.
- Two four-wheel drive (4WD) vehicles.

The language almost exclusively used during the survey was Swahili, the language that is most often spoken in the region, which has many ethnic groups, next to the native languages spoken at home.

Typically, a village would be contacted and a meeting organized in the following hours. During this meeting the current status, and the calendar of the project would be explained to the population, followed by its impact on employment, the proposed handling of compensation issues in case of project-caused damage, and a discussion on the impact of the project on the nation, the province and the local population through induced economic development and a long-term development program financed by the Company.

1.3 Timing of the Survey

The study was conducted between November 2005 and February 2006. It started only a few days after the official contract between the Congolese authorities and TFM had been signed. At the start of the study, the informal mining activities in the area had been stopped, and most non-local artisanal miners had left the concession, except for the Pumpi area.

The data obtained in the study[1] reflect generally the situation at the very beginning of the mining project, before any employment, economic development or changes in road infrastructure had taken place.

Villages in the Pumpi area have only been surveyed in April 2006, when the informal artisanal miners had left the area.

[1] Just before the survey, the informal mining had had an important effect on the villages. However, since the eviction of the miners was executed in, what the villagers considered to be a decent manner, and the hope that the TFM mining project will improve living conditions is high, this issue did not hamper the survey. Illegal mining was often part of the discussions, and is treated in various sections of this and the village report.

2 METHODOLOGY

2.1 Overview

The methodology applied mixes the benefits of qualitative and quantitative interviews. The socio-economic survey not only addresses the socio-economic aspects but also includes results of consultations in its approach, as information from the project to the villages is exchanged against information given by the villages to the project.

All the villages in the direct concession area (DCA, defined subsequently) have been visited, all households identified, an unbiased sample of a fixed proportion of families was identified and all families thus chosen have been interviewed. The approach allows, with certain limitations, quantitative baseline data to be obtained that are usable for future analyses and reference.

The multi-layered approach (summarized below) was applied to each village:

1. Identification of all the households within the limits of the village[2].
2. Quantitative survey questionnaire (20 questions) administered in one out of five households in the villages, and more than 100 in each urban area[3].
3. Detailed questionnaires on composition of the family and activities of its members in one out of two households.
4. AIDS awareness questionnaires among a target group of men and women between 15-49 years old, where female assistants interviewed women and male assistants interviewed men.
5. A description of the main project characteristics: calendar, issues concerning employment, compensation, resettlement, and development followed by a question and answer (Q&A) session.
6. A wide-ranging discussion on village socio-economic issues during a meeting with male and female villagers. The discussions were based on a standard interview guide, but also addressed specific extra issues in a participatory rural appraisal (PRA) approach. In this way many different topics have been addressed in at least two or more villages. The duration of these interviews was at least 2-4 hours. In smaller villages, and in those less directly impacted by the project, trained team members conducted these discussions.
7. Within the direct footprint a sample of agricultural fields was chosen and within these areas, farmers identified their main activities and practices.

2.2 Sampling Method

The sampling method was designed to obtain a statistically valid and unbiased cross section of the population. The underlying assumption was that with an exhaustive count of the number of

[2] As the survey took place in the rainy season, seasonal migration for agricultural purposes was observed. People residing within the borders of the village at the time of interview would be asked whether or not they considered themselves seasonal transhumant farmers or year-round residents. Those who lived in the field, and did not have a house in the village, have only been included in the villages or urban areas where their main residence is located.

[3] The aim was to obtain at least 100 questionnaires in both Tenke and Fungurume, which would allow valid comparisons between both towns as well as to measure development. In the end, the sample size was higher than expected, due mainly to the presence of more villages in the area than foreseen. The important number of questionnaires in Lukotola (65) has allowed us to defend the option of including this village with the urban rather than with the rural areas.

households, and an unbiased sample of these households, both the variation within the sample could be described, and the results considered valid for the whole region.

- Sampling density in the rural villages was one out of five households, which, based on the initial estimates in the terms of reference (TOR) would result in approximately 150-200 questionnaires.
- The objective was to obtain at least 100 questionnaires in both Tenke and Fungurume, which would allow valid comparisons to be made between both towns, and for levels of development to be measured and compared.
    - The validity of initial estimations in the TOR could not be verified, and an initial sample of 1/25 was drawn in Fungurume, but as the town appeared too big, it was reduced to 1/50 after the first neighborhood (quartier) was completed.
    - In Tenke, a sample of 1/10 households was drawn.
    - In the small villages (< 50 households) directly near the project footprint, a sample of 2/5 was chosen.

Table 1 below presents the final sample that was drawn for each area/community[4]:

Table 1. – Questionnaires Applied in the Study Area.

Questionnaire		Rural	Tenke	Fungurume	Total
household baseline questionnaire	questionnaire étude de référence	403	158	143	704
identified households	nombre de ménages identifiés	2,669	1,770	5,220	9,659
detailed questionnaires	questionnaires détaillés	144	80	65	289
AIDS awareness questionnaires	questionnaires SIDA	129	23	39	191
village interviews	interviews de village	34	0	0	34
focus group discussions	discussions de groupe	7	3	3	17

In the statistical analysis, all data have been weighted to reflect differences in sampling during the statistical analysis: each rural household was counted for five, each urban household in Lukotola for five, in Tenke for 10 and in Fungurume, by quartier, either 10, 25 or 50.

2.3 Study Area

The study area consists of the urban and rural zones around the main concession area of Kwatebala – Goma – Fungurume. This is the subset of the total concession area, the 'Direct Concession Area' (DCA) that is depicted on maps and drawings in use since 1996. Several regions within the DCA can be defined:

1. The urban sites of Tenke and of Fungurume.
2. The suburban villages of Mpala and Mitumbu bloc (included in the Fungurume sample).
3. The villages along the national highway between Fungurume and Tenke.

[4] Not including the villages surveyed after the month of February in the Pumpi area and around the airport

4. The villages directly between the railroad and the main project area: Mwela Mpande Gare, Kwatebala Gare, the villages between Kasanga and Mulumbu, the villages on the Tenke to Salabwe Road.
5. The northern villages around the quarry and the airport, with Lukotola as a main focus point.

The analysis splits out the rural villages and the three urban sites, the sex of the head of household, and distinguishes between permanent and temporary households.

During further studies, depending on the areas of greatest impact of the project, comparisons can be made through re-analysis of the data using other pertinent distinctions.

2.4 Instruments Used

2.4.1 Quantitative Household Survey

The *Household Baseline Questionnaire* consists of eleven main fields:

1. Demographic data.
2. Education of the children and adults of the household.
3. Profession and actual occupation of adults.
4. History of formal employment of household members.
5. Sources and volume of income, sales, and savings.
6. Agriculture, cattle.
7. Housing and equipment.
8. Health (access to imported medicines, children's diseases, quality of water, actions taken during the treatment of a recent spell of illness).
9. Food consumption through access to animal proteins.
10. Mobility (travel) of the head of households.
11. Negative and positive perceptions towards the mining project.

The questionnaire covers a realm of socio-economic characteristics, and the structuring of the various fields was aimed at addressing simultaneously both synchronically (present stage) and diachronically (evolution over time) dimensions of social life and the development in and around the project area.

The ideal was to apply the questionnaire to both the head of household and his spouse, in order to obtain the best information possible. The questionnaires were filled out, usually in the presence of the head of family or his spouse, with each interview lasting typically about 30 minutes for the main questionnaire, 15 minutes for the detailed demographic and economic questionnaire, and another 15 minutes for the agricultural questionnaire. In case all household members were absent, part of the commonly known information[5] was obtained by asking neighbors.

[5] For example, questions about household composition, children in school, equipment present, and deceased and born persons were asked. No questions concerning income and expenditure were asked to neighbors.

In practice, in 90 percent of the cases either the head of household (40 percent), his spouse (27 percent) or both (23 percent) were present during the interview. In the remaining cases most often an older child of the household (7 percent) a close parent (2 percent) or a neighbor (1 percent) replied to some of the basic and non-private questions.

2.4.2 Detailed Demographic and Economic Questionnaire

This questionnaire was applied to a sub sample of one out of two households, and concerned the detailed demographics of the family (sex, age, main activity, educational level, handicap), labor division between genders, involvement in extractive activities (hunting, gathering, fishing, mining), and household expenditures during the previous period.

2.4.3 Agricultural Questionnaire

The questionnaire was applied for people interviewed in the field and to those that were in potential relocatable areas. It aimed at understanding the occupation of the land people farmed: how, from whom, since when, at what price, during which part of the year, perceived agricultural characteristics of the soil, what part of the family lives in the permanent residence, and what part on the land.

2.4.4 Aids Awareness Questionnaire

The short form included questions about the knowledge about aids (causes, ways to avoid it, ways to recognize it), knowledge and previous use of condoms, and was administered to women and men by interviewers of the same sex.

2.4.5 Village Interview Guide and Participatory Rural Appraisal

The guide was administered in each site in order to collect general socioeconomic background information (not SE index facts) regarding the village. It was completed using *Open-ended interviews of village chiefs and other "key informants"* on the main characteristics of the site, village history, and perceptions about the Project. Often specific questions of interest to the project were developed in at least two different villages.

2.4.6 Key Informant Interviews

Key informant interviews concerned local officials in health, education, missions, government, and agriculture, and followed an open ended questionnaire.

2.4.7 Focus Group Discussions

Focus groups involved men, women, young people and migrants of which, in four sites, representatives were met during meetings that typically lasted 2-3 hours. Groups were usually between 8 and 12 people in size, but the group of elderly locals in Mulumbu consisted of only four men. The two urban sites were Fungurume and Tenke, the directly impacted project site was Mulumbu, and a rural, less impacted site was Kamungu Kitambo. In the urban sites, people active in trade and community were over represented compared to the more common category of people who only engage in subsistence agriculture.

During the meetings, a short explanation of the mining project was followed by a brief introduction of each of the participants, a detailed life history of three members of the focus groups, a discussion on specific issues for the group, and an analysis of major difficulties, individual, community and focus group priorities.

2.5 Socioeconomic Development Index

The questionnaire used is a local adaptation of a questionnaire used in various studies in Cameroon (oil pipeline, hydraulic dam project) and in Chad (new road, oil development project)[6]. In these projects the core questions of the questionnaire allowed for an extremely important distinction between more and less developed regions and towns in the area. In that case the resulting index varied from as high as 20 to as low as 2 (among the local Pygmies). The same index has been calculated in the TFM area, but with new variables added.

In order to obtain an overall index, weighting factors were based on the relative importance of each reply for each question of the questionnaire. Though the choice of a weighting factor is an arbitrary one, it is based on the assumption that each extra (or negative) point means a more (or less) affluent and "developed" household. As long as the same questionnaire and the same weighting indices are used over time and between locations, one can argue that any reproducible index is valid.

Weightings are distributed as follows:

- *Housing*: an aluminum roof yields 2 points, a mud wall 1, mud bricks 2, a partly cemented wall 4, baked bricks 3, a completely cemented wall 6, a partly cemented floor 1, a completely cemented floor 2, and a tiled floor 3.
- *Education:* points are gained according to the school(s) the children attend, with a negative point given in case school-age children do not attend. Similarly points are distributed according to the education level attained by adults.
- *Health:* a mosquito net yields 1 point, the presence of different kinds of latrines yields between 1 and 4 points, purchased medicines between 1 and 3 points depending on where they are purchased.
- *Regular revenue:* valued between 3 points for salary and 1 point for regular outside help, adherence to a savings group gives 1 point, and each item that obtained at least 100,000 Congolese Francs (Fc) of yearly revenue gives 2 points.
- *Equipment, goods and services:* owned items usually get each 1 point, expensive items such as a generator, a motor bike, and a car up to 6 points.
- *Children's health*: The percentage of 0-5 year old children in the total mortality has a weighting factor of $^{-}10$, the prevalence of "*diarrhea since 1 week*", "*fever since 1 week*" and of "*skin diseases*" has, respectively, a weighting factor of $^{-}1$.
- *Extra items taken into account in this study*: Manufactured bed, mattress, meat consumption, possession of cattle, education level of male and female adults in the household have been added in this survey, but do not basically alter the results of the survey.

The prevalence of children's diseases, the mortality rate of children under five, and school attendance are included on the index because they represent good indicators for the quality of life. However, they are not as easily affected by money as other indicators such as housing, furniture, equipment and possessions.

A simplified index using the same questions has been used in other parts of tropical Africa (Cameroon and Chad). See http://www.ulb.ac.be/socio/anthropo/tchad/CoverSEstudies_fichiers/v3_slide0001.htm for the results of the Chad studies.

In order to take into account the characteristics of employment in the DRC, salaried jobs were divided into three different categories: government employment, where salary payment is usually very uncertain, was awarded 1 point, employment in any local society 3 points and employment through an international society 5 points.

2.6 Database

All geographical information has been entered in databases:

1. Geographical information on housing and the quality of housing (material of roof, walls and floors), trades, water points etc.
2. Socio-economic baseline and detailed questionnaire.
3. Agricultural questionnaire.
4. AIDS awareness questionnaire.

The data collected identifies people by name of head of the family for the baseline and agricultural survey.

3 GEOGRAPHICAL PRESENTATION OF THE AREA

3.1 Overview

The area is located in a hilly area 120 kilometers east of Likasi and 150 kilometers west of Kolwezi. The local population is mostly Sanga. The area attracted many migrants in the 1970s when SMTF, the first concessionaire of the Tenke Fungurume concession, planned to develop a mine there, and has since developed only slightly.

Figure 1. – Map of Katanga and its Administrative Sections[7].

[7] Map created by OCHA – DRC. Sources: DCW (Digital Chart of the World), MoI (Ministry of the Interior), IGC (Institute Géographique du Congo), OMS (World Health Organization), BCD

A specific characteristic of the area is that very few villages existed more than 30 years ago in their present location, and only a few villages like Nguba, Mpala, Kafwaya, Tenke, Mwela Mpande and Lukotola seem to have existed when the initial TFM project was developed. Other villages have moved around the area, but the population density has always been very low.

Tenke has developed as an important railway crossroads, but has since seen its importance diminish compared to Fungurume.

3.2 Ethnic Groups

3.2.1 Overview

Although most people indicate that they were not been born in the village where they now live and moved to recently, the majority belong to the main ethnic group, the Sanga. There are five ethnic groups that make up 80 percent of the total population (Table 2 below):

Ethnic Group	Traditional Origin	Number of Households	Percentage	Cumulative %
Sanga	local	342	48.8%	48.8%
Lubakat	Nord du Katanga	96	13.7%	62.5%
Tshokwe	Lualaba: Dilolo	64	9.1%	71.6%
Ruund	Lualaba East of Kolwezi	57	8.1%	79.7%
Kaonde	Lualaba East of Kolwezi	27	3.9%	83.6%
Ndembo		23	3.3%	86.9%
Hemba	Tanganika (refugees)	13	1.9%	88.7%
Bemba		10	1.4%	90.2%
Bangubangu	East RDC (refugees)	10	1.4%	91.6%
Lubakas	Kasai	9	1.3%	92.9%
Lwena	Lualaba	9	1.3%	94.2%
others		30	5.8%	100%

Table 2. – Ethnic Groups in the Area (Based on the Ethnic Group of the Head of Household, Unweighted for Sample Size)

3.2.2 The Sanga

The Sanga are considered to be the original population group in the area. They had never formed an independent kingdom and were part of the Luba Kingdoms, until the arrival of Msiri, in the late-nineteenth century who integrated them into his Garenganze kingdom. Mpanda was the chief of the Sanga during the period of the great King Msiri who governed between 1874 and 1891. He had received the power of the Sanga community through Mpande. Msiri was related to all the local tribes, as each of his governors had to give one of his sisters in marriage. The Garenganze kingdom is present in the local traditional power structure through the chiefs of the Bayeke, whose king, lives in Bunkeya.

3.2.3 The Luba

The cultural area of the Luba consisted of, until the end of the nineteenth century, a kingdom made up of many relatively independent chiefdoms under the authority of a sacred king: the “Mulopwe”. The myth of origin of this royalty is that a foreign hunter, Kalala Ilunga, the son of

Mbidi Kiluwe, became the first real king with the assistance of a powerful fortune teller ("devin"). Towards 1870, this kingdom controlled an area of about 200,000 square kilometers. In the twentieth century, the kingdom fractured into a multitude of smaller chiefdoms, all of whom had a relationship of kinship, alliance or subordination with the original dynasty founded by Kalala Ilunga.

3.2.4 The Tshokwe

The Tshokwe, a matrilineal Bantu population, were originally located in the Serra de Muzamba, (Northern Angola) where they had formed powerful chiefdoms, while at the same time developing a vigorous and refined court art. In the middle of the nineteenth century, likely under the pressure of economic upheavals, they started emigrating towards the north and the north-east, invading vast areas and crossing the present-day border between Angola and the Congo to Kwilu, in the Kasaï and Katanga provinces. The Lwena are related to the Tshokwe.

3.2.5 The Bembe and the Boyo

The Bemba and the Boyo are located in Eastern Congo, in the region north of Lake Tanganyika. Bembe and Boyo have similar cultural traditions, but are of a different origin. Their art – which has been greatly influenced by the neighboring populations (Lega, Hemba, Tabwa) – is especially renowned for its representation of their ancestors.

3.3 Languages

Swahili and Sanga are the most commonly spoken languages in the region. French is only spoken by a minority, and, even in meetings with intellectuals, translation into Swahili was usually necessary. The Swahili spoken in the region is also a dialect, close to the Katangese Swahili, but adapted locally. During interviews it appeared that people understand very well the local Swahili, but have more problems with Swahili form other parts of the DRC, and especially, with the kind of Swahili that is heard on the international radios.

Local languages of neighboring groups are mutually understandable, such as Luba, Ruund and Sanga who are among the most important ethnic groups in the area.

3.4 Political Organization

3.4.1 Overview

Within the DRC, Katanga is a province and the "*district urbano-rural*" de Kolwezi is part of it. The district of Kolwezi is divided in three "territories": the town of Kolwezi, and the territories of Mutshatsha and Lubudi. Both Tenke and Fungurume are part of the territory of Lubudi.

Administrative Organization of the Katanga Province

Chef-Lieu de Province (Province capital):
Lubumbashi (L'shi)

Districts : (Districts)
Tanganyika (Kalemie), Haut-Lomami (Kamina), Haut-Katanga (Kipushi), Lualaba (Kasaji), Kolwezi

Territoires : (Territories)
Kalemie, Kongolo, Kabalo, Nyunzu, Manono, Moba, Kamina, Kabongo, Malemba-Nkulu, Kaniama, Bukama, Kipushi, Pweto, Mitwaba, Kasenga, Sakania, Kambove ; Kapanga, Sandoa, Dilolo ; Mutshatsha, Lubudi

Zones de Santé : (Health districts)
Kongolo, Nyunzu, Kalemie, Moba, Kabalo, Kiambi, Kansimba, Pweto, Kalonda Est, Kitenge, Ankoro, Menono, Kabongo, Malemba-Nkulu, Kitenge, Mulongo, Kaniama, Sanga-Mwilambwe, Kikondja, Kabondo-

Lubudi is divided:

- Administratively[8] into "*postes administratifs*" among which there is the "*poste administratif de Tenke*" and two cités, Lubudi and Fungurume,
- In a traditional way into four "*chefferies*" (Bayeke, Mwana Muadi, Monzangule and Mulundu. Within the Bayeke territory, the "*chef de groupement*" de Nguba is the most important person and is in charge of the lower traditional units such as the "*chefs de terre*" and the "*chefs de village*".

The chain of command within the province is the following:

Chain of command within the Katanga province

DRC → Katanga → District de Kolwezi → Lubudi → Poste administrative de Tenke & Cité de Fungurume, → "Chefs de quartiers" (of Fungurume) and → representatives of the "chef de poste" (Tenke) in the villages

3.4.2 Administrative Organization

Within the Kolwezi district, Lubudi is the lowest level with a government and an independent budget. Subdivisions of Lubudi, such as the cities of Lubudi and of Fungurume and the seven "postes" de Kakanda, Tenke, Kansenia, Bunkeya, Mukabe Kasari, Buyofwe and Mukaka have neither a budget nor financial independence. The traditional "groupement" of Nguba, includes three chiefs: Fungurume, Tenke and Kansenia.

Chain of command within the local administration

1. Downwards:

Chef de poste → Representative/secretary of the chef de poste (administrative function) → chef de village (traditional function) → kapita → minor chiefs

2. Upwards:

Chef de village → Chef de poste

The Chefs de Terre have no function in the modern administration and are not recognized by the government

- At the village level of Tenke, the administration is present in two forms: the "kapita" (a colonial word used for a government appointed chief, often called locally Chef de Quartier) and the traditional customary chief ("chef coutumier") Mulopwe.
- In Fungurume the situation is different Chef de poste → four quartiers (Kilangele, Lukeka, Mwela Mpande and Dipeta), who each are subdivided in urban and rural blocs.
- The villages of Kafwaya, Kasanga and Mwela Mpande Gare are rural blocs of Mwela Mpande; the hamlet of Ndela 1 is a "*cellule*" of Kasanga.
- Other "rural blocs" of Fungurume are: Mpala, Kakoko, and Campement Kuriya Kujiba (Qu. Kilangele), and Kabombwa, ferme (farm) Kamibambwe et camp des militaries (military camp) (Qu. Dipeta).

[8] (1) Cité de Lubudi, (2) Cité de Fungurume and seven "postes administratives"

The “chef de poste” also has an official representative in the village, his secretary, in charge of transmitting message from the authorities to the village, while messages from the village to the authorities are usually directly transmitted by customary chiefs and “*kapitas*”. For the chef de poste, it is clear who the most important people in the village are: in Mulumbu for example, Mulumbu Kazadi is the most important traditional authority. Kyabondo, though in a struggle for power internally with Mulumbu, is not recognized by the Tenke chief other than as a minor kapita, who is even less important than Gavage, the secretary of the *chef de poste*.

Not all villages have a "chef de village", many have *kapitas* that are part of one big village. Mulumbu has *kapita* in Mulumbu, Amoni and Kiboko. Along the National Road, Lutanda is a village chief who has kapita in the hamlets of Zakeo, Lutanda, Nkonga, Kimilombe, Kilusonsa and Postolo. The three Mutaka hamlets (Mutaka II, M. Mwelwa and MM quartier Kibangu) have one village chief but each has a kapita.

The site of Fungurume is one administrative entity with four distinctive administrative quarters each with urban and rural blocks and, sometimes under a block, various “cells” (French: “cellules”).

Table 3 hereunder shows the administrative subdivisions within Fungurume town:

Quartiers/quarters	Blocs à tendence urbains/ urban blocks	Blocs à tendence rural/rural blocks
1. Kilangile	1. Nguba 2. Mutobo	1. Mpala 2. Kakoko 3. Campement Kurya Kujiba
2. Lukeka	1. Moïse Tshombe 2. Kasavubu 3. Mukoma	1. None
3. Mwela Mpande	1. Munongo 2. Commercial 3. Mitumbo	1. Kafwaya 2. Mweal Mpande Gare 3. Kasanga (et Ndela 1)
4. Dipeta	1. Cinq ans 1 2. Cinq ans 2 3. Lumbwe 4. Kabila	1. Kabombwe 2. Ferme Kamibambwe 3. Camp des militaires

Table 3. – Administration of the Cité de Fungurume

3.4.3 Traditional Organization

3.4.3.1 Overview

Local chieftaincy in the Sanga area is extremely vague and unclear. The chefs de Terre, “Chief of the land”, are often considered to be the intermediary between humans, the land and the spirits/ancestors to whom it belongs). They are the people that can distribute land, and are responsible for performing the right ceremonies that will maintain the equilibrium between men and the ancestors. However, this approach hardly seems to work in the Tenke-Fungurume area because of the disagreements about which chief is responsible for which area. Various interviews indicated that, in fact, most locals hardly worry about their “Chef de Terre”, and that they all live in extreme poverty, as least as much if not more, than normal villagers. In village discussions, there was always much discussion (and ignorance) about who owns which position in the traditional hierarchy.

3.4.3.2 "Powers" of a chief

Powers of a chief are inherited from former chiefs. There have been and there are many different chiefs in the area, a derivative of many and various ethnic groups. They go back hundreds of years. The older ones are derived from the Luba, the Tshokwe and the Ruund, and the newer ones from Msiri and the Bayeke. As all these powers are not recognized widely, the assignment and the actual powers of the various chiefs is often not very clear.

The chief of the Bayeke (who lives in Bunkeya, some 50 kilometers north of Likasi) is the supreme chief of the area, an area that has been divided into six major chiefdoms (Bayeke 1 to 6). Each chiefdom has been divided in two to six "groupements", over which chefs de groupement preside. This level of traditional government is recognized by the Congolese administration.

The Chef de groupement Nguba, is responsible for the presently defined concession area, and though he is a link between the administrative and traditional government, he has little influence on the government administration. The chef de groupement heads the other traditional chiefs such as the chefs de terre, and during a meeting in May 2005, a traditional council has tried to define the role of each of the Chefs de terre. This had led to some changes in hierarchy between chiefs (e.g., the chief Lutanda was told that it was not him but Mpala who is in charge of the concession area), which has not been accepted and thus has not done much to resolve power struggles regarding what all traditional chiefs seem to see as the lucrative area of the TFM mining concession.

At a local level, similar hierarchical problems arise. After the death of a chief, all his sons can and will claim that they are a chief of some sort and it may take many years before a chief is recognized officially by the village and the "chef de groupement". In early 2006, no successor had yet been found for chiefs such as Tenki (for Tenke) and Mwanga Bijimba, and the presence of several disputing chiefs is frequently found in villages. This is not only related to in-fighting of potential heirs, but also to the gradual loss of power by the elder chiefs. In the Mwela Mpande area, north of Tenke, one observes that four families of Mwanga, where the former chief died, have left the village to join Mulumbu Kyasa, where a young chief is taking up power. Further to the north, the formerly famous Chef de terre of Mwela Mpande lives now with only two to three other families in a small hamlet as all the other families have moved to neighboring villages such as Salabwe.

Appendix B4.1-11, Section 13 (presents some historical elements related to chiefdom.)

A complicating factor is that when a new chief emerges, he will typically install himself in a new village, and will take with him part or all of the population in the former village. Such movements were occurring just outside the footprint area in the villages of Mulumbu Kyasa and Mwanga Bijimba, and may have an impact on the organization of the project and the Resettlement Action Plan.

3.4.3.3 Customary Courts

Customary courts in the area are present in Fungurume, Lukotola and in Tenke. As Fungurume is a "cité", and Tenke a "poste administratif", their organization is slightly different.

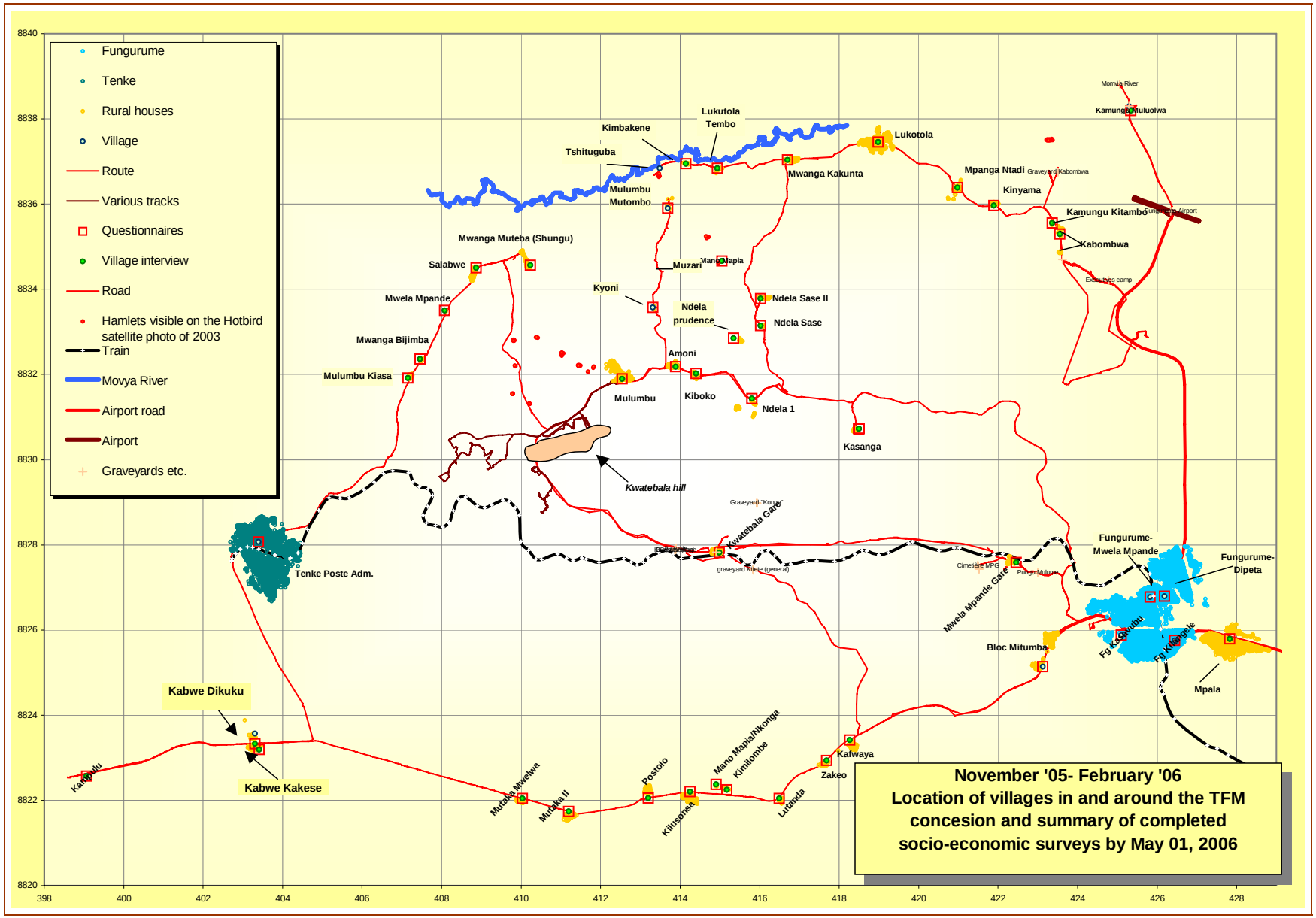


Figure 2. – Map of the towns and villages in the concession area, based on observations of the study.

The Bayeke, whose major chief lives in Bunkeya, have a main traditional court, a secondary court is organized by the Chef de Groupement (of neighboring Nguba), and the third degree concerns the “Tribunal de la cité”: a “greffier” and a government appointed “secretary of the court”; the main judge (the chef de Cité in Fungurume, one of the traditional chiefs elsewhere), and the assessor judges, chosen among the “wise elders” in the area.

Typical litigations that come to the Fungurume court concern: land issues (limits between fields, or heritage problems), adultery, sorcery and violence. Among the land problems are the illicit sale of land, and the rights to land that has not been valued and is squatted upon by other people.

3.4.4 Implications of the Traditional Organization for the Project

The traditional land chiefs have some responsibilities with regards to the concession area and the mine. The chiefs are concerned about the economic benefits that the most important land chief can draw from the protection he can give to the mining area and to the company. The chief who will be taken by TFM as the most important land chief hopes that he will receive many gifts from the company. The memory of what allegedly Lutanda received from the company during previous rituals is still fresh in mind. Now that Lutanda, with the help of the chef de groupement of Nguba, has lost most of his power, Mpala hopes to reclaim his territory.

Unless the government administrative service or the “*chef de groupement*” makes a clear decision as to which chief will be the project’s point of contact, consensus must be sought in establishing one particular chief as a preferred contact point with the TFM project. Specifically, he should be designated by the villagers in an open meeting with TFM representatives. This is especially important in Mulumbu, where not only the animosity between Mulumbu and Kyabondo seems important, but the statute of the latter as a powerful magician has been raised when he recently broke a window of a TFM car with his head, without suffering any pain or scar on his head.

Within a village, the main chief will be consulted but much effort should be put into consulting with the various kapitas, in individual and team meetings.

Rural villages and hamlets in and around the concession area should decide in a democratic meeting on who will be their contact person with the project.

3.5 Settlement Patterns

Settlement patterns in the area have been diriven by industrial development, agricultural and illegal mining. Fungurume, (about 37,000 inhabitants) and Tenke (17,000) are the main centers, and approximately 35 villages and hamlets are located along the national road (11 villages and hamlets), the Fungurume to Tenke rail road (two villages/hamlets), the Fungurume to Mulumbu road (five villages/hamlets), the "ringroad" north of the concession area (Tenke – Salabwe – Lukotola – Fungurume) with another series of 15 villages, and a few dispersed villages elsewhere. The schematic map of the villages is presented below, where each dot on the map represents a dwelling.

The town of Tenke grew in the 1920s and 1930s through the development of the railway. The town of Fungurume grew around the mining operations of SMTF in the 1970s. Recent developments in Katanga concern the reinstallation of war displaced people in Tenke and in

Fungurume, and the need to find agricultural land for the growing population. Since 2002-3, with higher prices of cobalt and copper on the world market, the many displaced people from the war in eastern DRC, and the closing of the Shinkolobwe illegal mining site, many people moved toward the rich ores of Mulumbu and Fungurume. The present extension of Fungurume and especially of Tenke compared to aerial photographs only made two years earlier, illustrates the attraction of mining.

During the interviews most people would indicate, as a reason for coming to an area, either the wish to join a relative or to search for agricultural land. A high proportion of people, however, have had some employment experience: 43.4 percent in Fungurume, and 21.9 percent of the rural population. Among 275 households, 8 percent had ever worked at Gécamines, 6 percent at Trabeco[9], 9 percent for TFM/STF or its subcontractors, 12 percent for other national employers, 16 percent for international employers, and 10.5 percent for the government.

Employees who finished their contract with the railroad company and decided to stay in the area often found villages.

Though people are proud of their African culture and the social and economic safety net it provides, during various meetings the strain of being with family was also emphasized. This could be because people do not have enough freedom when they remain in their original village, and also because they fear they will become the victim of sorcery through a neighbor's use of witchcraft.

3.6 Demographic Overview

The total population in the area was evaluated in the survey to be 67,842, with 7,608 people in the rural villages, 42,000 in Fungurume, 11,000 in Tenke, 740 in Bloc Mitumba, 4,762 in Mpala and 1,750 in Lukotola.

- The population is young, with on average 54 percent between 0 and 15 years of age.
- The rural villages appear much less dynamic than the urban areas: households are small (4.36 people on average, compared to a global average of almost 6), 48 percent are less than 16 years of age and 7 percent are over 50 years of age.
- In rural villages school age children are under represented, as many of them have had to leave their villages to study in town, where they often live with their relatives.
- A similar lack of school age children is found among temporary households and for households in the area for less than a year (including agricultural migrants); households are smaller, with less school age children.
- Elderly people represent on average 5 percent of the population, but more so in:
    - Households headed by females.
    - Rural villages.
    - Lukotola.
- A striking characteristic of the villages is the very small number of people that were actually born in the villages:

[9] A locally installed company that makes concrete railway sleepers.

- less that 10 percent of those living in a village were actually born in that village.
- 40 percent of the population in the rural villages and 40 percent in the urban areas has been living less than five years in their present site.

This percentage is slightly higher in the rural villages than in town, but not much more, and very different from what is seen in other areas of the Congo, Africa and the world.

Table 4 below presents the main characteristics of the demographic structure. Further details are provided in Appendix B4.1-11, Section 12.

Table 4. – Age Distribution of the Population According to Sex, Location and Residential Situation

	Sex/Sexe		Location/résidence				Status		Total	
	Women Femmes	Men Hommes	Rural Brousse	Fungurume	Tenke	Lukotola	Permanent	Temporary Temporaire	%	Number
children 0-15 years enfants 0-15	53%	53%	48%	54%	54%	49%	54%	50%	53.8%	32,700
adults 16-49 years adultes 16-49	34%	42%	45%	40%	41%	42%	40%	47%	40.6%	24,700
elderly 50+ years personnes âgées 50+ ans	14%	5%	7%	5%	4%	11%	6%	3%	5.6%	3,400

Note: (2006 survey results, weighted for sample density in each of the villages).

Table 5. – Summary table of the population in the 41 villages and 5 urban areas surveyed.

	Village	Total	M	F	Number of Houses	Average Family Size	Population Size	Church	School	Water	% Temporary Transhumants	Village Meting	Focus Groups
1	Kafwaya	65	32	33	80	4.4	349	N		River		X	
2	Zakeo	5	5	0	25	4.4	109	N		Cemented source		X	
3	Lutanda	5	3	2	19	4.4	83	N		River		X	
4	Kimilombe	10			15	4.4	65	N		Traditional Source		FS	
5	Mano Mapia, Nkonga	2			5	4.4	22	N		Traditional Source		FS	
6	Kilusonsa	16			76	4.4	331	Yes	Yes	Cemented source		X	
7	Postolo	41	14	25	47	4.4	205	Yes		Cemented source		X	
8	Mutaka II	56	24	32	65	4.4	283	Yes		River		X	
9	Mutaka Mwelwa, Q Kibangu.	29	12	17	26	4.4	113	Yes		River		X	
10	Kabwe Kakese	19	16	3	41	4.4	179	Yes		River		X	
11	Kabwe Kikuku	13	9	4	52	4.4	227	Yes	2 years	River		X	
12	Mwela Mpande Gare	10			26	4.4	113	N		River	~10%	X	
13	Kwaebala Gare	41	28	13	86	4.4	375	Yes		River		X	
14	Mulumbu	110	86	24	275	4.4	1199	Yes	Yes	River		X	Yes
15	Shungu (Mwanga Muteba)	12	7	5	35	4.4	153	N		River		X	
16	Salabwe	23	232	0	54	4.4	235	Yes		River	5%	X	
17	Mulumbu Kiasa	19	14	5	26	4.4	113	N		Traditional source	15%	Z	
18	Mwanga Sangu (Mwanga Bijimba)	2			8	4.4	35	N			0%	JK	
19	Mwela Mpande village	3	2	1	4	4.4	17	N		Traditional source	25%	X	
20	Kasanga	41	24	17	32	4.4	140	N		Cemented source	40%	X	
21	Ndela 1&2	54	31	23	57	4.4	249	N		River	79%	X	
22	Ndela Prudence	14	7	7	15	4.4	65	N		River	98%	Explanation	
23	Ndela Sase 2	72	40	32	10	4.4	44	N		River	98%	X	
24	Ndela Sase 1				42	4.4	183	N		Traditional source	98%	X	
25	Mano Mapia	31	27	4	36	4.4	157	Yes		River		JK	
26	Kiboko	18	10	8	28	4.4	122	N			38%	JK	
27	Amoni	62	35	27	59	4.4	257	Yes		Traditional source	20%	X	
28	Mulumbu Mutombo	10			11	4.4	48	N		River?		Sommaire	
29	Kyoni	32	2	1	4	4.4	17	N		Traditional source	75%	Sommaire	
30	Kimbakene	9	8	1	12	4.4	52			River + photo		JK	
31	Lukotola Tembo	11	7	4	17	4.4	74			River + photo		JK	
32	Mwanga Kukunta	44	25	19	46	4.4	201	Yes	2 years	Kampekete river		JK	
33	Mpanga Ntadi	8	5	3	41	4.4	179	N		Traditional source	41%	JK	
34	Kinyama	31	15	16	42	4.4	183	N		Cemented source	58%	JK	
35	Kabombwa	27	19	8	35	4.4	153	Yes		River	53%	JK	
36	Kamungu Kitambo	18	9	9	13	4.4	57	Yes		River	38%	JK	Yes
37	Kamungu Mulolowo	19	13	6	191	4.4	833	Yes	4 years	River + wells		JK	
Pumpi Area													
1	Lukonde	19	10	9	26	4.4	113	No		River	41%	X	
2	Pumpi Gare	26	13	13	35	4.4	153	Yes		Seasonal well + river	58%	JK	
3	Kyaboja-Onze	10			11	4.4	48	No		River	53%	JK	
4	Kampulu	40	25	15	17	4.4	74	No		River	38%	X	
Total for the rural villages		1,048			1,745	4.4	7,608						
Urban and semi-urban areas													
1	Lukotola	64	55	9	320	5.5	1,750	Yes	Yes	Piped		X	
2	Mitumba Bloc				152	4.9	740	Yes	Yes	Piped + river + well		JK	
3	Mpala	14	12	2	768	6.2	4,762	Yes	Yes	River + well		X	
4	Fungurume	4	4	0	5220	6.9	42,000	Yes	Yes	Piped + well			Yes
5	Tenke				1,777	6.2	10,982	Yes	Yes	Peped with river water			Yes
Total for the urban villages					8,237		60,234						
Total for the rural villages and urban areas					10,071		67,842						4

2006 survey results; population estimated using the average household size.

4 LIVELIHOODS

4.1 Economic Activities

The area is mainly agricultural, even in the urban areas of Tenke, Fungurume and Lukotola. Agriculture is mandatory (mandated by the government) for the rural populations, mostly as the primary activity: 90 percent in rural areas and 72 percent in urban areas, but as a secondary activity for an additional 9 percent in the rural and 12 percent in the urban areas.

As a consequence, 99 percent of the rural households and 82 percent of the urban ones engage in agriculture.

Paid labor and civil servant salaries are often cited as a secondary source of income, mainly because for any government and private sector jobs salaries are very low.

Almost all people have secondary activities to support their general income (see Figure 3). Various activities that fall under crafts, petty jobs, and – mainly – agricultural contracts are important for the people to earn some extra money and to provide security during the difficult period of the year, when last year's harvest is finished and next year's is not yet ripe. Besides agricultural work, these activities are charcoal burning, various repair jobs (bicycles, radios, watches), carpenters, masons, private nurses, traditional doctor, etc. It should be noted that these activities are even more important in the rural than in the urban area. Most of them fall under the heading "crafts and petty jobs". Up to 60 percent of the families in rural areas and up to 40 percent of people in rural areas engage in such activities.

Trade is the third most important activity: up to 30 percent of the urban households and 20 percent of the rural ones engage in trade.

Fishing and hunting are rare, and almost always cited as secondary activities.

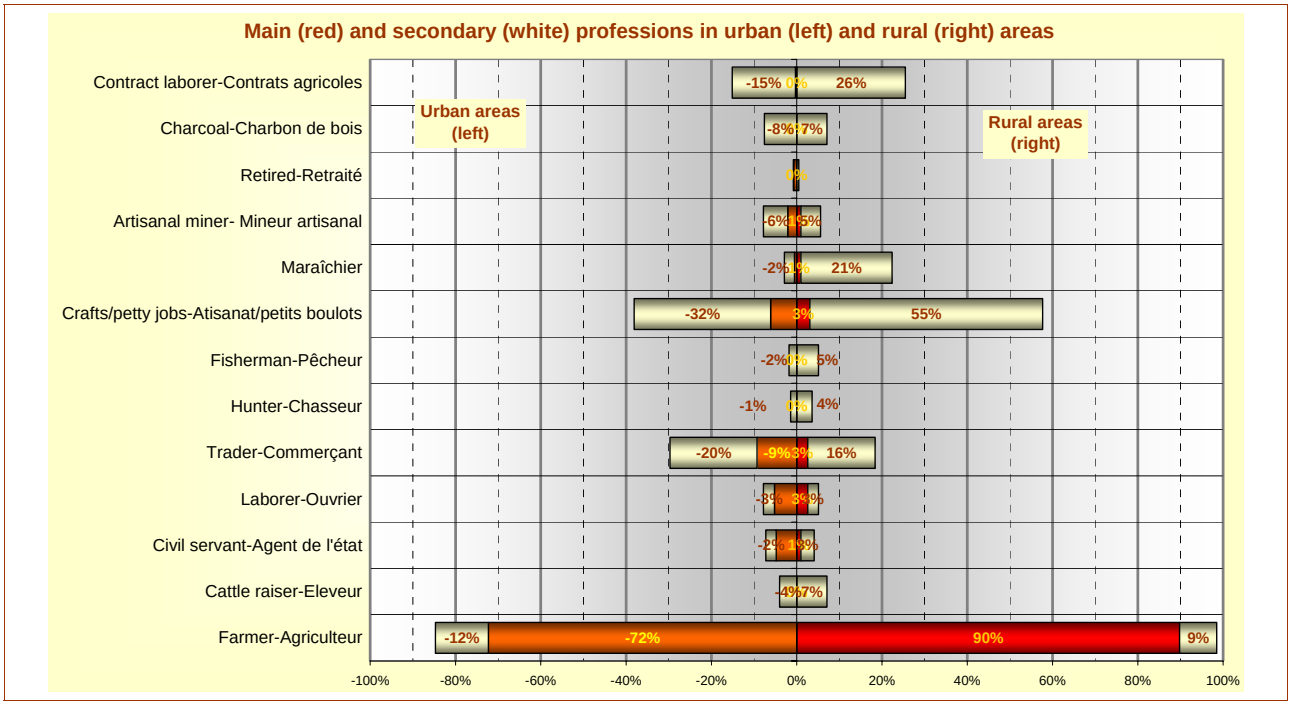
Table 6 presents an overview of activities in rural areas and towns:

Table 6. – Main Profession According to Village of Residence

Main activity	Principale activité	Rural	Fungurume	Tenke	Lukotola	Total
farmer	agriculteur	91.2%	68.4%	70.5%	81.4%	72.5%
trader	commerçant	2.1%	12.9%	7.1%	1.7%	10.3%
crafts + petty jobs	petits boulots et artisanat	2.8%	7.6%	4.5%	3.4%	5.9%
laborer	ouvrier	2.1%	3.7%	9.6%	8.5%	4.7%
civil servant	agent de l'état	0.7%	4.9%	3.8%	1.7%	4.1%
other activities	autres activités	1.1%	2.5%	4.5%	3.3%	2.5%

2006 survey results, weighted for sample density in each of the villages.

Figure 3. – Main and Secondary Professions by Area of Residence (the Negative Percentages Show the Urban Areas, the Positive the Rural Areas; Red is the Main Activity White the Secondary Activity.



2006 survey results, weighted for sample density in each of the villages.

Table 7. – Main Source of Income According to Village of Residence.

Main Source of Income	Principale source de revenu	Rural	Fungurume	Tenke	Lukotola	Total
agriculture	agriculture	84.8%	65.7%	63.6%	78.6%	68.5%
trade	commerce	4.0%	12.2%	9.3%	1.8%	10.4%
salaries	travail salarié	2.5%	5.9%	12.6%	12.5%	6.9%
artisanal mining	creusage	1.4%	5.2%	3.3%	0.0%	4.2%
crafts + petty jobs	artisanat & petits boulots	0.0%	3.3%	5.3%	3.6%	3.5%
contracts	contrats	2.2%	2.8%	0.7%	3.6%	1.8%
TFM	TFM	0.0%	1.7%	0.0%	0.0%	1.1%
other sources	autres sources	4.4%	3.3%	7.2%	-0.1%	4.2%

2006 survey results, weighted for sample density in each of the villages.

Main activities and main sources of income are similar with the exception that artisanal mining – an effectively forbidden activity in the area since November 2005 – is more often reported as revenue generating during the last year.

For most of the urban population and almost all of the rural population, agriculture is the main source of income, followed by (small) trade, various crafts and petty jobs, and agricultural contracts. Throughout the year local drinks (for the women) and charcoal making provide this

extra income[10]. 11 percent of the total population – mainly in Fungurume – admitted having obtained income from artisanal mining.

Table 8. – All Main and Secondary Sources of Income According to Village of Residence.

Any Source of Income	Toute source de revenu	Rural	Fungurume	Tenke	Lukotola	Total
agriculture	agriculture	94.6%	81.4%	72.8%	94.6%	82.0%
trade	commerce	28.5%	44.8%	31.8%	26.8%	39.9%
crafts + petty jobs	artisanat & petits boulots	17.4%	23.2%	14.6%	17.9%	21.5%
agricultural contract labor	contrats	32.5%	17.2%	17.9%	30.4%	19.8%
local drinks	boissons locales	24.9%	17.6%	12.6%	10.7%	18.1%
charcoal making	charbon	12.3%	13.8%	11.3%	3.6%	13.2%
paid employment	travail salarié	6.1%	12.1%	16.6%	21.4%	12.6%
artisanal mining	creusage	9.4%	12.0%	7.9%	0.0%	10.7%
rent	loyers	4.0%	12.9%	7.3%	5.4%	10.5%

2006 survey results, weighted for sample density in each of the villages.

4.2 Agriculture

During the dry season, most of the population lives in the two main urban centers of Tenke and Fungurume. But even in the urban areas people are mostly subsistence farmers and they move from their dry season home to land they can cultivate during the rainy season. Agriculture is based on two major crops, maize and beans, with secondary crops such a cassava, peanuts, and soy beans that are more or less commonly grown in the different areas, and tertiary market garden crops that are grown in the lower lying marshy soils such as sweet potatoes, Irish potatoes, pop corn maize, onions, tomatoes, cabbages, various leafy vegetables etc.

The two main crops, maize and beans that basically pillar the agricultural system give it the appearance of an almost monocultural system. The soil is rich and not very prone to erosion. This has two major consequences:

1. The same plot of land can and will be used for years and years (up to 10, 15 or reportedly more than 20 years) without apparently losing its fertility and without the locals acknowledging a specific crop rotation in order to maintain the soil fertility.
2. Even steep slopes are used for agriculture, without appearing to suffer from erosion, although the ridges are in the direction of the slopes.

In spite of the apparent fertility of the land, large parts of land along the railroad and the national highway remain uncultivated. The people explain that the previous use of fertilizer on these lands has made it unfit for cultivation without fertilizer. The people from Tenke indicate the same land fertility problems around Tenke as the people from Fungurume. Those from Fungurume have to search for farmland up to 10-20 kilometers from the town in all directions,

[10] In these kinds of community surveys, people tend to have quite a short memory. As the survey was conducted during the rainy season, people will more readily remember agricultural contracts, than drinks or charcoal, in spite of the fact that the surveyors reminded them specifically about these activities.

but one can easily see the important area they occupy to the northwest of the town towards the airport and in the valleys of the Sase and Kasanga rivers.

The Quickbird satellite photo shows that a great part of the concession area is used as agricultural land.

Villages located along the three main axes behave differently:

(1) Along the national highway people exploit land that is a few kilometers distance from the village towards the south and less so towards the north. Except for Kafwaya, all villages are recent and concern people that migrated from other areas (Kilusonsa, Apostolo) or from the southern part (Mutaka Mwelwa).

(2) On the central axis, on the ridge road between Fungurume and Mulumbu, local villagers have land within a few minutes' walking distance of the village. Villages have a high proportion of seasonal transhumants within the village limits, and other people farm land further away from the village center, along the railroad. There is only one main village, Kwatebala Gare, and the agricultural land in the valley is not considered very fertile, as it has been used before with fertilizer.

(3) In the north along the Monvya[11] River, villages appear older and the center of Lukotola is developing under the impact of the Spanish mission. In the area between Lukotola and Fungurume and around the Kwatebala Hill, transhumant farmers are the majority[12].

4.2.1 Land Tenure

4.2.1.1 Legal Framework

According[13] to the Congolese law (Law 73-021 du 01 April 1974), commonly known as the Bakajika Law, “all land belongs to the state, who is the exclusive, inalienable and imprescriptible owner of the land”. Private persons may have a perpetual usage right on the land if they are Congolese, and a temporary right if they are foreigners.

4.2.1.2 Traditional Framework

Traditionally, the land belongs to the community, and all villages insisted that only the representative of the community can hand out land. This is usually the “Chef de terre” who is the official guardian of the village land, and all land – around the villages but also in the bush – has a “Chef de terre” as its guardian. The translation of the local name for “Chef de terre” refers to his ownership of the land. Though there are different “levels” of Chefs de Terre in an area, the most local one will distribute land. He is also the chief of the village in which he lives. Chiefs of the dependent villages and hamlets in the area are supposed to inform the Chef de Terre when they distribute land.

- The traditional population in a village has a usage right over the land given by his village chief. This land can be under culture or used as a reserve (fallow or unused).

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[11] Various names are used for the river: Monvya, Momvya, Mofya.

[13] See for instance Vincent KANGULUMBA : Le bilan de 30 ans de lois foncières au Congo. RCN Justice et Démocratie, Le Bulletin, December 2004. http://www.rcn-ong.be/pdf/bulletin_10_2004.pdf

- Children of the local population can inherit land, local landowners can rent land to outsiders from the village.
- Land is not sold, but a more or less important ceremonial gift is expected from the new land user.
- People lose their right to the land when they leave the village. If they come back, they may recover their land if other people have not yet used it.
- People have right to land through their kinship relationship with the village. This relation can be through the father's parents, the mother's parents or through the spouse's parents.
- The "*Mwadi*" are the spouses of the Chef de Terre and his feminine relatives who have an important function during the enthroning of a new chief. This is the main reason that many people find a traditional right to obtain land in the villages of their wives as well as in the villages of their maternal family.
- People who do not live in the village – like the seasonal or transhumant farmers from Tenke, Fungurume or other towns – can be given land by the village or land chiefs, but they have less traditional ownership over this land than local villagers.
    - They may not sell the land, but – if the village chief agrees – they may give it to their children.
    - The new land-user may also negotiate with the absent former owner the right to use the land, but needs to ask permission from the person who gave the land.
    - The land may not be sold, but as a fertile field that has been cleaned and used has more value than uncultivated land, the monetary value of "added value" may be asked from the next land-user.

4.2.1.3 Rôle of the "Chef de Terre": the Land Chief

All traditional and sacred rituals are clouded in a mist of secrecy, and villagers do not like to talk about it. The role of the Chef de Terre (CdT) as the protector of the community is part of that. All villages acknowledge his role in the blessing of the seeds at the start of the rainy seasons, but other functions remain obscure. The poverty in which most CdT live may mean that the function is not much valued by the community. E.g., the chief of Kamungu explained that it was not economically beneficial to be a chief "as we receive about nothing from the villagers".

A CdT has to be a farmer like all the others, according to land chief Mwela Mpande. However, A important CdT invites the other chiefs to come to meetings, he does not travel. He waits until other villages give him his traditional offerings, the "*mulambu*". Every head of household has to give two meka of maize for the chief, but very few respect this tradition. The CdT respects the land (*Biloba*$^{(sg)}$ or *Bulonga*$^{(sw)}$), the hills (*Mitumba*$^{(sg)}$ or *Bilima*$^{(sw)}$) and the rivers (*Méma*$^{(sg)}$ or *Mahi*$^{(sw)}$). The CdTs pray to the ancestors to "*put them to sleep*", so that there are no accidents such as snakebites.

Agricultural ceremonies are still carried out on a yearly basis[14], [15]. The CdTs pray to the ancestors and perform rituals for the mining companies, for hunting and fishing: once per year, to the *mapeshu*, the ancestors. These *mapeshu* ceremonials traditionally take place after the first rains of the year and roughly consist of the following:

- A shelter is built, near the crossing of two roads to the fields, where samples of the seeds to be sown are brought by the village women.
- The CdT prays and asks that the seeds germinate well and that the rains will be favorable.
- The hoes to be used during the agricultural work are left in the chief's compound.
- People from the area come and dance.

That day, villagers do not go to the fields. In Kasanga it was explained that the seed ritual is only conducted every second year. No animals are slaughtered, as this may cause the field to be transformed into blood.

No specific rituals are performed before the harvest. In case of severe draught, the CdT will pray or ask the women to prepare local beer (*munkoyo*), part of which will be taken to a crossing of the various roads and paths that lead to the fields, while the remainder is consumed.

Lutanda – The land chief is responsible for the traditional ceremonies concerning hunting, fishing, disease, mining and agriculture. However, these ceremonies do not take place regularly: there is no more fish, since maize is not soaked in the rivers anymore, but ground in mills and hunting has become rare. If Lutanda does carry out the ceremony, game will reappear, but he has not done so since 1980! The site where fertility rituals for the agricultural are carried out are not sacred sites, because the CdT can easily find other replacement sites.

4.2.1.4 Local and Transhumant farmers

In the village with good quality land, people not only from the nearby towns of Tenke and Fungurume but also from further away (Kolwezi, Likasi, Lubumbashi) in search of fertile land for agriculture. In the project footprint area between the first hills north of the railway and the

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[14] Rituals confirmed in many villages.

[15] *Salabwe*. – The land chief is responsible for "his population and its agricultural production by performing the right rituals". There are also rituals that are performed when the rains are lacking. Rituals are not believed anymore by some of the people who adhere to Christian churches. However, for every accidental or sudden dead the CdT is asked to perform rituals. People will move to another location individually, or with the whole village if there are too many unexplained deaths.

Mulumbu Kiasa. – A village is not obliged to move after a chief dies. But it will take a long time before a new chief is designated. In the mean time, many sons of the previous chief will try to become chief. Once a new chief is officially designated (after a period of reclusion, with the authorization of the Chef de Groupement), it's common for new chiefs to establish themselves in a new village.

In Kilusonsa, a village of migrants, the role of the CdT was described as: (1) Performing rituals to demand peace and happiness; (2) rituals for mining; (3) rituals for protection against accidents (4) Traditionally rituals to beg for rain, but these do not exist anymore. The CdT has a right to receive gifts from his constituents. These *Mulambu,* amount to five pots (meka) of maize per village per year, and are not enough for a CdT to survive on.

Mpanga Ntadi. – (1) the ritual before the agricultural season takes place near the Lubanga River, but follows the same program: a sample of seeds from each of the households in the village is taken to the river by 4 to 5 village elders (the village chief and ordinary villagers are not allowed to assist).

Kamungu Kitambo. – The chiefs perform rituals for agriculture, mining activities, in case of fires in the village, suicide, drowning, or serious fighting, with wounded victims.

Kamungu Mulolwo. The CdT creates a small field of one ridge at the start of the rainy season. Each of the villagers, sows a sample of the seeds they are planning to use.

Momvya River, most land is occupied by agriculture or as temporarily unused fallow land. The resident population occupies the area closest to the village, the urban farmers the remaining area. These urban farmers live as transhumants: they arrive around the month of September to start preparing the field, and leave around April, when the crops are ripe, to return to their urban dwellings.

In the villages, like in Kamungu and Mulumbu, people are in general happy about the arrival of transhumant farmers: the sheer number of households is more and mutual aid will be more easily obtained, transhumant farmers often ask villagers to work for them through contracts, though most transhumants do not use outside labor[16]. Transhumant farmers that have a good house in the village are better off as they have the advantages of both town and village life.

The villagers do not consider the transhumant farmers to be part of their village community and transhumants cannot participate in village decisions.

4.2.1.5 Traditional Practice: Observations in the Villages

The generally recognized system is for land to be given freely to locals and people from the town, but a small gift sealing the acquisition process, and some kind of yearly gift of a small share of the crop to the person who provided the land is welcomed.

In practice, the majority of the transhumant people said that they did not pay a yearly rent, but only provided a gift when they received the land. Villages that consist completely of transhumants (such as Ndela Sase) report that they only give five pots of maize every year for the whole village, which would mean a completely symbolic gift.

Subcontractors of people who have recognized land and who pay taxes to the local authorities ask more than symbolic rent: in Mulumbu the rate in such cases is between 40-60 pots of maize per hectare.

Lorsque les terrains sont grands, plus de 10 ha? On voit le responsible du cadastre à la poste de Tenke ou Fungurume, qui delivre un titre definitive ou provisoire. If the land is given directly by the cadastre, no more rights have to be paid to the land chief. Tous le ans une taxe doit être aquitée à la poste administrative concernée. Cette rédévance est d'une somme fixe de xxx FC/ha. Ces terres sont régulièrement loués à des tiers qui payent alors une redevance au concessionaire, et les redevances sont payés à travers de l'agronome.

Mulumbu – The traditional practice is less clearly defined than the corresponding theory. In the village of Mulumbu, land is allocated in a variety of ways that do not always correspond to the tradition.

- Two competing chiefs – one the "official" chief, the other his elder brother – each govern an area of land they hand out independently.
- The sister of the Mulumbu chief has a well-defined area of land northeast of the village, which she rents on a yearly basis to outsiders from the village.
- At least three people in the village have what are locally called "*fermettes*", which are defined agricultural areas of 10-40 hectares, which are recognized by the local

[16] In a sample of 20 transhumant farmers, only three used contract labor.

authorities and over which annual taxes are paid. Within these “fermettes”, either land is used by the original “owner” by his parents, or rented to unrelated persons. [17]

Each village has some particular characteristics[18], but it is apparent from the observations that the local village chief, quite independent from the fact that he is a major recognized chef de terre, or a minor local *kapita* without traditional power is proud of his role as a distributor of land. The land does not seem to have been assessed for monetary value, but one may expect that the compensation paid for lost land by the mining project, as well as the increased pressure on the land by both the mining project and population growth, may lead rapidly to an increased and monetary value of the land.

4.2.1.6 Land Status of the Rural and Urban Farmers

Table 9 shows clearly that a land market has not yet developed in the area, in spite of the complaints issued in Fungurume and – to a lesser degree – in Tenke, that people had to go further and further to find suitable land. Less than 10 percent of the land users say that they have to pay rent, which is often paid in kind in the form of a small part of the harvest. The most common practice in the area is to present a small gift to a village or land chief when one asks for land, and to pay a little of the harvest every year.

Table 9. – Land Rights by Village and Average Yearly Rent Paid by Those Who Pay Rent

Land status	Statut de propriété	Rural	Fungurume	Tenke	Lukotola	Total
traditional land user	propriétaire traditionnel	65%	40%	26%	60%	49%
official title	titre foncier	0%	2%	0%	0%	1%
rent	location/prêt	9%	8%	5%	9%	8%
free of charge	gratuit	23%	37%	38%	20%	30%
no agriculture	sans agriculture	4%	13%	31%	11%	13%
weighted number of observations	total pondéré	1,120	745	645	225	2,650
average rent	loyer annuel	6,062 Fc	3,060 Fc	4,571 Fc	6,750 Fc	5,124 Fc

Source: 2005-6 socioeconomic survey.

[17] The administration recognizes three types of farms : plots less than 5 hectares are managed by the local village authorities alone and are free to establish rules regarding them ; plots between 5 and 40 hectares are called « fermettes », more than 40 hectares, « fermes ». Both the territorial administrator and the agricultural specialist of the territory verifies that the land is unoccupied. The agricultural specialist is paid for this work. The acquirer has to pay about $3 per hectares, according to the size of the plot to receive a temporary occupancy certificate, which is valid for three years. After three years the land is regarded as offcially owned by the occupant and the necessary certificates are produced.

[18] *Kwatebala Gare* – In case a new person comes and wants a plot of land in the village, he will see the village chief (Ilunga Martin) who will take him to the CdT Konga Bantu Léonard, who will give him the land. There is no fixed price for land, but the chief may ask for some salt, or to be built a house. The same system applies to the seasonal transhumants, who must first ask the local chief who then talks with the CdT. The land itself is not valued, only its productivity: once allotted to someone, that person can keep a field as long as it's in production. When he dies, his inheritors can take the land, even the part that is not under cultivation. When a land users leaves, he can sell the added value of having brought the land into cultivation.

Mulumbu – If land is rented, the price is 1,000 Fc/year for a plot of 25 by 25 square meters. This money is only asked for black and red soil. A son can inherit land from his father. Land can only be transferred to another person, through the village chief. If the tenant leaves, he has to return the land to the village.

Shungu (Mwanga Muteba)- The village chief distributes land and is not obliged to seek advice on the matter. Land in this village is very fertile and abundant. Fields are very close to the village (less than five minutes walking).

Amoni – New migrants receive land from the Amoni village chief, who is the sole decision maker. If somebody leaves the village, he will normally have to return the land to the village, in which case he will get back the land when he returns. He can give it to one of his children, or sell the added value of the field (not the field itself) to another person, upon which he loses all rights to the land. Transhumant farmers do not pay the traditional yearly gifts “*milambu”* to the chief and tend to ignore the chief.

Kiboko – Local salary is 850 Fc/day. Land is not sold, but the added value of already cleared land is sold. In Kiboko, one plot of 3 hectares was sold for 75,000 Fc.

Kamungu – It is not difficult for young people to obtain land, one just asks the CdT. Women and men have usually a common field. The harvest belongs to both of them, but the men generally decide what to do with it.

4.2.2 Agricultural System

Agriculture is the main occupation of the local population in the rural villages as well as in the urban areas. The rainy season is from November-December until March-April, but agricultural activities often start as early as August-September, and the last crops are harvested in June (See Table 11).

Table 11)

4.2.2.1 Soils and Crops

Agriculture is practiced on three kinds of land: (1) the common fields are prepared using ridge farming on land already cultivated the previous year (*kurima*); (2) the opening of new field or after a short fallow (*kimbalama)* (3) the agriculture in swampy areas and wetlands during the dry season (*kinyanga*).

Agriculture is based on the mulching system where weeds are buried under ridges, and in the ridges pockets of maize and beans are planted, mixed with small quantities of other plants such as sweet potatoes and leafy vegetables. Work in the field is mostly manual. Animal traction is rare, but promoted by a development program of the Spanish mission in Lukotola. In the socioeconomic survey, only nine farmers (1 percent) of the locals report that they owned oxen, and they were seen only in Mulumbu and Lukotola (8 of 9).

The first crops of the season – sown in early December after the first rains – are most often maize, beans or a mixture of maize and beans. The beans will be harvested after about two months. If the field was mixed with maize, the maize can then mature alone. On monoculture bean fields, harvested in January-February, a new crop of beans is planted only a few days later, using the seeds of the first harvest. This is possible because beans don't have a dormancy period, as most other seeds have.

4.2.2.2 Rotations and Fallow

The first crop is often beans, as is done on *Kimbalama*, the fields created in the middle of the rainy season. The second year, maize or maize and beans are planted. In one village, people said that after five to six years, it was better to plant cassava, which, as it takes three years to mature, and is not very well maintained, looks like a kind of fallow.

Farmers could not cite a clear agricultural cycle where different crop associations follow each other in a fixed order.

Farmers do not recognize a distinct fallow period, but one observes lots of formerly cultivated land that is uncultivated. When people do not have the possibilities to farm all the land, or if they have better land available, they will leave fields, and use it only during the second half of the rainy season: the same year or later, which is in fact a kind of short fallow.

Officially, the reasons cited by villagers for *Kimbalama* are the creation of new fields from previously unused land, the diminished the work load over agricultural season, and – but only secondary – for reasons concerning the fertility of the soils.

4.2.2.3 Creating a New Field

To create a new field, from forestland, farmers start with ringing the trees during the dry season, so they die. After the first crops have been put well in place, in December, the new fields are then cleared, and burnt in January, and when the soil has become softer, the land tilled. Such fields are called "*kimbalama*" "second rainy season crops". In February/March they receive a first crop of beans, which will ripen after the rains. Only after a first "bean" year, this land can be used for maize crops.

The villagers consider that an already used field is worth more than a newly cleared field, as in general, the first harvest on a new field is not good. The quality of the soil, as elsewhere, is

indicated by the grasses and weeds that grow, not by the age of the field[19]. This is an important observation, as it means that in case land has to be replaced for the mine, not only the value of the present crop has to be taken into account, but also the production loss during the first year in a new field.

4.2.2.4 Governmental Agricultural Extension Services

There are agricultural specialists present in Fungurume and Tenke in the government administration. These agronomists are mainly active in solving conflicts: land surveys, land conflicts, measurements of fields, measurements of yields. A recent government policy is to mandate a greater variety of crops to the local farmers: each farmer should grow at least cassava, beans, soybeans and peanuts. This means a change for the local farmers, as cassava is a little grown secondary crop and soybeans and peanuts are rarely grown, except around Fungurume.

4.2.2.5 Cultivated Surfaces

During the village discussions people reported that on average 1 hectare is needed to feed a family. This is close to the results obtained during the socio-economic survey: the average number of hectares possessed is more than 1.0 hectare, as some farmers have commercial size surfaces, but the median size (e.g., attained by half of the farmers) is close to this value of 1 hectare. Surfaces are higher in Lukotola, as 15 percent interviewees used oxen to plow their fields.

Table 10. – Cultivated Surface (in Hectares) According to Location

		Rural	Fungurume	Tenke	Lukotola	Total
Mean	moyenne	1.39	1.44	1.02	2.35	1.42
Median	médiane	1.06	1.03	0.75	1.34	1.00

Average of all Population, and Median, Surface Attained by 50 percent of the Farmers.

4.2.3 Agricultural Calendar

The agricultural calendar was established during discussion with the farmers of Mwela Mpande Gare and Lutanda, during a meeting where both men and women assisted and participated. The knowledge of the local calendar is very good and women and men would argue before agreeing on dates and orders of importance. The differences observed between the calendars given in Mwela Mpande Gare and Lutanda, were extremely minor, indicating the quality of the information.

[19] Information was provided at a Kamungu meeting with men and young people.

Table 11. – Agricultural Calendar for the TFM Study Area as Dressed Up Using Information from the Villages Lutanda and Mwela Mpande Gare.

Month	Main Activities	Level of Activities	Rains	Food Availability
September	▪ start of clearing, digging, preparing ridges	+	no rain	a little
October	▪ continue field preparation: clearing, digging, preparing ridges ▪ after the second rains, sowing of maize, beans, peanuts	++	2-3 times per month	a little
November	▪ continue field preparation: clearing, digging, preparing ridges ▪ sowing of maize, beans, peanuts, Irish potatoes	+++	2 times per week	diminishes
December	▪ sowing of soy beans and sweet potatoes ▪ prepare cassava fields ▪ weeding of maize ▪ start clearing the kimbalama fields for the second beans harvest	+++	every day	poor supply
January	▪ harvest of maize and beans from the marsh fields (kinyanga) ▪ start harvest of early beans and early peanuts ▪ second weeding of maize, weeding of soy beans ▪ start sowing of the kimbalama beans	++/+++	several times per day	hunger period, not more than one meal per day
February	▪ towards the 15/02 start of the maize harvest (maize will be left to dry in the field) ▪ sowing of cassava, small egg plants ▪ main harvest of early peanuts ▪ end of the first bean harvest ▪ end of the 2nd beans sowing haricots (kimbalama) ▪ no further hoeing and weeding	+++	2-3 times per week	less hunger as new products (beans, maize, peanuts) become available.
March	▪ dry maize and beans ▪ no further hoeing and weeding	+	1-2 times per week	the famine is over, one can eat as much as one wants
April	▪ start of the harvest of the late peanuts, soy beans, sweet potatoes ▪ harvest of maize as consumed (remainder dries in the field) ▪ start of preparation of the kitchen garden fields in the marshy areas	+	very little	abundancy of food
May	▪ surveillance of the fields against thieves ▪ harvest of maize as consumed (remainder dries in the field) ▪ clear a corridor around the fields to avoid damage by bush fires ▪ sowing of market garden crops: cabbages, onions, tomatoes, Irish potatoes	rest	no rain	abundancy of food
June	▪ main harvest of maize, threshing and transporting the harvest to the village ▪ harvest of the second beans crop ▪ start of the preparation of the marsh land fields	++	no rain but very cold	abundancy of food
July	▪ end of maize and beans crop ▪ preparation of the marsh land fields ▪ start of sowing the marsh lands (beans, maize,…) ▪ burning of the harvested fields ▪ start of clearing of bush land for the new year	+/++	no rain but cold	abundancy of food
August	▪ sowing the marsh lands (beans, maize,…) ▪ building and improving the dwellings in the fields	+	no rain	abundancy of food

In both villages, the major impact on agriculture was the onset of the rains; the rains were late in 2005, and people complained that during the last few years, rains that would normally start in October-November had been delayed by one to two months.

Table 12. – Agricultural Calendar for Individual Crops in the TFM Study Area as Dressed Up Using Information From the Villages Lutanda and Mwela Mpande Gare:

		Months of the year: J=January to D=December																
Culture/crop	**Days**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
maïs /maize	120			++	++	++	++	R	R	R									
maïs de marécage marsh land maize	120	++	++	++	++								++	++	++	++	R	R	
haricots beans	90			–+	++	++	R												
haricots *Kimbalama* kimbalama beans	90						++	++	++	++	R	R							
arachides hâtifs early peanuts	60-65				++	++	++	R	R										
arachides tardifs late peanuts	120-50				++	++	++	++	+-	R	R								
patates douces sweet potatoes	120				++	++	++	++	R	R									
manioc early maturing cassava	6mois 6 months				+	+	+	+	+	+	+/ R	+/ R	+/ R	R	R	R			
manioc late maturing cassava	12-36 mois 12-26 months	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

+/++ Growing season/saison de culture.

R Harvest/récolte.

The calendar shows the complexity of the agricultural system and the important workload it represents for the local population.

Only during the months of March, April, May, August and September do the farmers have less work, but even during these relatively quiet months they are occupied by guarding the fields, or the preparations of the new fields for the following year.

4.2.4 Agricultural Economy

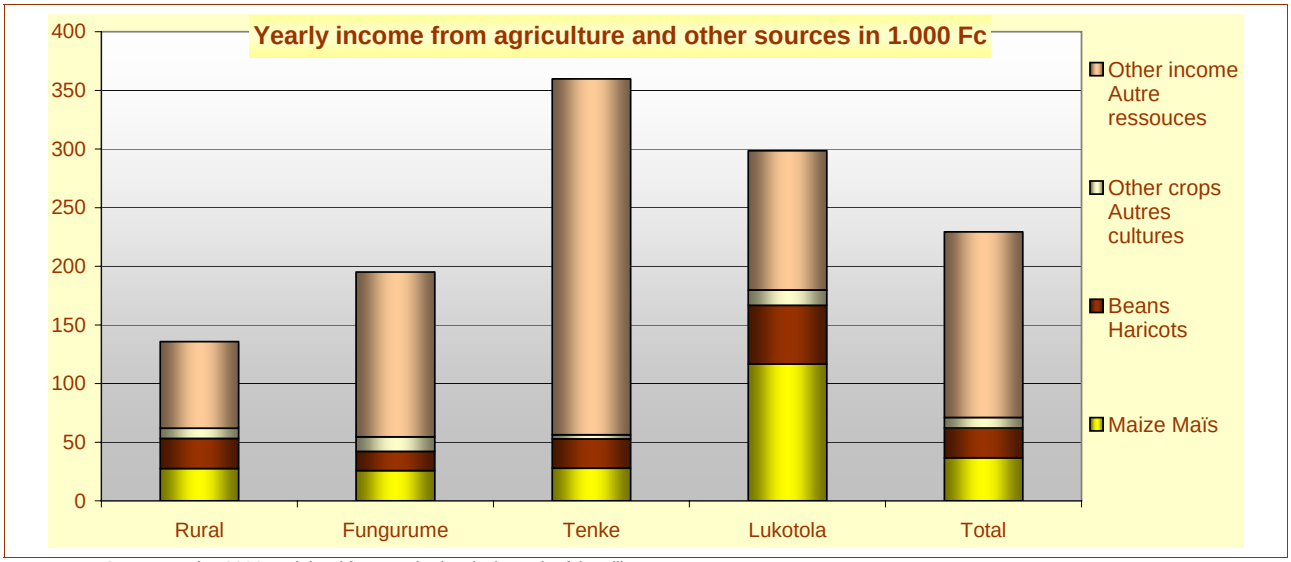
4.2.4.1 Income from Agriculture

Income from agriculture was obtained during the household interviews. It was often difficult for the people to provide a clear response: farmers easily remember the important amounts they sell directly after the harvest, but have more difficulty in remembering the small amounts of food (mainly maize) they sell every time they need some money to go to the market to buy medicine or for other daily needs. The results of the quantitative survey should thus be considered more indicative than definitive.

On average, agriculture provided 32 percent of the income: 43 percent in the rural villages, 27 percent in Fungurume, 16 percent in Tenke, and 60 percent in Lukotola. The average amount reported for last year was between 69,000 Fc in rural villages, about 60,000 Fc in both Tenke

and Fungurume, and 179,000 Fc in Lukotola. Maize[20] is the most important crop (16 percent of income) followed by beans (11 percent).

Figure 4. – Yearly Income From Agriculture in 1,000 Fc According to Location.



Note: Survey results, 2006, weighted for sample density in each of the villages.

4.2.4.2 Animal Husbandry

Cattle raising is not an important activity in the area. Reasons sometimes cited are the fear of damage to the fields, and, more unspoken, the fear of having the cattle stolen. As can be seen from the following table, oxen are still mostly confined to Lukotola; pigs are present in several villages, but on average less than one per household. Goats are kept, while sheep are said not to fare well in the area. The fowl category concerns mostly hens, but also ducks, pigeons, and sometimes Guinea fowl. One observes that on average 40 percent of the people have no animals.

Table 13. – Average Number of Oxen, Pigs, Small Ruminants and Fowl per Village, and the Score Attributed in the Global Socio-economic Index Score for Cattle Possession.

English	Français	Rural n=	Fungurume n=	Tenke n=	Lukotola n=	Total n=
oxen	bœufs	0.0	0.0	0.0	0.5	0.02
pigs	porcins	0.4	0.9	0.8	0.4	0.8
goats	caprins	0.7	0.4	0.5	1.7	0.5
fowl	volaille	3.2	2.3	2.3	7.6	2.6
% households without animals	% de ménages sans bétail	36%	38%	44%	27%	39%
Score SE index	Score indice SE	0.72	0.80	0.75	1.81	0.82

Source: SE survey 2005-2006.

[20] This is contrary to what people usually said during village meetings when they all insisted that beans were a far better source than income than maize. This inconsistency in the replies shows how difficult it is to get reliable data based on memory only.

The price of the various animals fluctuates strongly as a result of fluctuation in supply and demand. During the harvest season, animals are more expensive, as people consume meat and try to invest in animals, during the lean season – when cereals and money are in short supply – some people are obliged to sell against very low prices.

Table 14. – Indicative Prices of the Main Animals in the Rural Villages of the TFM concession.

Pig	Goat	Hen	Duck	Guinea fowl
Porc	Chèvre	Poule	Canard	pintade
12,000-25.000 Fc	12,000-15.000 Fc	1,000-2.000 Fc	1,000-2.500 Fc	2,500-3,000 Fc

Source: village interviews.

4.2.5 Yields

The agricultural calendar (Table 11) describes how the harvesting of maize and beans takes place: whenever possible people would leave the crop to dry in the field and just take their daily needs for one or two months. In June, when the crop was completely dry, they would harvest and bring the crop to the village, keeping part for home consumption and part for selling. However, before the moment of the main harvest, a more or less important proportion of the production has already been consumed for daily use or sold to meet daily needs.

In interviews, it was clear that people more easily remembered how much of the harvest they brought back from the fields to their homes, than the part that gradually disappeared through day-to-day consumption.

The following, Table 15, was compiled using data from village interviews.

Maize – Poor harvest: less than 500 to 1,000 kilograms per hectare; average harvest 1,000 to 1,900 kg/ha, a good harvest: more than 1,900 kilograms per hectare; with improved seeds and fertilizer: more than 4,000 kilograms per hectare.

Table 15. – Average Reported Yields for Maize and Beans in the Villages of the TFM Concession Area

Village	Crop	Bad (meka of 2.5-3 kg)	Average (meka of 2.5-3 kg)	Good (meka of 2.5-3 kg)
Mwela Mpande Gare	maize	10 meka	25 meka	>50
	beans	2-5 meka	10-20 meka	>20
	soy beans	Never		More than 30-35
	peanuts	<20 meka	20-30 meka	>30
Mutaka II	maize	25 meka	40-45 meka	50 meka or more
Kasanga	maize	<20 meka	20-40 meka	>40 meka
	beans	< 10 meka	10-20 meka	>20-25 meka
Lukotola	maize without fertilizer		25-35 meka	
	maize with fertilizer		> 4,000 kg/ha	
average in kg /ha	maize	500-1,000 kg/ha	1,000 – 1,900 kg/ha	> 1,900 kg/ha
	beans	100-400 kg/ha	400-900 kg/ha	> 900 kg/ha
	peanuts	< 800 kg/ha	800-1200 kg/ha	>1,200 kg/ha

4.2.6 Seasonal Variations in Food Supply

The seasonal variations in food supply are very marked in the area. The lowest prices in the markets for the main foods (maize, beans, peanuts and vegetables) are observed during the abundancy period that follows the start of the harvest season (March-April). From then on prices

rapidly rise until they are at their peak during the lean season around Christmas. At that time all food stocks are finished and people can only obtain food against high prices in the markets or through lending themselves out for agricultural contracts paid in-kind with cereals, by farmers who still have food in stock.

The 2004-5 campaign was a typical one, with extreme price fluctuations:

- *Maize* – In most villages maize was reportedly sold for 125 to 150 Fc after the harvest in April-May, rose to about 450 Fungurume in September 2005, 700 Fc in December and 750 Fc in January 2006. Only in the end of February did the price suddenly drop, when new maize came available: to 150 Fc at the end of March, but then rose again to 200 Fc and more in April.
- *Beans* – Beans rose from 400 to 450 Fc during the harvest early 2005 to 1,300 Fc in January 2006.

Not all years have such extreme variations, in 2004/5 prices for maize had generally varied between 100 and 400 Fc, and for beans between 400 and 650 to 700 Fc.

The high prices for food observed at the end of 2005 were the result of multiple causes. The illegal mining in the area had not only drawn from the fields into the mining trade, but had also created an easy market for selling the harvest. The 2004/5 rains had been unfavorable and caused a less than average harvest. Problems with cereal supply in neighboring Zambia also had a negative effect on the cereal price.

The notions of “famine” and “hunger” are known in the area, but – at least in living memory – are not part of the local history. People know about hunger[21], and maize can be in short supply but they admit that they do not remember a period that there was so much hunger that children would die[22].

4.3 Formal Employment

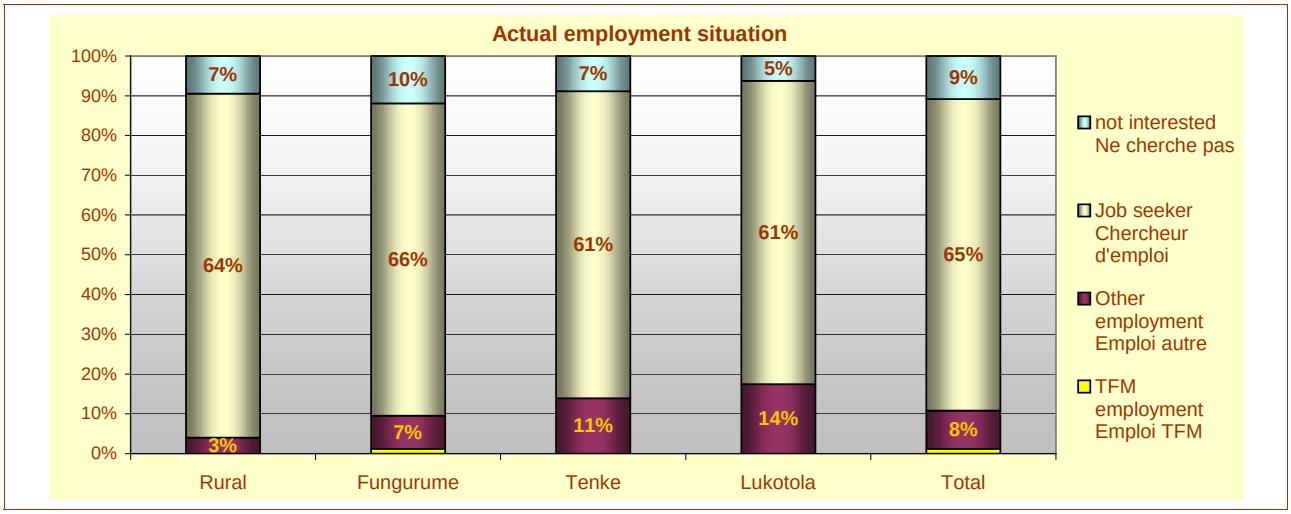
As indicated before, about 10 percent of the population is actually working on a wage-earning job, but not all of them receive regular pay. Civil servants, and teachers in the various schools, as well as people working in the various health centers belong to this group. The companies of Trabeco in Fungurume and the railway company in Tenke provide industrial work. So far, the impact of TFM as an employer is not visible, in spite of the fact that in some areas daily laborers were recruited during the survey period.

The estimation of the number of job seekers in the area – excluding those who already have a job, even though most of them said they would rather work for TFM – is 75 percent of the 12,000 men between 16 and 49 years or 9,000 job seekers.

[21] Hunger is "nzala" in Swahili, but "Kipowe kyapona mumuzi" translates as “hunger /came down /village” hunger has invaded our village.

[22] Several cases of malnutrition among young children were observed in the villages, but they are more often related to other pathologies or psychological reasons (such as the young girl whose mother died), than to a basic lack in food.

Figure 5. – Actual Employment of the 16-49 Years Males by Village of Residence.

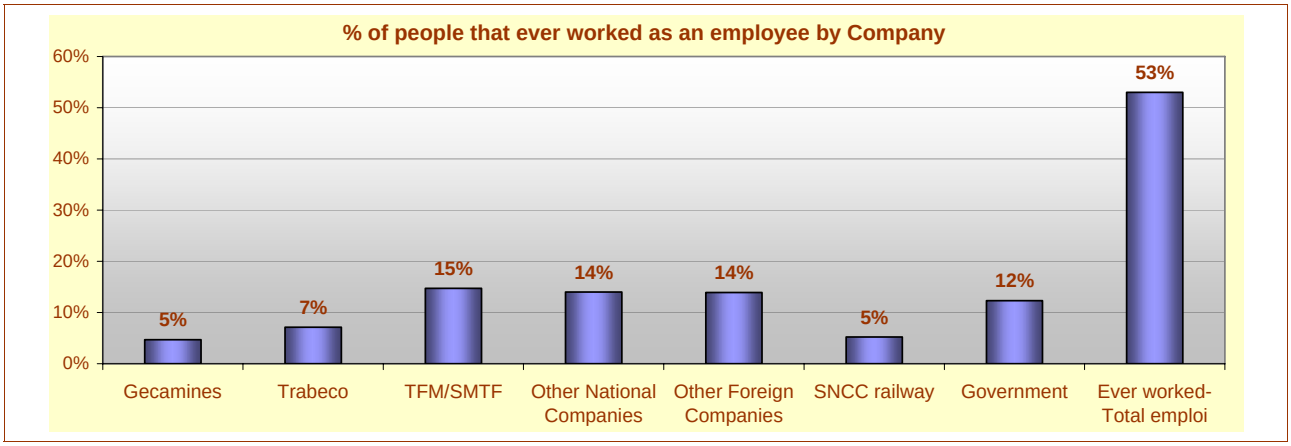


Note: 2006 survey results, weighted for sample density in each of the villages.

The region has regular employment as can be seen from next graph: in more than 50 percent of the households people have had a regular job at a certain moment. The duration of these jobs was on average 9.7 years. In spite the fact that the construction of SMTF base was stopped about 30 years ago, work related to the SMTF/TFM mine (including companies like Fluor Utah) has employed 15 percent of the households, more than any of the other categories. However, periods were short, on average 2.9 years, compared to about 10 years in Gécamines or Railway Company and even 16 years in government jobs.

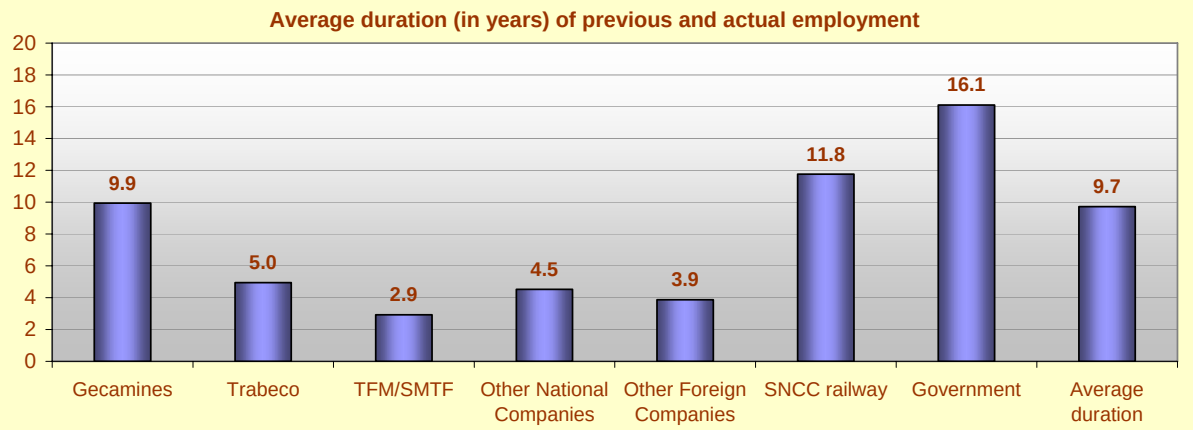
Surprisingly, 53 percent people in the rural villages had ever had a job, almost the same proportion as in Fungurume (53 percent) and in Tenke (54 percent). See Figures 6 and 7.

Figure 5. – Proportion of Households (%) that Ever Worked as Employees



Note: 2006 survey results, weighted for sample density in each of the villages.

Figure 6. – Duration of Employment of Those Who Had Worked by Kind Employment.



Note: 2006 survey results, weighted for sample density in each of the villages.

As an indicator, 50 percent of the people had stopped working for the Gecamines by 1984, 80 percent by 1993. Most people that had worked for TFM had stooped doing so between 1996 and 1998. The only companies that kept some of their employees were Trabeco, the railway and the government. See Table 16.

Table 16. – Year that people who ever worked stopped being employed by the company.

English	French	50% stopped being employed	80% stopped being employed
Gecamines	Gecamines	1984	1993
Trabeco	Trabeco	1995	2004
TFM/SMTF	TFM/SMTF	1996	1998
Other National Companies	Autres companies nationales	1994	2005
Other Foreign Companies	Autres companies internationales	1993	2001
SNCC railway	Chemin de fer	2001	44% still working
Government	Gouvernement	54% still working	54% still working

Note: 2006 survey results, weighted for sample density in each of the villages.

4.4 Secondary Activities

4.4.1 Blacksmiths

The blacksmiths that work with copper (*mukuba*), have a relationship with the ancestors. Such blacksmiths are apparently rare now (Mwela Mpande Gare). Blacksmiths that work iron (most agricultural tools observed had been made in the villages by local blacksmiths) have no traditional or ceremonial role.

4.4.2 Cereal Mills

In many villages a cereal mill is present. Often these mills are not kept by local people but by outsiders, who use a local caretaker. The grinding of maize is expensive: 50 to 100 Fc for a meka of maize (2.5 to 2.8 kg), or, when paid in kind, up to two cups of maize for every five cups grinded. Women are prepared to pay this price because of the important amount of

time necessary for soaking and pounding maize manually[23]. In one village, (Mulumbu Kyasa) a transhumant farmer keeps the mill near his field.

4.4.3 Local Breweries

Beer brewing (*munkoyo*) is an important source of income for the women. The ingredients for beer are mainly maize and "*munkoyo*" roots and lots of firewood for the boiling of the beer. These ingredients are either bought or taken from their own stock. A few examples show the profit that women can draw from it:

1. 350 Fc of *munkoyo* roots, 600 Fc for grinding the 8 meka maize flour from the private stock (price of the day 100 Fc/meka) was sold for 10 meka of maize and 1,500 Fc, leading to a net profit of 750 Fc.
2. 7 meka of maize (worth 700 Fc) ground for 525 Fc were sold for 6 meka of maize and 3,000 Fc, leading to a net profit of 2,375 Fc.

Beer brewing is an important activity especially for the women, and it is often the only way that money earned by the men transfers to the women. In discussions about the effect of illegal mining on the local communities, the consumption of local maize beer "*Munkoyo*" and distilled liquor "*Lukutu*" was often cited with as main impacts, the social problems related to drunkenness, and the financial gains that women could obtain from selling liquor.

In the socio-economic survey, local drinks are a source of income for 27 percent of the houses headed by women, and 24 percent of the households in the rural villages. In terms of income, the sale of local drinks represent 16 percent of the reported income of women, and 5 percent of men. However, as women irregularly prepare local drinks, they often do not have a good idea of exactly how much they sold over a year and what their actual profit was. Among those that reported selling local drinks, the average income of 84 households from local drinks was 40,000 Fc, or 28 percent of the total income of 144,000 Fc these households reported.

4.5 Artisanal Mining

Obtaining good information about illegal mining through the questionnaires has been difficult. The demographic survey would have likely obtained the most reliable answers, as at this point of the survey, trust was gained between interviewer and interviewee. One out of 7 families in the rural areas and 1 out of 4 in Tenke indicated that they had engaged in artisanal mining. See Table 17.

Table 17. – Percentage of Households that Reported Having Been Engaged in Artisanal Mining.

English	French	Villages Ruraux Rural Villages	Fungurume	Tenke	Tous Villages All Villages
artisanal mining	Exploitation minière artisanale	14.7%	14.3%	25.0%	17.8%

4.5.1 Organization of the Miners

According to the local population (e.g. in Mwela Mpande Gare) most artisanal miners came from Likasi, Lubumbashi, Kolwezi and Kambove, and worked for drinks and to buy clothing.

[23] In markets, maize flour is only slightly more expensive than whole-grain maize, as the weight of a pot of flour is less than the weight of a pot of grains.

Child labor was common. In the mines, children from 12 years onwards worked, and children as young as 4 or 5 would participate in washing the heterogenite.

A team of 5-6 people could dig up to 2 tons (50 bags) per day. There were two systems[24]:

1. The house '"*maison*"; where the "*boss*" hires, houses and feeds his crew, and pays them once the production has been sold. The tariff per sac was between 1,500 and 1,800 Fc for the gravel-size products, and 2,000-2,500 Fc for the bigger stones. The "*boss*" will deduct form his sale 400 Fc/person/day for food and housing, and give the remaining sum to his team. If ever the production has been confiscated by the mining police, the "*boss*" loses his investment in food.
2. Independent miners, who organize their own housing and food, and sell directly to the boss.

The miners' *boss* would deposit the bags of mined heterogenite in the village (up to 1,000 bags/week) and people would wash and sort for a payment of 100 Fc for each activity or 150 Fc for the two activities. Adults could wash up to 10 bags per day.

The illegal mining had to stop, when the bosses were arrested. Without the bosses, there was no way to sell the heterogenite, and the market collapsed.

4.5.2 Mining in the Mulumbu Area

The mining activity was very important in this village. The actual mining was done by people from outside the area. The young village men were afraid to descend into the mines, and mainly participated with the transport of the heterogenite. This transport was paid 200-250 Fc per sac from the mountain to the river, where it was washed and purified, and 400-800 Fc from the river to Tenke. Of this profit, the police roadblocks between Mulumbu and Tenke would take a share: 300 Fc, to be paid by the owner of the heterogenite at the first roadblock, and 300 Fc to be paid by the transporter at the second one. This transport was still profitable as bicycles could carry up to five sacs at the time.

The induced income-generating activities were very important, but mainly taken care of by outsiders from the village. The local villagers sold maize, beans, vegetables, local beer and local alcohol to the miners. They participated in washing the heterogenite. Women prepared meals they sold to the miners: for 500 Fc for a meal of fish or meat, 800 Fc for chicken. Good food was in sight everywhere and was a very valued expenditure for the miners[25].

The miners spent most of their money on food, drinks, clothing, and radios. Their fear to go down into the deep mines was overcome by alcohol and drugs.

4.5.2.1 Perceived Positive Aspects of the Artisanal Mining

The economic development, and the expanding trade possibilities were perceived as an advantage of the mining activities: goods were available in the markets on a daily basis, goats were slaughtered almost every day. There were mobile phones in the village, and products were paid for in cash, and miners drank a lot in the mines and in the village, providing income to the women. Products were easily sold, but inflation was apparently

[24] Village interview, Mwela Mpande Gare.
[25] In the villages one could generally recognize a former miner by his healthy aspect and his strong muscles.

limited: a bottle of local alcohol that sold for 250 Fc during the mining period, was sold for 200 Fc when the miners had left.

The women came for prostitution from as far as Kamina, Lubumbashi, and even Kinshasa, selling their charms for 500-800 Fc. According to the population from Mulumbu, these women probably earned more from the mining than the men, as they knew much better how to save money: when the mining was finally stopped the women "left the village with lots of money and well dressed" while the diggers left "poor".

4.5.2.2 Perceived Negative Aspects of the Artisanal Mining

Negatively perceived in the villages were the inflation of local products, the tendency of the local population to sell off too much of its cereal supply, the way money was spent without thinking about tomorrow, the daily fights in the village, the disputes between spouses about adultery[26], the young men who were entertained and supported by elderly women, …

4.5.2.3 General Perception by the Population of the Artisanal Mining

The various discussions in the villages[27] show that the people appreciated the income from mining, and considered it as a beneficial activity in their village, noticing however the social problems it created. The eviction of the miners by the mining police was accepted, as they hoped that the villages would obtain more benefits from a big commercial mine than the induced benefits they received from the illegal miners.

Local authorities (village chiefs, CHEFS DE TERRE) often had a more negative view on the illegal mining, as the miners in general neither respected their authority nor rewarded them with the gifts they were supposed to receive.

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[26] In one village, the men replied to the accusation of their infidelity that the mining activities provided them with enough money to take care of both their legal spouse and their mistress.

[27] Notes of some of the village discussions:

Salabwe – Young people had worked in the mines. They sold one bag of rough copper ore for 1,500 Fc and a bag of cobalt ore for 2,000 Fc. A team of five miners would be able to dig between 10 and 15 bags. Much money was spent on food, which was important, often up to 5,000 Fc per day: a shopping list was prepared, and once the food was there, everybody could eat whatever they wanted. Some of the money was saved, and one young man indicated how he had spent 50,000 Fc on roofing material for his house and bought two radio-cassette players.

Kiboko – The village participated in transporting and washing the heterogenite: transport 50-150 Fc per 50 kilogram bag, washing and sorting 100-150 Fc/50 kilogram bag. "People from Mulumbu worked more than us. They participated in the digging and have made important profit out of the mining".

Ndela 1 – Illegal mining. The activity was considered beneficial to the village, and appeared obvious during the discussion that many young people had participated: diggers (some with experience in other mines of the Katanga in Likasi and Kambove[27]), transporters (many bicycles have been confiscated by the mines' police). Concrete examples of how money was spent include: payment of dowry, bicycles, and financing of university studies. However, much money was used in a consumptive way to pay for "good food", drinks, women, clothing, beds and foam mattresses, cassette radios, etc. The whole population regrets the illegal mining ("yes, yes…") as since its end an economic crisis has replaced its benefits.

Ndela Prudence – The diggers were responsible that the villagers abandoned their agricultural work.

Mwanga Kakunt. – A young man explains how he earned 7 Kfc/day, but never managed to take anything home to his grandmother with whom he lived.

Fungurume – There were many artisanal miners, many of who came from elsewhere. Now that you have chased them we were expecting employment, but apparently there is not enough.

Women's focus group – Illegal mining was good for the local economy and the small trade practiced by women. One teacher tells that even in the schools it was observed that people had less difficulty paying attendance fees. "The absence of illegal mining is bad for our business".

4.6 Hunting, Fishing and Gathering

The extractive activities in the area appear to be of minor economic importance as most game is extinct; there are no big rivers or lakes for fishing. Firewood and charcoal are the main products harvested from the bush while further gathering is mostly limited to fruits, some medicinal plants, and – seasonally – mushrooms, termites, and caterpillars.

Names of the various products hunted, fished and gathered are given in Appendix B4.1-11, Section 15.

4.6.1 Hunting

Table 18.– Hunting According to Village Note:(Lukotola has Been Included with the Rural Villages).

English	French	Villages Ruraux Rural Villages	Fungurume	Tenke	Tous Villages All Villages
does not hunt	ne chasse pas	93%	94%	94%	94%
snares	pièges	6.0%	3.5%	1.3%	4.8%
lance (and dogs)	lance	1.5%	0.7%	0.0%	1.1%
bow and arrow	arc-et-flêche	0.0%	1.4%	2.6%	0.7%
rifle	chasse fusil	0.0%	0.7%	1.3%	0.4%
sells bushmeat	vente viande	0.0%	0.7%	1.3%	0.4%

Both hunting (Table 18) are very secondary activities only performed by a minority of the rural dwellers. Snares are the only hunting gear still used near the fields and serve to catch rats that come to feed on the crops. A few people have rifles, but they hunt far from the villages, mainly north of the Monvia River and east of Lukotola.

4.6.2 Fishing

Adults and children engage sometimes in a little fishing with line and hook in the small rivers, while some use nets to fish in the bigger Dipeta and Monfya rivers (Table 19).

Table 19. – Fishing According to Village Note: (Lukotola has Been Included with the Rural Villages).

English	French	Villages Ruraux Rural Villages	Fungurume	Tenke	Tous Villages All Villages
Does not fish	Ne pêche pas	93%	99%	100%	96%
Angling with line and hook	Pêche à la ligne	5.3%	0.7%	0.0%	2.9%
Net	Filet	3.0%	0.0%	0.0%	1.5%
Sells fish	Vente de poisson frais	0.8%	0.0%	0.0%	0.4%

5 INCOME AND EXPENDITURES

5.1 Overview

Obtaining data for income and expenditures in a society essentially based on subsistence and barter and where money is rare, is very difficult. At best, the data can provide an indication of various sources of income and expenditures. Several of characteristics of the local economy in the Tenke Fungurume complicate the data gathering:

- Seasonal differences in agricultural prices are very strong. In 2005/6 the price of a meka of maize (about 2.6-2.8 kg) varied between 150 and 750 Fc, and a meka of beans between 450 and 1,300 Fc. Income derived from these main agricultural products depends on the month and season of sale, expenditures of the month and season of buying.
- Products that are sold on a few occasions during the year, which is often the case for the bean harvest, are more easily remembered than products that are sold irregularly in small quantities in order to provide money for the daily expenditures.
- The economy in Katanga is still largely based on barter, a consequence of years of hyperinflation[28]. School fees, agricultural contracts, clothing, and many other items are sold in-kind in the villages.
- People borrow during the year and repay in-kind during the harvest. Data on this phenomenon are difficult to obtain.
- Revenue from trade in the markets and from activities like beer brewing is fairly regular, and thus difficult to extrapolate to a yearly income. People also usually confound gross income and profit, and do not take into account their costs while selling products[29].
- Consumption of homegrown foods is part of the income and should theoretically be included as part of the income. However, this home consumption of agricultural products ("*autoconsommation*") is very difficult to evaluate in rural societies. The survey indicates that the diet of most people was based on cereals and a vegetable relish, generally produced by the household, which contains, as the only bought items, salt in the rural areas and in the urban areas for the more affluent households, dried fish.
- Men tend to be more aware of the bigger revenues, while women take care of the smaller revenues and expenses.

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[28] Inflation has been extreme in the DRC during the last 25 years. The Zaire, the precursor of the actual Franc Congolais, used to be at a rate of 1 Zaïre to the dollar. The actual Congolese franc (=10,000 Zaïre), started at about 0.7 Fc to the dollar and is now about 430-440 Fc to the dollar.

[29] Three aspects make it difficult to remember income and expenditures: (1) income is the difference between expenditures and sale, which are not easily obtained in a reliable way; (2) daily expenditures on income from sale are part of the benefits, and should be included in the income. (3) costs related to selling products should be deducted from income of sale: the buying price of the products, transport costs to go to the market, food bought in to market to eat there, etc. (a woman who sells maize in the market, and buys salt and soap with her revenue, should include the selling price in her income, if the maize is form her field, but deduct the buying price if she bought the maize.

5.2 Methodology

Income – Income was noted, as far as possible, as yearly income. Questions related to income have been submitted to all interviewed persons, as they were part of the main questionnaire of the baseline survey. They provided data for 201 rural and 342 urban families. Amounts given were converted to yearly incomes. For all items, people tended to remember most recent events. That is probably why agricultural work, a rainy season activity, is much more cited than charcoal making or beer brewing, which are dry season activities. The resulting tables of income and expenditure are only indicative of what people spend money on and how much they spend in the concession area.

Expenditures – During the survey, the expenditures were based on expenditures during the preceding period for daily items (one day in the urban areas, one week in the rural areas), and partly on the yearly items (education, clothing, ceremonial expenses). The questionnaires were administered in one out of two families where a knowledgeable person was available to provide sufficient answers. The total sample for expenditure covers 112 people in the rural villages and 133 in the urban areas[30].

5.3 Results

5.3.1 Income

The distribution of income in the population is skewed as many people have a small income and a few people with a very high income. The resulting average income gives a false idea about the prosperity of the general population. The use of the median income, the income attained by 50 percent of the population, is a better indicator, which gives a much lower value than the average income.

Overall in the area, the average income is almost 250,000 Fc, but the median income is half as low with 109,000 Fc. Median income is less different between categories than absolute income. Categories that had the smallest income were, quite unsurprisingly, the rural population and the households headed by women. Just as food was the most important item of expenditures, agriculture was the most important source of revenues[31].

Average household size is 4-4.5 in the rural villages and 5.5-6 in Tenke and Fungurume. At 1 USD = 500 Fc, the money spent is less than a dollar/day/household in the bush. Various monetary sources are represented in (Table 20). Figure 20 shows that agriculture is the prime source of income in the rural areas and trade the main source in the urban areas. However, trade is not a main livelihood of many people, but some of the traders have a quite substantial income, which skews the overall outcome.

[30] Urban sites: Fungurume (including Mpala and Bloc Mitumbu), Tenke, Lukotola. Rural areas include all other sites surveyed.
[31] Details on the crops that provided the agricultural revenue are described in Section 4.2.4.1 on agriculture.

Table 20. – Average and Median Incomes by Sex, by Location and by Duration of Residence

		Average (x 1,000 Fc)	Median (50%) (x 1,000 Fc)	n=
By sex / Par sexe				
women	Femmes	205.7	95	630
men	Hommes	251.6	110	5935
By location / Par lieu d'habitation				
rural	Rural	160.8	80	745
Fungurume	Fungurume	216.4	114	4285
Tenke	Tenke	381.3	126	1290
Lukotola	Lukotola	340.4	95	245
all urban	Tous sites urbains	258.2	115	5820
By residence / Par résidence				
permanent rural	Ruraux permanents	129.3	79	470
temporary rural	Ruraux temporaires	219.9	86	265
permanent town	Urbains permanents	245.7	114	5450
temporary town	Urbains temporaires	569.5	150	265
all populations	Toutes catégories	249.4	109	6450

Note: 2006 survey, dated weighted for sampling size.

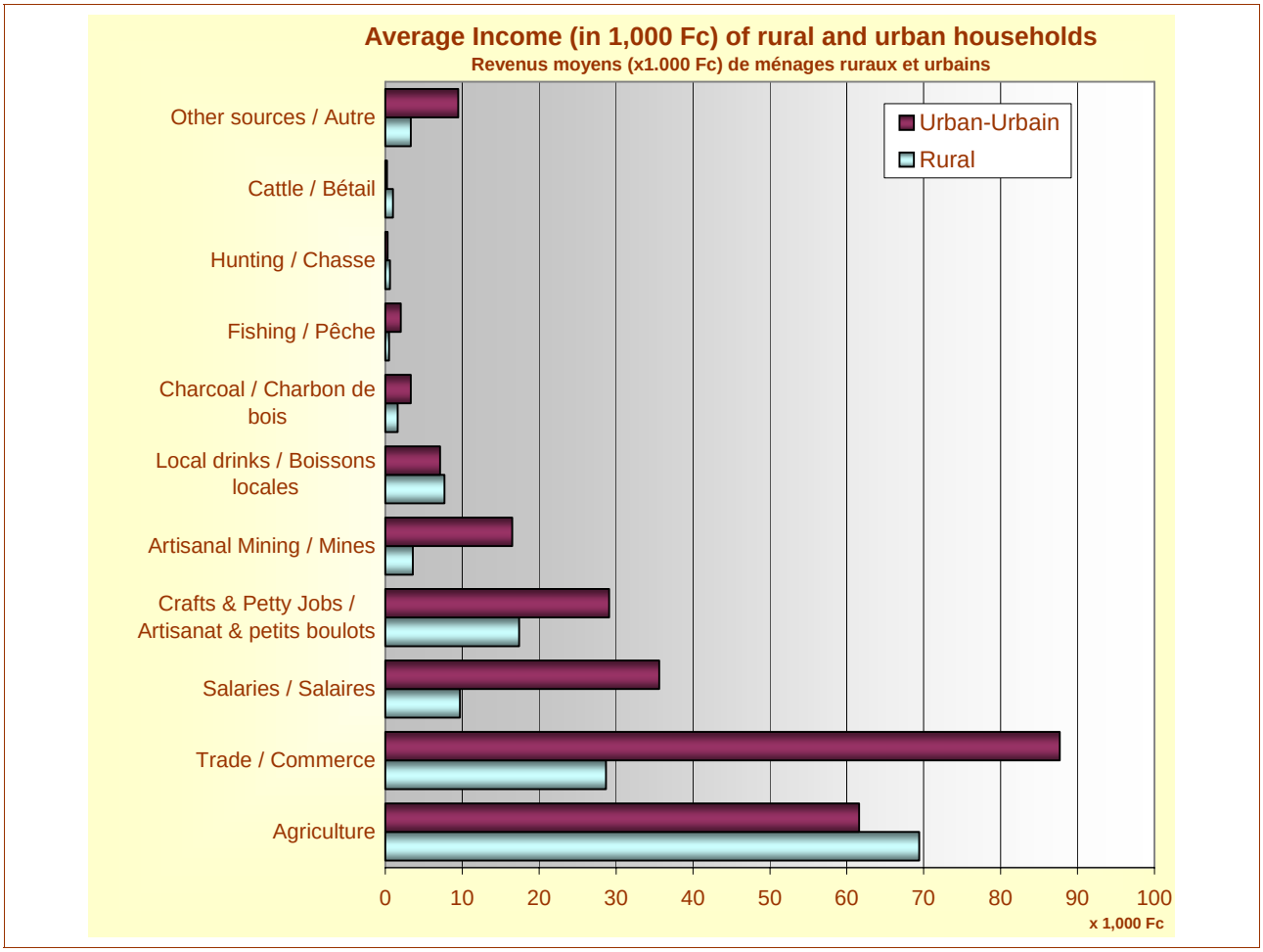

Figure 8. – Average Revenue in Urban and Rural Areas (in 1,000 Fc or about 2USD)

In the urban areas money from salaries, crafts and petty jobs also add a substantial amount to the local income.

Income from illegal artisanal mining was on average estimated at 17,000 Fc in the urban areas, but was almost 91.000 among the recent urban migrants. Fear of reprisals by the police or diminished chances for project employment, has probably led to a significant under reporting of such revenue.

Traditional activities such as hunting, gathering and fishing do not provide significant income. Selling local drinks brings up to 10,000 Fc/year among households headed by women.

5.3.2 Expenditures

The global average expenditure is 196,000 Fc, but subject to great variations. In fact, the median (50 percent limit) is 142,000, and 10 percent of the population indicated that they had made no expenses whatsoever over the period interrogated.

Urban areas – Average expenditures 223,000 Fc, median 179,000, main expenditures on food: 156,000 Fc or 70 percent of all expenses.

Rural areas – Average expenditures 142,000 Fc, median 91,000, main expenditures on food: 69,000 Fc or 49 percent of all expenses.

Expenses in the urban area are thus about 50 percent higher than in the rural areas. Locally people indicate that an average family needs one "*meka*" of cereal per day, which costs, between 150 Fc at the harvest and 750 Fc at the peak during the rainy season, or on average 450 Fc. An average family would thus need about 165,000 Fc annually, just to feed their family with cereals. Other unavoidable food expenses are salt, spices, vegetables and for those who can afford it, oil, fish, meat and bread.

Among the average total expenditure food is the main item (Table 21 and Figure 7), both in the rural and the urban areas.

In spite of the fact that in Tenke and Fungurume 70 percent of the families considers themselves to be farmers, food is the most important item of expenditure for urban populations. Urban families spend more than double the amount spent by rural families on their food: 70 percent of their income, close to the amount that is needed to provide them with cereals over one year. As the survey was conducted during the agricultural season, when food stocks were often depleted and food prices very high, this seasonal influence may have boosted the amount and the proportion of money spent on food.

In the rural areas, most money is spent on the small secondary needs of the households, as most food is produced by the household or earned in-kind through agricultural contract labor: salt (indispensable item of the diet), soap, and candles for lighting. Health expenditures are 10 percent in the rural areas, and 5 percent in the urban areas; they are even higher in the rural area in absolute terms as people often have to spend more money using the informal health sector than the urban people who can use the formal sector and have a wider choice of health centers and medicines available.

Both in the urban and rural areas, education costs per year were less than 5 percent of the total expenditures, but urban people paid about twice as much in absolute terms. The rural

population paid extra money for their children to be fed in town, but on average the amount was very small.

Drinks and tobacco are important items of expenditure in the rural areas, but probably underestimated as it is not a behavior that people easily admit[32]. Even clothing, an item often bought at the time of the harvest, does not appear as an important source of expenditures for urban people. Rural people say they spent on average almost 8,000 Fc on clothing[33].

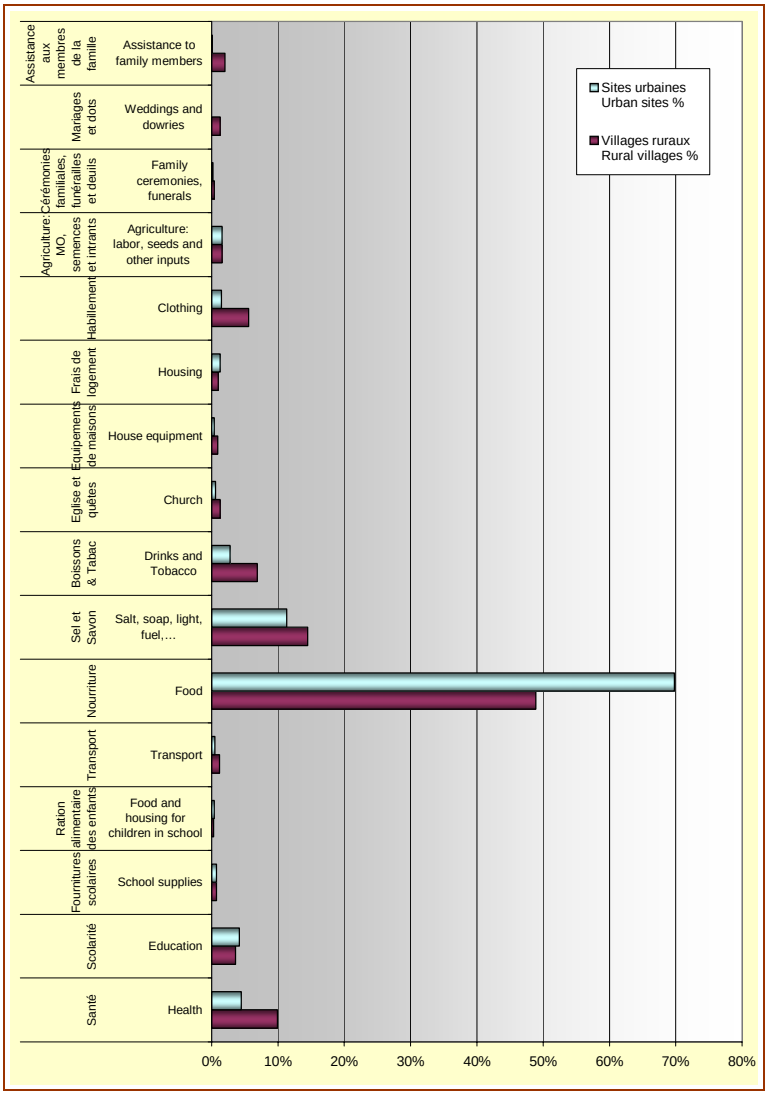

Figure 7. – Average Expenses (in % of Total Expenses) in Urban and Rural Areas (2006 Survey).

[32] Although some of the elderly persons clearly indicated that most of their revenue was spent on smoking and drinking, the economy of local drinks is an important gray area in traditional societies that cannot easily be captured in the kind of community surveys as the one conducted here.

[33] During the first days of the bean harvest in Mulumbu, in-kind traders of clothing used the following rates (based on a pot (meka) of beans current price of 600 Fc): jean trousers: 9 meka beans or 5,000 Fc, 6 yards wrapper (pagne) 8 meka or 4,000 Fc, a woman's dress 6 meka (3,000 Fc). Second hand clothing was much cheaper: a pair of trousers between 2-3 meka, training gear 5 meka. Shoes were between 2,500 Fc (for sport shoes), and 1,000 Fc (for woman's and children's shoes).

Table 21. – Average Expenses in Urban and Rural Households.

Household expenditures		Villages ruraux Rural villages		Sites urbaines Urban sites		Tous All	
Français	English	Fc	%	Fc	%	Fc	%
Santé	health	14,107	9.9%	10,035	4.5%	11,404	5.8%
Scolarité	education	5,072	3.6%	9,387	4.2%	7 937	4.1%
Fournitures scolaires	school supplies	1,059	0.7%	1,647	0.7%	1,449	0.7%
Ration alimentaire des enfants	food and housing for children in school	366	0.3%	946	0.4%	751	0.4%
Transport	transport	1,644	1.2%	1,113	0.5%	1,291	0.7%
Nourriture	food	69,466	48.9%	155,539	69.8%	126,613	64.7%
Sel et Savon	salt, soap, light, fuel	20,520	14.5%	25,133	11.3%	23,583	12.1%
Boissons & Tabac	drinks and tobacco	9,835	6.9%	6,240	2.8%	7,449	3.8%
Eglise et quêtes	church	1,835	1.3%	1,275	0.6%	1,464	0.7%
Equipements de maisons	house equipment	1,268	0.9%	989	0.4%	1,083	0.6%
Frais de logement	housing	1,390	1.0%	2,948	1.3%	2,424	1.2%
Habillement	clothing	7,886	5.6%	3,260	1.5%	4,815	2.5%
Agriculture: MO, semences et intrants	agriculture: labor, seeds and other inputs	2,331	1.6%	3,504	1.6%	3,110	1.6%
Cérémonies familiales, funérailles et deuils	family ceremonies, funerals	613	0.4%	373	0.2%	454	0.2%
Mariages et dots	weddings and dowries	1,787	1.3%	37	0.0%	625	0.3%
Assistance aux membres de la famille	assistance to family members	2,799	2.0%	266	0.1%	1,117	0.6%
Total	Total	141,980 Fc	100%	222,693 Fc	100%	195,568 Fc	100%
Nombre d'observations valides	Number of valid observations	112		133		245	

Note: All expenditures were recalculated to cover a year: days were multiplied by 250, weeks by 40; months by 9 so as to take into account seasonal and daily variations.

Expenditures in agriculture consist of payment for contract laborers, and buying of seeds and sometimes fertilizer. Both urban and rural populations spent about 2 percent of their income on these items.

Small amounts (less than 1,000 Fc) are spent on various ceremonial costs such as weddings, funerals and assistance to relatives.

5.4 Selling and Bartering of Agricultural Products

Products are often bartered at harvest time (against clothing) but also against beignets, meat, etc. During the harvest time all sorts of traders are in the villages, which gives them a festive aspect: all things bought and sold have a monetary price but are usually paid for in-kind at the daily rate of maize. Beer is sold for five pots of maize, a heap of dried fish for two pots of maize, meat, trousers, shoes, everything is again present in the villages.

Traders from the Kasai often come to buy the harvest. People appreciate them as they will pay a good price and pay cash. Small traders barter goods against the harvest, which creates a problem if they lend on credit. People realize at harvest time that they have to pay back large loans. Some people even decide to flee the village because of difficulties repaying debts.

5.5 Agricultural Contracts

There is a strict structure of price rates that is valid for agricultural work all around the area, and such work, commonly called "contrat" (also the name in Swahili) is one of the most common ways to earn some money. The standard surface of land is the plot of 25 x 25 square meters "vingt-cinq carré" (*kikongwanyi* or task), which is measured using a rope or a stick. In general, people seem to have a good idea about the surfaces they cultivate, but not many fields have been measured.

The various activities are well codified as to their nature and price[34]. However, the initial activity of clearing new land can vary a lot depending on the initial state of the land. As land is used for many years in a row, contracts typically concern the preparing last year's fields for new crops. In this case, the vegetation will be cut, laid in between two ridges and covered with the soil of the two adjacent ridges. This activity will take 2-3 days per plot of 25 x 25 square meters.

[34] *Kusengela* – Land clearing. This means the removal of the standing vegetation only, nothing more. Standard price: 1,000 Fc if there are no trees, up to 3-4,000 Fc, depending on the number of trees.

Kutshipa – Plowing (tilling, labourer) is done on fields that were plowed the previous year (and thus do not have ridges). Plowing with oxen is the same price as plowing by hand and hoe: about 2.500 Fc per 25 x 25 square meter plot.

Kupumununa (harrowing, hersage)--Breaking the earth in order to transform it into fine soil. 2,500 Fc for a new field, less for a former field.

Kusapika – On a field that was used the previous year; no specific tilling is done. The field is cleared, the waste is laid in the furrow between two ridges. This is followed by:

Kufukira – (ridging, billonnage) The second action after the kusupika weeding is the covering of the weeds with the earth of last year's ridge. This activity is paid 2,500 Fc per 25 x 25 square meter plot in villages like Kasanga.

Kusekura – (weeding, sarclage). This pays usually about 1,250 –1,500 fc per 25 x 25 square meter plot.

Kuwangurs – In general people do not use outside labor for the harvest; when it's done, the price depends on the distance, and is usually as a portion of the crop.

Table 22. – Average Cost for Contract Laborers Paid Different Agricultural Tasks for a Standard Plot of 25 by 25 m^2 (625 m^2 or 1/16 of a hectare).

English	French	Swahili	New field	Former field	Days of work
Clearing	Défrichement	*Kusengela*	2,500	0	3
Tilling/plowing	Labour	*Kutshipa*	2,500-3000	2,000	4
Harrowing	Hersage	*Kupumununa*	2,000-2,500	1,500	2
Sowing	Semis	*Kubiala*	1,250-1,500	1,250-1,500	0.5
Weeding	Sarclage	*Kusekura*	1,250-1,500	1,250-1,500	0.5
Harvesting	Récolte	*Kuwangura*	Part of the harvest	Part of the harvest	

Source: village interviews.

5.6 Mutual Assistance in Agriculture

5.6.1 Kinkurimba

Kinkurimba is a rotational mutual assistance system for agriculture, where a group of people help each other with the agricultural work. Food and drinks are normally not expected to be provided. As the system is symmetric, it does not need any investment.

5.6.2 Mbile

Mbile is a system where somebody in the village invites the other villagers to help him in the field, for a good meal and drinks. For *mbile* one has to have the means to feed the people that come and help. The groups are small in general. Mbile is not a rotational system *per se* and those who are invited are not expected to return the invitation. Not everybody has the means to invite people for a Mbile.

5.7 Alternative Sources of Income: Where to Borrow Money

Obtaining money when in need is often very difficult. In the villages people can often ask their relatives or their neighbors. In the urban areas it is more difficult: almost 60 percent had no one who would provide money. Asked as a specific question, many people said that they would sell their goods (bicycles, clothing, harvest, cattle) when in need, or borrow money, which they would later reimburse by doing agricultural labor.

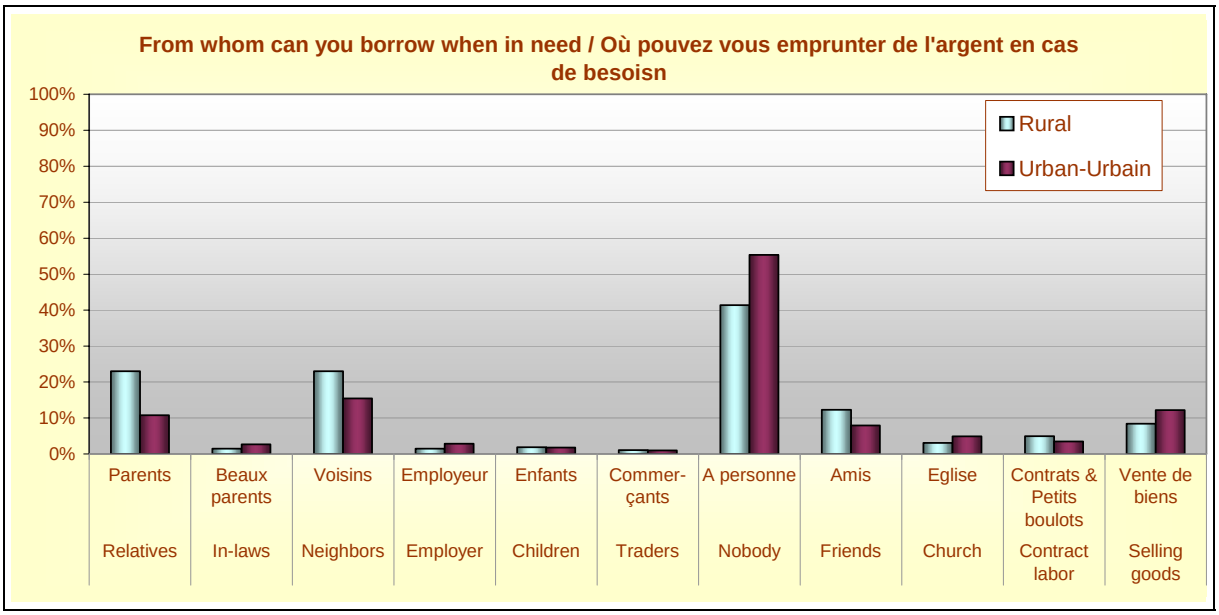

Figure 8. – Persons to Borrow Money From, When in Sudden Need for a Disease or a Funeral by Location.
Note: (2006 survey, weighted for sample size)

5.8 Conclusion

The modal yearly monetary income and expenses in the urban and rural areas are quite close, with in both areas on average slightly more income than expenditures.

Both income and expenditure, though probably significantly under-evaluated as a consequence of a retrospective survey, are very low: their amount corresponds to about $1USD/day in the rural communities and $1.70 USD/day in the urban communities.

The urban families may seem to have a higher income than the rural ones, but this effect is offset by the average family size of 4.4 in the rural villages and 6.0 in towns. Per capita monetary income and expenditure are 23 $cts in rural villages and 27 $cts in urban families.

Table 23. – Average and Median Income and Expenses by Location (2006 survey).

		Average Income	Average Expenditure	Median Income	Median Expenditure
Rural populations	Populations rurales	160.8	141.0	91	80
Urban populations	Populations urbaines	258.2	242.2	179	115

6 ACCESS TO SERVICES

6.1 Water Supply

The water supply, be it in the rural villages or in the urban areas, is still mostly surface water from rivers, streams or unprotected sources. Only 5 of the 36 rural villages and hamlets have sources that have been cemented and are protected (see location of villages, Figure 2: Settlement Patterns), while the others usually use rivers or unprotected sources of upwelling water, at the start of rivers.

In the urban areas, the situation is not much better:

- Tenke has piped water but this water is directly drawn from the Dipeta River and without any prior treatment it should be considered undrinkable.
- In Fungurume, the population around the TFM and Trabeco use the clean piped water from the “château d’eau”, but this is only 15 percent of the total population. Other people use one of the 315 permanent and seasonal wells in the town, or water from the rivers that flow through it.
- The graphs shows that Lukotola is the only village where all people drink water from a drinkable water supply: a protected water sources from which water is pumped to a water tower and then distributed by pipe to five faucets in the village.

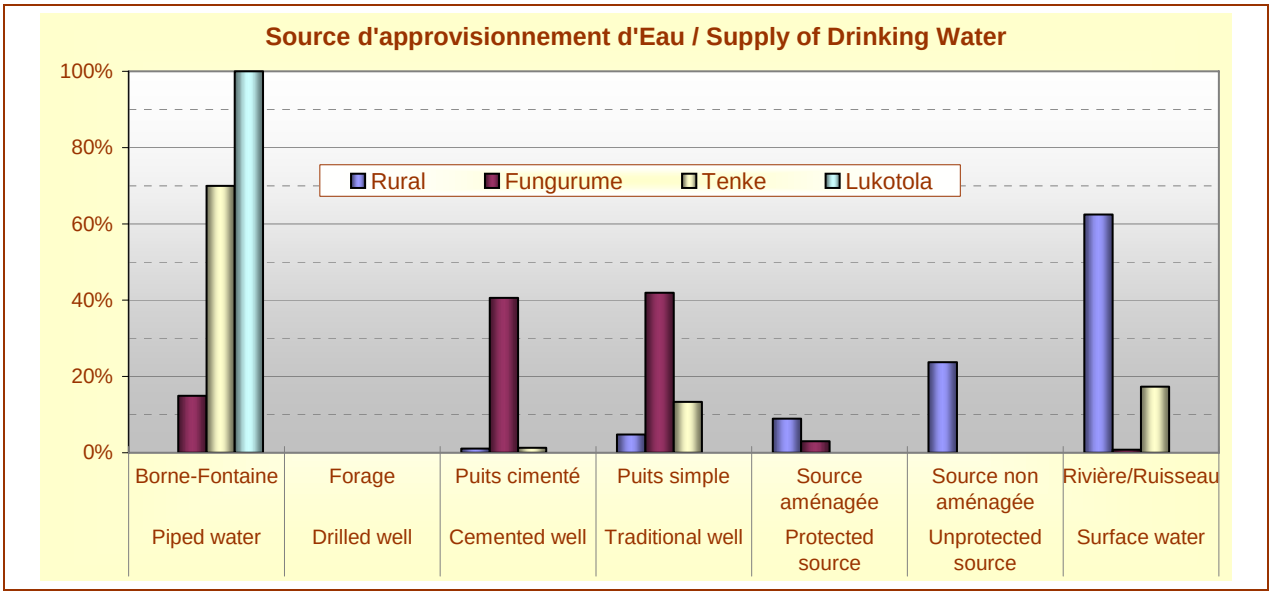

Figure 9. – Drinking Water Supply by Location.
Note: 2006 survey, weighted for sample size.

6.2 Energy Sources

Firewood and charcoal are used as fuel for cooking. Charcoal is needed as most people live in houses with only one or sometimes two small rooms, and its use gives off less smoke than firewood. Men traditionally make charcoal, while women usually gather firewood. Women

often have to buy charcoal unless their husband has made it, whereby he has to give it to her for free.

Lighting houses is a challenge. Candles are most often cited, but have to be bought for 75-100 Fc. Kerosene (lamp oil) is not easily available in the area, and the hurricane lamps that are so popular elsewhere in tropical areas are rarely seen. People often use local lamps *'Katoritori*" that can burn any kind of oil, even diesel fuel. See Table 24.

Charcoal is used for cooking most often in the urban areas and firewood in the rural areas. See Table 25. Charcoal has several advantages:

- It is lighter and easier to transport so it will be cheaper than firewood when sold in the urban areas.
- As most people have houses with only one room, in which they cook and sleep, and have to keep themselves warm during the cold season, charcoal has the advantage of giving heat without giving off too much smoke.

Table 24. – Source of Light (More Than one Choice Possible) According to Village

English	French	Villages Ruraux Rural villages	Fungurume	Tenke	Tous villages All villages
Candle	Bougie	67.7%	86.9%	83.3%	76.5%
Local lamp	Lampe locale	24.1%	19.7%	6.4%	18.0%
Firewood	Bois	24.8%	1.6%	5.1%	14.0%
Hurricane lamp	Lampe tempête	6.0%	6.6%	9.0%	7.0%
Electricity	Electricité	0.8%	9.8%	10.3%	5.5%
Flashlight	Lampe torche électrique	1.5%	0.0%	0.0%	0.7%

Note: Lukotola has been included with the rural villages.

Table 25. – Source of Fuel for Cooking (More than one Choice Possible) According to Village

English	French	Villages Ruraux Rural villages	Fungurume	Tenke	Tous villages All villages
Kerosene stove	Pétrole	0.0%	0.0%	0.0%	0.0%
Cooks with firewood	Bois	59.8%	4.8%	13.9%	33.6%
Cooks with charcoal	Charbon	58.3%	96.8%	92.4%	77.2%

Note: Lukotola has been included with the rural villages.

6.3 Health Centers

6.3.1 Overview

Health structures visited were the service in charge of the regional health care in Fungurume, which is a health district[35] since May 2003. Demographic data used by the health service in Fungurume indicate a total population of 96,639 inhabitants in the district. Only three sites have health centers: Fungurume (10), Tenke (2) and Lukotola (1).

[35] Principal Health District Dr. Laurent LC, and Health District Supervisor Dr. Alain Kaij are directing the health district and were interviewed January 31 2006, and provided much of the information described in this section.

- Only one center is officially owned and supposed to be financed by the state: the Dipeta reference hospital in Fungurume. It is maintained, however, mainly through self-financing. This hospital has a doctor.
- Three health centers (St. Xavier in Tenke, Lukotola, St. Jacques) in Fungurume belong to the Catholic Church. Only Lukotola has a permanent doctor.
- Three centers belong to private companies and are only accessible to employees and their families: the SNCC railway company, the Trabeco, and TFM. Only TFM has a permanent doctor.
- Six private centers exist in Fungurume of which the NEHEMA center[36] is the most important one and has the best quality of care. Though no resident doctor, an external doctor comes frequently. They have a small car with which the patient can be transported to Likasi if necessary. None of the other five private centers has a resident doctor, and they are rated from medium to low quality and enjoy variable success in attracting clients.
- The health district has seven doctors, three of whom are paid by the government.
- Health centers rarely have enough medicines in store and most medicines have to be bought in local drugstores that are normally officially licensed and regularly checked by the pharmaceutical service of the health district.
- The health district doctor's motorbike is the only vehicle owned in the district. Officially most centers are supposed to have at least a bicycle but only a few have one and external activities in the rural villages are very difficult to organize.

Though the number of 13 centers may seem to indicate good coverage, at least in Fungurume, the poor state of buildings, the lack of medicines, the qualifications of the medical personnel, and the lack of purchasing power of the local population all affect access of the population to modern medicine. The socio-economic survey shows that only 21 percent of the urban households and 12 percent of the rural ones had access to medical care from a health center during the previous six months, while most other people had to buy their medicines either in private pharmacies or from shops and markets. (See next table). It is only in the village of Lukotola that the majority of people have been able to buy their medicines.

All medical facilities have to find their own financing through charging for consultations, care and the sale of medicines. The centers generally do not receive many new patients, e.g. the St. Xavier clinic in Tenke had only 139 new patients in December 2005 for a covered area of 7,800 inhabitants.

Recent epidemics in the area (Tenke) concerned measles in June 2005, and cholera in 2002. Health authorities indicate that HIV/AIDS is not yet a very visible problem, but as there are no tests and the disease appears under various forms, this may easily change in the future. The high-risk behavior, observed during the period of illegal mining, and the increased prevalence of STIs, may be forewarnings of a higher prevalence. In Tenke it was observed that many STI patients concerned young girls of 14 to 20 years, as well as illegal miners and also married women. Health authorities in Tenke, Lukotola and from the health district fear for the future.

[36] Known as Justin in the villages.

The AIDS awareness survey shows that knowledge of protective methods against STI's is very limited, and few people admit ever having used condoms.

6.3.1.1 Reasons for Consultation

The most important reason for visiting a health center is for treatment of *malaria*, which accounts for 54 percent of new cases in the area. Malaria is followed by pulmonary diseases (14 percent), diarrhea (7 percent), and sexually transmitted infections (3.5 percent).

- There exists a malaria prevention program through which impregnated mosquito nets are sold at a subsidized price (900 Fc or 2 USD, but only one per family) and Fansidar is given as a prophylaxis to pregnant women. 300 mosquito nets were sold last year[37].
- No nutritional center is available in the area, except in Kansenia, through the Catholic mission.
- Treatment of tuberculosis is free.
- Sexually transmitted diseases have always been prevalent in the region but during the period of the illegal mining, its prevalence has risen considerably, according to the chief nurse of Tenke.

Table 26 Cost of Various Medical Treatments

Table 26	Lukotola	Tenke	Fungurume
Visit to a doctor	250 Fc	250 Fc	600 Fc (doctor) 300 Fc (nurse)
Child delivery	3000 Fc	2500 Fc	2,500-3,500 Fc the lower price is valid if prenatal care is followed
Malaria	Simple oral 200 Severe oral 700-800 Fc 2,500-3,000 Fc if drips are needed		Simple oral 300 Fc Severe oral 700-1000 Fc Drips: 3,000 Fc

Malaria is often expensive to treat especially when vomiting occurs. See Table 26.

Even though these prices may appear low, people prefer buying their own medicines in the private sector.

6.3.2 Health Centers in Tenke, Fungurume and Lukotola

In the three sites where health centers were available, key persons were met concerning the health problems in the area and their ability to function.

6.3.2.1 SNCC Health Center in Tenke

This center used to have a beautiful building, which was destroyed by a fallen tree a few years ago. It is now located in one of the houses in the SNCC camp. There is a permanent qualified (A3) nurse and a midwife. The center has no equipment at all and only a very few medicines. It provides free health care to the SNCC employees and gives them medicines if they are available. Private patients can also access services but they have to pay for the medicines. 143 new patients were treated in December 2005 with, as major diseases, malaria (31 percent) respiratory diseases (12 percent) and diarrhea (5 percent).

[37] The socioeconomic survey shows that only 12 percent of the households own a mosquito net.

A major problem in Tenke is the drinking water, which, though distributed through a water tower and pipes, is untreated river water.

6.3.2.2 St. François Xavier Health Center in Tenke

The center has a qualified A1 nurse[38], a locally trained nurse and two locally trained midwives. Doctors without Borders have helped the Center between 1999 and 2003, but since then it is financed by its own proceeds. The hospital has 11 beds in two rooms and can practice deliveries and general treatments. Surgery is not possible. Infant health monitoring and general vaccination is practiced, but for malnutrition treatment people have to go to Kansenia. Malnutrition starts around ten months and is related to a new pregnancy of the women and early weaning. Women tend to come more often for pregnancy visits than for monitoring the growth of their infants. The health center has a motorbike.

Problems encountered are, beside the lack of basic equipment and a regular supply of medicines, the difficulty in finding transportation to the hospital, the opposition of certain religious groups (Apostolic church refuses all medical treatment and Jehovah witnesses refuse blood transfusions), medical conditions such as epilepsy which are considered to be caused by sorcery and enlarged spleens that are treated at home with a razor blade and traditional powders. Sorcery is often suspected if the deceased person is not a very young or a very old person.

Health education sessions for the population, are held twice per month and have attracted 142 participants in December 2005.

6.3.2.3 Health Center of Lukutola

The center, initially sponsored by the Catholic Church, has existed for more than 25 years. It has been transformed into a development organization for more than ten years. A qualified doctor[39] is permanently present since September 2004, in charge of curative and preventive medicine. The center has second-hand European and locally made equipment: delivery table, refrigerator, surgical table, a sterilizer for medical equipment and an incubator “couveuse” for premature babies.

Medically, the problems are the same as elsewhere: malaria, respiratory infections, diarrhea, STIs. Self medication, the animist Basantu church and its exorcism, and lack of money prevent people to come to the health post. Some people even leave some of their belongings at the hospital, which they’ll get back when they pay for the treatment. Payment in-kind is possible, at current market prices, but is not often used by the patients.

Blood transfusions are carried out, with blood that is tested against HIV/AIDS, but as donors are chosen after a screening interview, positive cases are rare. Prostitution in the area takes place especially at harvest time.

Kits to test AIDS on all pregnant women are unfortunately not available. When women deliver in the health post, they return several times afterwards for check-ups and vaccinations. Family planning is discussed privately with both spouses in a meeting that takes place seven weeks after delivery. It is not yet commonly practiced.

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[38] Kikaka Morton, 081.050.9691
[39] Dr. Sumba Mwana Ngongo Serge.

Though the center tries to reach out to the villages, the only means of transport they have are a bicycle. In the villages the center organizes meetings and discussions dealing with hygiene, HIV/AIDS and vaccinations.

6.3.2.4 CS Dipeta in Fungurume

The resident pharmacist[40] was met in the Center, which has one permanent doctor and seven qualified nurses. The Center is in a very run down state, and part of the roof has been blown off. Only a few patients were seen in the hospital, which has seven beds, among them a mother who had just delivered. The center can practice small surgeries.

The Center has to run on its own budget as the government only pays the basic salary of the personnel. Medical interventions and the medicines that are present pay for the cost: the gross income of the Center was 178,000 Fc (a little more than 400 USD) in January 2006. People often have no money to pay and are held hostage in the hospital, until their family comes with the money. Other people leave their bicycle or other valuable goods in exchange for payment.

6.3.3 Conclusion: Modern Health Care is in a Dire State in the Area

The visits to the health centers show that most of them are in a pitiful state, with as the most stringent example the railway health post in Tenke, which has to work without a building, without equipment and an almost complete lack of medicines.

The official centers in Tenke (St. Xavier) and Fungurume (Dipeta) are a little better, but the quality of the installations, the lack of sufficient equipment, the impossibility to carry out even the simplest medical tests, and the difficulties in finding cheap medicines hamper their functioning. The price of the services is also considered too high by the local population, and their quality too low. People thus often prefer to resort to automedication, or – at the most – get some advice and medicines from the locally available informal health worker.

6.4 Education

6.4.1 Overview

Education in the area was discussed with the regional authorities[41] in Fungurume and schools in Fungurume, Tenke, Lukotola and Mulumbu were visited.

In the territory of Fungurume, which includes Tenke, are seven primary and six secondary schools. Most schools are privately organized, but those that are recognized by the state and “Conventionné” can deliver recognized diplomas and receive some help from the state to pay salaries. Only one of all primary and secondary schools is a public school, solely organized and funded by the government: the agricultural high school[42] of Fungurume. Others are promoted by churches and private persons.

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[40] Ilunga Mawonda Magiri. Pharmacienne niveau AZ.

[41] Mulomb M. Tshingamb, Inspecteur chef de Pool territoire de Lubudi (phone 081.403.4546) and André Tshuma Muhanuenu Muene (phone 081.073.8513), Inspecteur itinérant de l’EPSP Territoire de Lubudi, Zone Inspectorale Lubudi I, Fungurume. Toto Naweji Zeu, comptable titré de Fungurume : (081.298.7062).

[42] Institut des Techniques Agricoles de Fungurume.

Since September 2005, schools were supposed to be free and tuition paid by the government. However, for most schools the government has only been able to pay some of the arrears of previous years. In Fungurume, only the first two quarters of 2002 have been paid. The hope of free education had pushed people in Fungurume to register more than 240 children in one of the secondary schools, but only 90 had been able to continue when it became clear that tuition still had to be paid.

Children often lag several years behind normal school progress or 3 to 5 years, especially in secondary education. Teaching is done in French and Swahili. In some schools the children are forced to speak French only, including on the playground. In Tenke, some teachers complained that the local population was less willing to send its children to school than the migrants.

6.4.2 Major Difficulties Encountered

The population expects good education but has difficulties accepting that they have to participate with the cost of such education. For the education authorities interviewed, major difficulties exist concerning the lack of equipment and classrooms, the lack of any educational materials, and the overpopulation of classes that have often between 100 and 120 pupils. In general, the teachers in the primary school have a proper qualification, but this is less frequently the case in secondary education. The very low salaries[43] is an obstacle to retaining teachers and most of them leave education as soon as they find a better job.

In secondary schools, the problems are similar: lack of money to pay tuition, especially during the agricultural season, children who leave with their parents for transhumance activity and girls that have to leave school after unwanted pregnancies. In general, parents tend to take girls out of school more easily after poor performance.

6.4.3 Impact of Transhumant Agriculture

Transhumant agriculture, as practiced by many families in the urban sites of Tenke and Fungurume means that the family will spend most of the school year, often from September-October to April-May, in the fields that may be tens of kilometers from the town. Only parents who can afford it or have older people available can leave their children in towns, but the lack of supervision means, according to the teachers, that most of them have rather mediocre school results. Education authorities often see that these children are either sexually abused, or often get pregnant from boyfriends of the same age groups. Prostitution of such children “is still limited”.

Children whose parents cannot afford to leave them in town simply go to the bush and do not go to school anymore, while some leave only temporarily during the height of the agricultural season when both parents are in the field.

6.4.4 Impact of Artisanal Mining

In most schools the impact that illegal mining has on education has been acknowledged. Some stress the fact that many boys prematurely left school to participate in mining, while others stress the fact that parents often earned enough money with mining to pay the tuition fees.

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[43] Primary school, and according to qualification: 4-6,000 Fc + a bonus of 8-11,000 or a total of 12-17,000 Fc (about 30-40 USD); secondary school 6-7,000 plus a bonus of 10-13,000 Fc or a total of about 16-20,000 Fc/month or about 40-50 USD.

The common observation is that children between 10 and 15 years tended to drop out of school in order to help the illegal diggers. The impact of the money earned on school attendance is variously appreciated: the regional authorities and most headmasters of the schools that were interviewed indicated that drop out rates were high, and that money earned with illegal mining rapidly squandered. A few had a differing opinion and indicated that the illegal mining had helped other people get money to send their children to school.

The director of the Orthodox school in Tenke was very negative about the mining: "Children fled school, 50 percent of the children in the higher grades of the primary school have fled to the mines", "*they have become thieves, without education*", "*I have not met parents that paid tuition fees with money from the mining*". Since the mining has been stopped by the authorities "*ten pupils have returned to school*".

6.4.5 School Tuition Fees

The payment of regular school fees was introduced during the Mobutu era and has officially been abandoned since the start of the present school year 2005/6. Normally, the state now pays the salaries of the teachers, but so far only part of the first of three endowments[44] has been paid be the state, which means that parents still have to pay monthly fees for their children.

Tuition fees in Tenke are around 10,000-15,000 Fc, and paid at the start of the year, with various monthly and three-month fees. Salaries of the teachers are partly (for government recognized schools) or completely (other schools) paid by the tuition fees. In the village schools, most of the money can be paid in kind, using maize, at the current market rate. In urban schools in-kind payment is possible as well but less practiced.

Tenke – In most schools, monthly tuition is between 1,000 and 1.500 Fc/month.

Fungurume – Most government recognized schools have received twice 87,600 Fc of the government. Pupils in primary schools paid in 2005/6 only 400-500 Fc/month. In secondary schools 1,100 Fc/month.

Primary school in Kasanga: Fc: 500 Fc/month for general costs, registry fee 150 Fc, 2,500 Fc/year for school supplies and 2,500 Fc for a uniform. Total costs 10,150

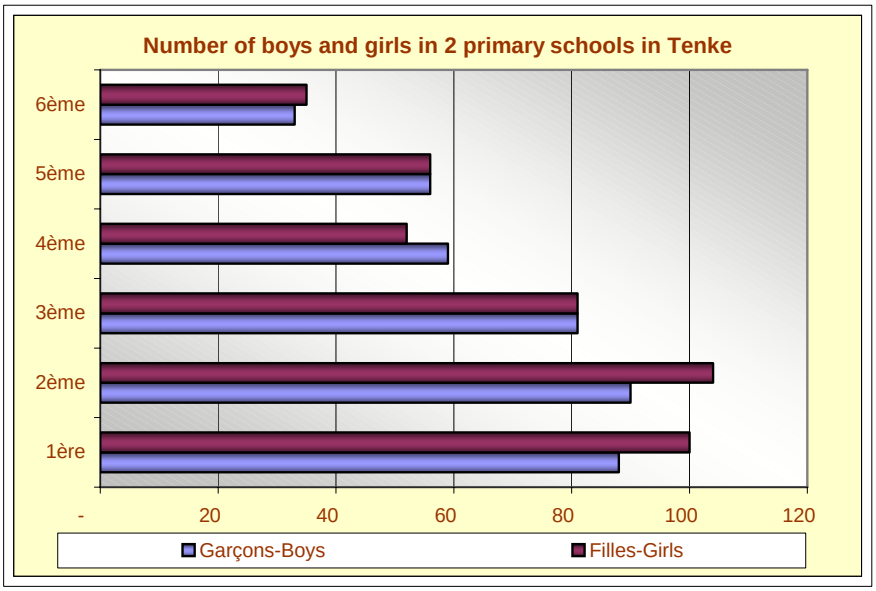
In secondary school: FIP regular monthly fee of 1,000 Fc, registry fee 150 Fc uniform 3,000 fc, supplies 1,500 Fc, bag 2,000 Fc and shoes 3,500 Fc. Total costs 20,150

Mulumbu: (according to Amoni): 15 buckets of maize/year, 850 Fc for inscription, 1,500 Fc for school supplies and 3,200 Fc for a uniform and shoes.

[44] The schools in Fungurume had received the first two installments of the 2002/3 year only during the last quarter 2005: twice 87,600 Fc, independently of the size of the schools.

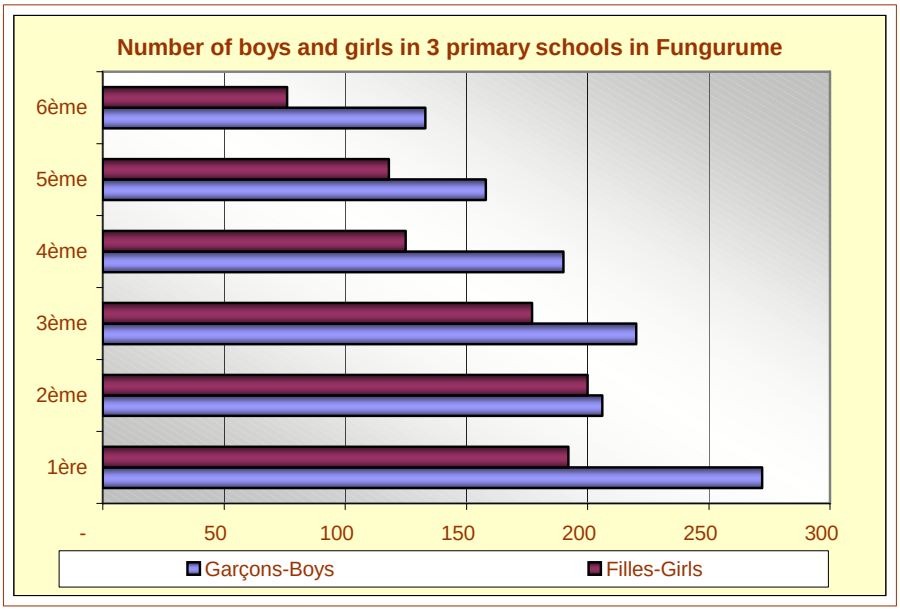
6.4.6 Tenke

In the schools visited in Tenke there were usually more girls than boys (see graph), except in some of the higher grades. School authorities report that girls work better than boys.



The following schools are present:

1. Catholic school (Primary school in completely run down buildings, secondary school[45] in buildings used by the Railway company for its primary school in the morning),
2. The school from the Orthodox church[46] (new buildings, but not yet recognized) with a secondary (technical and commercial) school[47] in development.
3. The railway school[48]: a primary school with a complete cycle.



6.4.7 Fungurume

School attendance in Fungurume is better for boys (58 percent of the total) than for girls (42 percent). The following graph shows that

[45] Ecole Secondaire mixte, exists since 1995: with 24 girls and 66 boys. In the final examination grade, there are 9 boys and 2 girls. The school has 4 completely qualified teachers and three incompletely (D6) qualified teachers. Tuition fees: 1.400 Fc inscription + 1.000 Fc/month (general costs) or a total of 11.400 Fc/year.

[46] Orthodox Primary School created in 2003, “Lumière du Christ”, Director Nawezi Mununga Athanase (081.006.5006). The school has 553 pupils: 232 boys and 263 girls). In 2004/5, the year was completed by 80 percent of the children and 20 percent abandoned. Tuition fees: 1,500 Fc inscription + 750 Fc/month (general costs) + 800 Fc/trimester (Minerval) or a total of 11.400 Fc/year.

[47] Institut Technique Commercial Lumière de Christ de Tenke. Mission Orthodoxe; Préfet Mujunga Mwandu David (099.702.1439). In 2005/6 the school has 159 pupils: 60 girls and 99 boys. In 2004/5, 33 out of 123 pupils abandoned (27 percent). Tuition fees: 2.000 Fc inscription + 1.500 Fc/month (general costs) + 2.000 Fc/uniform or a total of 19.000 Fc/year.

[48] SNCC school, created in 1955. Directeur: Honoré Kasongo Ntombe Matongole. The school has 282 pupils: 135 boys and 147 girls, 40 percent of them are children of SNCC employees, the others are private pupils. Tuition fees are 1.500 Fc/months, and paid 10 months per year or a total of 15.000 Fc/year.

after the first three years, school enrolment drops rapidly, more so among boys than among girls.

- Four Primary schools (Majengo, Juhudi, Tukankamane, l'Espoir).
- One kindergarten (Ecole Maternelle de la Grâce).
- Two vocational schools (Institut Technique de l'Alliance, Institut Technique Agricole de Fungurume).
    - Two secondary schools: (Institut Lupeto[49], ITC Tsupendane).

6.4.8 Rural Villages

1. Lukotola: Primary school with six grades: ten groups for seven classrooms, secondary school up to the 4th grade; vocational school at the mission (carpentry, welding, sewing, masonry).
2. Kilusonsa: complete primary school, organized by the Pentecostal church.
3. Mulumbu: complete primary school, organized privately.
4. Mwanga Kakuta and in Kabwe Dikuku (first two years of primary school).

6.4.9 Abandoned Schools in the Rural Villages

Until recently, some of the villages had schools, which were organized within the local community. Teachers were paid in-kind, with meka of maize, often at the end of the year. During the last few years most of these schools have been closed, reportedly because parents have not been able to pay their contribution.

Among the villages surveyed, the village schools in Kwatebala Gare, Salabwe, Kafwaya, Mutaka II have had to be closed because parents did not pay the (in-kind) tuition fees.

[49] Institute Lupeto, created in 1975 by the employees of STMF. In the early days, STMF helped the school with supplies for the building and school supplies. Director Bukasa-Mwamba Mwanabute (081.405.1960). The school has 318 boys and 152 girls in 7 classes with 8 qualified D6 teachers, 3 "graduated" teachers and two "Licenciés".

7 HEALTH

The socioeconomic survey included several sections items about health and access to modern health care:

(1) The place of provision for medicines.

(2) Health care sought for the latest spell of illness in the household.

(3) Prevalence among young children of fever, diarrhea and skin diseases.

(4) Mortality data.

(5) As sexually transmitted infections (STI), including AIDS, are generally considered to be an important negative aspect of industrial development projects, the baseline included a special section on AIDS awareness and present STI preventing behavior.

7.1 Prevalence of Major Diseases Reported by the Health Centers

According to data obtained from the health centers, malaria is the most important disease in the area, and the majority of patients who visit the health centers are children under five years. See Table 27.

Tenke health center – 60 percent of hospital visits concern children under five years old, 57 percent of them suffered from malaria, 10 percent from diarrhea, 8 percent from anemia, seven percent form respiratory infections. Among the patients of over five years, 53 percent suffered from Malaria, 9 percent form respiratory infections and also 9 percent from sexually transmitted infections (STI).

Lukotola health center – 54 percent malaria, 14 percent respiratory infections, 7 percent diarrhea, 3.5 percent STI.

7.2 Treatment of Recent Ailments

7.2.1 Overview and Methodology

The treatment of a recent spell of disease was discussed in all families during the main socio-economic survey, in order to obtain insight into effective access to health services.

The ages of the persons whose illnesses were cited were young, especially in the rural areas: 38 percent were up to 5 years only. The presence of health centers, and the availability of drugs in the urban areas may be responsible for the fact that more adult people in the urban areas complain about diseases than in the rural areas where people would go without treatment.

Table 27. – Sex and Age Distribution of Reported Ill People?

Age/sex category	Catégorie d'âge et de sexe	Urban/Villes	Rural	Total
Children 0-5	Enfants 0-5	32%	38%	36%
Children 6-15	Enfants >5+-15	8%	11%	10%
Women 16+ years	Femmes 15+	33%	31%	32%
Men 16+ years	Hommes 15+	28%	20%	23%

Note : 2006 survey results, weighted for sample density in each of the villages.

7.2.2 Diseases Observed

The most frequently observed diseases, as defined by the households, are fever and malaria which make up 30 to 60 percent of the diseases in the various categories. Young children especially suffer from fevers and malaria. See Table 28.

Differences between the urban and the rural areas concern the higher prevalence of fever in the former and of diarrhea and headaches in the latter. As the survey was conducted during the main agricultural season, rural complaints are probably influenced by the heavy workload of the people.

Table 28. – Reported Diseases by Location, and Sex/Age Groups Distribution

Urban/ Villes	Rural	Disease	Maladie	Men- Hommes	Women- Femmes	Children - Enfants	
						6-15 a/y	0-5 a/y
27%	20%	Fever	Fièvre	12%	8%	46%	56%
14%	14%	Malaria	Malaria	24%	25%	13%	8%
10%	18%	Diarrhea	Diarrhée	6%	8%	13%	33%
6%	12%	Head	Tête	18%	15%	17%	1%
11%	11%	Stomach	Ventre et estomac	11%	25%	13%	5%
8%	6%	Pulmonary diseases	Toux et rhume	15%	6%	11%	7%
4%	3%	Various back aches	Lombalgie et dos	11%	6%	0%	0%
2%	5%	Lower limbs	Hanches, jambes et pieds	13%	4%	0%	0%
3%	2%	Skin	Peau	3%	3%	4%	3%
1%	3%	Flu	Grippe	3%	4%	0%	2%
3%	3%	Other ailments	Autres affectations	3%	11%	0%	0%

Note : 2006 survey results, weighted for sample density in each of the villages.

7.2.3 Treatments Observed

Treatment for diseases (Table 29) is home- based, usually with some kind of drug (40-50 percent) but also often without any drugs (around 10 percent). The only health centers in the area are in urban centers, but even there they intervene in only one out of three cases. In the rural areas, people visit local nurses, or "*croix rouge*", local people who received some basic training through the Red Cross.

In 10-13 percent of the cases no treatment was given. Traditional medicine, either at home or with a traditional doctor, was not often cited, but as many of these treatments are surrounded by secrecy, their prevalence is probably higher.

The presence of a local health center in which people have confidence, certainly has a positive impact. In Lukotola, 49 percent of the people had sought official treatment, in Fungurume 32 percent in Tenke 27 percent, which is almost as few as in the rural villages (23 percent).

Table 29. – Reported Diseases Treatment by Location, and sex/age groups

Urban/ Villes	Rural	Disease	Maladie	Men- Hommes	Women- Femmes	Enfants-Children	
						6-15 a/y	0-5 a/y
46%	46%	Drugs without prescription	Médicaments sans ordonnance	48%	40%	48%	48%
32%	23%	Health Center	Centre de Santé	26%	29%	24%	29%
17%	25%	Unlicensed nurse	Infirmier Privé	26%	18%	17%	21%
12%	11%	No treatment	Sans Traitement	8%	13%	13%	11%
5%	9%	Traditional treatment at home	Traditionnel à Domicile	6%	9%	0%	8%
4%	0%	Praying	Prière	2%	3%	0%	3%
0%	1%	Traditional doctor	Guérisseur	1%	0%	0%	0%

Note : 2006 survey results, weighted for sample density in each of the villages.

7.2.4 Reasons for the Actual Choice of Treatment

There were positive and negative reasons for adopting the treatment given to the cited diseases. Positive reasons were that people thought that either the chosen treatment had proven its effectiveness, they had confidence in the treatment or that the disease was not a serious one. These “positive” reasons were more often present in the urban populations, where people could choose the kind of health care they wanted, than in the rural areas.

In the rural areas, the costs of treatment (29 percent), and its corollary (payment facilities offered possible in the informal sector) were major difficulties/reasons for obtaining the best possible health care.

Cost is less cited as an obstacle for children’s diseases than for diseases of adults, but still in almost 20 percent of the cases. A second question, “Why not having chosen hospital treatment” indicated also that for 34 percent of the rural households and 27 percent of the urbanites cost had stopped the families from seeking medical treatment. See Table 30.

Table 30. – Reasons for Adopted Treatment by Location, and Sex/age Groups

Urban/ Villes	Rural	Reason for adopted treatment	Raison du choix de traitement	Men- Hommes	Women- Femmes	Enfants-Children	
						6-15 a/y	0-5 a/y
34%	21%	Effectiveness	Efficacité	26%	29%	28%	31%
20%	29%	Cost	Coût	26%	30%	17%	19%
18%	19%	Benign disease	Maladie bénigne	18%	15%	28%	19%
18%	15%	Confidence	Confiance	17%	16%	11%	19%
7%	9%	Distance	Distance	6%	5%	9%	12%
1%	5%	Payment facility	Facilité de paiement	5%	2%	0%	3%

Note : 2006 survey results, weighted for sample density in each of the villages.

Cost is less cited an obstacle for children’s diseases than for diseases of adults, but still in almost 20 percent of the cases. A second question, “Why not having chosen hospital treatment” indicated also that for 34 percent of the rural households and 27 percent of the urbanites cost had stopped the families from seeking medical treatment.

7.3 Drugs Bought During the Last Six Months

Table 31 shows that most people buy their drugs in one of the commercial outlets in the town of Tenke and Fungurume. These pharmacies officially sell only recognized drugs and are supposedly controlled by the health authorities. In the villages a majority of the people also

buys their medicines from these sources, but an important majority gets them through one of the local nurses with formal education or simple Red Cross training, who may help with the diagnose and sell the medicines they have available. Street vendors and unrecognized shops are used by about a quarter of the local population, without any guarantee about the quality and the usefulness of the bought drugs.

The medicine supply is best in Lukotola, which is the only site where the majority of people use official health care through the local center. In Tenke and Fungurume, in spite of the presence of official health centers, less than a quarter have access to it. Reasons given relate mainly to the additional cost of going though a center to buy medicines.

Table 31. – Payment of Medicines in the Household During the Last Six Months, and Resulting Score for the Socioeconomic Index.

Supply of drugs	Provision de médicaments	Rural villages	Fungurume	Tenke	Lukotola	Total
Village pharmacy or nurse	Pharmacie ou infirmier villageois	7.9%	2.0%	0.0%	0.0%	2.6%
Recognized health center	Centre de santé reconnu	12.0%	22.0%	21.1%	60.0%	21.1%
Pharmacy shops Tenke and Fungurume	Pharmacie commercial Tenke/Fungurume	40.8%	64.3%	39.5%	9.1%	54.4%
Markets, shops and street traders	Marché, boutiques, rue	25.5%	15.5%	16.4%	25.5%	18.0%
No medicines bought	Sans médicaments achetés	19.9%	11.6%	28.3%	7.3%	15.7%
Score medicines bought	Score achat médicaments	1.59	2.14	1.59	2.24	1.95

Source: SE survey 2005-6, main questionnaire.

7.4 Prevalence of Diarrhea, Fever and Skin diseases Among Young Children

The prevalence of three children's diseases was discussed with the socioeconomic index. The main data are reproduced here, to show that families, and especially urban families, are in a constant struggle against the diseases of their children. Urban families reported more problems than rural ones, especially regarding skin diseases, but also regarding fever. It's difficult to say what causes this difference, though the urban areas of Tenke and Fungurume are much dirtier, and had more stagnating water, (excellent breeding ground for mosquitoes) than the rural villages. Skin diseases may be favored by the use of foam mattresses in the urban areas.

Table 32. – Prevalence of Diarrhea Fever and Skin Diseases Among Young Children by Location.

Children's diseases	Maladies des enfants	Permanent rural	Permanent Town
Diarrhea (1-4 years, last week)	Diarrhée (1-4 ans, dernière semaine)	36%	37%
Fever (1-4 years, last week)	Fièvre (1-4 ans, dernière semaine)	49%	64%
Skin disease (< 10 years, presence)	Maladie de la peau (< 10 ans, présence)	13%	40%

Note : 2006 survey results, weighted for sample density in each of the villages.

7.5 Mortality Data

The survey results for mortality over the year preceding the survey (Figure 10), show that the average age at death of the 68 people counted was 9.6 years.

Of the 68 people that died the year preceding the survey 74 percent were children under 5 years of age, 6 percent between 6 and 15, 15 percent between 16 and 49 and 7 percent were over 50 years.

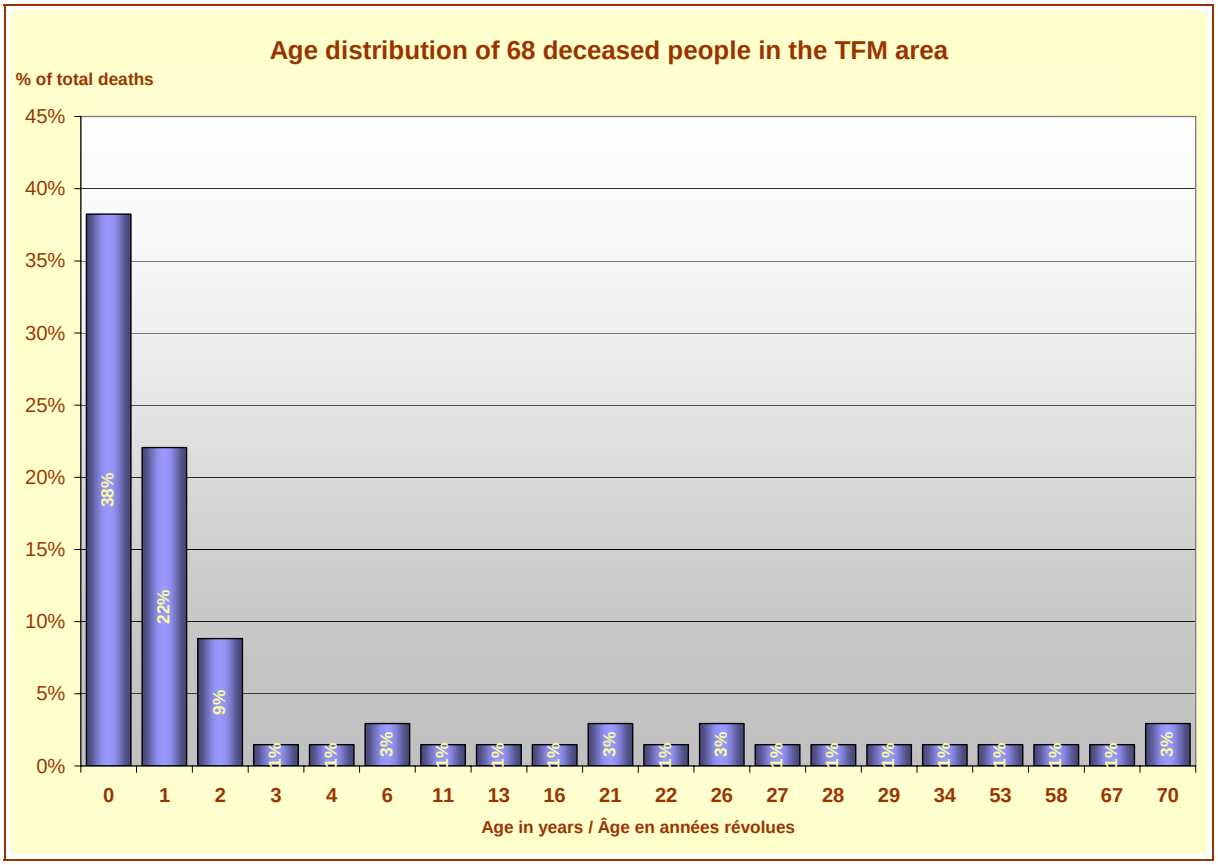


Figure 10. – Age Distribution of the 68 People who had Died the Year Prior to the Survey Date
Note: 2005/6 survey results.

7.6 Family Planning

During the focus group discussions Fungurume women were uncertain about the ideal number of children they wanted to have. Some want as many as possible and others want only a limited number. These better than average educated women in general wanted to adopt family planning but said that their husbands were against it. The burden of children concerns food, and employment is important as people that work benefit from child allowances.

In Lukotola the doctor confirmed that family planning was possible through a three-month shot of hormones, but it can only be applied when the two spouses agree.

7.7 AIDS Awareness Survey

7.7.1 Overview and Methodology

The AIDS awareness survey was completed in a sub-sample of the households where the main socio-economic survey was conducted, among men and women between the ages of 16 and 49 years. The female interviewers in the team interviewed women, men the male. Questions were open- ended and concerned the following topics:

- Knowledge of HIV/AIDS.
- How one gets HIV/AIDS.
- What to do to avoid HIV/AIDS.
- Use of condoms.
- Have you ever seen an AIDS sufferer and how to recognize one.
- Previous training about HIV/AIDS.
- AIDS test.

For those who were interested a sample parcel of the locally available "Prudence" condoms was handed out. The interviewers were asked to do the interview in private, without the presence of other people, in order to speak out freely.

7.7.2 Sample

Questionnaires were administered in all families where an eligible person was available for the interviewer. The total sample is 195 people, equally distributed between rural and urban, and between male and females. See Table 33.

Table 33. – Sample of the AIDS Awareness Questionnaire.

Urban/ villes	Rural	Sample	Echantillon	Men-Hommes	Women-Femmes
55%	45%	Men	Homme	100%	0%
44%	54%	Women	Femme	0%	100%
86	109	Sample size (N=)	Taille de l'échantillon (N=)	96	97

Note : 2006 survey results.

7.7.3 Results

7.7.3.1 What is AIDS?

This was an open question, where people gave their initial reaction on what they thought about AIDS. Except for some rural women, everybody had heard about AIDS. It was usually connected with "mortal", "incurable", "sex" and "prostitutes". A few people declared that it was "punishment of God" or a plague imported by "the white man". See Table 34.

Table 34. – What is AIDS

Urban/ villes	Rural	What is HIV/AIDS?	Qu'est ce que le Vih/Sida ?	Men- hommes	Women- femmes
1%	5%	Does not know	Connaît pas	0%	6%
83%	79%	Knows	Connaît	93%	68%
71%	64%	Mortal	Maladie mortelle	79%	56%
22%	28%	Incurable	Maladie incurable	44%	7%
17%	16%	Unspecified disease	Maladie non spécifiée	7%	26%
17%	10%	Sexually transmitted Infection	Infection Sexuellement Transmise	17%	10%
10%	5%	Prostitute's disease	Prostitution	14%	1%
5%	2%	Bad disease	Maladie mauvaise	4%	2%
2%	1%	Punishment of God	Malédiction des Dieux	3%	0%
1%	0%	White men's disease	Maladie des blancs	1%	0%

Note: 2006 survey results.

For the men the disease was more often “mortal”, “incurable” and related to “prostitutes”, for women more often “unspecified”.

Urban areas were more aware of the disease, its dangers and its sexual origins than rural areas.

7.7.3.2 How Does One Get HIV/AIDS?

This was again an open question, where any cause about AIDS was given. In general the replies showed that sexual intercourse in general, and extra-marital sex, philandering and prostitutes were the greatest dangers. As a second cause came infections with razor blades, blood transfusions, injections in hospitals, and using “contaminated objects”. Thirdly, a minority of people had the opinion that AIDS could be contracted by using other people’s latrines, shaking hands, and sharing food and drinks with AIDS patients.

Table 35. – How Does one get AIDS?

Urban/ villes	Rural	How does one get HIV/AIDS?	Comment attrape-t-on le Sida ?	Men- hommes	Women- femmes
95%	84%	Sexual intercourse	Rapports sexuels	98%	80%
47%	36%	Prostitutes	Prostituées	53%	28%
17%	14%	Blood (general)	Sang	17%	14%
22%	8%	Razor blades	Lames de rasoir	21%	7%
8%	17%	Philandering	Vagabondage	6%	21%
17%	4%	Injections	Piqûres	11%	7%
13%	4%	"Contaminated objects"	Objets souillés	8%	6%
8%	8%	Latrines	Latrines	7%	8%
3%	13%	Loving HIV/AIDS sufferers	Rapports avec Sidéens	13%	5%
3%	11%	Does not know	Connaît pas Mode de transmission	0%	15%
9%	5%	(Sharing) food and meals	Nourriture & repas	8%	9%
1%	8%	Touch people	Toucher personnes	6%	4%
2%	1%	Mosquitoes	Moustiques	3%	0%
2%	1%	Through women	Par les femmes	2%	1%
1%	1%	Through men	Par les hommes	1%	1%

Note: 2006 survey results.

7.7.3.3 How Does One Prevent Getting HIV/AIDS?

People often gave more than one method of prevention. The main solution of avoiding AIDS was fidelity, especially in the urban areas (83 percent), often translated by young people as getting married early. 20 percent of the women said that they did not know how to prevent getting AIDS, but this may be more because of shame to talk about the disease, than other reasons. Abstinence was the second method chosen by 1 to 1/3 of the interviewed.

Use of condoms, as a method of prevention is not commonly known or practiced, especially by the rural areas and among the women. See Table 36.

Table 36. – How does one Protect Him/Her self from HIV/AIDS?

Urban/ villes	Rural	How does one protect him/her self from HIV/AIDS?	Comment se protéger du Sida ?	Men- hommes	Women- femmes
2%	15%	Protection unknown	Connaît pas mode de protection	0%	19%
83%	51%	Fidelity	Fidélité	68%	63%
34%	27%	Abstinence	Abstinence	30%	29%
19%	12%	Condoms	Condoms	19%	11%

Note: 2006 survey results.

7.7.3.4 Ever Used Condoms?

The actual use of condoms is even less, than the possible use as asked in the previous question, but it is still the urban sites and the men that use condoms more often. When used, the interviewee always buys them: 14 percent of the men, and 6 percent of the women. The quasi absence of people that received condoms from projects means that AIDS awareness campaigns have not yet distributed condoms in the area. See Table 37.

Table 37. – Did You Ever Use Condoms and Where did you get them?

Urban/ villes	Rural	Use of condoms?	Utilisation des préservatifs ?	Men- hommes	Women- femmes
84%	84%	No Condoms	Non Préservatifs	80%	88%
16%	10%	Yes Condoms	Oui préservatifs	18%	8%
15%	6%	Bought	Achat préservatifs	14%	6%
1%	0%	Provided by partner	Partenaire préservatifs	0%	1%
0%	1%	Provided by project	Projet préservatifs	1%	0%

Note : 2006 survey results.

7.7.3.5 Actual Experiences and Awareness of AIDS as a Disease

One-third of the people admit that they have already seen an AIDS patient, sometimes on TV or through reading, but most often in real life. See Table 38.

Table 38. – Have you Ever Seen a HIV/AIDS Case and How can you recognize him/her?

Urban/ villes	Rural	Awareness of AIDS as a disease	Connaissance de la maladie HIV/Sida	Men- hommes	Women- femmes
34%	36%	Seen an AIDS sufferer	Vu sidéen	39%	31%
42%	32%	Can recognize an AIDS sufferer	Sait reconnaître un sidéen	47%	26%
42%	29%	Slimming	maigre	42%	28%
13%	8%	Diarrhea	diarrhée	11%	9%
8%	5%	Hair change	cheveux	11%	1%
3%	2%	Ulcers	Boutons et plaies	1%	3%
2%	1%	Illness	Maladif	2%	1%
1%	0%	Eye changes	Yeux	1%	0%

Note : 2006 survey results.

Many people, especially urban males think they can recognize an AIDS patient[50], with the main characteristics being diarrhea, slimming and hair changes.

7.7.3.6 AIDS Awareness Training

One-third of the people in urban areas, twice as many than in rural areas, indicate that they have received some AIDS awareness training, usually from doctors, but also often from churches. Further information was gathered from radio and reading while among the younger people, schools had provided some training.

Table 39. – Have you Ever Participated in a HIV/AIDS training?

Urban/ villes	Rural	Awareness of AIDS as a disease	Connaissance de la maladie HIV/Sida	Men- hommes	Women- femmes
36%	18%	AIDS awareness training	Formation Sida	32%	22%
18%	2%	Hospital or medical service	Hôpital	10%	9%
12%	0%	Churches	Eglise	7%	4%
5%	3%	Radio	Radio	7%	1%
8%	0%	Schools	Ecole	3%	4%
0%	1%	TFM project	Projet TFM	1%	0%

Note :(2006 survey results).

7.7.3.7 AIDS Testing

AIDS testing is still very rare: tests are not readily available, and few people have had one. Of the few confirmed tests, most were taken in the context of a school project on AIDS awareness and one was before a blood transfusion in Lukotola. All tests have been taken with men. See Table 40.

Table 40. – Have you Ever Participated in a HIV/AIDS training?

Urban/ villes	Rural			Men- hommes	Women- femmes
3%	5%	HIV tested	Test VIH fait	6%	0%

Note :(2006 survey results).

7.7.3.8 Condom Distribution

About half of the people interviewed accepted a sample of condoms and for many of them it was the first time they saw condoms. The aim was to show people in a private encounter the existence of condoms. See Table 41.

Table 41. – Acceptance of a Sample 3-Pack of Condoms?

Urban/ villes	Rural			Men- hommes	Women- femmes
46%	55%	Accepts a sample of condoms	Accepte un échantillon de condoms	54%	50%

Note: (2006 survey results).

[50] The question did not make a difference between people that were seropositive and people that were actually ill. The responses given show that people were referring to people that were already ill.

7.8 Conclusions

7.8.1 AIDS

Most people in the area, rural as well as urban, know about the existence of AIDS and are aware of its main causes, such as sexual intercourse and contamination through blood. As a method against AIDS, fidelity to one spouse is a commonly indicated solution, while people also indicate that they avoid objects that may be contaminated.

Such a behavior is able to protect people from AIDS as long as men and women remain faithful to their fidelity and people marry at a young age, which is still the case. During focus groups discussions it appears that people marry young and that divorce is still rare and badly regarded. However, certain behaviors may have a negative influence, as no form of protection seems to be commonly protected:

- About 15 percent of the households are openly polygamist and other people have a second partner in secret which are both factors of risk for HIV/AIDS contamination.
- The prevalence of STIs observed – even among the village women – by the medical authorities during the illegal mining, indicates that the common and traditional norm of a long-lasting and faithful marriage is less strong than monetary gain.

Medical authorities indicate that the prevalence of AIDS is probably still quite low, but they do not have the means to test it. The results of this survey indicate that this is probably based on a behavior that may be changed, when a project with rich employees settles in the area.

7.8.2 General Health Care

The local population, and especially the rural population have a hard time getting access to medical care. Cost is the most cited reason, especially in the rural areas. The recourse to informal doctors (private nurses and Red Cross trained villagers) helps the rural population, without guaranteeing good-quality health care. Children are more often treated in official centers than adults, but the high infant mortality in the area (three out of four people who had died in the households in 2005 were children under five), shows that progress in providing good healthcare for all, in towns as well as in rural areas, should be one the most important indicators of progress.

8 GENDER ISSUES

In the concession area, spouses equally share the agricultural tasks, but for all other tasks the men are still clearly the heads of the households, the ones who make the major decisions and the ones who are responsible for the family. Questions related to these issues were asked in 232 households, where at least a married couple was present.

During village interviews and key person interviews, the role of the men tended to be more accentuated, especially with regards to their responsibility for clearing new land. However, as farmers do not have to clear new land every year, this theoretical responsibility is not often put into practice.

The clearing of new agricultural land is the responsibility of the men, who may recruit external laborers[51]. Tilling (plowing), ridging and weeding of the land is performed by men, women and external labor, but children often have to help with weeding. The harvest is done by the whole family: men, women and children.

Fields, in most cases, belong to the two spouses together[52]. However, it is possible that men and women each have their own fields (trouble in the family, a second wife, a mistresses, drunkenness of the spouse, etc.) and though often discussed, this was not often observed in the field. See Table 42.

Table 42. Gender Issues : Who Does What in Households at Least Composed of a Married couple.

French	English	Hommes Men[53]	Femmes Women	Hommes+Femmes Men+Women	Enfants Children	Main d'œuvre External labor
Sexe de la personne interviewé	Sex of the person interviewed	32.8%	27.6%	36.7%	0.0%	0.0%
Défrichement champs	Land clearing	27.2%	2.2%	63.6%	8.2%	26.3%
Entretien des cultures	Other agricultural activities	3.6%	4.1%	81.5%	17.2%	21.2%
Achat viande / poisson	Buying meat and fish	70.2%	4.4%	25.5%	1.6%	0.0%
Achat médicaments	Medical care	70.8%	3.5%	27.2%	0.0%	0.0%
Inscription école	School fees	67.1%	2.8%	28.8%	0.0%	0.7%
Petites fournitures	School supplies	65.0%	2.9%	34.6%	0.0%	0.7%

Note: The categories men, women and men + women all include those who also used children and/or external labor resulting in total percentages exceeding 100%. (n=232 households equal numbers from rural and urban areas).

[51] Village interview in Kilusonsa

[52] Interviews in most villages confirm this.

[53] The category "men" includes all men who are responsible without women, the category "women" includes all women responsible without men, the category men + women, all categories where at least men and women are responsible together. In all cases they can use children and external labor as well.

9 SACRED SITES AND GRAVEYARDS

9.1 Graveyards

After passing away, people are buried in dedicated graveyards that are usually located 1 to 2 kilometers from the villages. They are far from the village because people fear what is happening around the graveyards, where there is contact with the dead, the ancestors and various spirits. Not everybody in the village dares to visit them and it was not always easy to obtain their Global Positioning System (GPS) locations. The exact locations of the graveyards are indicated on the village sheets.

More than one village can use the same graveyard, as was the case for the villages between Lutanda and Postolo who have the same chief Lutanda, and also in Mwela Mpande Gare, where people from Mitumbu bloc do not have money to get buried in Fungurume. Kasanga also shares a graveyard. The main graveyard is for the general population, however, villages tend to bury young babies separately (defined as babies that have not yet teeth) as well as twins, people that have died a violent death, and important chiefs. This means that in several villages there are two or three separate graveyards.

The graves are mound-shaped and usually have a wooden cross on the top, often with the name, date of birth and date of death indicated. A grave of a railroad worker was clearly marked by a cross and an upright buried railway sleeper. A regional tradition is to leave an enamel cup on top of the grave which serves the purpose of reminding for a long time that there is a grave, and allowing the dead to drink “in their new village of the death” without having to ask a cup to their neighbors.

Gravesites are often old and do not seem to be as easily abandoned as villages. The gravesite in Kwatebala Gare had been created in 1968 after chief and village elders had prayed to the ancestor to indicate to them a suitable plot of land. During the night, one of the elders dreamt about a site, went there the next day and found a traditional chain (Sabo[sg] / Butshanga[sw]) which was the accepted indication that the ancestors had approved the site. Graveyards observed are:

Kafwaya – Five graveyards for various categories of people.

Zakeo – Graveyard 300 meters north of the village, abandoned graves all around the village.

Lutanda – Two graveyards, for the general population, and for twins and their parents. Graveyard used by the villages Kimilombe, Manomapia, Postolo and Kilusonsa.

Mutaka II and Mutaka Mwelwa – No information.

Kabwe Kakese and Kabwe Dikuku – A cemetery is near the national highway, about 2 kilometers from the village.

Mwela Mpande Gare – A cemetery, with different zones for twins, chiefs, accidental deaths, etc. is located about 600 meters to the south, and south of the railroad. Serves the villages Mwela Mpande Gare, Ndela and Kasanga.

Kwatebala Gare Three different graveyards: for the children without teeth (1 kilometer, next to the road to Kwatebala); for the general population (1 kilometer, next to the road to Kafwaya); for important chiefs (1.6 kilometers, northeast of the village).

Mulumbu – A communal graveyard 750 meters south of the village, which serves Mulumbu, Amoni and Kiboko. In an area that may directly be impacted by the project.

Ndela Sase 1&2 – Deaths are buried in Fungurume.

Mano Mapia – To be verified.

Shungu (Mwanga Muteba), Salabwe, Mwela Mpande village, Mwanga Sangu – The cemetery is located north of Salabwe, outside the project-affected zones

Kimbakene, Lukotola Tembo – To be verified, probably outside the project-affected zone.

Lukotola – Graveyard in the village but not located yet. Probably outside the project-affected zone.

Mpanga Ntadi, Kamungu Kitambo and Kabombwe - One graveyard located, about 2 kilometers east of the road, between the village and the airport. Other graveyards are present but not yet visited. Explanations from the villagers indicate that they are probably outside the project-affected area.

9.2 Sacred and Traditional Sites

Villagers are reluctant to give details and clear indications about exact locations of sacred sites. After explaining to the local community the importance of identifying their whereabouts so they could be avoided or mitigated, some information was obtained. The most important sacred sites that are potentially affected by the project are provided in Table 43.

Table 43. Important Sacred Sites Potentially Affected by the Project.

	Villages that refer to the site
Mahoma, a site within the concession area where chiefs are buried, in one of the meanders of the Konka river.	Kafwaya
Ka Mpungulume or Tu Fungurume, the sacred rock of Fungurume. The specific site of this hill cannot be mined. The remaining area around this hill, the *kimbiri*, can be mined without any danger.	Kafwaya (Only the chief of Kafwaya has the power to go there and ask the spirits). Mwela Mpande Gare, Mpala, Kwatebala Gare
Kabakishi R – A river near Kwatebala Gare, rich in fish, but if people go there without the authorization of the chief, they only catch pearls (*sambo*) and chauwris (*butshanga*), they even risk to die.	Kafwaya, Mwala Mpande Gare
Kitantulo, to the north, and the Kalebi river, probably outside the project-impacted zones	Shungu
Kiyoni, a site on the Kalebi River and affluent of the Monvia, where new chiefs are enthroned.	Villages around Lukotola. Different villages do not indicate the same location for the river and the sacred site.
Kyama hill caves used by the locals to hide during the Msiri wars between 1850 and 1900. Never clearly indicated, but probably outside the area covered by the present concession map.	Most villages in the north and around Lukotola refer to this cave
Lwanzo Lwa Mikuba: a furnace where traditional copper crosses were made. About 1.5 kilometers north of the northern Mano Mapia village.	Mano Mapia
Crossroads near the villages where yearly rituals pledging good rainfall and an abundant crop are held. The rituals are here more important.	Most villages practice the ritual, some every year, others every 2-3 years.

The village consultation records give the various names of sacred sites that have been cited, and sometimes with indications about direction or location.

10 QUALITY OF LIFE INDEX

10.1 Overview

The socioeconomic survey among a sample of household in the project area, has made it possible to calculate an index based on possessions, income opportunities, education and health statistics in the area. The aim of creating an index is not to use it directly as a measurement tool, but to establish an instrument of measurement that can assist in analyzing and describing different settings, and measure socioeconomic evolution in an objective way. In other studies in Africa, the index varied between 25 for the most affluent, and 1.5 for the poorest populations[54].

Figure 13 shows the results of this index for the rural and urban sites as well as the comparison of the men and women in all sites included in the sample.

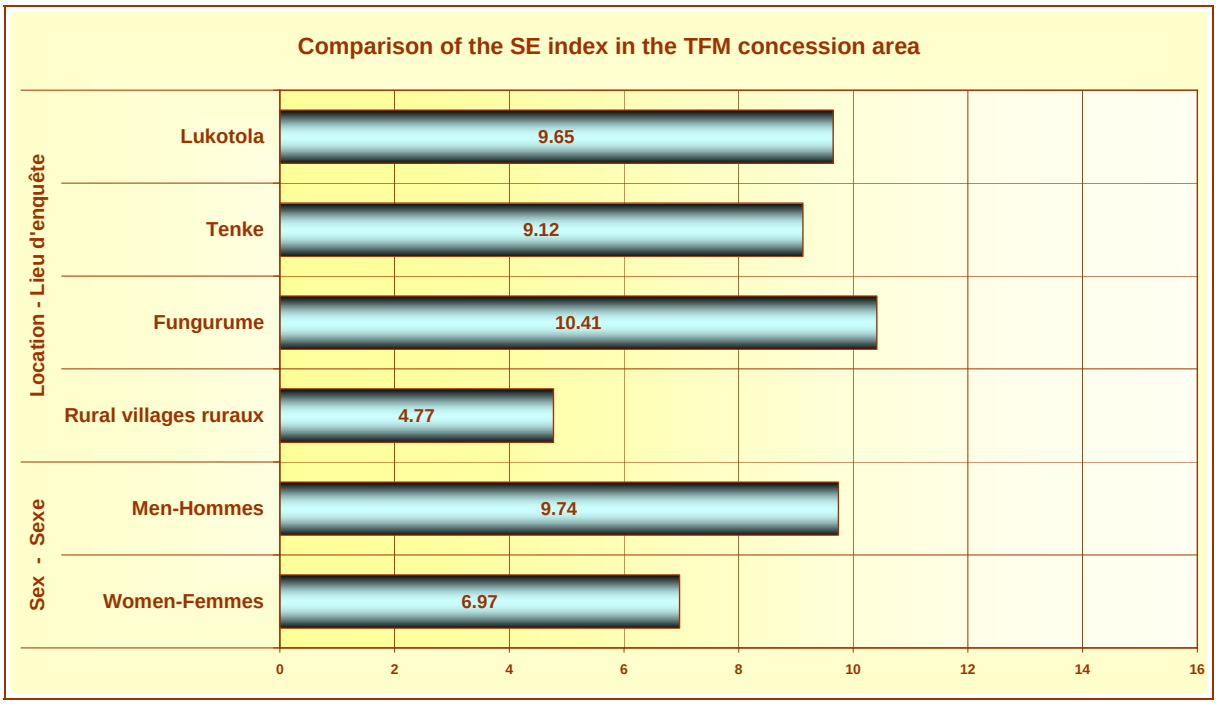


Figure 11. – Socioeconomic Index in the TFM Concession.

The rural villages in the project area are among the poorer ones, looking at this "comparison" in regional terms, while the two towns of Tenke and Fungurume, with an index almost twice as high, remain poor according to these inter-African yardsticks.

- Urban areas distinguish themselves clearly from the rural areas, and Lukotola appears as an urban area and not as a rural area.

[54] A similar index has been used by the authors in studies in Cameroon and Chad. In Cameroon the value of the index varied between more than 20 on the affluent coastal area, 13-15 in the forest area and 5-10 in the savannah area. The Bakola/Bagyeli Pygmies, the poorest population in the country, had an index of only 1.5. Details on the Chad survey can be found on http://www.ulb.ac.be/socio/anthropo/tchad/.

- Men (form both urban and rural areas) have a significantly higher index than women.
- All subgroups are in the lower ranges of the index compared to the other African areas, indicating that there is still an important lack of development and an important potential for improvement in the area.

The score is made up by valuing different items that reflect economic affluence and non-economic well-being:

Infant health – Prevalence of fever and diarrhea during the last week in one to four years old, of skin diseases among the less than ten years old.

General health – Presence of latrines, mosquito-nets, access to modern health care and consumption of animal foods the previous day.

Housing – Material of the roof, the walls and the floor of the main house of the compound.

*Equipmen*t – Furniture, bedding, bought items such as radios, bicycles and any item having cost more than 50,000 Fc (about 100 USD).

Revenue – Presence of regular revenue through employment, retirement, people that send money, assistance to saving groups, and travel.

10.2 Elements of the Socioeconomic Index

Figure 14 summarizes the various elements that compose the index for the rural and the urban areas. For all of the elements, with the exception of the health situation of the infants, the urban areas have a much better score than the rural areas in, for example, quality of the housing, access to education, and various equipments that the households possess. However:

- Urban sources of revenue are hardly better than those in the rural areas.
- In spite of being closer to an official healthcare institution, the general health index for the urban areas is not as high as what might have been expected.

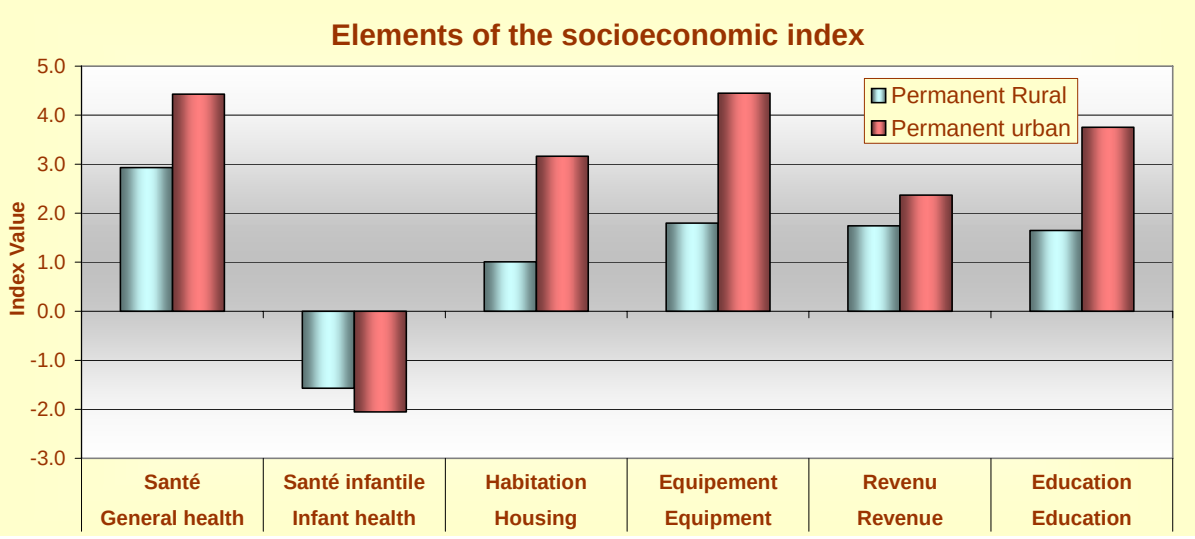


Figure 12. – Elements of the Socioeconomic Index in the Rural and Urban Areas Around the TFM Concession Area. Note: (2006 survey results, weighted for sample density in each of the villages).

10.2.1 Education

Education is better in the urban than in the rural areas, expressed through better access to primary and secondary education and less children between 6 and 15 years that do not attend school[55]. See Figure 13.

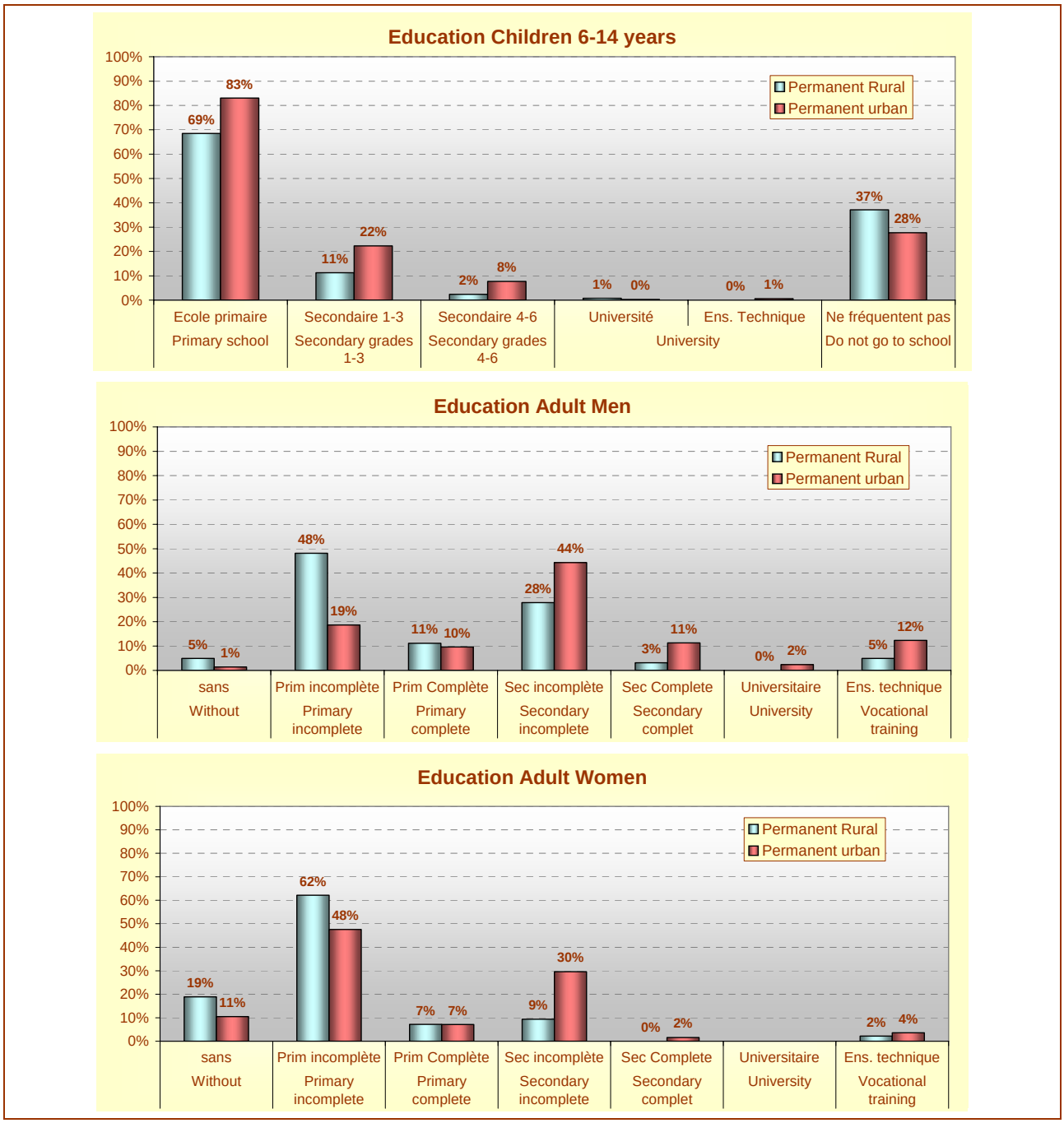


Figure 13. – Enrollment in Education, and Education Level of Adult Men and Women in Rural and Urban Areas. Note: 2006 survey results, weighted for sample density in each of the villages.

[55] Detailed demographic survey indicates that in the bush 73/134 children between 6 and 15 years go to school (=54 percent), in Fungurume, Tenke and Lukotola in 180 of 259 (both 69 percent).

Though present school enrolment differences between girls and boys are not very high, education level of adult men is much higher than the level of women. In rural areas 19 percent of the women admit that they have not been to school. The male population reports that 60 percent of the urban and 43 percent of the rural population has at least completed primary school.

10.2.2 General Health

Latrines – The presence of a latrine is mandatory in the area, and government controllers may come to a village, and fine all those who do not have a latrine. In spite of this, almost half of the rural people do not have a latrine. Two-thirds of the latrines observed are shared with neighbors. Most latrines are protected from view only by a simple wall of straw or bricks, but 10 percent of the rural and 20 percent of the urban latrines are well protected by walls and a roof.

Access to modern health care – People can find simple medicines in the area but access to modern health care usually means getting a prescription from a private nurse, or buying medicines directly in the street or in many of the commercial pharmacies on the street and market. Only 10 percent of the rural households and 24 percent of the urban households indicated that they bad been able to obtain medicines directly from a recognized health center.

Access to animal proteins during the previous day –

- Bush meat is becoming extremely rare in the area, though every now and then referred to in village interviews. The 8 percent of rural people that consumed "bushmeat" all had either mice, rats or a pigeon.
- Domestic meat, such as goats and chickens, are irregularly consumed: the percentage indicated (5 to 6 percent) means that people eat meat only once every three weeks.
- Fish is mainly (more than 90 percent of the cases), dried, smoked and salted fish and is often used more as a condiment, than as a significant source of proteins. Through the absence of markets, rural people consume fish only 14 percent of the days (or about once a week) while the urbanites have fish every 2 to 3 days.

See Figure 14 for a comparison of health related indicators in rural and urban areas.

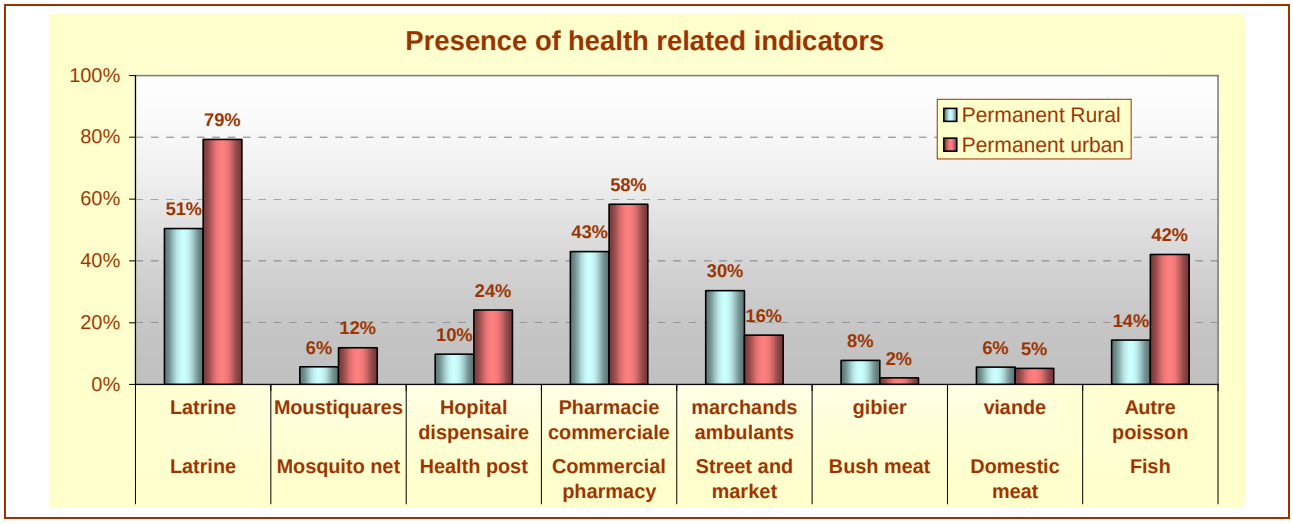


Figure 14. – Health Related Indicators in Rural and Urban Areas.
Note: 2006 survey results, weighted for sample density in each of the villages.

10.2.3 Infant Health

Infant health has been measured through asking the mother about the presence of diarrhea, fever and skin diseases in their children. Diarrhea and fever were looked at among the one to four year olds, as they are at the age in which the environmental impact on their health is most strongly felt; skin disease concerns all children under ten. See Figure 17.

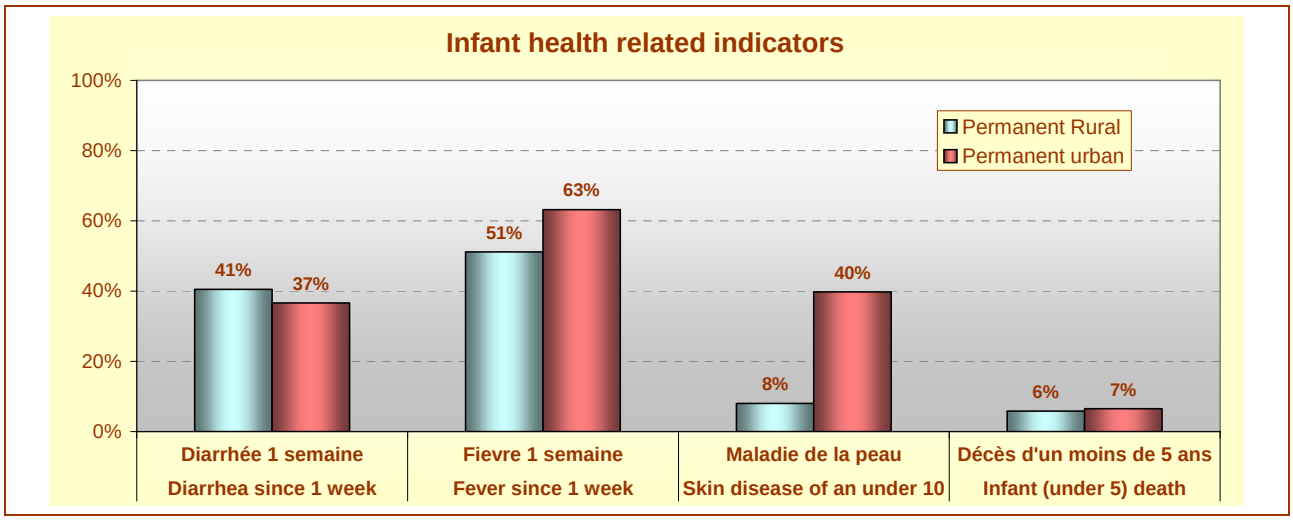


Figure 15. – Infant Health Related Items in Rural and Urban Areas.
Note: 2006 survey results, weighted for sample density in each of the villages.

Any children under five that die should be considered as avoidable calamities, but they often happen in the area. In both urban and rural villages this was the case in 6 to7 percent of the households. The mortality of young people can also be deduced from the indicator “average

age at death, during the year preceding the survey", which was 11.3 years in the rural villages and 7.7 years in the urban sites[56].

10.2.4 Housing

Figure shows that an important difference in quality and durability between rural and urban housing. In towns, most house are covered with permanent, usually aluminum roofs, fired bricks are often used for walls and cement covers part or all of the floors. During the consultation people express the desire for improved housing and aluminum roofs are especially wanted, as this gives much added comfort during the rainy season. One should note that 11 percent of the permanent rural households – that have been living in the present village for more than a year – still live in temporary huts with straw walls. Mud walls, the more traditional style of housing, less durable than mud bricks, are still present in some of the villages. In summary, the housing index was 1.01 in the rural villages and 3.16 in the urban sites.

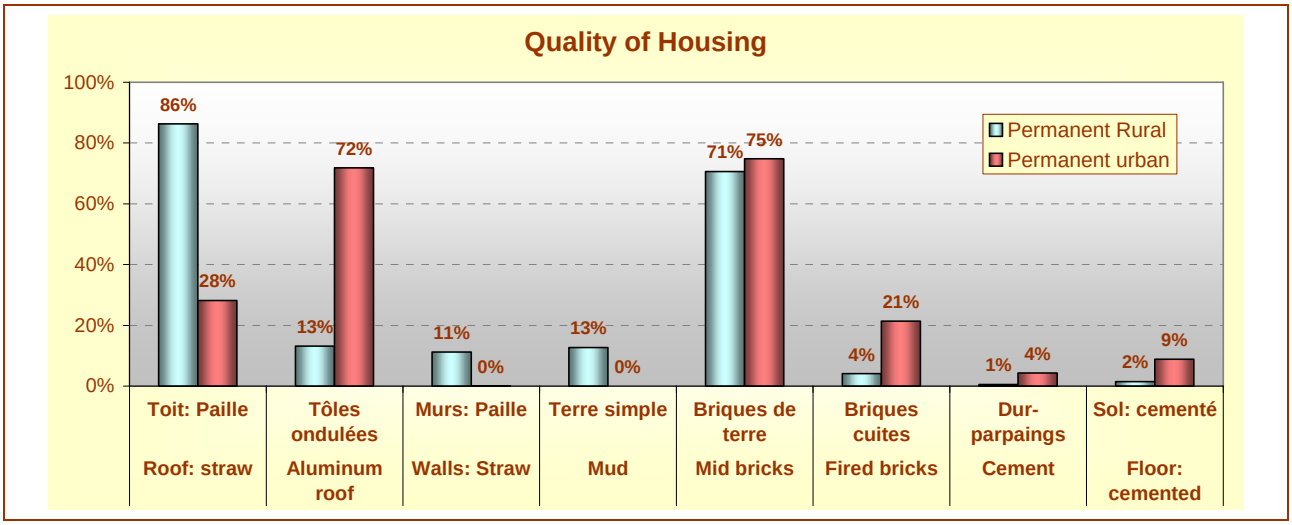


Figure 16. – Quality of housing in Rural and Urban Areas
Note: 2006 survey results, weighted for sample density in each of the villages.

10.2.5 Equipment and Possessions

The prime possessions of villagers and urbanites are the bicycle and the radio. See Figure 17. Both items keep people in contact with the outside world, either through information or through his travels. New bicycles cost between 30 and 45 thousand Fc (60 to 100 USD), and there is also a lively trade in second-hand bicycles. Eleven percent of the families even have more than one bicycle, which are often bought with money earned from selling agricultural products.

[56] In Cameroon the indicator was 32 years in the forest area and 19 years in the savanna area; in Chad the average age was 15 years.

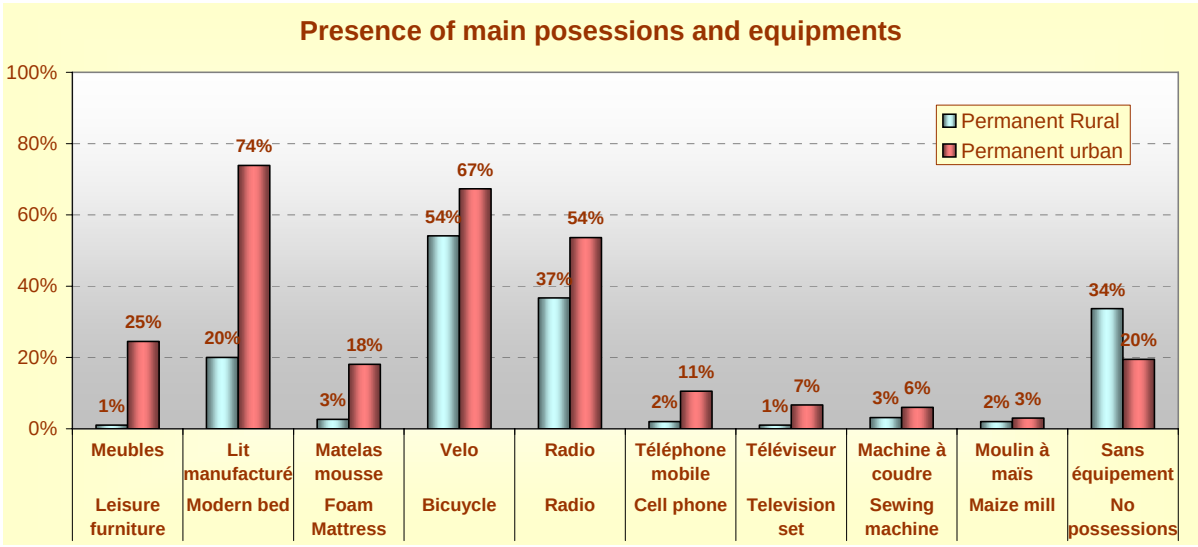


Figure 17. – Presence of Main Possessions in Rural and Urban Areas.
Note: 2006 survey results, weighted for sample density in each of the villages.

Leisure furniture is only present in town: mostly wooden chairs and couches, although rare, and with foam cushions only for the rich. Though all urban areas theoretically have access to electric grid, only 14 percent of the households benefit from it. In the urban centers, 7 percent of the households now own a mobile phone, marking the importance of this new means of communication. 7 percent own a TV set and 6 percent a sewing machine.

10.2.6 Income

Most families in the area do not have significant sources of income, and outside help from relatives in town or abroad is for many the major source of regular and irregular income. 85 percent of the rural families and 77 percent of the urban families report that they have no regular income. See Figure 18.

The lack of regular and irregular income is apparent through the absence of saving groups, in which only very few (3 percent or less) of the families participate.

Agriculture is the most important activity, but only one out of six families indicate that they earn more than 100,000 Fc from agriculture products.

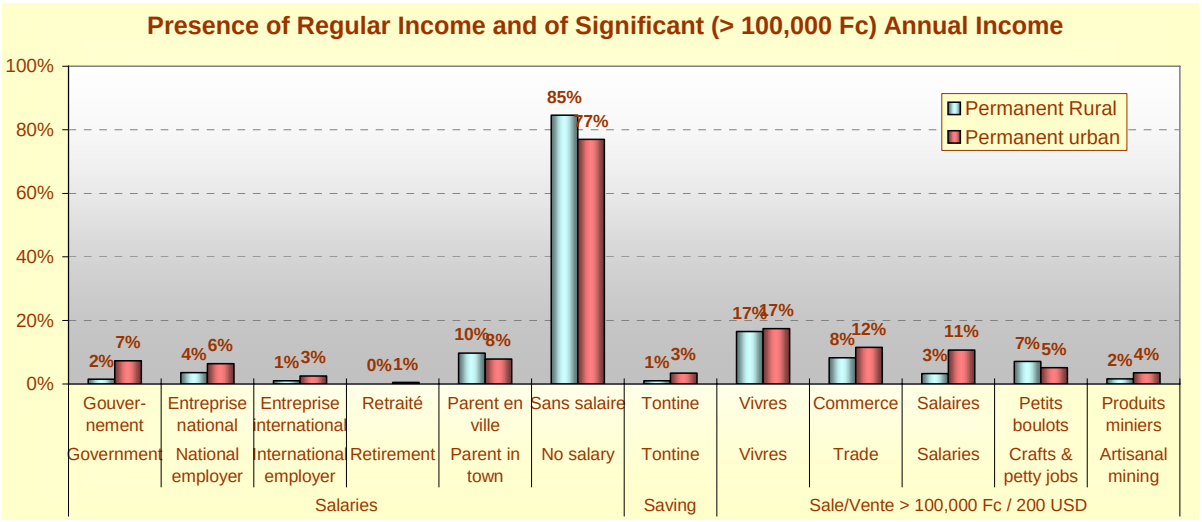


Figure 18. – Presence of Important Sources of Income in Rural and Urban Areas.
Note: 2006 survey results, weighted for sample density in each of the villages.

Average income reported in the area is more than 100,000 Fc, but the distribution is skewed with a few rich people. Among the people that reported income, the median value (attained by 50 percent of the population) was 79,000 Fc in rural areas and 115,000 Fc in urban areas. The median income is the one that has to be adopted for the overall income.

10.2.7 Conclusion

The rural population in the TFM area lacks many of the items that are part of decent development: lack of education, poor housing, absence of equipment, difficult access to health care, and almost no regular or irregular income.

In the urban sites the situation is somewhat better: improved housing, better education, slightly more regular income, and better access to health care. Many more families in towns have access to protein foods in the form of dried fish. The resulting index is almost twice as high in the urban than in the rural areas. It must be noted however, that this index is just a partial picture of life in the urban and rural environments.

The better living conditions that prevail in the urban areas are among the attractions of the urban area, together with the possibility of obtaining income through employment, crafts and petty jobs.

The income situation has to be compared with the data described in Section 5.3.1, page 43 (median income among the permanent rural households was 79,000 Fc, and among the permanent urban households 115,000 Fc).

The indicators used in compiling the socioeconomic index confirm what was obtained in that section: very few people in the area have either regular income, or significant income from any source, which represent the major cause of the low scores that people attain in the other items such as education, access to health care, housing quality and housing equipment.

The TFM mining project can have important positive impacts on the socioeconomic index through:

(1) Direct impact through the employment it provides, compensation paid to farmers, especially if the population manages to invest the money earned or received in housing, equipment and possessions.

(2) Indirect impact through the increased possibilities of informal employment, trade, crafts and petty jobs in an environment with the presence of an affluent wage earning group of employees from the project.

(3) General development impact through the planned program of regional participative development through improved education, health care, agricultural production, commerce and governance.

The present baseline of indicators can so be used to show the effective impact on the general population of the mining project.

11 OPINIONS AND EXPECTATIONS ABOUT THE MINING PROJECT

During the survey, questions were asked about personal expectations and fears concerning the TFM mining project and also about its potential impact on the village community.

11.1 Individual Expectations

Individual expectations concerning the project mainly concern employment, which is an expected result. See Figure 19. One should note, however, that for the rural populations the situation is slightly different: less people than in other categories expect employment as the major benefit from the project, but look to other benefits such as education, health, assistance with agriculture, houses built by the company, or house building materials handed out.

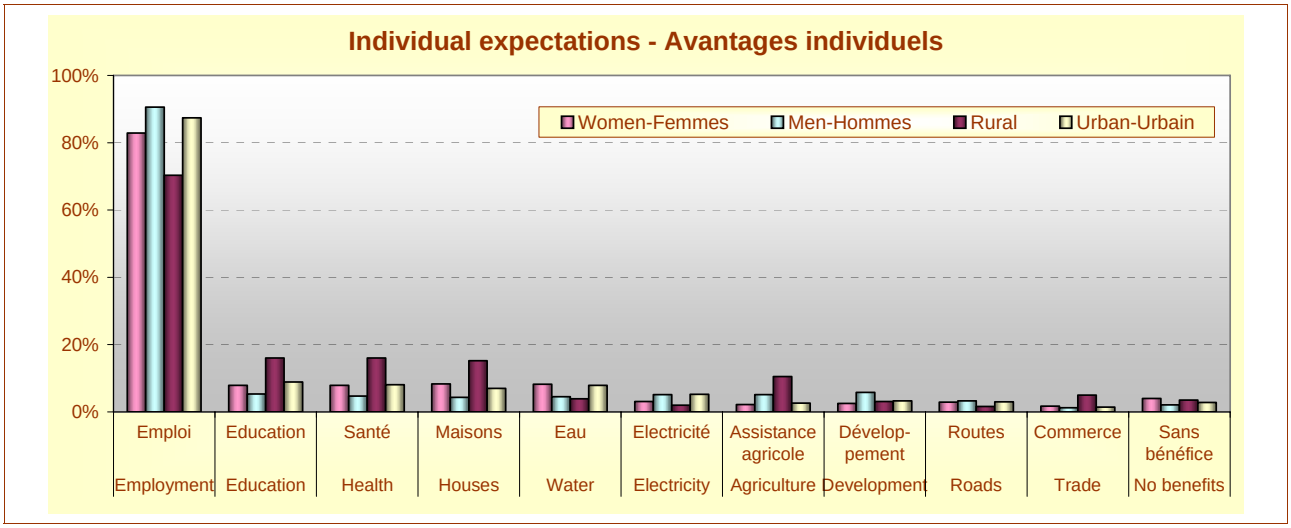


Figure 19. – Individual Benefits Expected from the Development of the TFM mine by Sex and By Origin. Note: 2006 survey results, weighted for the sample density in each of the village).

11.2 Community (Village) Expectations

Community expectations, or what people expect as improvements provided by the project, cover a wider range of items than the individual expectations. See Figure 20. Women still insist on employment, mainly for the men of their households, but also for themselves. Health improvements and assistance with education are the most important items for all categories. Water and electricity are important for the urban areas and for women. For the rural population they are less important and agricultural assistance (improved seeds, fertilizer) and the building of new houses, more important. There is a widespread expectation that the project is going to build houses and give them to the local population. People also expect agricultural assistance, but realize that improved seeds and fertilizer will have to be paid or reimbursed to the project and they hope that subsidized prices are possible.

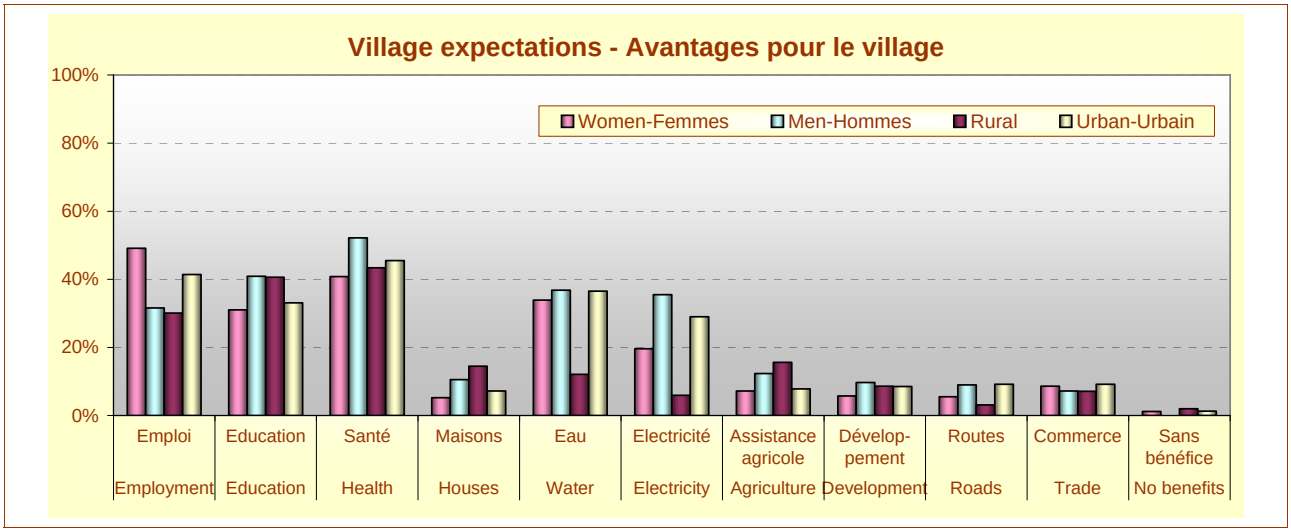


Figure 20. – Village Benefits Expected from the Development of the TFM mine by Sex and By Origin.
Note: 2006 survey results, weighted for the sample density in each of the villages.

11.3 Individual and Community Fears

Almost 90 percent of the population answered directly, that they did not fear anything about the project. Only a minority of the rural population expressed concerns about resettlement of their village or loss of their fields. Among the rural village, there were also more concerns about employment issues, pollution and risk of accidents ("natural" and "sorcery caused"). Sorcery was also present when people talked about employment issues within the village, or if too much employment is being were given to foreigners. See Figure 21.

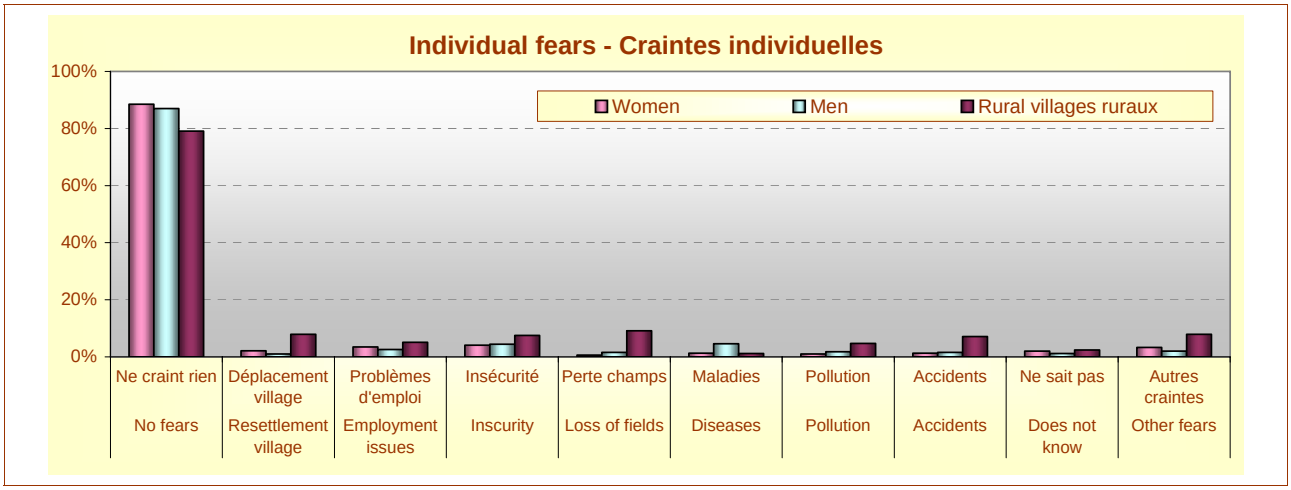


Figure 21. – Village Fears Expressed About the Development of the TFM Mine by Sex and by Origin.
Note: 2006 survey results, weighted for the sample density in each of the villages.

11.4 Conclusion

At the start of the TFM's mining project, when people still expect that the project is going to change their lives for the better, people prefer not to cite any fears, as this might jeopardize

their chances of becoming involved with the project through employment or other benefits for their community.

The population perceives important benefits from the project, both for improving individual as well as village conditions. Though part of the expected benefits are generally considered to be items to be provided by a government, the population perceives things differently. They feel daily the absence of a government with an investment budget in the area and remember how Gécamines in general and TFM's predecessor, SMTF in the particular area, handed out benefits to the population, usually as free gifts, and provided almost full employment. Now that TFM's mine will only have limited recruitment, the need for independent and sustainable development, is paramount, in order to avoid tensions in the society among those who have employment and benefits and those who have not.

Hesitantly, some of these fears are expressed when people indicate, that they fear jealousy and sorcery in the village, when they are worried about reprisals if something goes wrong in the mine through the fault of a villager and their fear of all the benefits going to other places than the local area.

APPENDIX B4.1-II

RESULTS OF THE SOCIO-ECONOMIC VILLAGE STUDIES IN THE TFM CONCESSION AREA

Groupe d'Étude des Populations Forestières Équatoriales
7 Quai Voltaire, 75007 PARIS - France
Tel. 33 1 40 79 34 24 ou 33 1 40 79 38 15 - Fax 33 1 40 79 38 15
e-mail bahuchet@mnhn.fr

Results of the Socio-economic Village Studies in the TFM Concession Area

November 2005 – April 2006

Appendix B4.1-II

A report by

Dr. George KOPPERT Ph.D.

In collaboration with

Julienne KITOTO KATENDELA

Albert KIBILA KASSONGO

Florent SAHATO WA KALUMBA

Jerry KOLONJI WA MPOYO

Lydie NGOIE SOMWE

Table of Contents

1 Summary

This document summarizes the discussions with key informants and village focus groups conducted in the 41 villages and hamlets in the main concession area of the planned TFM project.

1.1 Village Reports

During these discussions the key elements of the project were explained to an informal gathering of villagers:

- Scope and calendar of activities (studies, construction, exploitation) until the actual mining.
- The potential but limited recruitment and employment possibilities and constraints.
- The complete compensation according to national and international laws and guidelines for any lost assets through the company.
- The direct impact of the project on the economy of the area.
- The impact on the nation and the Katanga province through taxes.
- The establishment of a dedicated regional social development fund that will function throughout the life of the project and will be conducted in a participative way, in order to remain sustainable independently from the mining project.

The villagers, especially those in the immediate vicinity of the potential mining area, would ask questions, make remarks, and express concerns. These main concerns and questions about the project are noted, and community projects derived from the discussion are reported (Appendices 3 and 4).

The second part of the meeting concerned discussing the local economy with the assembled villagers: results of these interviews, including maps showing village locations and village housing and community assets are the main subject of this village report (Appendices 5, 6, 7 and 8).

The general baseline information, not specifically related to individual villages has been reported in the main report entitled: "Socio-economic Baseline Report: TFM Concession Area."

1.2 Focus Group Discussions

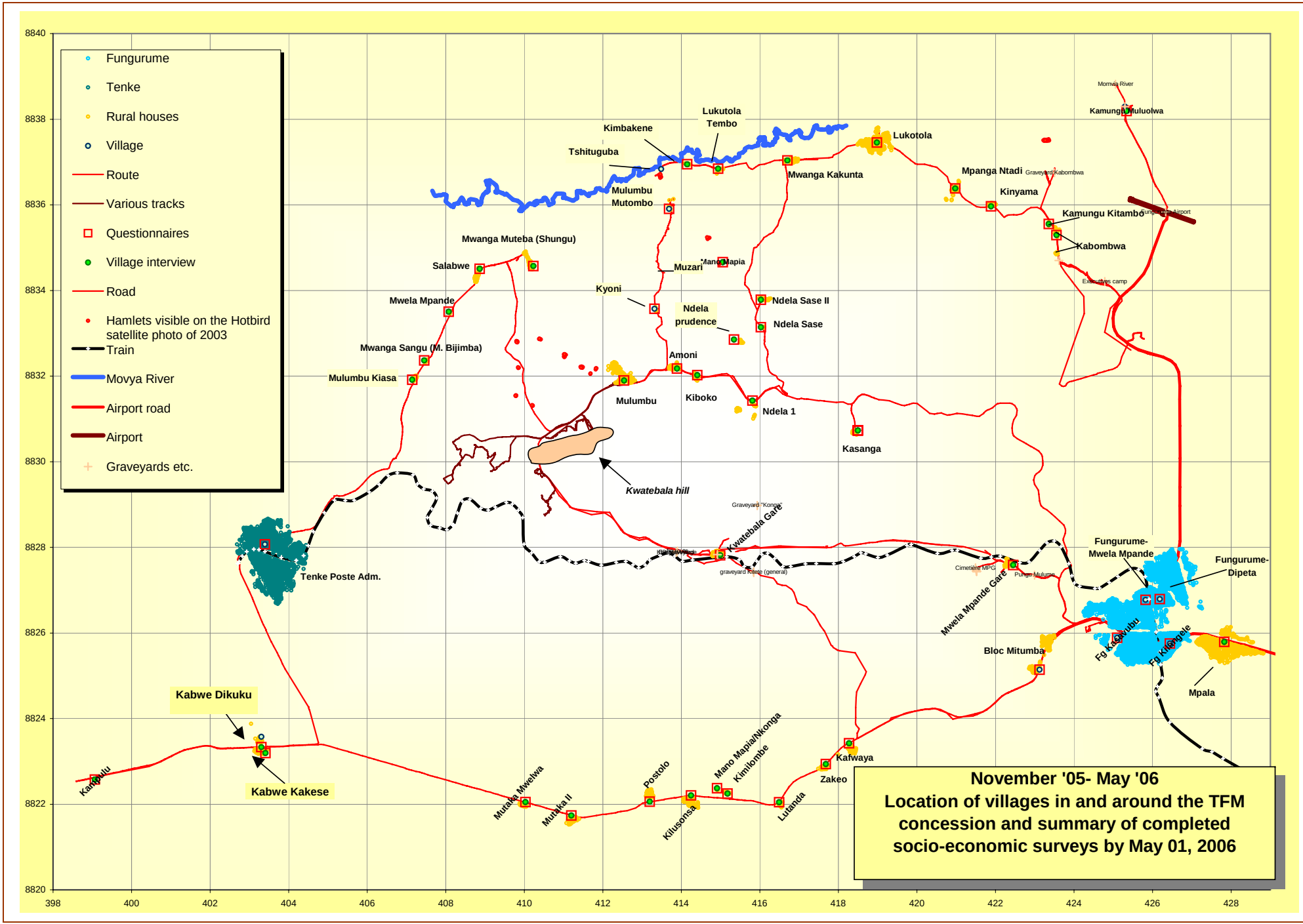
Focus group discussions with men, women, and young people (mainly boys) were conducted in the urban sites of Fungurume and Tenke, and in the rural villages of Kamungu Kitembo and Mulumbu. In the last village a specific meeting was also organized with the important group of transhumant farmers.

Results of these discussions with focus groups are presented in Appendix 9.

A glossary of abbreviations and local terms used is provided in Appendix 21.

2 Summary Table and Map

	Village	Total	M	F	Number of Houses	Average Family Size	Population Size	Church	School	Water	% Temporary Transhumants	Village Meting	Focus Groups
1	Kafwaya	65	32	33	80	4.4	349	N		River		X	
2	Zakeo	5	5	0	25	4.4	109	N		Cemented source		X	
3	Lutanda	5	3	2	19	4.4	83	N		River		X	
4	Kimilombe	10			15	4.4	65	N		Traditional Source		FS	
5	Mano Mapia, Nkonga	2			5	4.4	22	N		Traditional Source		FS	
6	Kilusonsa	16			76	4.4	331	Yes	Yes	Cemented source		X	
7	Postolo	41	14	25	47	4.4	205	Yes		Cemented source		X	
8	Mutaka II	56	24	32	65	4.4	283	Yes		River		X	
9	Mutaka Mwelwa, Q Kibangu.	29	12	17	26	4.4	113	Yes		River		X	
10	Kabwe Kakese	19	16	3	41	4.4	179	Yes		River		X	
11	Kabwe Kikuku	13	9	4	52	4.4	227	Yes	2 years	River		X	
12	Mwela Mpande Gare	10			26	4.4	113	N		River	~10%	X	
13	Kwaebala Gare	41	28	13	86	4.4	375	Yes		River		X	
14	Mulumbu	110	86	24	275	4.4	1199	Yes	Yes	River		X	Yes
15	Shungu (Mwanga Muteba)	12	7	5	35	4.4	153	N		River		X	
16	Salabwe	23	232	0	54	4.4	235	Yes		River	5%	X	
17	Mulumbu Kiasa	19	14	5	26	4.4	113	N		Traditional source	15%	Z	
18	Mwanga Sangu (Mwanga Bijimba)	2			8	4.4	35	N			0%	JK	
19	Mwela Mpande village	3	2	1	4	4.4	17	N		Traditional source	25%	X	
20	Kasanga	41	24	17	32	4.4	140	N		Cemented source	40%	X	
21	Ndela 1&2	54	31	23	57	4.4	249	N		River	79%	X	
22	Ndela Prudence	14	7	7	15	4.4	65	N		River	98%	Explanation	
23	Ndela Sase 2	72	40	32	10	4.4	44	N		River	98%	X	
24	Ndela Sase 1				42	4.4	183	N		Traditional source	98%	X	
25	Mano Mapia	31	27	4	36	4.4	157	Yes		River		JK	
26	Kiboko	18	10	8	28	4.4	122	N			38%	JK	
27	Amoni	62	35	27	59	4.4	257	Yes		Traditional source	20%	X	
28	Mulumbu Mutombo	10			11	4.4	48	N		River?		Sommaire	
29	Kyoni	32	2	1	4	4.4	17	N		Traditional source	75%	Sommaire	
30	Kimbakene	9	8	1	12	4.4	52			River + photo		JK	
31	Lukotola Tembo	11	7	4	17	4.4	74			River + photo		JK	
32	Mwanga Kukunta	44	25	19	46	4.4	201	Yes	2 years	Kampekete river		JK	
33	Mpanga Ntadi	8	5	3	41	4.4	179	N		Traditional source	41%	JK	
34	Kinyama	31	15	16	42	4.4	183	N		Cemented source	58%	JK	
35	Kabombwa	27	19	8	35	4.4	153	Yes		River	53%	JK	
36	Kamungu Kitambo	18	9	9	13	4.4	57	Yes		River	38%	JK	Yes
37	Kamungu Mulolowo	19	13	6	191	4.4	833	Yes	4 years	River + wells		JK	
Pumpi Area													
1	Lukonde	19	10	9	26	4.4	113	No		River	41%	X	
2	Pumpi Gare	26	13	13	35	4.4	153	Yes		Seasonal well + river	58%	JK	
3	Kyaboja-Onze	10			11	4.4	48	No		River	53%	JK	
4	Kampulu	40	25	15	17	4.4	74	No		River	38%	X	
Total for the rural villages		1,048			1,745	4.4	7,608						
Urban and semi-urban areas													
1	Lukotola	64	55	9	320	5.5	1,750	Yes	Yes	Piped		X	
2	Mitumba Bloc				152	4.9	740	Yes	Yes	Piped + river + well		JK	
3	Mpala	14	12	2	768	6.2	4,762	Yes	Yes	River + well		X	
4	Fungurume	4	4	0	5220	6.9	42,000	Yes	Yes	Piped + well			Yes
5	Tenke				1,777	6.2	10,982	Yes	Yes	Peped with river water			Yes
Total for the urban villages					8,237		60,234						
Total for the rural villages and urban areas					10,071		67,842						4


Fungurume
Tenke
Rural houses
Village
Route
Various tracks
Questionnaires
Village interview
Road
Hamlets visible on the Hotbird satellite photo of 2003
Train
Movya River
Airport road
Airport
Graveyards etc.
Lukutola Tembo
Kimbakene
Tshituguba
Lukotola
Mwanga Kakunta
Mpanga Ntadi
Kinyama
Kamungu Kitambo
Kabombwa
Mulumbu Mutombo
Mwanga Muteba (Shungu)
Salabwe
Muzari
Kyoni
Ndela Sase II
Ndela Sase
Ndela prudence
Mwela Mpande
Mwanga Sangu (M. Bijimba)
Mulumbu Kiasa
Amoni
Mulumbu
Kiboko
Ndela 1
Kasanga
Kwatebala hill
Kwatebala Gare
Tenke Poste Adm.
Fungurume-Mwela Mpande
Fungurume-Dipeta
Mwela Mpande Gare
Bloc Mitumba
Mpala
Kabwe Dikuku
Kabwe Kakese
Kafwaya
Zakeo
Postolo
Kilusonsa
Lutanda
Mutaka Mweiwa
Mutaka II
Mano Mapia/Nkonga Kimilombe
November '05- May '06
Location of villages in and around the TFM concession and summary of completed socio-economic surveys by May 01, 2006

3 Main Issues

- Employment opportunities in general.
- Employment for women.
- A foolproof and honest system of recruitment, giving everybody a similar and fair chance to be recruited.
- Agricultural development: especially the need for fertilizer and improved seeds, often linked to a promise by the population to pay back its cost at harvest time.
- Education: there used to be several village schools that have shut down because parents cannot pay their (in-kind) contribution to the schools with which the teachers are paid.
- Health centers where people can receive free or very low cost treatment.
- Payment to bogus recruiters in order to get jobs.
- Animosity between the major Chefs de terre (Especially Mpala and Lutanda; Mwela Mpande and Mulumbu, also Kamungu and Lukotola). Not much contested is Mutanda Mwelwa (but mainly south of the concession and the Route Nationale).
- Chefs de terre are supposed to receive Mulambu (traditional gifts) from their population, but apparently do not receive very much, as they all live in striking poverty, at least similar if not worse than the villagers.
- Actions of the Agence National de Renseignement (ANR) chief in Tenke that is disruptive to the good conduct of the project. The villagers of Tenke complain about the actions of the ANR chief, which they consider to be detrimental to their chances of obtaining benefits from the project.
- Fear of relocation expressed in Fungurume, Mwela Mpande Gare, Mulumbu, and Ndela Sase.
- What to do if informal miners are in our area (~ Fear that the village will be punished, not receive benefits if informal mining continues).
- During the village interviews, no fears of dangers by the project were expressed, such as complaints about noise, dust, or accidents.
- Jealousy and sorcery are major characteristics of the local societies, and worries were expressed about what may happen in the village if only some people are recruited.
- Agricultural land. In general women and men have one common field, but in discussions it appears that separate fields have become more common recently, though only for a minority (10-20 percent). This issue has to be taken into account when deciding who is the land user that is to be compensated.
- In spite of the fact the Sanga belong to a matriarchal and matrilocal society, men appear to have all the power in the household. Agreements with both spouses have to be sought in any contract that concerns compensation and relocation.
- All chefs de terre (CdT's) of the area have to be united to perform the traditional rituals necessary for the success of the mine. Each chief who considers himself a CdT (about 10[1]) thinks that he is the most powerful to perform such rituals, and in order to avoid animosity they should all be invited: before the construction starts and again before the actual mining starts.

[1] Mpala, Lutanda, Mwela Mpande, Mutaka Mwelwa, Kafwaya, Salabwe, Mwanga Muteba (Shungu), Mulumbu, Lukotola, Kamungu, and the successor of Tenki, when he is chosen.

4 Potential Community Development Projects

Projects that are of interest to the local population include employment generation initiatives and programs that provide for increased agricultural production, health, education, water and electricity.

Community development projects will need to be carefully planned with built-in mechanisms to evaluate their benefits. Although early in the project, discussions around possible community development initiatives were discussed informally and formally and in the key-person interviews.

- *Buying of agricultural crops by the project*

If the TFM project purchases part of the crop this can be beneficial to the local people, especially as the growing season 2005/6 appears at this point to be a very good one. It is possible, however, that some people may sell too much food at the harvest season and create an artificially high price during the hunger season 2006/7.

- *Fertilizer and improved seeds*

Former experiences with Gécamines and the Mission from Lukotola have shown that providing fertilizer that will have to be paid back at harvest time is not workable. Repayment of debts was very poor in these two projects and it is not advisable for villagers to build up a debt during their first year they experience the “New” TFM.

- *Buy maize, and pay part of it by fertilizer and improved seeds*

An intermediate solution will be to buy the maize that TFM needs at close to market price and to add a bonus in the from of fertilizer and/or improved seeds to the farmers. This will both help next year’s harvest and have a stabilizing effect on the cereal market in the region.

- *Health*

There are very few health facilities in the area: 10 in Fungurume, two in Tenke and one in Lukotola. None of these centers have reach-out services to the villagers.

Contributions to health centers could be:

- One bicycle for each recognized “centre de santé.”
- A fixed amount of money to be spent in-kind on improvements to the physical structures of the non-profit health centers and a contingency fund for repairs to the building or to buy equipment.
- The sanitary authorities prefer to have intermediate centres in the central villages of Kilusonsa and Mulumbu and they say they are prepared to provide the necessary nurse. If villagers can prepare the bricks help could be sought from the Lukotola technicians to build a small health center.
- The possibility of providing a kit of essential medicines to officially recognized non-profit health centers should be envisaged in light of its potential to be used in a sustainable way, and sold at basic or subsidized prices to the local population.

- *Impregnated mosquito nets*

Malaria is the reason for more than half of the consultations in the local health posts and responsible for many casualties, especially among young children[2]. Impregnated mosquito nets are available in the area through the health centers at a cost of 900 FC, or 2 USD. However, few are used and only 500 have been sold in the Fungurume area during the preceding 12 months. A program of distributing impregnated mosquito nets in all households, at a rate of one per bedroom has been effective in other African countries, and should be envisaged to be implemented before the next rainy season.

- *Education*

Local schools are usually housed in very poor buildings, without any equipment. Though most teachers have some formal training, most schools have no books or teaching materials at all for the teachers, while none of the pupils have any books whatsoever.

A good project would be to provide all existing schools in the area with basic school supplies for teaching: books, blackboards, chalk, a notebook and a pencil for every child enrolled in each school. Teachers could be brought to Fungurume or Tenke and receive some training in the use of their textbooks, at the same time they receive them.

[2] More than 2/3 of those that had died last year in interviewed families were children under 5 years old (initial results based on part of the sample).

Such action would reach many households in the area and show that the project actions are aimed at helping the widest range of people in the area.

Village schools in remote areas (such as Mulumbu, Kilusonsa, Kbawe, Mwanga Kapenda) and other villages where the village has provided the basic school building material of baked bricks and sand, should be assisted in completing their schools with corrugated iron roofs and blackboards.

A program of equipping the schools with benches and tables can be envisaged at a later stage and could involve the participation of the villagers.

- *Water*

Water projects are important but are not easy to implement. Even the improved traditional wells, of which there are several that are more or less functional in the villages, have several important drawbacks, and cannot function without thorough training and participation of the local population. Villages do have water; however, it is often of very poor quality. A sound water supply program will have to developed.

5 Summary of Villages and Hamlets Visited

The following sections summarize the main information for each of the 41 villages and five urban areas, as obtained during discussions in the villages. The village chief, village elders and ordinary villagers, both men and women generally attended these information meetings – which usually lasted between two and four hours. The information reflects their view of the socio-economic village situation.

The team would like to sincerely thank the more than 1,000 persons, women, men and young people, who participated with such enthusiasm and patience in these meetings.

6 Rural Villages in and Around the Concession Area

6.1 Kafwaya

Established. 1802. Administratively the village is part of the Mwela Mpande Quarter of Fungurume and considered a “bloc”, with an administrative representative Mukekwa wa Ndakasha.

The village chief is Kafwaya, formerly know as Mwebe Lambert

- *Questions and Issues*

Q. When will the recruitment start? A: after a year, do not give money to recruiters.

Q. Are you TFM or Government? A: Gepfe.

Q. We are the first settlers in the area and have named all the rivers and hills. There has been a Kafwaya chief since 1802. A: Ok.

Informal miners. – Chief: the illegal miners never respected my authority, and did not give me anything. I’m not satisfied about it; this is not my business, but TFM’s. Other villagers: we were happy to earn some money washing the heterogenite and we sold food to the illegal miners. But the chief replies: we have sold too much and no food is left in the village. Women: we could not discipline our husbands with the illegal miners, but we women, never did any wrong.

The mines’ police was not violent while expelling the miners. When the miners saw the police they all ran away as fast as they could, some fell and were wounded, but not because of the violence of the mines’ police. The mining stopped because there were no buyers [of heterogenite] anymore, and the mines police stopped the trucks that came form the hills. Without a market, it became impossible to sell heterogenite

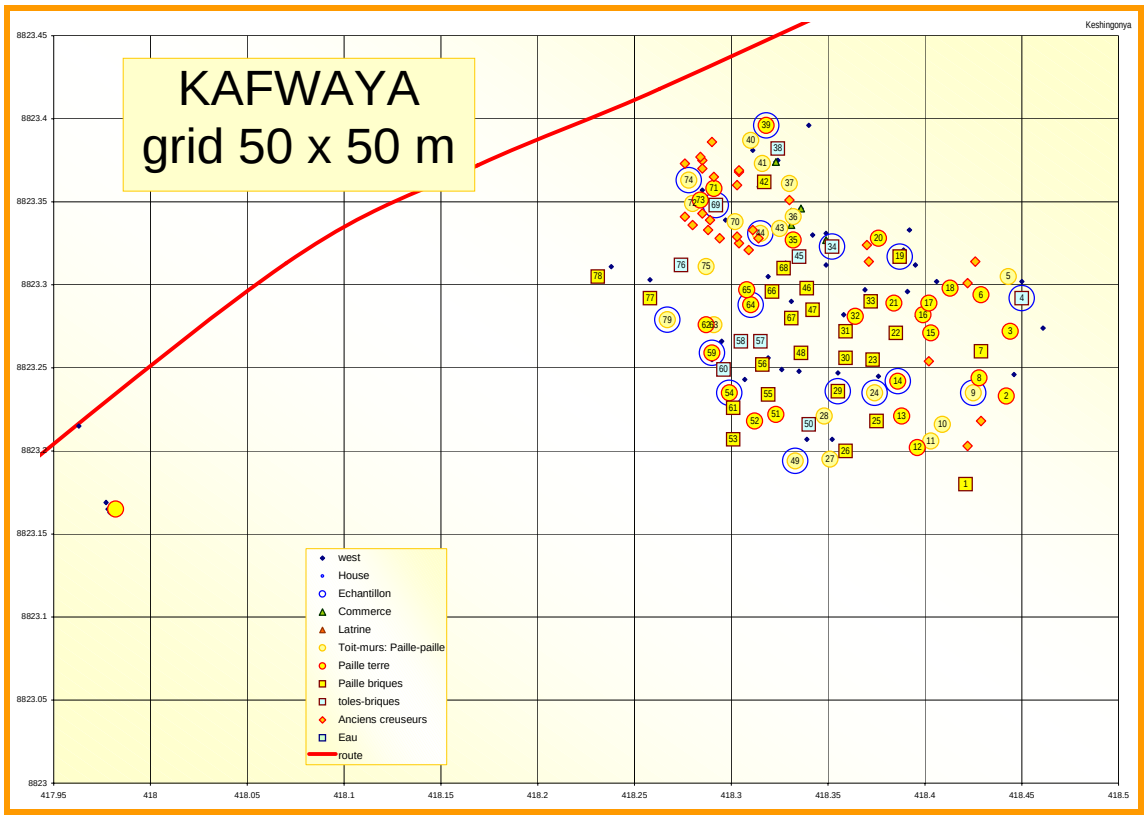
The mines’ police was not violent while expelling the miners. When the miners saw the police they all ran away as fast as they could, some fell and were wounded, but not because of the violence of the mines’ police. The mining stopped because there were no buyers [of heterogenite] anymore, and the mines police stopped the trucks that came form the hills. Without a market, it became impossible to sell heterogenite.

Function/fonction	Name/nom	Village/Lieu d’habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala	Fungurume	
Chef de poste ou chef de cité	Kapenda Lukeka	Fungurume	
Chef de quartier	Kamiji Luendela	Fungurume, quartier Mwela Mpande	
Chef de village	Mwebe Lambert	Kafwaya	Mulopwe
Représentant chef de quartier	Mukekwa wa Ndakasha	Kafwaye	

Characteristic	Description
Population	80 compounds, Est. 360 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Ruund, Ndembo
Languages	Sanga, Swahili, very little French
Religion	Methodists, Pentecostals, Catholics, no church in the village
Housing	Walls: Straw 24%, mud: 33%; bricks: 43%; Roof: Aluminium: 13%
Water	Nkonka River, Kesinyonya (a well in the river bed)
Electricity	None, one generator for the village bar
Fuel	Firewood and charcoal
Radio	Local radio: none, national radio : Okapi, International radios: RFI, Zambia, VOA
Television	None
Cell phone	Vodacom
Education	None of the children go to school, a village school was closed 7 years ago, because the parents did not participate[3]. Primary School available in Kilusonsa (3.5 km)

[3] According to the women: "Our men have money for alcohol, not to send our children to school"

Health	No trained health personal available, only in Fungurume (CS Dipeta, Catholique, cliniques privés), operations à Kakanda et Kambove.
Commerce	1 bar with generator, 2 small shops or “kiosks", a black smith
Transport	Kolwezi 1000 F, Likasi 1500 F
Agriculture	Production : 1. maize, 2. beans, (3) wet lands; commercialization: 1. beans; 2. maize
Animals	1. pigs, 2. goats 3. chicken, 4. ducks
Government Services	Environment (checks latrines), Unicef (vaccinations), Agriculture (land disputes and crop damage by animals)
Roads	National road, last upgraded in 1989
Sacred Sites	Mahoma. – site where chiefs are buried, within the concession area, no fields are allowed there, in a bend of the Kongka River. Kabakishi R. – A river near Kwatebala Gare, rich in fish, but if people go there without the authorization of the chief, they only catch pearls (sambo) and chauwris (butshanga), they even risk to die. Senegalese people who had tried to fish the pearls have all died. Mululu Mpunga. A sacred tree “arbre de la malediction”. The chief has to take the medicinal bark before other people can touch it, if not it does not work. The sacred rock of Fungurume. – *Ka Mpungulume* or Tu Fungurume. The specific site of this hill cannot be mined, only the chief of Kafwaya has the power to go there and ask the spirits. The remaining area around this hill, the *kimbiri*, can be mined without any danger.
Archeology	Towards the south there is site where copper was smelted and the traditional crosses “*lwanzo lwa mikuba*” were made. Other mines are present in the concession area, but some mines have been destroyed by the informal miners.
Cemetery	There are several different cemeteries: (1) for babies before they have teeth, (2) for violent deaths, for (3) twins and their parents, (4) for chiefs, (5) for all others. (6) old cemeteries. The coordinates UTM 35L (418399 8823556) refer to the entry of the main cemetery.



6.2 Zakeo

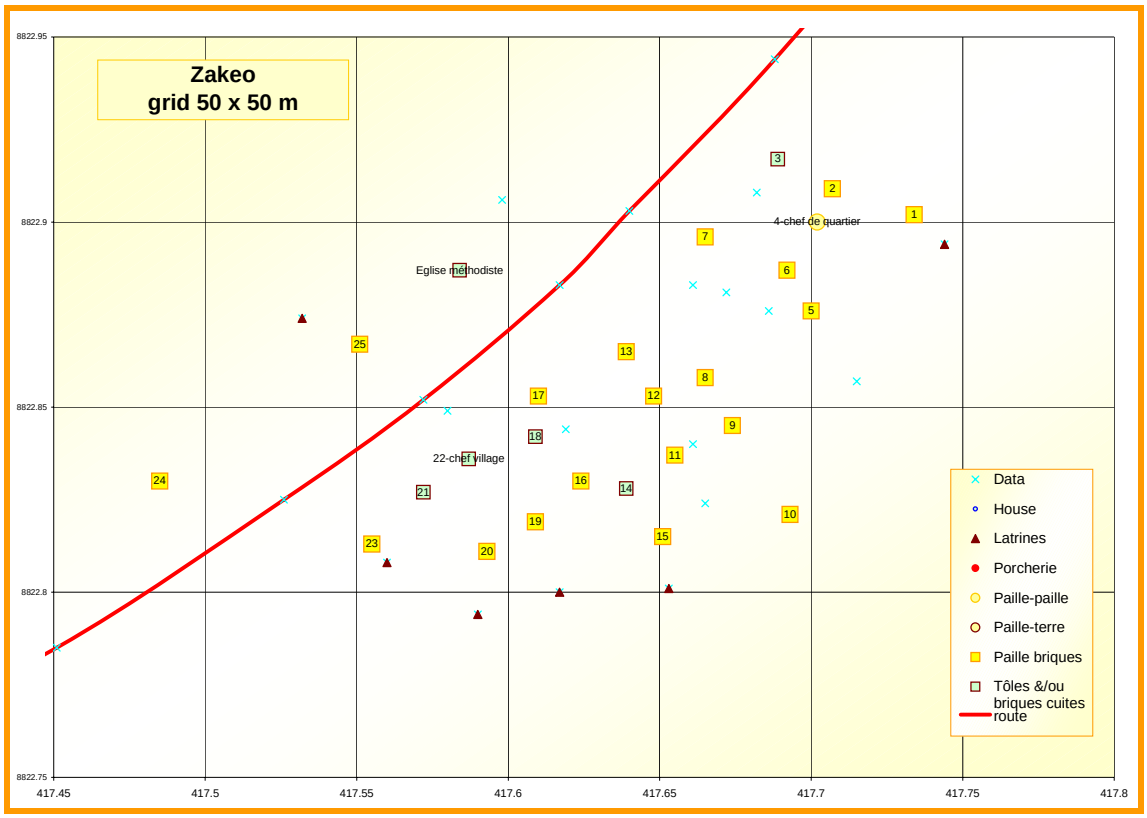
Zakeo was established around 1911 with people from Malawi. The site became an official village in 1931. The present chief is the fourth chief. The first chief worked for the railroad, married a local woman and became assimilated here. Through the matriarchal system, all population is now Sanga.

Fields are far from the village, about one hour, in all directions around the village. There are no recognized boundaries with neighboring villages. Kafwaya is to the east and Lutanda is to the west. Boundaries are not recognized north or south either. Some people live only near the fields and have no house in the village.

Questions: Project calendar → provided; Recruitment of women →not impossible, look at our team, Gepfe supports and will write in the report

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala	Fungurume	
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de quartier			
Chef de village	ZAKEO Mubamba Anasta	Zakeo	*Kapita*
Représentant chef de quartier			

Characteristic	Description
Population	25 compounds, Est. 113 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Tshokwe
Languages	Sanga, Swahili, very little French
Religion	Methodist church in the village (straw and baked bricks)
Housing	Walls: Straw 0%, mud: 4%; bricks: 81%; red bricks 16%; Roof: Aluminum: 12%, straw 88%
Water	Cemented well, built with Unicef assistance
Electricity	None
Fuel	Firewood and charcoal
Radio	Local radio: none, national radio : Okapi, International radios: RFI, Zambia, VOA
Television	None
Cell phone	Vodacom OK
Education	Primary School available in Kilusonsa (3.5 km)
Health	No trained health personnel available, only in Fungurume, vaccination (polio, deworming, vitamin A)
Commerce	1 mill
Transport	Station (Kwatebala Gare); Kolwezi 1000 F, Likasi 1500 F
Agriculture	Production : 1. maize, 2. beans, (3) wet lands; commercialization: 1. beans; 2. Irish potatoes. Fields located up to 1 hour form the village in all directions.
Animals	1. pigs, 2. goats 3. chickens
Government services	Vaccination program; Agriculture (land disputes and crop damage by animals)
Roads	National road, last upgraded in 1989
Prices	2005: 150 → 500; beans 300/350→ 750/800 (end November) 2004: maize 75→450/500; beans → 300/350 → 750/800
Sacred sites	Cemetery 300 m north of the village, abandoned graves "all around the village".


Zakeo
grid 50 x 50 m
8822.95
8822.9
8822.85
8822.8
8822.75
417.45
417.5
417.55
417.6
417.65
417.7
417.75
417.8
Eglise méthodiste
4-chef de quartier
22-chef village
Data
House
Latrines
Porcherie
Paille-paille
Paille-terre
Paille briques
Tôles &/ou briques cuites
route

6.3 Lutanda

Meetings on 15/01/2006 and 28/11/2005 with the chief and village elders (men and women).

Established in 1981; originals from Fungurume to look for land; The chief of Lutanda is a widely accepted as chef de village for the villages, Zakeo, Kimilombe, Nkonga, Kilusonsa and Postolo, but contested as a CdT in the area.

- *Questions and Issues:*

Agricultural inputs, as Gécamines used to do though CEPSE[4]; The wrong ceremonies have been celebrated by the CdT Mpala, I can do better; The project failed through the actions of the population and the military who occupied the Fluor Utah camp near the airport; The CdT refuses the informal miners, and does not want to give them land; they have to go, we want TFM as only the mine can assist us really. Informal miners do not give anything to the CdT, they are only responsible for too much “desordre” between [mine] police and creuseurs. As a CdT I cannot stop those that are protected by generals and governors!

- *TFM and land chiefs*

According to a letter[5] Lutanda cannot pretend being the land chief, but has to leave that power to Mpala. Though Lutanda says he accepts this decision, he is not convinced that Mpala's power will be enough to make TFM's mine project a success. Lutanda accepts that Mpala is now the major CdT in the area.

Lutanda is recognized by the *Chef de poste* as an important village chief, as well as by the chief Mwela Mpande. He is despised by the chief Mpala, who seems to be jealous that Lutanda carried out the traditional sacrifices during the TFM project in the 1990s.

- *Traditional power*

Different sources of traditional power are present in the region: The oldest kingdoms are the kingdoms of the Luba (main ancestor, Kasongo Wanyembo), and of the Ruund (main ancestor: Mwant Yav). The tradition explains that a Luba hunter (Mbidi Kiluwe) went out, got lost in the bush and found and married a Ruund girl, called Ruwej. As it were the women who owned the power in her village, she gave it to her husband, in spite of her brothers' protests. The brothers angrily left and formed the Tshokwe ethnic group. Lutanda traces his ancestry to Mbidi Kiluwe. The ancestors of Mpala initially also traced back their power to Mbidi Kiluwe, and both lived side by side each in charge of separate areas.

The Bayeke are a tribe from Tanzania who have taken over the power in part of Katanga at the end of the nineteenth century through their first chief M’siri. The Bayeke are now the officially recognized traditional power in the Lubudi district. Their local representative is the chief Nguba. Mpala (in fact one of his direct ancestors) went into a coalition with the Bayeke and so gained official recognition of his status as a Chef de Terre.

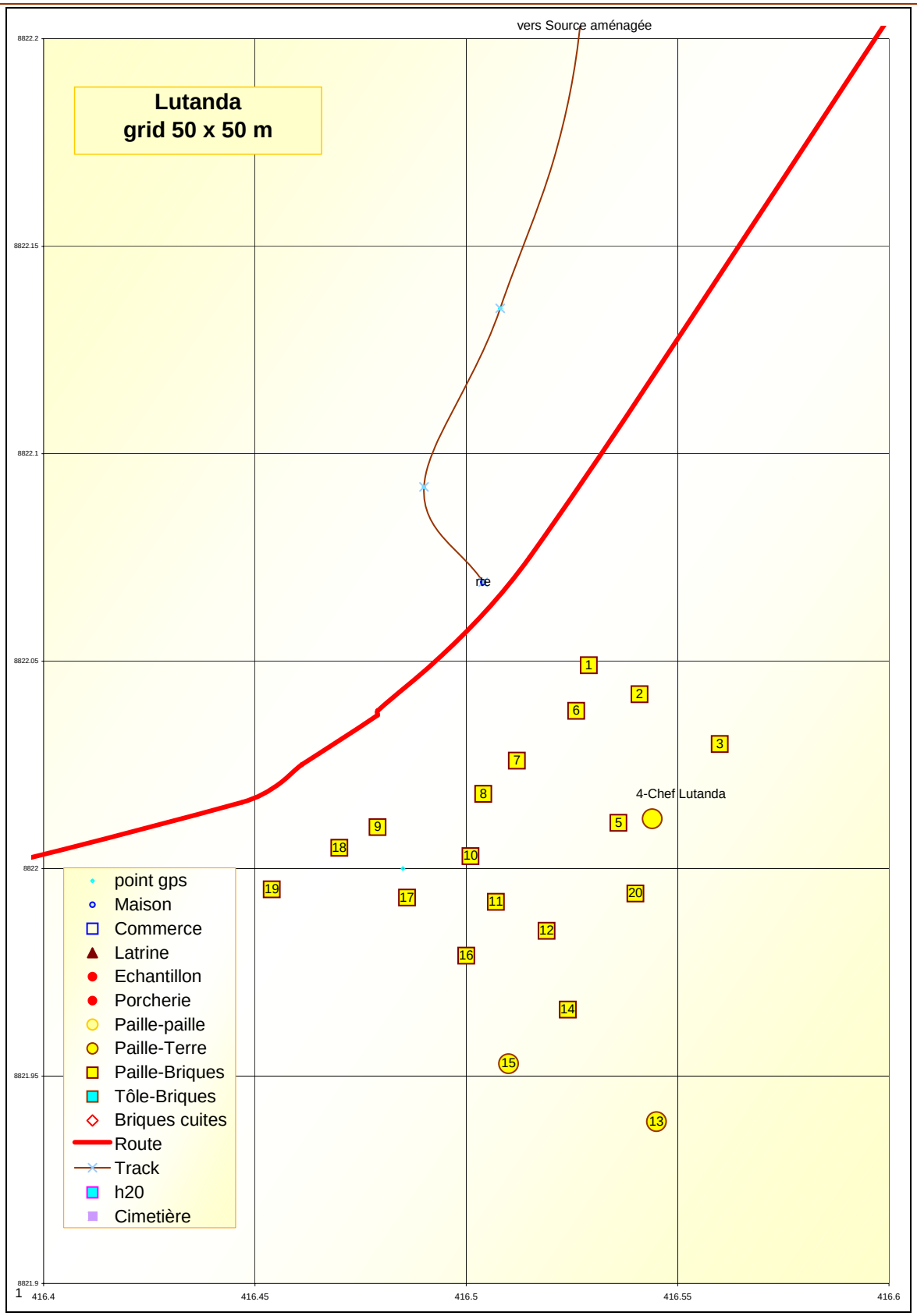
Lutanda now accuses Mpala of having lost his traditional power over the spirits by colliding with the Bayeke strangers and he says that only he himself can take charge of the spirits.

Lutanda refers to the first visits of the white men to the area and cites Robert Williams, a Scottish engineer who in 1899, founded the Tanganyika Concessions (Tanks) for copper and gold mining.

Function/fonction	Name/nom	Village/Lieu d’habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala	Fungurume	The village has been forced to recognize Mpala
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de quartier	Kapinga Michel	Lutanda	
Chef de village	Lutanda Kayinga Edmond	Lutanda	Chef de terre, but also chief of the villages and hamlets Nkonga, Kimilombé, Kilusonsa and Apostolo
Représentant Chef de Village	Mwelwa wa Mwelwa	Fungurume Bloc Mitumba	Represents Lutanda when he is away

[4] Probably Centre des Progarmmes Sociaux et Economiques, the socio-economic development program financed by Gécamines.

[5] Written by the Chef de Groupement Nicola Kayumba Mbula) July 22 2005.



Characteristic	Description
Population	19 compounds, Est. 86 people
Ethnic groups	Majority: Milomoto (Sanga); Minorities: Luba, Tshokwe
Languages	Sanga, Swahili, very little French

Characteristic	Description
Religion	Christians, animists. No church in the village.
Housing	Mostly mud brick walls and all roofs straw thatched.
Water	Traditional water source
Electricity	None
Fuel	Firewood and charcoal
Radio	Local radio: none, national radio: Okapi
Television	None
Cell phone	Vodacom OK
Education	Primary School available in Kilusonsa (2 km)
Health	No trained health personal available, only in Fungurume, vaccination (polio, deworming, vitamin A)
Commerce	None
Transport	Station (Kwatebala Gare); Kolwezi 1000-1500 F, Likasi 1500-2000 F
Agriculture	Production : 1. maize, 2. beans, (3) wet lands; commercialization: 1. beans; 2. Irish potatoes. Fields located up to 1-1.5 hours from the village mainly towards the south.
Animals	1. pigs, 2. goats 3. chickens
Government services	Unicef (vaccinations), Environment (charcoal burning)
Roads	National road, last upgraded in 1989
Prices	2005; Maize → beans → 2004: Maize; Beans →
Sacred sites	The site where fertility rituals for the harvest are carried out are not sacred sites, because the CdT can easily find other replacement sites.
Cemetery	There are two cemeteries in Lutanda: (1) twins and their parents (coordinates UTM 35L 415252-8822720), (2) for all others (coordinates UTM 35L 413540-8822036). The Lutanda cemetery is used by the villages Lutanda, Kimilombe, Manomapia, Postolo and Kilusonsa.

- *Rôle of the land chief*

The land chief is responsible for the traditional ceremonies concerning hunting, fishing, disease, mining and agriculture. However, these ceremonies do not take place regularly. There is no more fish, since maize is not soaked in the rivers anymore but is ground in mills, and hunting has become rare. If Lutanda does perform the ceremony, game will reappear, but he has not done so since 1980!

Agricultural ceremonies are still held on a yearly basis. After the first rains, the villager takes samples of seeds to a crossroads, where they build a small shelter. The CdT prays and asks that the seeds will germinate and that the rains will be favorable. That day, villagers do not go to the fields. The site where fertility rituals for the harvest are held are not sacred sites, because the CdT can easily find other replacement sites

6.4 Kimilombe

The village was created in 1984, and is mainly occupied by transhumant farmers that are present during the rainy season.

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Lutanda	Lutanda	Mpala is not recognized as CdT
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Lutanda Kayinga Edmond	Lutanda	Chef de terre, but also chief of the villages and hamlets Nkonga, Kimilombé, Kilusonsa and Apostolo
Chef de quartier	Mambwe	Kimilombe	Kapita

Characteristic	Description
Population	15 compounds, Est. 68 people
Ethnic groups	Majority: Sanga; Minorities: Ruund
Languages	Sanga, Swahili, very little French
Religion	Christians (Methodists), animists. No church in the hamlet
Housing	Walls: 27% straw, 77% mud brick, 100% straw roofs
Water	Traditional water source
Electricity	None
Fuel	Firewood only
Radio	Reception is poor
Television	None
Cell phone	Vodacom OK
Education	Primary School available in Kilusonsa (1 km)
Health	Local nurse available in Kilusonsa, only in Fungurume, vaccination (polio, deworming, vitamin A)
Commerce	None
Transport	Station (Kwatebala Gare); Kolwezi 800-1000 F, Likasi 800-1000 F
Agriculture	Agriculture and wetland cultures north and south of the village, fishing by children in the small streams
Animals	1. pigs, 2. goats 3. chickens
Government services	Unicef (vaccinations), Environment (Service d'hygiène)
Roads	National road, last upgraded in 1989
Local organizations	Maman Kipandano: women's organization that works on harmony in the family, hygiene of body and of clothing.
Sacred sites	
Cemetery	There are two cemeteries in Lutanda : (1) twins and their parents (coordinates UTM 35L 415252-8822720), (2) for all others (coordinates UTM 35L 413540-8822036). The Lutanda cemetery is used by the villages Lutanda, Kimilombe, Manomapia, Postolo and Kilusonsa.

6.5 Mano Mapia, Nkonga

Established in 1963, the village was abandoned after the founding chief died in 1984, but has again been occupied since 2001.

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Lutanda	Lutanda	Mpala is not recognized as CdT
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Lutanda Kayinga Edmond	Lutanda	Chef de terre, but also chief of the villages and hamlets Nkonqa, Kimilombé, Kilusonsa and Apostolo
Chef de quartier	Mbangu Jérôme	Nkonga	Kapita

Characteristic	Description
Population	5 compounds, Est. 23 people
Ethnic groups	Majority: Sanga; Minorities: Ruund, Molomotwa
Languages	Sanga
Religion	Christians. No church in the hamlet
Housing	Walls: 27% straw, 77% mud brick, 100% straw roofs
Water	Traditional water source, shared with Kimilombe
Electricity	None
Fuel	Firewood only
Radio	Reception is poor
Television	None
Cell phone	Vodacom OK
Education	Primary School available in Kilusonsa (0.5 km)
Health	Local nurse available in Kilusonsa, only in Fungurume, vaccination (polio, deworming, vitamin A)
Commerce	None
Transport	Station (Kwatebala Gare); Kolwezi 800-1000 F, Likasi 800-1000 F
Agriculture	Agriculture and wetland cultures north and south of the village, fishing by children in the small streams
Animals	1. pigs, 2. goats 3. chickens
Government services	Only polio vaccination of the children
Roads	National road, last upgraded in 1989
Prices	
Local organizations	None
Sacred sites	
Cemetery	There are two cemeteries in Lutanda: (1) twins and their parents (coordinates UTM 35L 415252-8822720), (2) for all others (coordinates UTM 35L 413540-8822036). The Lutanda cemetery is used by the villages Lutanda, Kimilombe, Manomapia, Postolo and Kilusonsa.

6.6 Kilusonsa

Village meeting with 16 people was held on Sunday November 27 2005.

The village was established in 1993 after the arrival of Mwenda Mukose who moved closer to the main road. The name is derived from a nearby river and means " Qui a des épines/the one that has spikes".

- *Education*

The village has a small school with a complete six year primary cycle. There are five teachers. Children come from Postolo, Lutanda, Mukekwa and Kilusonsa. The school has been in existance since 1999 and is part of the Pentecostal[6] LEP Primary school in Fungurume of the CPECO (Eglise pentecôtiste). It provides a full six years primary education course, but has only four classrooms.

The school started the 2005/6 year in September with 120 pupils of whom only 51 remained for the mid-term examinations in March 2006. 34 boys and 35 girls were present at the end of March. This was partly caused by four families who had left the village and partly by other families who stopped sending their children (lack of money). The school has four qualified[7] teachers.

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Lutanda	Lutanda	Mpala is not recognized as CdT
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Lutanda Kayinga Edmond	Lutanda	Chef de terre, but also chief of the villages and hamlets Nkonqa, Kimilombé, Kilusonsa and Apostolo
Chef de quartier	MWANZA André	Kilusonsa	Kapita, who is also the local Pentecostal priest

Characteristic	Description
Population	76 compounds, Est. 342 people
Ethnic groups	Majority: 50 families Sanga; Minorities: 14 Luba, 7 Tshokwe, Ruund
Languages	Sanga, Swahili, French
Religion	Christians; A Pentecostal church in a definitive building
Housing	Walls: 0% straw, 3% mud, 53% mud brick, 44% red bricks; Roofs: 73% straw, 27% aluminimum
Water	Improved cemented water source in reasonable state of repair, but with insufficient production
Electricity	None
Fuel	Firewood and secondary charcoal
Radio	Reception is poor
Television	None
Cell phone	Vodacom
Education	Primary School with 6 grades, secondary school in Fungurume, Tenke
Health	Local private nurse available in Kilusonsa, Health centers in Fungurume are visited
Commerce	Mill, blacksmith, carpenter
Transport	Station (7 km, Kwatebala Gare); Kolwezi 1500 F, Likasi 2000 F
Agriculture	Agriculture and wetland cultures north and south of the village, fishing by children in the small streams, fruits are rare
Animals	1. pigs, 2. goats 3. chickens
Hunting/Fishing	Rare
Government services	Only polio vaccination of the children
Roads	National road, last upgraded in 1989
Prices (harvest →	2005; Maize 100→200 Fc beans 400 → 700/750 Fc

[6] CPECO: one of the main Pentecostal churches.

[7] Two with D4 qualification for the lower classes, and two teachers with D6 qualification.

Characteristic	Description
lean season	2004: Maize; 200→ 450 Fc Beans 400 → 700/750 Fc (in end November)
Local organizations	Parents association, Health training through MD from Fungurume[8], Soccer club: FC Kilusonsa; church choir (Maindeleo ("progress"), women's church group
Sacred and archaeological sites	Interdiction to smoke in the village, to drink or to sell alcoholic beverages. Pentecostal village of the "30° communauté Pentecôtiste au Congo". Sacred sites, other than the graveyard, are not known by the village. Caves are present near Mulumbu.
Cemetery	There are two cemeteries in Lutanda: (1) twins and their parents (coordinates UTM 35L 415252-8822720), (2) for all others (coordinates UTM 35L 413540-8822036). The Lutanda cemetery is used by the villages Lutanda, Kimilombe, Manomapia, Postolo and Kilusonsa.

- *The village*

Agriculture near the Route Nationale is difficult as the soil is not good, so fields are a few kilometers outside the village. No specific questions about the TFM Project. During the discussion, the only items concerned a very vague explanation of the project.

- *Land allocation*

The village chief allocates land but will inform the chief (Lutanda) later. All land belongs in one way or another to the traditional CdT. The Congolese law[9] (Loi Bakajika)[10] states that that "all land, what is above it, in it, and under it belongs to the state who can only deliver a temporary concession to exploit it".

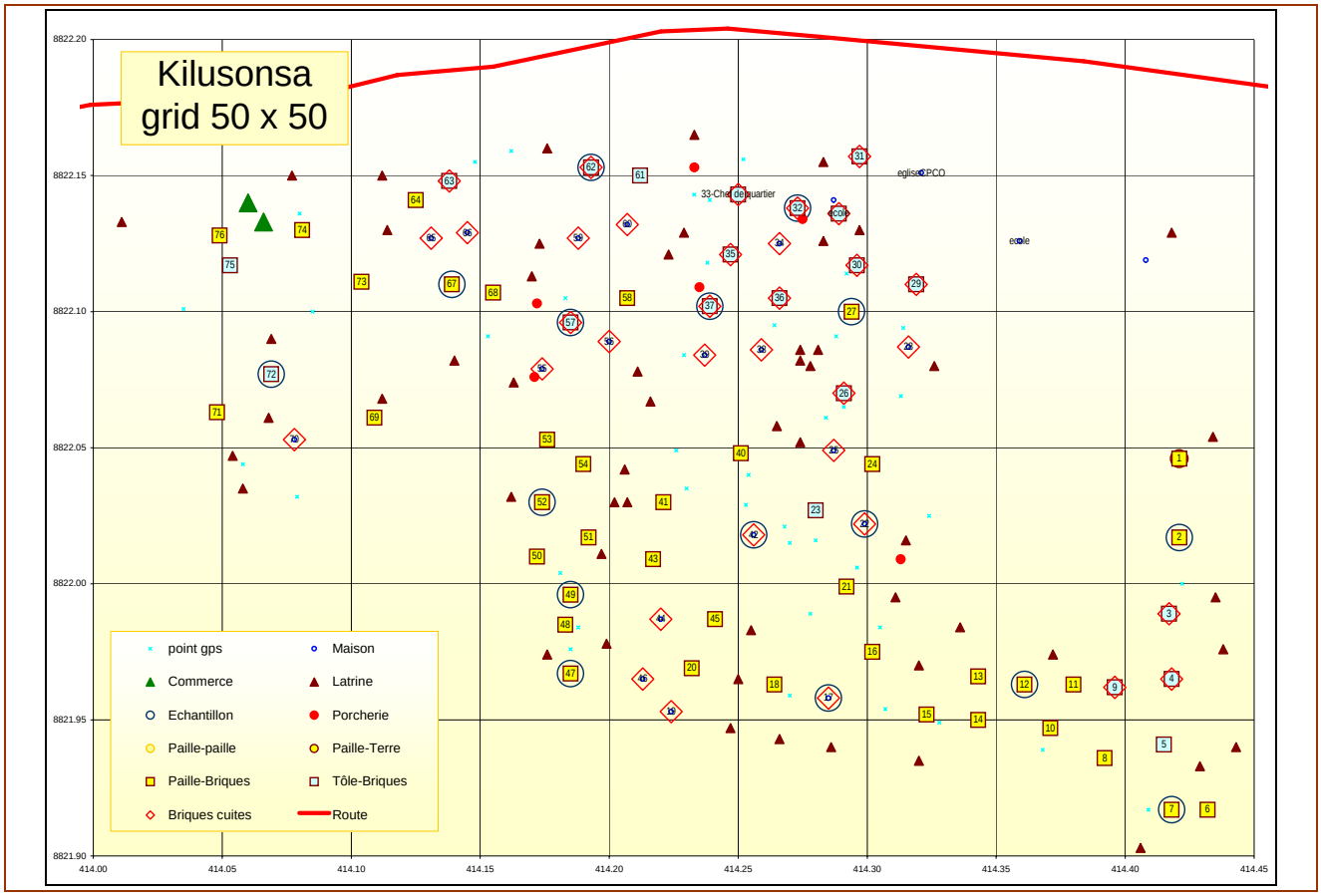
Fields are located to the north as well as to the south of the village.

The village does not have exact limits, as it is all part of the area governed by Lutanda, but the nearby village recognized are Lutanda in the east, Apostolo to the west and Kwatebala Gare to the north. No neighboring village is recognized to the south.

[8] Dr Akalemali.

[9] Toute la terre, le sol, le sous-sol appartiennent à l'état qui ne peut que délivrer une concession de durée limitée.

[10] The recently adopted constitution allows for a new law.


Kilusonsa
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point gps
Maison
Commerce
Latrine
Echantillon
Porcherie
Paille-paille
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
Route

6.7 Postolo

An initial visit to the village took place in September 2005. The survey was undertaken on November 28, 2005, and the main village meeting with 41 people (14 men and 25 women) was held on January 13, 2006.

The village was established in 1980 with people of the Ruund[11] ethnic group from Dilolo (Lualaba territory). They first lived in Mpala, and then moved to the present site. They chose this area because Mpala is of the same ethnic Ruund group. They came in search of land, not of employment. The village is not affected by either migrants or transhumance.

Though Lutanda is both the village chief and the CdT, the local chief Tshibabko distributes agricultural land and Lutanda only performs the traditional rituals. The blessing ritual of the seeds to be used after the first rains is the regular one. Other, *ad hoc*, rituals concern the absence of rain, diseases and epidemics, war, and unexplained fires.

- *Questions and Issues*

The village chief expresses his desire to see the project start, after the long years that people have been talking about it. → Now that the contract is signed, the project will surely go ahead. Other issues concern employment, but most of the meeting concerns the explanation of the village economy.

- *Specific characteristics*

Cassava, a secondary crop in most of the villages surveyed, is an important crop here.

- *Village location*

The Kalmumba River is the limit to the north, between the village and Kwatebala; no or very vague limits are recognized with Kilusonsa to the east and Mutaka to the west. In the southern direction, all is bush land. The village and the surrounding land are all governed by the CdT Lutanda.

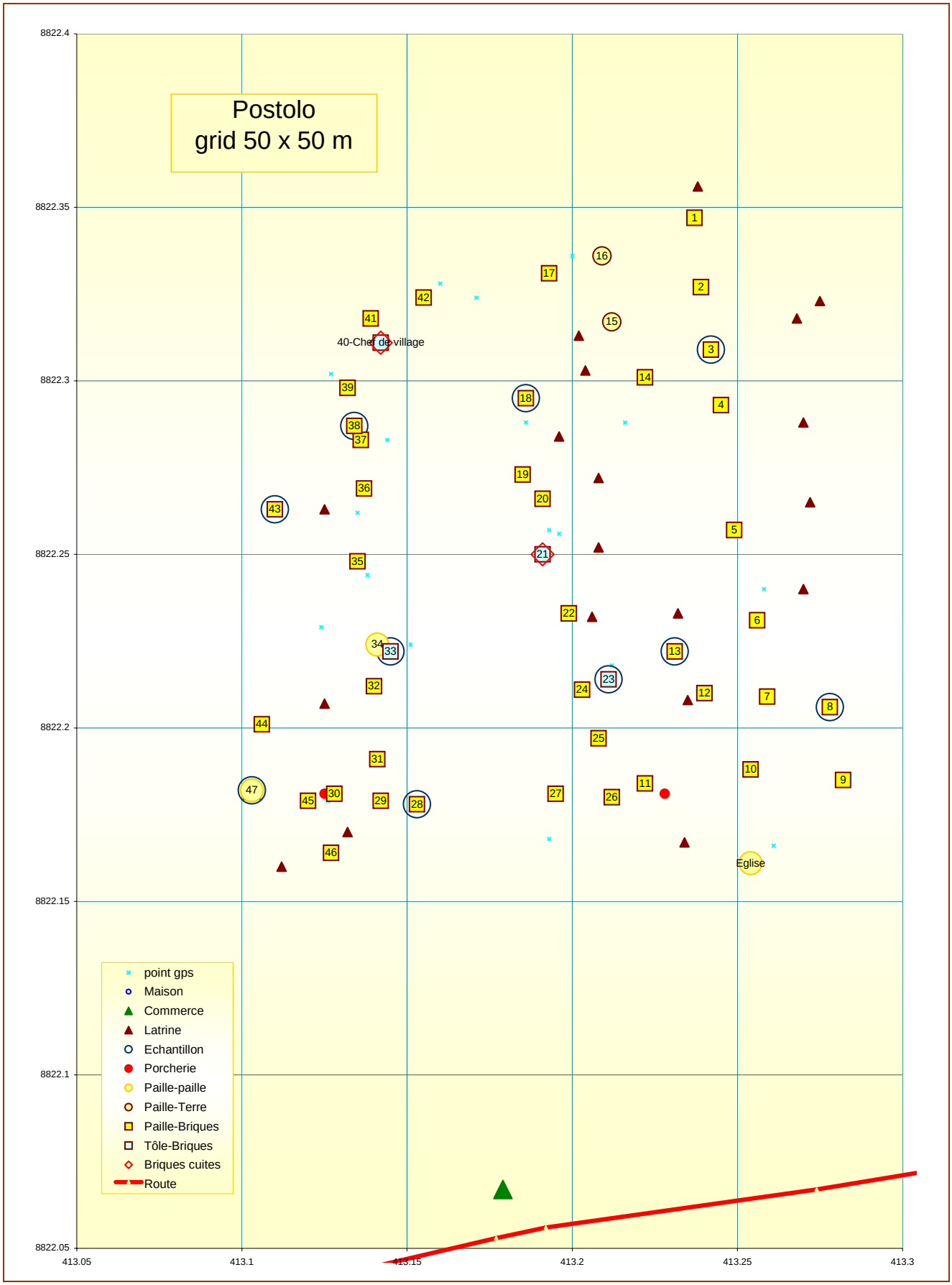
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Lutanda	Lutanda	
Chef de poste	Mapasa Jacques	Tenke	
Representative of the chef de poste	Ilungang Nkole	Postolo	Reports to Mapasa but has been named by Tshibabko
Chef de village	Lutanda	Lutanda	
Representative of the village chief	Tshibabko Nawezi	Postolo	Reports to Lutanda

Characteristic	Description
Population	76 compounds, Est. 342 people.
Ethnic groups	Ruund/Tshokwe, Sanga, Hemba.
Languages	Ruund, Swahili, Sanga
Religion	Majority Apostolic (with a church), others Bethseda. The village chief is the priest of the Apostolic community.
Housing	Walls: 4% straw, 4% mud, 88% mud brick, 4% red bricks; Roofs: 92% straw and 8% with permanent aluminum roof.
Water	An excellent cemented wall, built in 2004 with money from the Belgium, by a local non-governmental organization (NGO), with a good flow but rather far from the village, and built with mud bricks instead of baked bricks.
Electricity	No electricity nor generator
Fuel for cooking	
Radio	National radios: Zenith Lubumbashi (?), Okapi; International radio the French RFI. Young people listen to

[11] Also pronounced as "*luunda*" by the villagers.

Characteristic	Description
	music and news broadcasts in Swahili and French.
Television	None
Cell phone	Vodacom (OK) and Celtel (check).
Education	Kilusonsa (< 1 km) has a 6 grade primary school with 2 qualified teachers, and local assistants. Cost: 750 Fc/year + 750 Fc/month, which can be paid either in cash or in kind. Some children are in secondary education in Fungurume, but that is considered very expensive.
Health	No official health structure, there is a trained nurse, but he does not officiate. For minor illnesses people use the private medics of Kilusonsa and Mutaka ("their Injections often lead to abscesses"). If medical care is needed, people go on bicycle or walking to Fungurume[12], or if more serious to Kakanda and Likasi. Healthcare in Tenke is avoided.
Commerce	A local restaurant and a roadside stall. The mill is not working. Presence of a carpenter and a blacksmith. Two villagers work as drivers for TFM.
Transport	The national highway crosses the village, but the road is in a very bad state of repair. One often has to wait for days before a car stops, so it is better to go to Tenke or Fungurume, to catch a car. Kolwezi 1,000-1,500 Fc, Likasi 1,500 Fc. Trains are too expensive and too slow.
Agriculture	*Main production*: 1. Cassava, 2. Maize, 3. Beans, 4. Irish potatoes. Best sold are 1. Maize, 2. Beans. Note the presence of Cassava as a major crop, which is different from the other villages of the concession area. *Location*. – More fields to the north than to the south, about 10-15 minutes walking from the village. *Staple food*. Cassava is the major staple during the rainy season, maize during the dry season. Beans are more important for selling than for food.
Informal Mining	The village appears to have profited from the informal mining, "it's the only way for poor but educated young people to earn some money" but we prefer otherwise: the informal mining benefits mostly the people from Tenke and not our village. An official mining project like TFM will help our village more: schools, health posts, etc.
Animals	Pigs, goats, hens
Hunting/Fishing	*Hunting* – None. *Fishing* – None.
Gathering	Charcoal, termites, fruits
Prices (harvest → lean season)	2004/5; Maize 150→450 Fc beans 400 → 1000 Fc 2005/6: Maize; 250→ 650 Fc Beans 500/600 → 1500 Fc (in January)
Agricultural labor per 25 x 25 m^2.	Preparing a new field cost 6.500 Fc, preparing an already used field 5.500, weeding 1,250 Fc and harvesting 2 meka maize or 1 meka beans.
Government services	Sanitary services check the cleanliness of the village and the presence of latrines, pay taxes for charcoal making. ANR secret police ("intervenes in all conflicts, even within a married couple"). National vaccination days (polio, vitamin A and de-worming). Routine vaccination only in the health posts of Fungurume. Most women give birth in the village, assisted by a traditional midwife. No specific materials are present but clean towels and a new razor blade are used.
Roads	
Local organizations	Rotating mutual assistance groups (*kinkurimba*) for agricultural production. A women's discussion group on housekeeping is promoted by the Bethesda Church. The soccer team has ceased to function since 2004.
Sacred sites	"We do not know any, we are too recent here. You'll have to ask those things to the chiefs Mpala and Lutanda."
Archeology	We do not know about any archeological site.
Cemetery	There are two cemeteries in Lutanda : (1) twins and their parents (coordinates UTM 35L 415252-8822720), (2) for all others (coordinates UTM 35L 413540-8822036). The Lutanda cemetery is used by the villages Lutanda, Kimilombe, Manomapia, Postolo and Kilusonsa.

[12] Centers visited are the Dipeta reference hospital (called "Unicef" in the villages), the Catholic mission but "Justin" (*neema*) and Binephar are considered the best. Costs: 250-300 Fc for a consultation of children-adults, plus the cost of the drugs prescribed.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40-Chef de village
Eglise
point gps
Maison
Commerce
Latrine
Echantillon
Porcherie
Paille-paille
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
Route

6.8 Mutaka II

Consultation and information meeting November 27 2005, with 54 people: 24 men and 32 women.

Mutaka II was establshed in 1983 from the main village Mutaka Mwelwa, about12 kilometers south of the national highway. It has its own CdT Mutaka Kaando, who still lives in Mutaka Mwelwa. The status of the CdT seems undisputed, and the village is not really included in the TFM concession.

- *Questions and Issues*

Employment: women? → Why not, women work already with TFM and with Gepfe; Too many people come to the village questioning us, but we see no results. → TFM wants to obtain its own information to integrate in its programs of short-term and long-term development.

Informal miners: There was money in the village, as some dug, others transported, and women washed the heterogenite. It was easier to sell food and charcoal in the village. Problems were the confiscations of bicycles by the Police, and (according to the women), the infidelity the project generated among the men, while the men replied that even if that were true, they earned so much money that they could pay their wife and have money left to take another one (!). There had been accidents in the mines but none that affected inhabitants from the village.

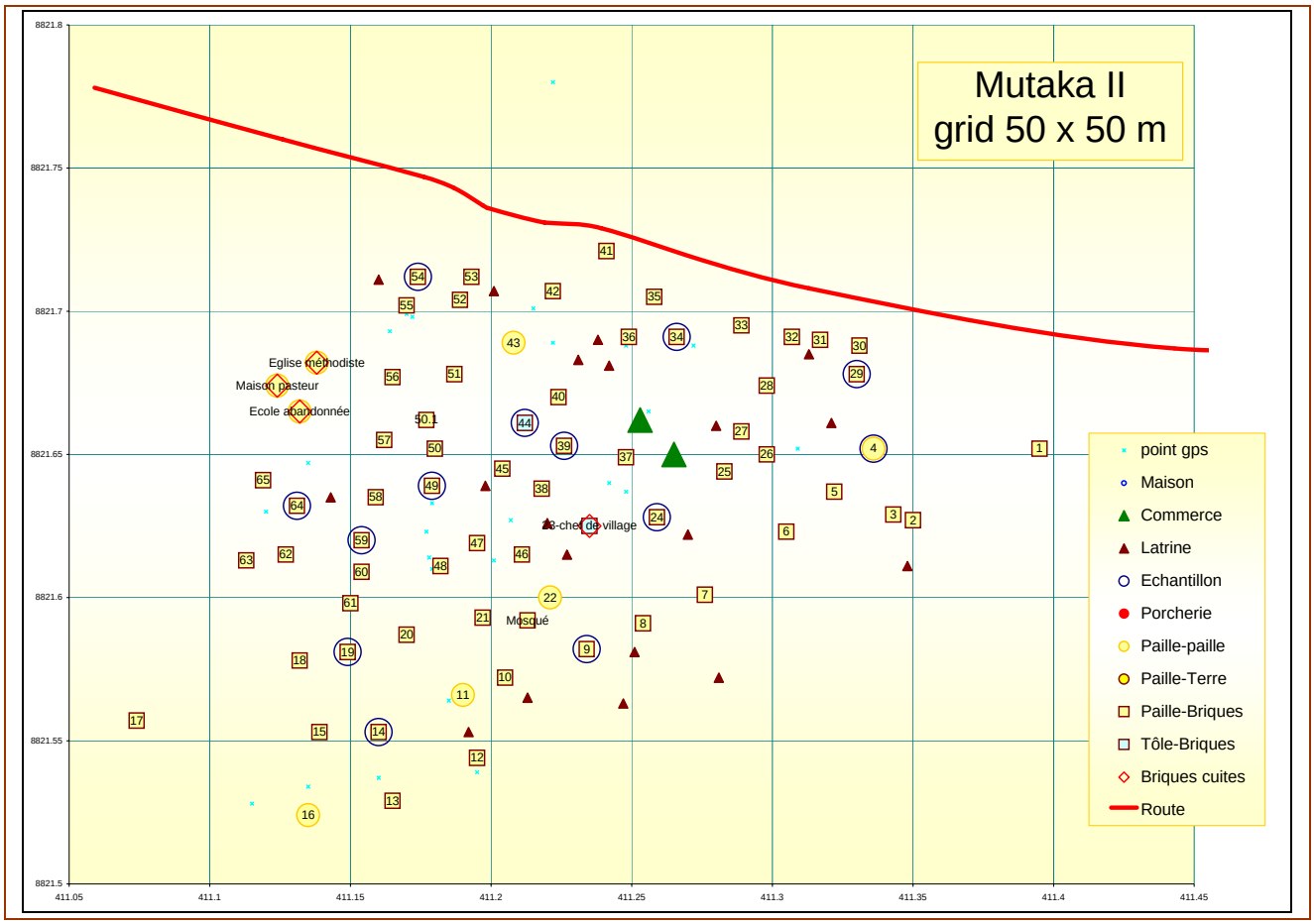
Agriculture: we need inputs → a small program has already started with oxen provided to the Lukotola mission, further developments are possible later. There are fields to the south, more than 30 minutes from the village, up to two hours.

Education: School until last year, but now closed due to lack of village participation in paying the teachers.

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mutaka Kaano	Mutaka Mwelwa	Undisputed as the CdT of this village
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Mutaka Kaano (= Lutanda Bertin)	Mutaka Mwelwa	Chef de terre, but also chief of the Mutaka Mwelwa village
Chef de quartier	Kasongo Joseph Pande	Muataka II	

Characteristic	Description
Population	65 compounds, Est. 293 people
Ethnic groups	Majority: Sanga; Minorities: Kaonde (2 households) Luba (1), Tshokwe (1)
Languages	Sanga, Swahili
Religion	Christians (Methodists), a church is being built with baked bricks
Housing	Walls: 0% straw, 7% mud, 87% mud brick, 6% red bricks; Roofs: 97% straw, 3% aluminum
Water	Hole dug in a low lying area near a non-permanent stream
Electricity	None
Fuel	Firewood and secondary charcoal
Radio	Nationals radio: Okapi; international RFI, VOA, problem of money to buy batteries
Television	None
Cell phone	Vodacom
Education	Primary school in Kilusonsa (2 km), secondary in Tenke (9 km) and Fungurume (18 km). The village school that lasted until 2004/5 has been closed by lack of parents' participation. One local teacher is still present, but does not work.
Health	No local health care; Health centers in Tenke and Fungurume.
Commerce	Small shop 'kiosk', blacksmith, trade of charcoal.
Transport	Station (8 km, Kwatebala Gare); Kolwezi 1000 F, Likasi 1500 F
Agriculture	Agriculture and wetland cultures mostly south of the village, at least half an hour, but up to two hours south of the village. One family uses fertilizers, nobody uses improved seeds. The village has no marsh lands for dry-season crops. (1) maize and (2) beans are the most important crops, while (1) beans and (2) maize provide most income. Cassava present but not very important.

Characteristic	Description
Animals	1. pigs 2. goats 3. chickens
Hunting/Fishing	Rare, not enough game left. Only rats.
Government services	Only polio vaccination of the children
Roads	National road, last upgraded in 1989
Local organizations	Parents association does not exist anymore since 2004/5, Maman Kipenda (mutual assistance and house keeping for women, promoted by the Methodist church).
Sacred sites	Tree in the village "*Kikabilo*", where the most important rituals (*kupupa*) are held. Kyowelo River, where new chiefs are enthroned (towards the south, and outside the project area).
Archeology	14 km to the south is a site *Kabwe Lunono* between two mountains and a river, where one can see stones where the ancestors use to prepare their meals.



6.9 Mutaka Mwelwa, Q. Kibangu

November 29 2005. Meeting with 25 people: 12 men and 17 women.

The village was created in 1988 by a former railroad worker from the Mutshatsha territory who decided to remain in the area after his contract ended. It's a hamlet which belongs to the main village of Mutaka Mwelwa, about 12 kilometers to the south, by road, and 9 kilometers through the fields.

- *Questions and Issues*

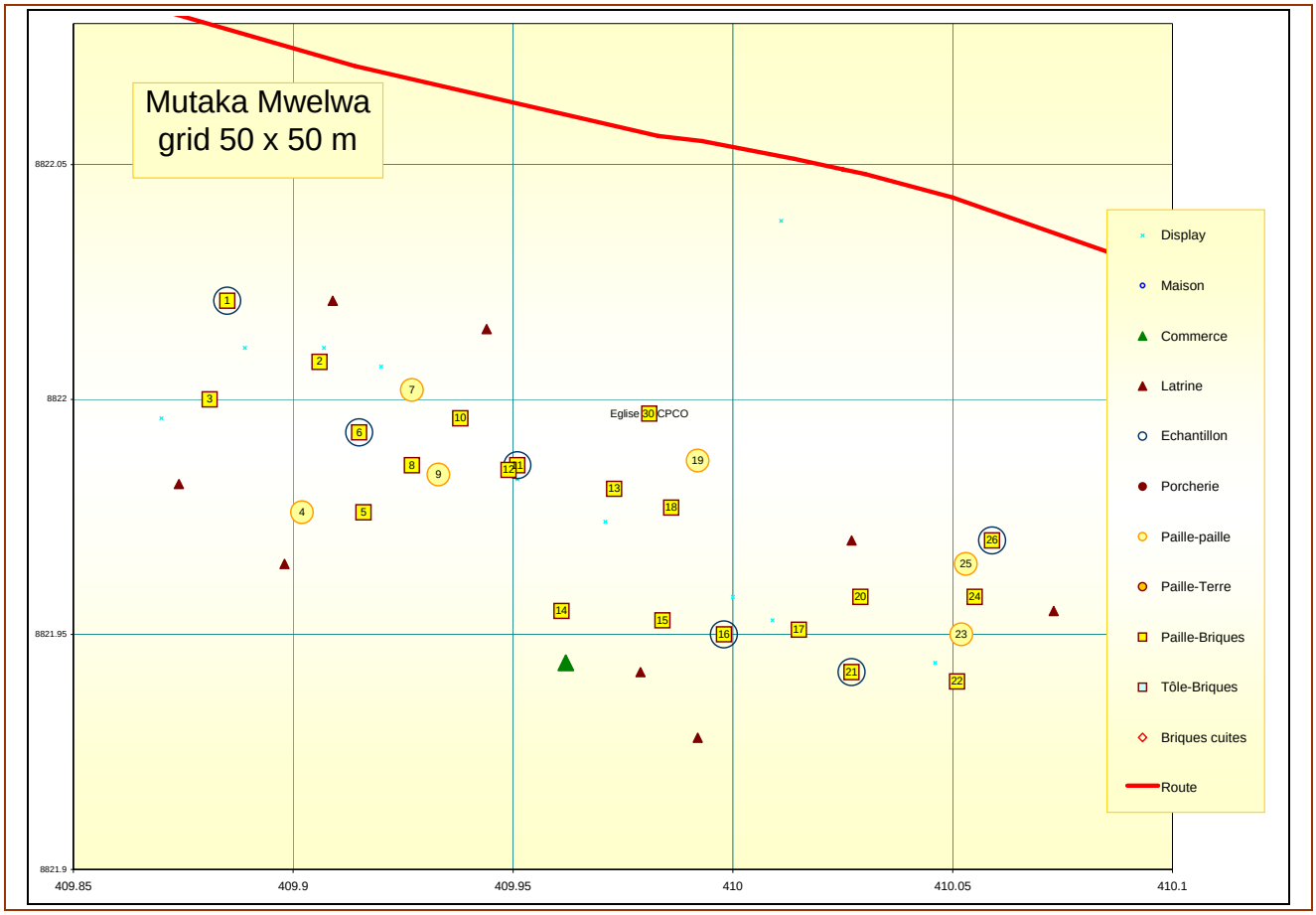
Education: no school except in the main village.

Informal miners: presence in the village reluctantly confirmed, women, and especially young men, regret that since their departure they can't earn money anymore (we earned lots of money according to some youngsters), men hope that TFM will provide better employment opportunities than informal mining, others await eagerly the opening of the mine for employment and commercial development. → The villagers in general regret the informal miners.

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mutaka Kaano (= Lutanda Bertin	Mutaka Mwelwa	Undisputed as the CdT of this village
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Mutaka Mwelwa (= Lutanda Bertin)	Mutaka Mwelwa	Chef de terre, but also chief of the Mutaka Mwelwa village
Chef de quartier	Katutu Wamongole	Muataka II	

Characteristic	Description
Population	26 compounds, Est. 117 people
Ethnic groups	Majority: Sanga; Minorities: Luena, Ndembo
Languages	Swahili, Sanga, French
Religion	Christians (Methodists), a church is being built with baked bricks
Housing	Walls: 0% straw, 22% mud, 78% mud brick, 0% red bricks; Roofs: 100% straw , 0% aluminum
Water	Hole dug in a low lying area "kibaangu", with milky water when visited in January
Electricity	None
Fuel	Firewood
Radio	National radio: Okapi; international RFI, VOA, People listen much to radio
Television	None
Cell phone	Vodacom OK
Education	8 km in Mutaka I, secondary in Tenke (9 km) and Fungurume (18 km). Children have to spend the night in the village where they go to school.
Health	No local health care, health centers in Tenke and Fungurume, Fungurume is favored and considered better.
Commerce	Blacksmith, trade of charcoal.
Transport	Station (7 km, Tenke); Kolwezi 700-1000 Fc, Likasi 1500-2000 Fc
Agriculture	Informal mining was the main activity, since that stopped it's agriculture again, followed by charcoal Agriculture and wetland cultures mostly south of the village, at least half an hour, but up to two hours south of the village. Two families use fertilizers, and improved seeds. Only one woman grows soy beans. (1) Maize (2) beans, small egg plants are the most important crops, while (1) beans and (2) maize provide most income. Cassava present but only for food.
Animals	1. hens, 2. ducks
Hunting/Fishing	One hunter owns a riffle, and a few families use snares
Government services	Only polio vaccination of the children
Roads	National road, last upgraded in 1989

Characteristic	Description
Local organizations	Parents association does not exist anymore since 2004/5, Maman Kipenda (mutual assistance and house keeping for women, promoted by the Methodist church).
Sacred sites	There is a place "Muyombo" to the east, where secret rituals are performed relating to the ancestors. If ever this place is destroyed, the spirits will take revenge and results will be serious.
Archeology	There are remains of iron smelting ovens to the south, used by the ancestors. 35 km to the south, near Kela, there are caves that were used by the ancestors for hiding



6.10 Kabwe Kakese

Meeting held on November 30 2005 attended by 24 people: 16 men and 8 women.

The village was created in 1983 when it moved to the present site along the Route Nationale from a former site, 1 kilometer away, where it was founded in 1970 by a resident of Buyoba, a village some 50 kilometers to the northwest. The twin village of Kabwe Dikuku is located on the other, southern, side of the road.

- *Questions and Issues*

Chef de terre. Participants in the meeting cannot agree upon the name of the local CdT: Mwelwa Mukabe Shabingi (from the groupement Nguba), or Mutobo who was chief in their former village (groupement of Mutobo or Mwenda Mukose).

Agriculture: We need inputs, as were formerly provided by the white men (Gécamines, Union Minière du Katanga) we cannot produce enough food without fertilizer. → development projects are possible in the future but need participation.

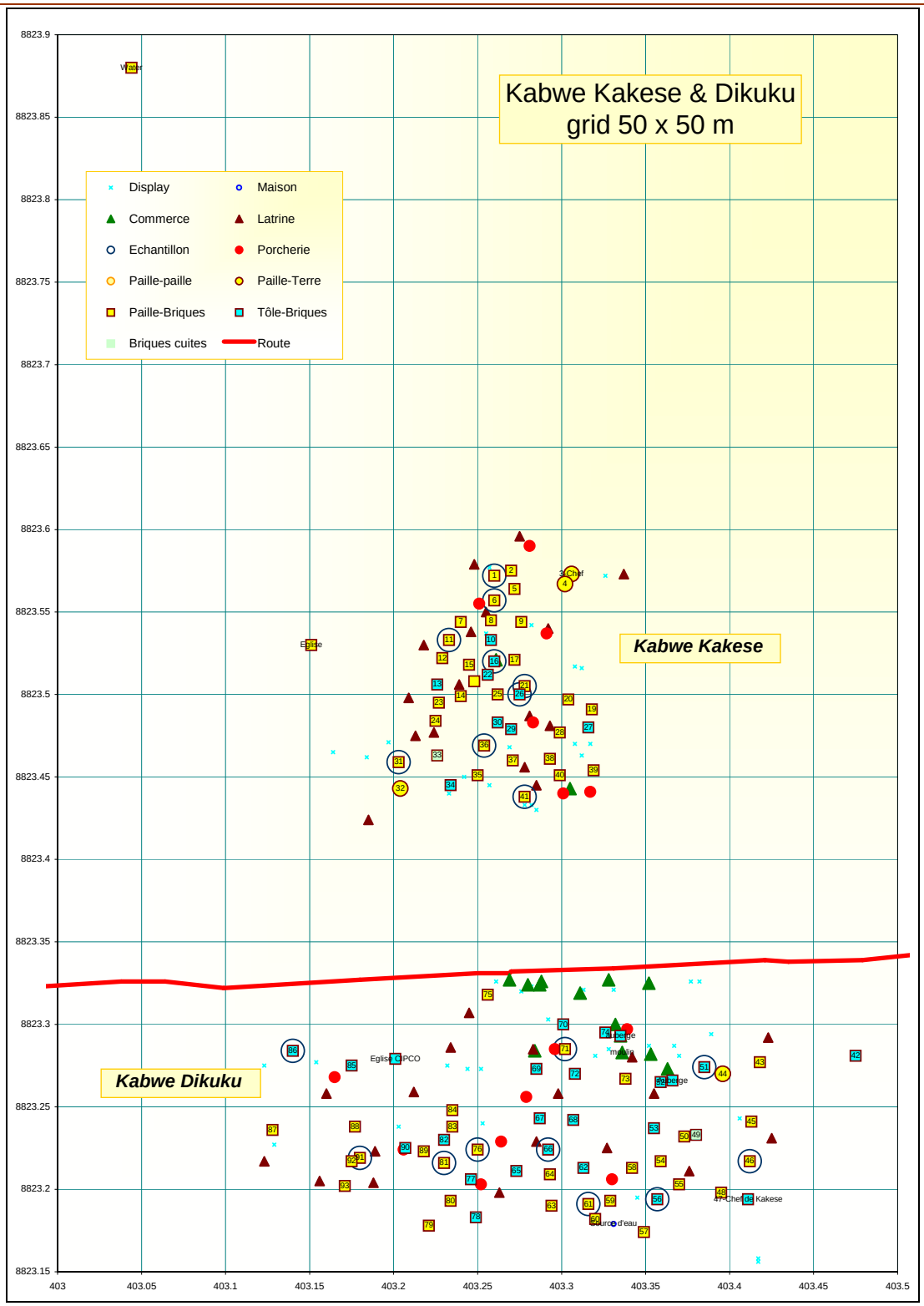
Development- We need “encadrement” development from the project. No assistance, we can reimburse in kind.

Education. – There is a small primary school (first two years) in the village, housed in the church. The school has one qualified teacher (37 years of experience), five girls and 19 boys.

Function/fonction	Name/nom	Village/Lieu d’habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwelwa Mukabe Shabingi	Mukabe Shabingi	No agreement on who is the CdT, who does not seem to be an prominent figure
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	KAKESE Lukotola (DCD/died)	Kabwe Kakese	Died and has not yet been replaced
Chef de quartier	KASWATI Kambobe Alexis	Kabwe Kakese	

Characteristic	Description
Population	41 compounds, Est. 185 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Tshokwe, Minungu, Hemba
Languages	Swahili, Sanga, French
Religion	Christians (Methodists), a church exists which is also used as a school, Neo Apostolics and Muslims have their church /mosque in Tenke
Housing	Walls: 0% straw, 7% mud, 91% mud brick, 2% red bricks; Roofs: 79% straw , 21% aluminum
Water	Permanent river Kilonga
Electricity	2 generators present in the village
Fuel	(1) Charcoal, 2() Firewood
Radio	National radio: Okapi; Zénith; International RFI, VOA, South Africa
Television	None
Cell phone	Vodacom OK, Celtel in some places only
Education	First two grades in the village, further in Tenke (4 km) and Fungurume (20 km). Children return from Tenke for the night.
Health	No local health care, health centers in Tenke, Catholic mission is OK, but medicines only available in private pharmacies.
Commerce	Two mall shops
Transport	Station (4 km, Tenke); Kolwezi 800-1000 Fc, Likasi 2500 Fc
Agriculture	Informal mining was the main activity, since that stopped it's agriculture again, followed by charcoal Agriculture and wetland cultures mostly south of the village, at least an hour south of the village in order to (1) avoid crop damage by marauding animals) (2) fertility (3) water. Two families use fertilizers, and improved seeds. Only one woman grows soy beans. (1) Maize (2) beans, (3) soy beans (4) cassava are the most important crops, while (1) beans (2) soy beans and (3) maize provide most income. Cassava present but only for food.

Characteristic	Description
Animals	1. Goats, 2. pigs 3. ducks 4. hens 5. pigeons 6. dogs
Hunting/Fishing	Fishing in the Kilongo River, using rods, baskets and dikes. Hunting with snares, lance and dogs.
Government services	Police, Only polio vaccination of the children
Roads	National road
Local organizations	School committee (problems), JPC (Jeunesse pour Christ), Choir, Maman Kipenda (women's organization).
Cemetery	See Kabwe Dikuku


Kabwe Kakese & Dikuku
grid 50 x 50 m
Display
Maison
Commerce
Latrine
Echantillon
Porcherie
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Paille-Terre
Paille-Briques
Tôle-Briques
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Route
Kabwe Kakese
Kabwe Dikuku
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6.11 Kabwe Dikuku

Meeting held on November 30 2005, attended by 13 people: 9 men and 4 women.

Established in 1989 along the road from a nearby (300 meter) site where it was created in 1964 by Dikuku, the brother of Kakese, the village located on the other, northern, side of the Route Nationale. (Note: dates of establishment provided by the two villages differ).

- *Questions and Issues*

Chiefs. Participants in the meeting first cannot agree upon the name of the local village chief: but finally agree that Dikuku Karuba Stani is their local chief and more reluctantly that Mwelwa Mukabe Shabingi (from Mukabe in the groupement Nguba), the Chef de terre.

Agriculture. – Discussions indicate that the food crises observed was due both to insufficient production and too much selling. The buying of cereals by informal miners from Tenke was probably also important.

- *Migration to and from the village*

People that retire or lose their jobs, those who come for trade, and those in search of arable land are the ones that come and settle in the village. Those who leave often settle in the new Kabila quarter that developed in Tenke.

- *Trade*

The village is an important stop for cars on the National Highway, as the town of Tenke itself does not lie on this main road. One of the main activities is the loading and unloading of trucks for trade with Tenke. Many men use their bicycle to carry loads between the stop and the village. The village has probably also played an important role in the heterogenite transport. For example, the transport of a bag of merchandize (salt, sugar, maize) to Tenke (4 kilometers) costs 450 Fc (1 USD), maize is 15 Fc/pot[13]. Transport to Fungurume costs 1,000 FC/bag and 30 Fc/pot.

- *Food shortage*

Food prices had risen much more in 2005 that in 2004, but the difference was less pronounced than in other villages. The price rise in 2005 was explained by (1) need to use maize as money if people need to buy something; (2) the overpopulation: production is insufficient; (3) Many people buy because they do not grow food; (4) the 2005 harvest was insufficient, though the planted surfaces were OK. As a conclusion, the production was insufficient and too much was sold.

- *Sacred sites*
  - The Fungurume mountain (Kam Pungulume in Sanga) is a sacred mountain, and one cannot climb this mountain. Several whites and locals have been killed on this mountain: three informal miners are said to have tried to dig into this mountain and have died and we do not want to go there anymore. Women cannot go on that mountain.
  - Kabakishi River near Kwatebala, which is protected by the spirits of the ancestors.

Function/fonction	Name/nom	Village/Lieu d'habitation	Title
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwelwa Mukabe Shabingi	Mukabe Shabingi	No agreement on who is the CdT, who does not seem to be an prominent figure
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village			No agreement on a name
Chef de quartier	Dikuku Karuba Stani	Kabwe Dikuku	Was not present during the interview

Characteristic	Description
Population	52 compounds, Est. 234 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Ndembo

[13] 1 meka is about 2 liters, and corresponds to 2.5-2.8 kilograms of grain.

Characteristic	Description
Languages	Sanga, Swahili, French
Religion	Pentecostals (with a local church); Christians (Methodists), with a church in Kabwe Kakese, Neo Apostolics and Muslims have their church /mosque in Tenke.
Housing	Walls: 0% straw, 2% mud, 96% mud brick, 2% red bricks; Roofs: 55% straw , 45% aluminum, the rural village with most aluminum roofs in the sample
Water	Head of a tributary of the Kilongo permanent river, *Katotshi.* Water is considered excellent, and some people from Tenke even come to fetch it.
Electricity	None
Fuel	(1) Firewood (2) Charcoal
Radio	National radio: Okapi; Zénith; International RFI, VOA, South Africa, Vatican radio
Television	None
Cell phone	Vodacom OK,
Education	First two grades in the Kabwe Kakese, further in Tenke (4 km) and Fungurume (20 km). Children return from Tenke 2 PM. One of the children had tried to pass the University entry exam.
Health	No local health care, health centers in Tenke, Catholic mission is OK, but medicines only available in private pharmacies.
Commerce	Commercial center: 1 restaurant, 3 kiosks, 2 bakeries, hostel with 2 rooms (100 Fc/night), 1 mill.
Transport	As in Kakese: Station (4 km, Tenke); Kolwezi 800-1000 Fc, Likasi 2500 Fc
Agriculture	Informal mining was the main activity, since that stopped it's agriculture again, followed by charcoal. (1) Maize (2) beans, are the most important crops, and also, in the same order, provide most income.
Animals	1. Pigs, 2. goats; 3. hens
Roads	National road
Prices (harvest → lean season	2005; Maize 100→500 Fc Beans 600→ 1200 Fc (by the end of November) 2004: Maize 100→ 250 Fc Beans 400→ 1000 Fc
Local organizations	Men and women's groups that are related to the church
Cemetery	Coordinates: UTM 35L 401562-8823392. The cemetery is used by the village Kabwe Kakese, Kabwe Dikuku and Kampulu.

6.12 Mwela Mpande Gare

Village meeting on Sunday December 04 2005- No sign-in sheet presented but about 10 men and women present.

The village was establshed in 1945. The ancestor of the present CdT Lutanda, in 1817, has fought a war with the ancestor of the present Mpala, about who was going to rule. Lutanda won, and he received all the land between the Fungurume mountain (Kansamba River) and Tenke, as well as the daughter of Mpala as his wife.

For the village Mwela Mpande, Lutanda is the chief who has the power to help TFM get the mine started: among the four main chiefs in the area (Mpala, Mwela Mpande, Lutanda, and Tenki ([now dead]), only Lutanda has shown that he was capable of performing the correct ceremonials for the mine[14]. That was in 1990-5.

The people from the village came originally from Mitwaba (Haute Katanga) and settled in a village Matongo Kafwaya. It does not exist anymore, but was split up after various disputes into three villages: (1) the present day Kafwaya, (2) Kyalaka (Mulopwe) which later became Kwatebala Gare, and (3) Kifungo, near the Kabulungo River, which is now called Mwela Mpande Gare.

- *Questions and Issues*

Fear of Relocation. – Will we be relocated. →No villages are planned to be moved, only fields, or individual houses can and may be destroyed or used for project facilities. The project has been designed to avoid resettlement. Our global positioning system (GPS) numbering of the houses serve to locate exactly the position of the houses on the map.

Developmental actions by TFM prior to construction. → No, only some gifts like oxen to Lukotola and an unspecified "gift to Fungurume and Tenke"; MH → there will be more development with than without the project, development projects can better succeed when the population participates.

Informal mining. – What to do with informal miners I observe in my area? → GK: I don't know, not my job; MH → I'll ask TFM; GK: tell the LCO.

- *Education*

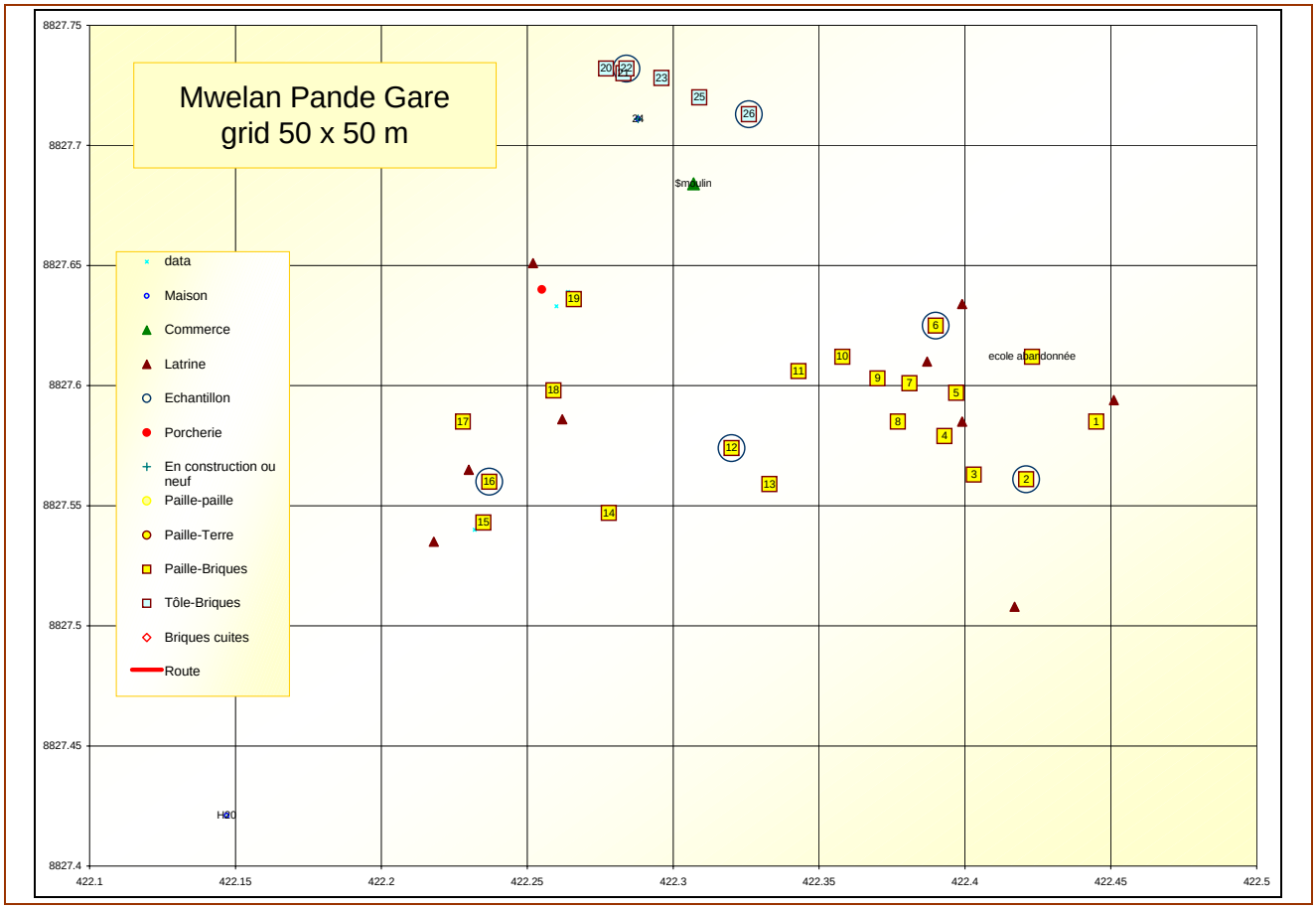
A primary school for the first two grades existed in the village but, according to the village chief, teaching stopped in July 2004 after the parents refused to pay the teachers before the sale of the maize harvest. Two children in the village follow vocational training in the Lupeta Institute in Fungurume.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Lutanda	Lutanda	Disputed by the CdT Mpala who does not recognize Lutanda
Chef de cité	Kapenda Lukeka François	Fungurume	
Chef de quartier	Kamiji Lwendela	Mwela Mpande	
Chef de localité	Mpanga Salabwe Denis	Mwela Mpande Gare	The close

Characteristic	Description
Population	26 compounds, Est. 117 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Tshokwe, Hemba
Languages	Sanga, Swahili, French (check)
Religion	No church, all churches are in Fungurume.
Housing	Walls: 0% straw, 0% mud, 100% mud brick, 0% red bricks; Roofs: 80% straw, 20% aluminum,
Water	Surface water from the nearby river Kabulungu
Electricity	Present at the train station,
Radio	People listen to the National radios Okapi; (where they had learnt about the signing of the TFM project)

[14] The same message is performed by Lutanda himself: even if TFM will ask other CdT to perform ceremonials, they will come to me in the end, and I shall prove that I'm the most powerful.

Characteristic	Description
	and Radio Fungurume. International radios RFI, VOA, Zambia, South Africa.
Television	None
Cell phone	Vodacom, Celtel
Education	All children go to school in Fungurume (3 km), where they can come home after classes. A school with the first 4 grades was closed last year.
Health	No trained midwife. All diseases are treated in Fungurume (CS Dipeta (public), CS St Jacques (Catholic), CS Volvanao (private). The problem is that all health centers only give prescription for medicines to be bought in the commercial pharmacies.
Commerce	1 functioning mill, 1 blacksmith (the village chief)
Transport	Though Mwela Mpande Gare is officially a station, the train does not stop anymore. All transport is through Fungurume. TFM maintains the local roads.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) cassava, (3) beans; (4) soy beans, (5) peanuts, (6) sweet potatoes, but best sold are (1) beans; (2) soy beans (3) peanuts. Fields are near the village, usually 10-15 minutes away, and never more than half an hour walking. Fields are all around the village. Rotations: the land is used for 10-15 years, than left with cassava and soy beans for up to years (as a proxy for fallow, and then again for beans, followed by maize.
Animals	Pig, goats, hens, ducks, pigeons. The sale of animals does not provide an important source of income.
Government services	Representatives from the Unicef (Dipeta clinic) from Fungurume come for vaccination.
Roads	Roads are maintained by TFM, and are open the whole year to Fungurume (but not to Kwatebala Gare).
Local organizations	No local organizations in the village, but people participate in organizations in Fungurume, such as for schools, local radio.
Sacred sites	Kabakishi River (cf. Kafwaya). Where traditional ceremonies were held and chawris would appear out of the soil. The Fungurume Hill (*Kampungulume*) is sacred, and cannot be climbed: several white and black people have already died on the hill. It's a site where Satan lives.
Archeology	No specific sites, see sacred sites
Cemeteries	One general cemetery with parts reserved for twins, chiefs, people deceased through disease and through violence. General location: (GPS UTM 35L 421512-8827449)


Mwelan Pande Gare
grid 50 x 50 m
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Paille-paille
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
Route
ecole abandonnée
8827.75
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6.13 Kwatebala Gare

Village meeting December 3 and 4 2005, with 41 people: 28 men and 13 women.

The village was established in 1924 by Kyalaka who was a railroad worker in the construction company of those times, B.C.K. The initial population of Kwatebala Gare consisted of forced laborers that were released after participating in the railroad construction. A station in Kwatebala has existed since 1914, but the present location has been occupied since 1970.

- *Questions and Issues*

Chiefs. – Konde/Konga: KONGA BANTU Léonard from Mano Mapia, who replaces Lutanda, is the presently recognized CdT; not others like Mpala and Mwela Mpande that are generally recognized as such in the concession.

Agriculture. – We need agricultural inputs, a school, a health post. → Not all is possible now; the mine will stay a long time and finance the development fund for along time. It will also take a long time to develop the region, and such development is only possible with participation of the village.

Education and health. – We need a health post, a school… → same answer

Informal mining. – Some of the participants regret informal mining, others not.

- *Village territory*

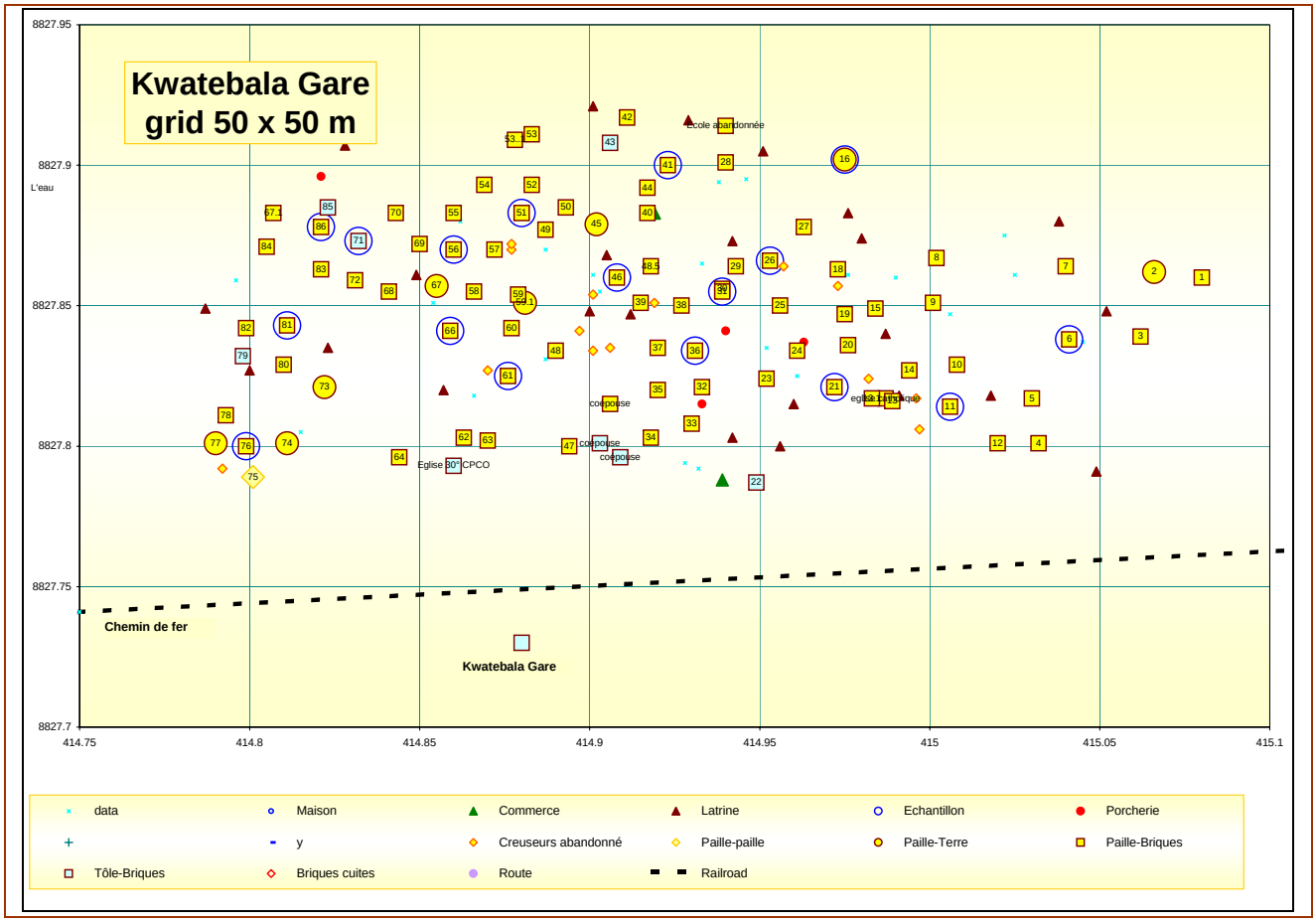
The Dipeta River is a clear boundary between Kwatebala Gare and the villages along the National Road, especially Kafwaya. Towards the other directions (Mwela Mpande Gare in the East, Mulumbu and Kiboko to the North and the West) there are no clear recognized limits. There exists a clear limit between the power of the two CdT Mpala and Konga: the pump station on Fungurume[15] hill.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Konga Bantu Leonard	Mano Mapia	Three other chiefs: Lutanda, Mpala, and Mwela Mpande consider themselves to be the CdT of Kwatebala Gare
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Ilunga Kapapa Martin	Kwatebala Gare	Has the rank of a "kapita", a non-traditional local chief

Characteristic	Description
Population	86 compounds, Est. 387 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Tshokwe
Languages	Sanga, Swahili, French
Religion	Pentecostals and Catholics, both with a church
Housing	Walls: 0% straw, 8% mud, 91% mud brick, 0% red bricks; Roofs: 92% straw, 8% aluminum,
Water	Surface water from the nearby Kimpiyi River
Electricity	Present at the train station, a video installation is present during harvest time, when people have the money to pay the entry fee
Fuel	(1) Firewood; (2) Charcoal
Radio	People listen a "little" to the National radio: Okapi; Zénith; International RFI, VOA, South Africa, Vatican radio. Most villagers do not understand the Swahili language as it is spoken on foreign radios.
Television	None
Cell phone	None?
Education	The school that existed last year, has been closed as parents appeared unable to pay the (in-kind) shool fees Children go to school in Fungurume (16 km), where they can only come home during the weekends, and we have give them their food, which they will have to prepare independently.

[15] This limit is often cited in interviews.

Characteristic	Description
Health	There is a "secouriste", a self proclaimed nurse, who has received a little Red Cross training in the village, and who has some medicines. No trained midwife. Serious diseases are treated in Fungurume and in Kakanda.
Commerce	1 small shop (kiosk), 1 functioning mill, 1 blacksmith
Transport	Only transport by train is possible from the village: 4,000 Fc to Kolwezi, 4,000 to Likasi, 1.500 Fc from Likasi by car to Lubumbashi. The train is much more expensive that the road.
Agriculture	Agriculture is the main activity, followed by charcoal. Most cultivated are (1) maize, (2) beans, (3) cassava; (4) soy beans, but best sold are (1) beans,; (2) maize; (3) sweet potatoes. Fields are near the village, usually 10-15 minutes away, and never more than half an hour walking. Fields are all around the village. Rotations: the land is used for 5-7 years, than left with cassava for 3-4 years (as a proxy for fallow, and then again for beans, followed by maize.
Animals	Pig, goats, hens, ducks, pigeons. The sale of animals does not provide an important source of income.
Hunting/Fishing	Both men (with rods) and women (with baskets) fish a little during the dry season
Government services	Representatives from the Unicef (Dipeta clinic) from Fungurume come 1-2 times per year for the children, for vaccination and counseling.
Roads	Transport only via the railroad. Cars, apart from TFM vehicles are extremely rare, except during the harvest season.
Local organizations	Rotating agricultural assistance, church choir, a field for the church
Archeology	Old village Kiyalaka, where people lived before the arrival of the railwayu in1929 near the cemetery of the babies.
Cemeteries	Three cemeteries that are separated several kilometers. 1. Babies before they have teeth (UTM 35L 413870-8827883; (UTM 35L) on the road to Kwatebala hill ; 2. General population (UTM 35L 415843-8827408) on the road to Kafwaya; 3. Graveyard for important chiefs 1.5 km NE of the village (UTM 35L 413870-8827883)



6.14 Mulumbu

The village interview took place December 5 2005, with 110 people: 86 men and 24 women. Men, women, young and migrants have also been interviewed in the village for the focus group discussions.

The village exists in the present location since 1988/9. Prior to this, it was located in the valley, 3 kilometers to the northwest. It was called Mwanga Muteba[16] and is now generally known as Shungu.

- *Questions and Issues*

Chiefs. – Murumbu (Mulumbu) Kazadi, assisted by his elder brother Kyabondo[17]. Mulumbu considers himself also to be a Chef de Terre, but outside the village, the recognized Chef de terre is (1) Mwela Mpande, and to a much lesser degree Mpala. Murumbu doe not recognize Lutanda "It's me who enthroned him".

TFM promises. – We do not like TFM, they always promise us many things but they never deliver. We have no school, no health post, no clean water; our chief does not have a nice house… → We promise only things of which we know that the project can deliver. We do not promise that all young men will have work. But we promise that for land taken compensation will be paid, and that if relocation is necessary that assistance will be given. MH → The development project attached to the mine will help the region to develop.

Education. – The village has a private primary school with one qualified and two non-qualified teachers paid for by the community.

Informal miners "Creuseurs". The village has profited from mines through sale of cattle and agricultural products, through mining and transport of heterogenite by the young, washing of heterogenite by women, a market and increased trade in the village, shift from a barter economy to a monetary economy. Problems with the diggers concerned the many fights in the village, the disrespect for village elders and chiefs, disrespect for the taboo of women climbing the hills, too much sale of agricultural products leading to food shortages, adultery and family problems among the locals, prostitution, problems at the roadblocks between mines' police and innocent villagers.

A total of 298 abandoned informal miner dwellings were counted in the village, one month after they had been forced to leave. As according to the villagers, each one was inhabited by five persons, and most had a day and a night shift, the number of miners present may be estimated in between 1,500 and 3,000.

Land issues. There is still enough land for agriculture left around the village: enough but not plenty. Land is rented to foreigners for a price of 1,000 Fc per plot of 25x25 m^2.

TFM issues. – The roadblock where the mines' police stops locals who have nothing to do with informal mining[18]. The bridge on the Dipeta (between Tenke and Mulumbu) has been destroyed by TFM, why don't you repair it?

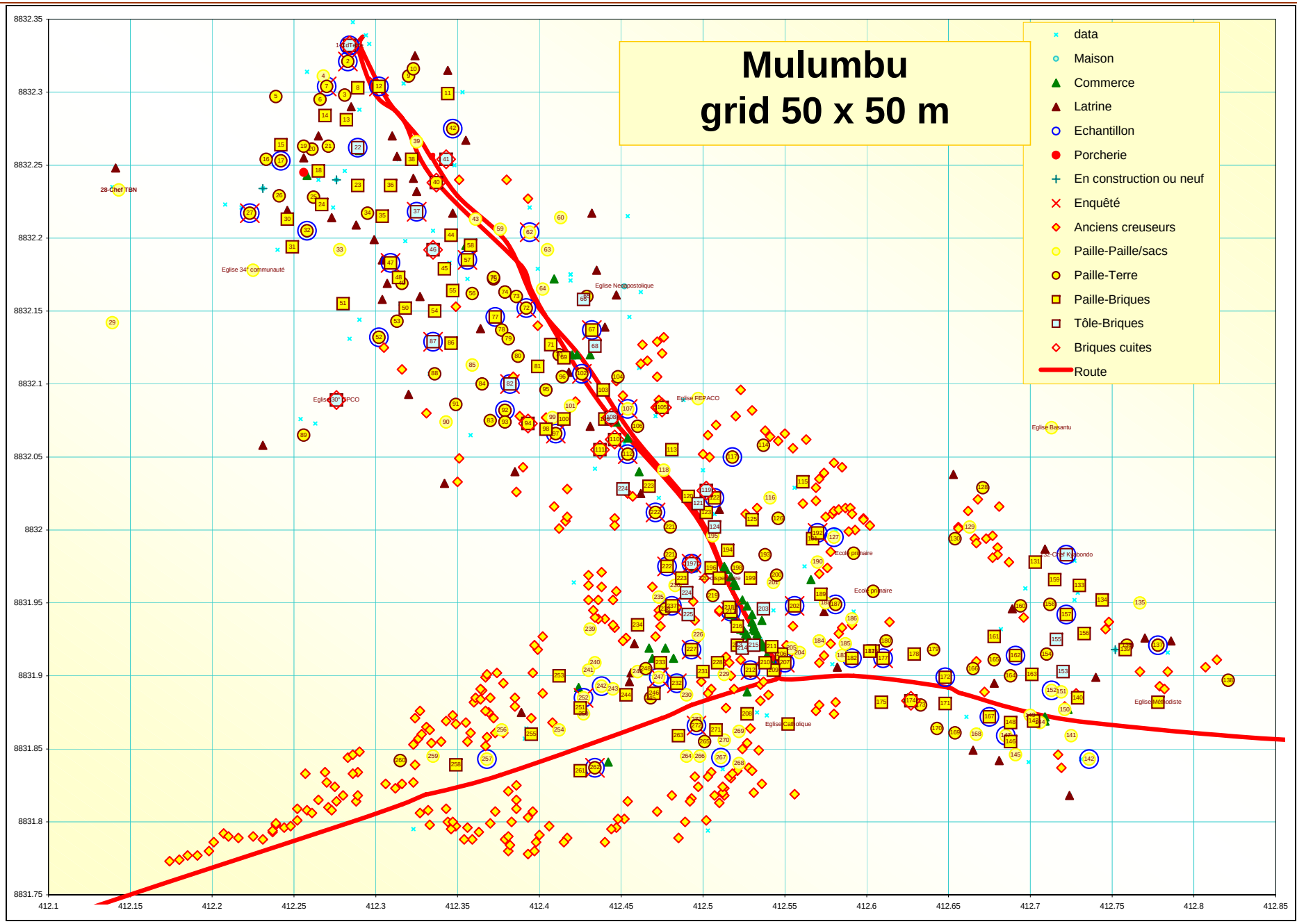
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef des Bayeke	Mwenda Munongo	Bunkeya	
Chef de groupement	Nguba	Nguba	
Chef de terre	Murumbu Kazadi (=Mwanza Kazari, Jules)	Mulumbu	The chief of Mwela Mpande considers himself to be the CdT de Mulumbu. Murumbu
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Murumbu Kazadi (=Mwanza Kazari, Jules)	Mulumbu	There is animosity between Mulumbu and his elder brother Kyabondo over who is the most powerful man in the village.
Chef de quartier	(1) Kibole David (2) Mumba Gavage	Mulumbu	Mumba Gavage is the representative of the *chef de poste* de tenke

The small villages around Mulumbu are all governed by the chief Mulumbu: Kiboko, Amoni, Mwanga, Lukotola, Mwela Mpande Gare. Other authorities (Mapasa, the *chef de poste*, and Mwela Mpande, the traditional CdT), rather consider Mulumbu as an important chief ("Notable", or "Elder") who is in charge of the village Mulumbu, Amoni and Kiboko.

[16] Mwanga Muteba (Shungu) lies about 4 kilometers to the north, and has been studied by the team.

[17] There is a lot of strife between Kyabondo and Mulumbu, and though Mulummbu Kazadi is widely recognized by all authorities as the chief of Mulumbu, Kyabondo is a very important person with lots of influence, as shown by the fact that most transhumant land users interviewed consider him as the man who gave them the land they use. According to Mulumbu, Kyabondo has been revoked by the chef the groupement Nguba.

[18] The road block was dismantled after the Socio-economic team requested it, but put back in place during the Christmas period when informal miners used the road again to transport heterogenite from Kwatebala Hill to Tenke.


Mulumbu
grid 50 x 50 m
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Anciens creuseurs
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
Route
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412.85

There are no real limits between Mulumbu and the neighboring villages. One person has an important agricultural concession of 30 hectare in the village. He uses local labor, oxen, fertilizer and improved seed on his fields. The fields closest to the village are occupied by the locals, fields further away are used by farmers from Tenke (especially around the Kwatebala hill) and Fungurume (to the north).

Characteristic	Description
Population	275 compounds, Est. 1238 people
Ethnic groups	Majority: Sanga; Minorities: Luba, Kambelebele, Tshokwe
Languages	Sanga, Swahili
Religion	(1) Catholics (2) Pentecostals (3) Zambe Malamu (traditional church), Methodists. All have a church
Housing	Walls: 24% straw, 29% mud, 41% mud brick, 5% red bricks; Roofs: 92% straw, 8% aluminum. The important proportion of straw walls is a sign of the poor state of the village.
Water	Surface water from the nearby rivers Kimpiyi, and the sources Kimungu and Kasana. Test drillings for a well have been done by the Lukotola mission but were unsuccessful.
Electricity	There were generators and video clubs when the informal miners were present? None is left
Fuel for cooking	
Radio	No capture of the National radios: Okapi; Zénith; International radios listened to are RFI, and Africa n° 1.
Television	None
Cell phone	Vodacom and Celtel
Education	A private school with a complete primary cycle exists in the village: One qualified and two voluntary teacher teachers. The education office has asked us to build a secondary school, but that is too difficult for our village. Children go to school in Fungurume (23 km), where they can only come home during the weekends. None go to a technical school.
Health	There are two private (self proclaimed?) nurses in the village, and one midwife who has received training in Tenke. Medicines are sold in the village. Serious diseases are treated in Fungurume and in Kakanda.
Commerce	Small daily market, 4 functioning mills, 1 blacksmith, 1 carpenter, 1 small shops, 1 tailor.
Transport	No transport in the village, but people leave from either Tenke or Fungurume: Kolwezi (800 Fc by truck, 1,500 Fc by minibus), Likasi about 1,000 Fc by road.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) cassava, but best sold are (1) beans; (2) maize. Marsh land crops (maize, beans, cabbages, onions, potatoes) are grown for local consumption and for selling. Only two farmers use improved seed. Four farmers own oxen. Fields are near the village, usually 10-15 minutes away. Fields are all around the village. There is still enough land available. Many transhumants come from Tenke and Fungurume for agriculture. They pay about 1,000 Fc/year for a plot of 25 x 25 m^2.
Animals	Pig, goats, hens, ducks, pigeons. The sale of animals does not provide an important source of income.
Hunting/Fishing	In the Mofia River. Only men fish with rods and nets. There is no more game in the area, and nobody hunts. Women do not fish. Gathering concerns mainly charcoal, roots for beer brewing (munkoya)
Government services	Tenke: administrative center, police, ANR (secret police). Vaccinations (polio, vitamin A and de-worming) are distributed in the village.
Roads	The road to Tenke is blocked due to the destroyed bridge over the Dipeta, the road toFungurume is maintained by TFM, bad but usable.
Local organizations	Church organizations: Catholics *maman kitumahini* (espérence); Methodists *maman kipendano* (l'amour); Apostoliques *maman Kiyongozi* (conductrice); Zambe Malumu (FEPACO), 30° CEPECO *Maman Asafa*. All these organizations work for mutual assistance, a field for the church.
Sacred sites	Women do not climb hills. There are female spirits on the hills that may become jealous. Water sources are protected by strict rules.
Cemeteries	A communal graveyard 750 m south of Mulumbu, which serves Mulumbu, Amoni and Kiboko. In an area that may directly be impacted by the project (UTM 35L 413106-8831509)
Archeology	

6.15 Shungu (Mwanga Muteba)

The meeting in Mwanga Muteba was held on December 10, 2005 covering project explanation and village information. 4 men and 4 women attended.

Village founded in the 1920s by the father of the actual chief. He came from Lubinda, a village 6 kilometers from the district capital Lubudi, but found a wife here and stayed. Mwela Mpande is recognized as the reigning CdT. The people from Mulumbu consider themselves as natives from this village.

Shungu is the name of a foreigner from the Equator province who has married a wife in the village.

- *Questions and Issues*

Chiefs. – No issues about chiefs are apparent. Mwela Mpande is recognized as the reigning CdT.

Land tenure. There is plenty of very good land available around the village.

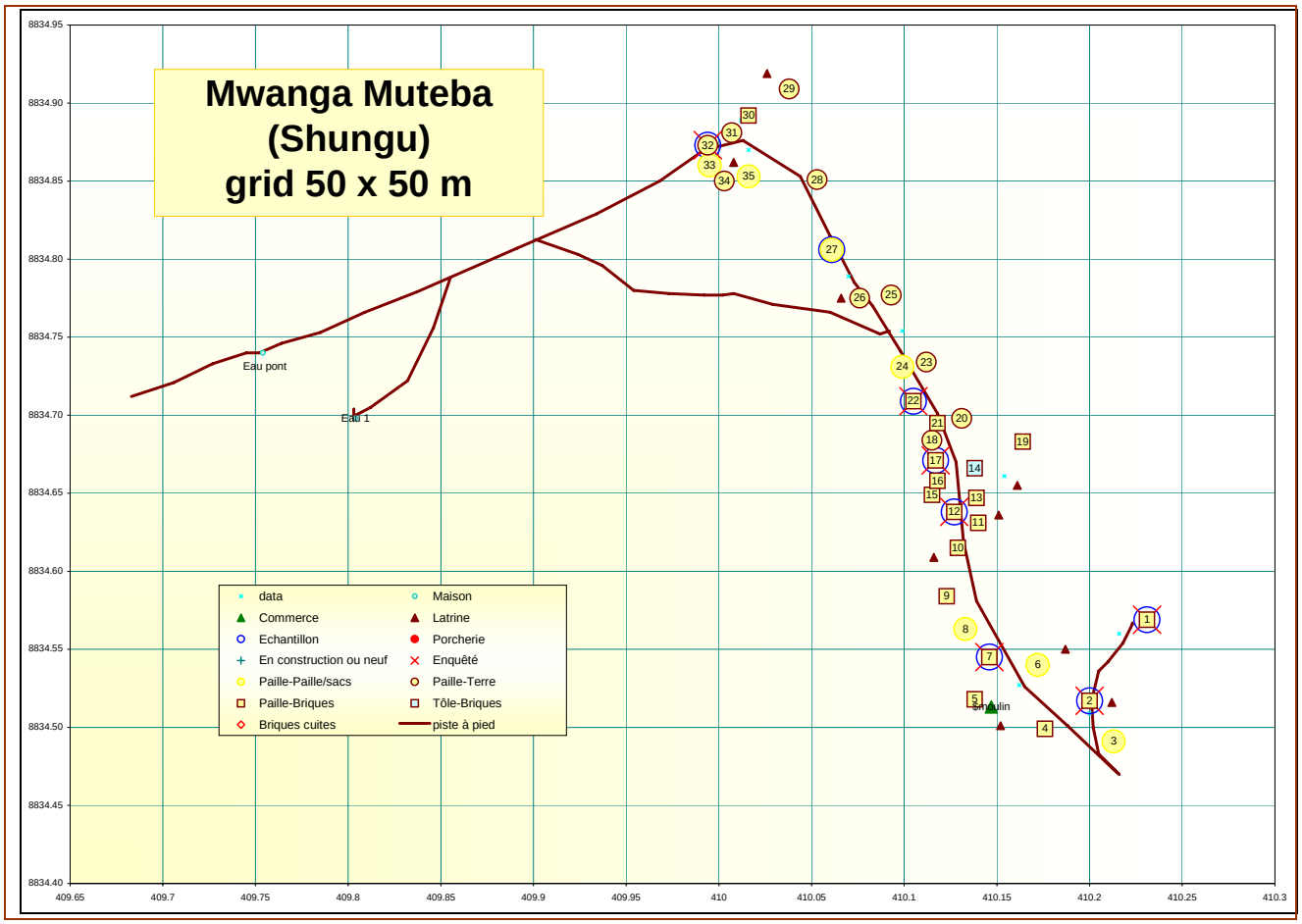
Housing. People in our village often sleep in straw huts, we want decent housing with corrugated iron roofs. GK--> other villagers build houses with mud bricks and good straw roofs, why not your village. The mining project cannot do things for you that you should be able to do yourself.

Village limits. – To the North Kiangu (6 kilometers) and Kabulumbu (~5 kilometers) separated by the Kimbangu River, to the east Kalebi, separated by the Kampé Ketwa River, to the southwest Salabwe separated by the Kanzyen Kenene and to the south Mulumbu with no clear separation.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande	Mwela Mpande	
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Mwanga Muteba (= Muteba Démarque)	Mwanga Muteba	The chief is considered as a "notable" and a "village chief" by both the *chef de poste* and the CdT

Characteristic	Description
Population	35 compounds, Est. 158 people, unknown number of households belong to transhumant farmers
Ethnic groups	Only Sanga
Languages	Sanga and a little Swahili, no French
Religion	(1) Pentecostals and (2) Catholics. Both religions have their churches in the village Salabwe
Housing	Walls: 19% straw, 28% mud, 53% mud brick, 0% red bricks; Roofs: 97% straw, 3% aluminum.
Water	Surface water from the nearby river *Kasana*
Electricity	No electricity
Fuel for cooking	Firewood mainly; rarely charcoal.
Radio	National radios: Okapi; International radios listened to are RFI, VOA, Africa n° 1.
Television	None
Cell phone	None
Education	Nearby school in Mulumbu (4 km), which are too far for children to be able to spent the night at home. Secondary education in Fungurume. Technical training in Lukotola.
Health	No medicines are sold in the village. Some men have Red Cross training. Diseases are treated in Lukotola, Fungurume for more serious cases.
Commerce	1 mill. The village chief is a traditional blacksmith.
Transport	No transport in the village, cars cannot reach the village, because of a broken bridge.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) onions; (4) Irish potatoes, but best sold are (1) beans; (2) maize (3) onions. People used to grow commercial tobacco until 2004/5, but not anymore, "because the price is too low". The village chief distributes land and asks advice of nobody. Land in this village is very fertile and abundant. Fields are very close to the village (less than 5 minutes walking).
Informal Mining	No information.
Animals	Goats, hens, ducks.

Characteristic	Description
Hunting/Fishing	No fishing, except by children. Hunting is possible but far from the village. Some hunt but rifles “are not used anymore”.
Gathering	Mushrooms, honey, Masuku (fruits)
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village.
Roads	The bridge to the village is too small to let cars pass.
Local organizations	None
Sacred sites	Kyama Kela hill cave, used during the Msiri wars in 1850-1900 In the Kalebi seasonal river, where at *kyowa* “ritual bath for the chiefs”. Kitantulo: near the Kalebi farm where the chiefs perform local ceremonies.
Archeology	See sacred sites.



6.16 Salabwe

Meeting in Salabwe on December 9, 2005 (with many men and women in the church) covering project explanation and village information. The next day the meeting is attended by 23 men.

Village founded in 1983, by children of the traditional Chef de Terre Mwela Mpande.

- *Questions and Issues*

Chiefs. – There are two chiefs in the village: Salabwe (Mangi Laurent) and a secondary chief Kasuati Fidèle with less power. Mwela Mpande is recognized as the reigning CdT.

Relocation. GK: --> No relocation is planned.

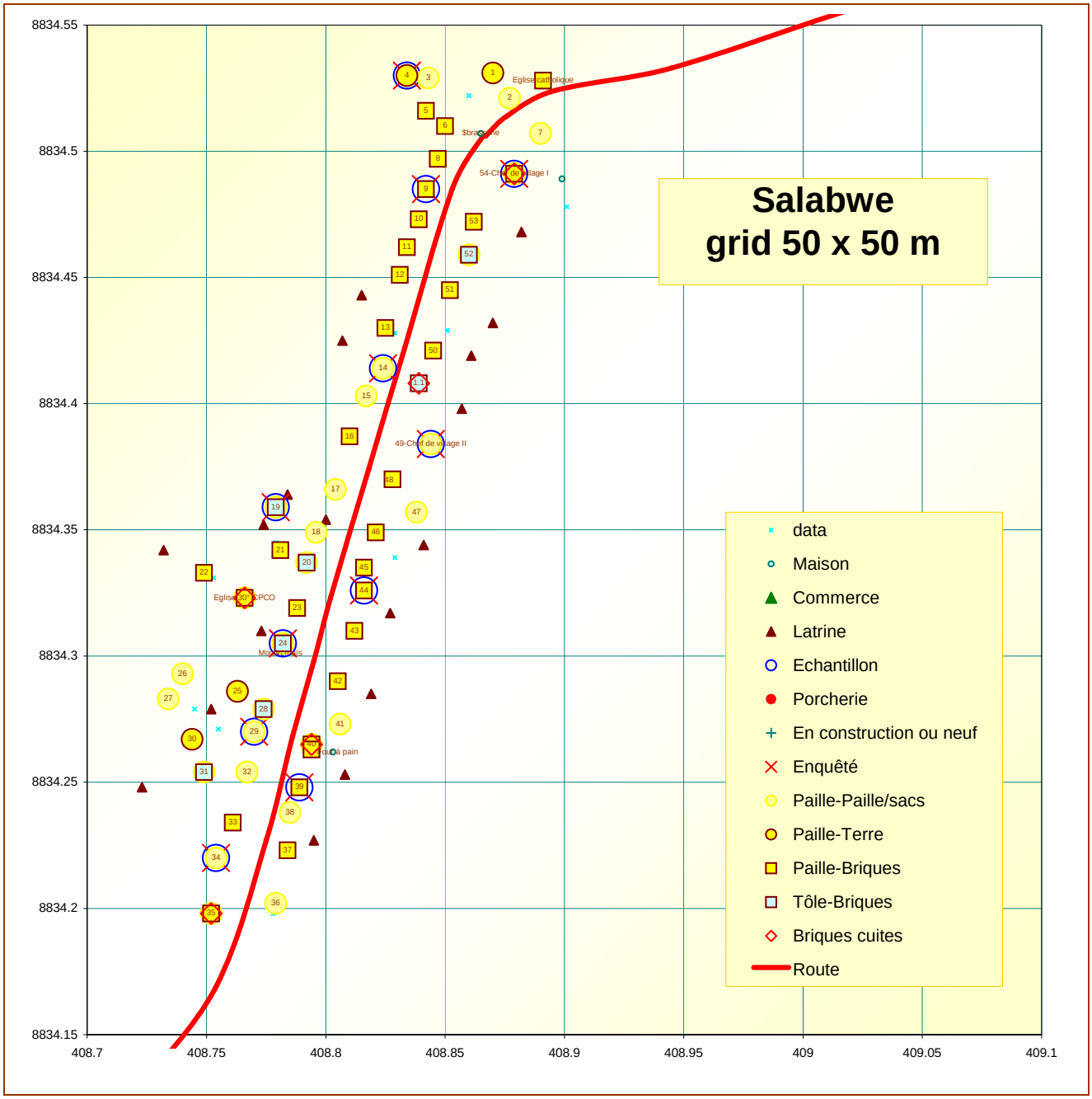
Informal mining. --> Some young have worked in the informal mining. One of them explains how he used the money to buy roofing for his house and two radio-cassette players.

Village limits. – No limit is recognized to the north, the Ditoma River is the limit with Mulumbu, the Kwamba River with Mwela Mpande, and the crossroads to Mulumbu, the limit with Shungu (Mwanga Muteba).

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef des Bayeke	Mwenda Munongo	Bunkeya	
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande	Mwela Mpande	
Chef de poste ou chef de cité	Mapasa	Tenke	
Chef de village	Mangi Laurent	Salabwe	Mangi Laurent is considered by others (Chef de Tenke, CdT Mwela Mpande) to be the official chief.
Chef de quartier	Kasuati Fidèle	Salabwe	A second chief

Characteristic	Description
Population	54 compounds, Est. 243 people, 2 households of transhumant farmers
Ethnic groups	Majority: Sanga; Minorities: Luba (2 families), Ruund (2), Tshokwe, Kaonde (1)
Languages	Sanga, Swahili
Religion	Catholics and Pentecostals are equally numerous. Both religions have their church in the village.
Housing	Walls: 29% straw, 7% mud, 48% mud brick, 9% red bricks; Roofs: 88% straw, 12% aluminum. The important proportion of straw walls is a sign of the poor state of the villages in this area.
Water	Surface water from the nearby Kanji Kenene River.
Electricity	No electricity, people have light from candles.
Fuel for cooking	Firewood mainly; less frequently charcoal.
Radio	National radios: Okapi; International radios listened to are RFI, Zambia and south Africa.
Television	None
Cell phone	Celtel only, not Vodacom
Education	The village school is not functional as there are no teachers. Nearby schools are in Tenke (8 km) and Mulumbu (4 km), which are too far for children to be able to spent the night at home.
Health	There is one Red Cross trained medical assistant in the village who has no medicines. No medicines are sold in the village. All diseases are treated in Tenke, Fungurume and Lukotola.
Commerce	1 mill. Nothing is sold in the village.
Transport	No transport in the village, only bicycle taxis (1,000 Fc/day). People travel by car from Tenke (8 km) or form Fungurume (24 km).
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) cassava, but best sold are (1) beans; (2) maize. People use to grow commercial tobacco, but not anymore. Only two farmers use improved seed, and two use fertilizer. Fields are near the village. Fields are all around the village, mostly to the north, others to the east and the south.
Informal Mining	Young people had worked in the mines. They sold one bag of rough copper ore for 1.500 Fc and a bag of cobalt ore for 2.000 Fc. A team of 5 miners would be able to dig between 10 and 15 bags. Much money was spent on food, which was important, often up to 5.000 Fc per day: a shopping list was prepared, and once the food was there, everybody could eat whatever they wanted. Some of the money was saved, and

Characteristic	Description
	one young man indicated how he had spent 50.000 Fc on roofing material for his house and bought two radio-cassette players.
Animals	Goats, hens, ducks.
Hunting/Fishing	No fishing nor hunting
Gathering	Mushrooms, honey, yams, Mosuku (fruits)
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village.
Roads	The road to Tenke is blocked due to the destroyed bridge over the Dipeta, the road to Fungurume is bad but usable.
Local organizations	Both churches have choirs and organizations for men and women. *Kinkurimba*, rotating agricultural assistance is practiced in the village. No saving groups.
Sacred sites	Kyama Kela hill cave, used during the Msiri wars in 1850-1900 Musanza Wa Mulenge: rain making rituals where ancestors are asked. Possibly within the concession area.
Archeology	Dibwe Dia Kalamba: a rock (stone?) near the Lungeyi River. When the Lubu in the old days warred with the Sanga, this rock barred their progression. (check if in concession area)


Salabwe
grid 50 x 50 m
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
Route
8834.55
8834.5
8834.45
8834.4
8834.35
8834.3
8834.25
8834.2
8834.15
408.7
408.75
408.8
408.85
408.9
408.95
409
409.05
409.1

6.17 Mwela Mpande Village

Main meeting - January 27 2006, with the of chief, his brother and one village woman.

Village established at least since 1973, when the present chief, who is one of the major Chefs de Terre of the region became chief. This village was located less than a kilometer to the south until a few years ago (date nsp.)

- *Questions and Issues*

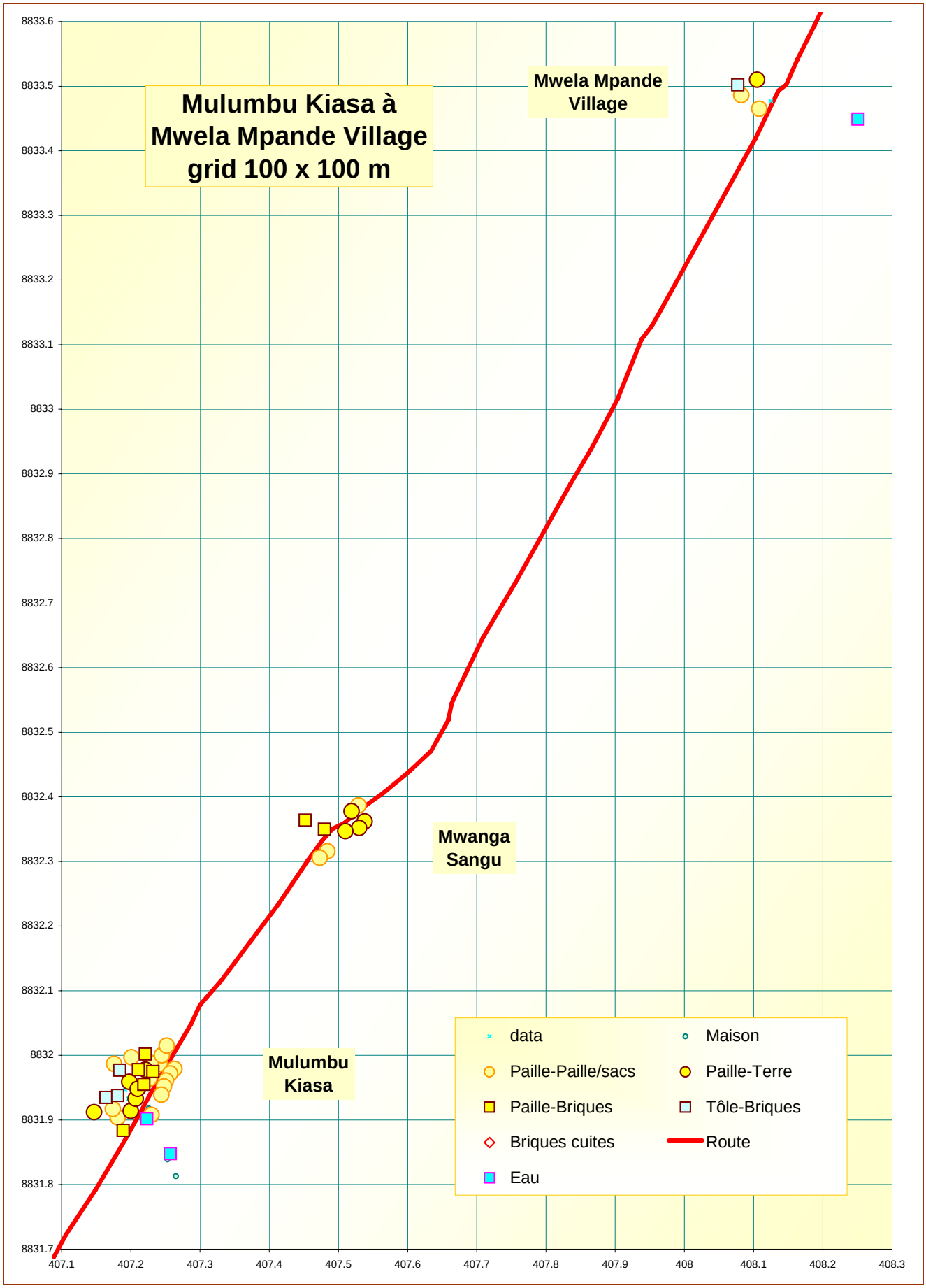
Chiefs. Mwela Mpande is also in the middle of a power struggle. Many villagers in the area consider him as a major chief, and his power should cover most of the project footprint. However, he has problems assessing his authority over chiefs such as Mulumbu (in Mulumbu) and Lutanda (in Lutanda), and of nearby Mulumbu Kiasa all of whom are directly concerned by the project footprint and the concession area. For Mwela Mpande, these chiefs are not Chefs de Terre, but merely respected village elders that have to be consulted when decisions are made.

Area where the CdT reigns: East: limited by Buyobia, North Mofia River: by Mutobo (Kansenia); North-east (Sase River): Lukotola and Kamungu; East of the Fungurume hill: Mpala; South: Mutaka Mwelwa. Over 90 percent of the concession area is thus within the land that Mwela Mpande claims.

Development. – The project should help the local population with agricultural inputs.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande	Mwela Mpande	Mwela Mpande is the most widely recognized CdT
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Mwela Mpande	Mwela Mpande	Kapîta Mwela Mpande

Characteristic	Description
Population	4 compounds, Est. 18 people, 2 transhumant families.
Ethnic groups	Sanga (locals), Kimbundu and Bemba (the 2 transhumant families)
Languages	Sanga
Religion	(1) Catholics. No church in the village, people go to Salabwe.
Housing	Walls: 50% straw, 25% mud, 25% mud brick, 0% red bricks; Roofs: 75% straw, 25% aluminum.
Water	Surface water from the Kyamba River, one of the tributaries of the Mofia River in Salabwe. Water considered dirty.
Electricity	No electricity
Fuel for cooking	Firewood only
Radio	No radio
Television	None
Cell phone	None
Education	Children go to school in Tenke (7 km), which is too far for children to be able to spend the night at home.
Health	No medicines are sold in the village. No one in the village has any medical or midwife training. If medical care is needed, people go to Tenke, and for surgery, to Kansenya, or Likasi.
Commerce	No traders in the village. Sometimes peddlers pass. Everything needed is bought in Tenke.
Transport	No transport in the village
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, but best sold are (1) beans; (2) maize. Onions and Irish potatoes in marsh lands.
Informal Mining	No information
Animals	Only fowl.
Hunting/Fishing	No fishing. No hunting.
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Police sometimes visit the village
Roads	The road is in a very poor state of repair and hardly practicable, no cars use the road.
Local organizations	Mutual assistance for agriculture, no church organizations.


Mulumbu Kiasa à
Mwela Mpande Village
grid 100 x 100 m
Mwela Mpande
Village
Mwanga
Sangu
Mulumbu
Kiasa
data
Maison
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
Route
Eau
8833.6
8833.5
8833.4
8833.3
8833.2
8833.1
8833
8832.9
8832.8
8832.7
8832.6
8832.5
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6.18 Mwanga Sangu (also known as Mwanga Bijimba)

Village established in nsp. There are two chiefs: the village chiefs who is village chief is Mwanga Sangu (=Kalenda Kasuba), and a second one, the Chef de Terre, Mwanga Bijimba (=now death, has heir and son has as his civil name Kalanda Kasuba). Most inhabitants (five families have recently left the village to join the adjacent village of Mulumbu Kyasa, site of their maternal relatives. The village plans to relocate in the next few months, independently from the mining project[19].

- *Questions and Issues*

An important village as many land users in the footprint of the mine facilities as defined in February 2006, refer to the Mwanga Bujimba chief, as the distributor of the land they cultivate. The village will be relocated shortly.

In January 2006, it was found that the village had been abandoned. A further visit is necessary to find where the people have settled. Four families have already left for the village Mulumbu Kyasa.

Some people in the footprint area around Mulumbu refer to Mwanga Bijimba as the chief who is responsible for their land.

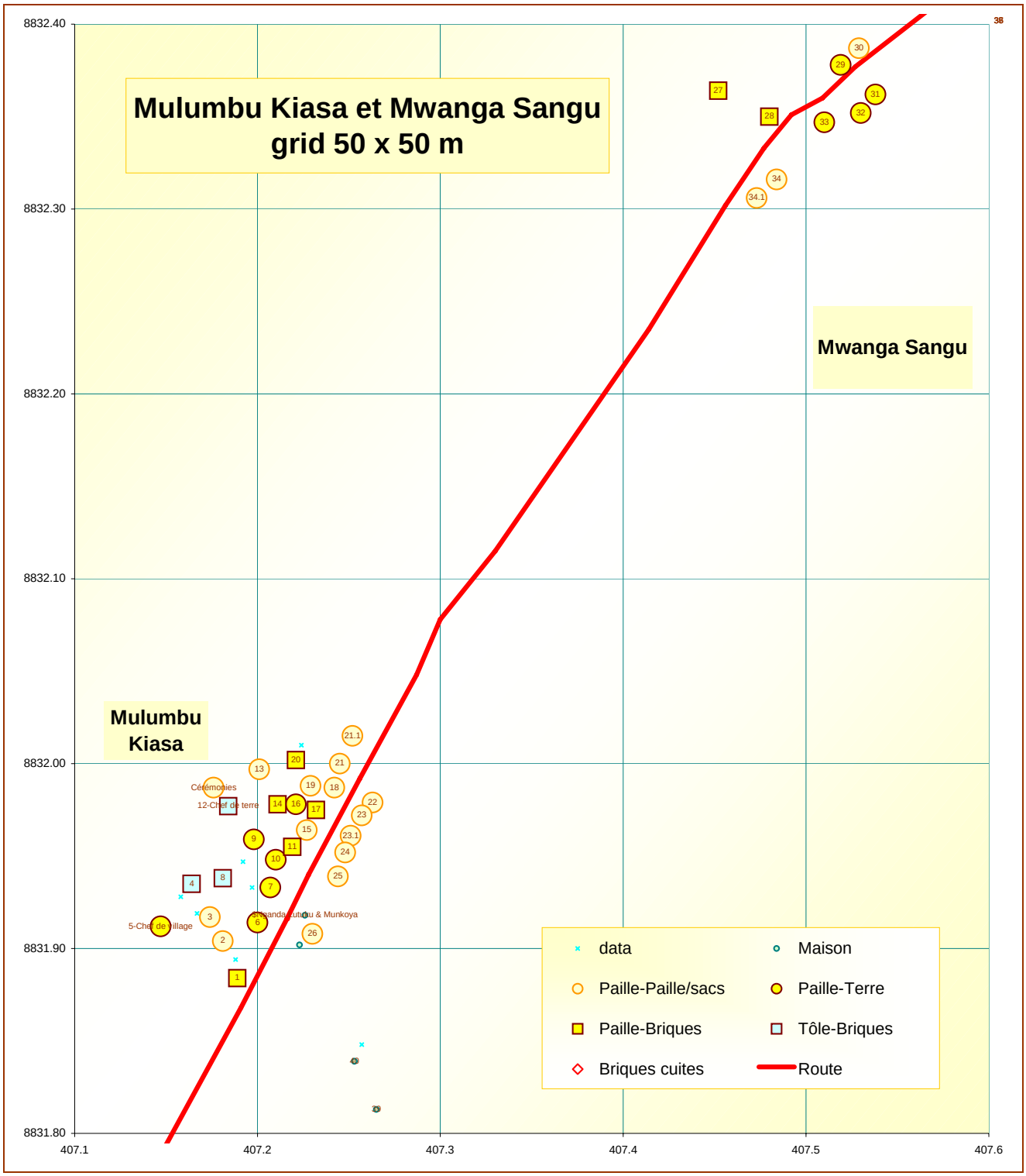
Questions and issues were discussed during the interview with Julienne Kitoto

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwanga Bijimba (=Bijimba Joseph)	Mwanga Sangu	Mwela Mpande is the most widely recognized CdT
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Mwanga Sangu (=Kalenda Kasuba)	Mwanga Sangu	Chef de village

Characteristic	Description
Population	8 compounds, Est. 36 people, 5 migrant families.
Ethnic groups	Sanga only
Languages	Sanga and Swahili
Religion	(1) Catholics. No church in the village, people go to Salabwe.
Housing	Walls: 33% straw, 44% mud, 22% mud brick, 0% red bricks; Roofs: 100% straw, 0% aluminum.
Water	Surface water from the Kyamba River, one of the tributaries of the Mofia River in Salabwe. Water considered dirty
Electricity	No electricity
Fuel for cooking	Firewood only
Radio	National radios: Okapi; international radios listened to in French.
Television	None
Cell phone	None
Education	Children are said to go to the primary school in Salabwe, which – according to the people in Salabwe – is not functioning this year. Secondary school is in Tenke (7 km), which is too far for children to be able to spend the night at home.
Health	No medicines are sold in the village. No one in the village has any medical or midwife training. If medical care is needed, people go to Tenke, and for surgery, to Kansenya, or Likasi.
Commerce	No traders in the village. Sometimes peddlers pass. Everything needed is bought in Tenke.
Transport	Bicycles are rented for 1500 Fc (2 days two Fungurume), or 500 Fc to go to Tenke.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) cassava; (4) peanuts, but best sold are (1) beans; (2) maize.
Informal Mining	No information
Animals	Only fowl.

[19] In February 2006 the village appeared all but abandoned, and all huts overgrown with grass. The team was told that the few remaining villagers all lived in their fields.

Characteristic	Description
Hunting/Fishing	No fishing. No hunting.
Gathering	
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Environmental services come to check if people have dug latrines.
Roads	The road is in a very poor state of repair and hardly practicable, no cars use the road.
Local organizations	Mutual assistance for agriculture, no church organizations.



6.19 Mulumbu Kyasa (Kiasa or Kiansa)

Village meeting held on December 11 2005 with 19 people present: 14 men and 15 women.

The village name is also spelled Kiansa, or Kiasa. Village established (unknown, very confused answer).

- *Questions and Issues*

Chiefs[20]. – A new chief says he has recently been designated Kiasa (= Tshansa Kamwanya), whose father Kamungu = Mukasa David) died in 1995 without an heir. He is considered by those present in the meeting as the official chief of Kiasa. A second chief, who seems to act as chief of part of the population of the small village, is called Kamungu. Kiasa considers himself as the successor of the Mwela Mpande CdT, but the traditional authorities such as the chef du groupement Nguba have not yet authorized officially this situation.

Those present in the meeting unanimously agree that Kiasa is the village chief.

Two kinds of traditional powers exist in the villages, each derived from a different source. The power over the people is derived from the traditional Sanga ancestors; the power over the land is derived from the former king "M'siri" who governed from the Bayeke capital Bunkeya[21]. The former chief, also called Kamungu (born David Mukasa), united the two powers in one person. After his death, the powers were separated between Mwela Mpande and Mwela Mpande Kamungu. The new chief, Mulumbu Kiasa hopes to reunite the two powers again into one person.

Relocation- We live within the boundaries of the concessions, and the stakes are close to our village, will we be relocated? GK: --> Nothing will happen this year, if your fields are concerned by the mining facilities, the project will give you sufficiently forward warning, and if necessary assistance with relocation. The village has a very temporary outlook, as more than half of the dwellings have only straw walls.

The village chief plans to move with his village to a new site in order to confirm his power.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande Mwela Mpande Kamungu	Mwela Mpande Mulumbu Kiasa	Two chiefs with different powers are recognized as CdT. Mwela Mpande is the most widely recognized CdT.
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Mulumbu Kiasa (= Tshansa Kamwanya)	Mulumbu Kiasa	
Chef de quartier	(1) Mulumbu Kiasa (2) Kamungu	Mulumbu Kiasa	MK is both village chief and quarter chief, Kamungu is only a quarter chief.

Characteristic	Description
Population	26 compounds, Est. 117 people, 4 families have recently migrated from the nearby village Mwanga. 5 families are transhumant migrants, or have arrived since less than a year.
Ethnic groups	(1) Sanga, a few Tshokwe and Lubakat families.
Languages	Sanga and Swahili
Religion	(1) Pentecostals (CEM) and (2) Catholics. No church in the village.
Housing	Walls: 52% straw, 21% mud, 28% mud brick, 0% red bricks; Roofs: 90% straw, 10% aluminum. The village has recently grown through agricultural migrants and migrants from neighboring Mwanga.
Water	Surface water from the source of the Kyamba River, one of the tributaries of the Mofia River in Salabwe.
Electricity	No electricity
Fuel for cooking	Firewood mainly
Radio	National radios: Okapi; International radios listened to for music and news are RFI, VOA, Africa n° 1.

[20] The relationship between the two chiefs is not very clear, but as the population unanimously agrees to the fact that Mulumbu Kiasa is the representative chief of the village, he should be the person the project makes contact with.

[21] A historical important figure who reigned from 1874 to 1891, Mpanda was the chief of the Sanga during the period of the great King Msiri who governed between 1874 and 1891. Msiri had received the power of the Sanga community from Mpande (!). Msiri was related with all the local tribes, as each of his governors had to give one of his sisters to the court.

Characteristic	Description
Television	None
Cell phone	None
Education	Nearby school in Tenke (6 km), which is too far for children to spend the night at home. No children in secondary education. There used to be a school in Mwela Mpande, but it closed many years ago
Health	No medicines are sold in the village. Two men have Red Cross training, one woman acts as a midwife but is untrained. Diseases are treated in Tenke, and if more serious or surgery is needed, in the mission hospital of Kansenya.
Commerce	1 mill. 1 small shop (etalage) with basic products: salt, candles, matches, sugar, candy, cigarettes.
Transport	No cars, bicycles rent for 1,000 Fc/day for transporting loads, 300-500 Fc if only transporting people.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) cassava, but best sold are (1) beans; (2) maize (3) onions. Fields directly around the village. Locals use neither improved seeds nor fertilizer, only the transhumants from Tenke. The chief of Mwela Mpande distributes land (and not the local chief). “There are many transhumants from Tenke”.
Informal Mining	No information
Animals	Only hens, ducks, no goats or pigs as the fields are too close to the village.
Hunting/Fishing	No fishing. One man practices hunting of animals like “shimbiriki” (rat?).
Gathering	A few villagers prepare charcoal for selling.
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Environmental Services comes to check if people have dug latrines.
Roads	The road is in a very poor state of repair and hardly practicable. Only TFM vehicles pass very infrequently.
Local organizations	No local organizations.
Sacred sites	Kyama Kela Hill cave, used during the Msiri wars in 1850-1900. Clothing would appear and disappear on the the Lungeyi River.
Archeology	In the Kalebi seasonal river, where at *kyowa* “ritual bath for the chiefs”. Near the Kinanga River there exists a hole, where two statues are located that people have not been able to take away.
Cemetery	

6.20 Kasanga

Main meeting- January 16 2006, with 41 people: 24 men and 17 women.

Village founded in 1940 by Ngeleke Kazadi – who died in 1953 – by originals of Lualaba, near the present day artificial lake of Mwanfé. The present chief still bears the ceremonial name of Ngeleka, but was born as Kazadi Mutombo. The village is part of the Mwela Mpande quarter of Fungurume, and is part of a bloc whose chief is Kazadi Mutombo. Ndela I is another “cellule” of the same bloc.

Many transhumant farmers come to the village during the rainy season and not everyone wants to admit that they are temporary residents only, for fear of not being selected for project jobs. The number of transhumant migrant households (40 percent of the total) is therefore probably underestimated.

- *Questions and Issues*

Employment. – We hear about recruitments by the project but know nothing about it. GK: recruitment concerns only daily labourers, who cannot be employed fro more than 30 days.

Education. – Women: we want a school, a health post- GK: the mine will be in the area for a long time, and gradually assist villages in their effort towards development.

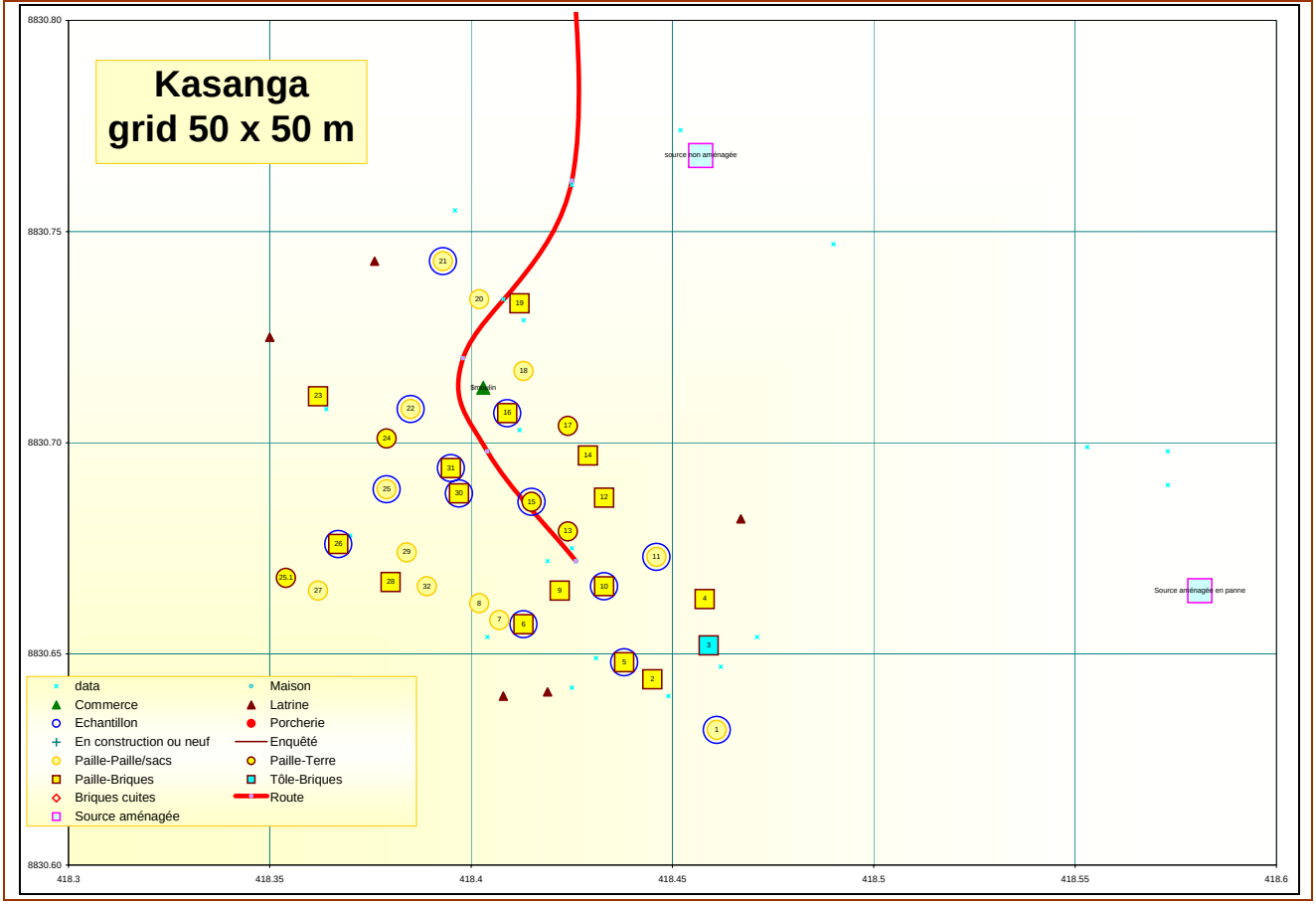
Agriculture. – The village has created a group of ten farmers who will participate in the oxen acquisition program of the Catholic mission of Lukotola.

Village limits. – The village is part of the cité de Fungurume. To the north, the road is the clearly recognized limit with Lukotola , Kamungu and Kamungu Mulolua. To the west, Ndela is part of the administrative bloc, while the limit is formed by the Kiboko River. To the south there exists no clear limit with Mwela Mpande Gare.

Function/fonction	Name/nom	Village/Lieu d’habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala	Fungurume	Everybody agrees on this name
Chef de Cité	Kapenda François	Fungurume	
Chef de quartier	Kamiji	Fungurume, quartier Mwela Mpande	
Chef de Kasanga	Ngeleke (=Kazadi Mutombo)	Kasanga	Both Secretary of Kamiji, and “chef de bloc” of Kasanga

Characteristic	Description
Population	32 compounds, Est. 144 people, 10 trans humant families.
Ethnic groups	Sanga mainly with minorities of 2 Hemba, and 1 Lubakat.
Languages	Sanga and Swahili, little French.
Religion	Neo-Apostolics, Methodists, Catholics, animists. There is no church in the village.
Housing	Walls: 36% straw, 15% mud, 48% mud brick, 0% red bricks; Roofs: 97% straw, 3% aluminum.
Water	There are two wells in the village, both feeding the Kasanga River. One has been cemented by the United Nations Food and Agriculture Organization (FAO)/APSA in 1999, but was flooded during the rainy season.
Electricity	No electricity
Fuel for cooking	Charcoal and firewood
Radio	National radios: Okapi; International radios listened to RFI, Zambia, Africa n° 1
Television	None
Cell phone	Vodacom, Celtel, in some spots of the village only.
Education	No village school. The older children go to Fungurume, (7-8 km) and they only return during the weekends and holidays. A child in a primary school costs 11.150 Fc/per annum, in secondary school 20.150 Fc.
Health	A Red Cross trained villager sells some medicines. No one in the village has midwife training. If medical care is needed, people go to Fungurume: CS Dipeta, and the private clinics of Justin and Bumba.
Commerce	Mill (1 cup for 6 cups milled). Sometimes peddlers pass. Presence of a blacksmith. No food is sold in the village.
Transport	Trucks pass to buy maize and beans during the harvest season. People sometimes take the train in Kwatebala of Fungurume, preferably without paying (*mustrong*). From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000, to Lubumbashi 2,500 Fc.

Characteristic	Description
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) soy beans; but best sold are (1) beans; (2) soy beans. Marshland crops: tomatoes, Irish potatoes, onions, garlic, sugarcane, maize. Fields are close to the village, mostly less than 15 minutes walking.
Informal Mining	No informal mining in the village: “we do not know how to do that, for us it’s a waste of time, we prefer agriculture”
Animals	Goats, hens
Hunting/Fishing	No fishing. No hunting.
Gathering	Mushrooms, charcoal, honey, grass, fruits: tusongole, *fungo*, *masuku*, *pundu*, caterpillars *bilulu*(sw) (general), and *tukotu*(sg), small ones, various medicinal plants.
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Environmental services come to check if people have dug latrines, and collect taxes.
Roads	The road is maintained by TFM.
Prices (harvest → lean season	2003/4 maize low: 150 Fc→ high 300 Fc; beans low: 500 Fc → high 600 Fc 2004/5 maize low: 250 Fc→ high 700 Fc; beans low: 500 Fc → high 1300 Fc
Local organizations	A group of 10 farmers has been created for the oxen acquisition program.
Sacred sites	None according to the men. Women: there is a place, *pamikisi*, where we leave a sample of the seeds we are going to use at the start of the rainy season. Not every year, only every second year. The village chief has his ceremonial hut “*miyombo*” in the village, where he performs rituals in case of diseases or lack of rain.
Archeology	No information



6.21 Ndela 1 (Lenge Miaba)

Main meeting- January 19 2006, with 54 people: 31 men and 23 women.

The village has existed since 1982, and was founded by Papa Nguz. Administratively it depends on Fungurume → Quartier. Mwela Mpande → Bloc Kasanga → Cellule Ndela. It pays allegiance to the Chef de Terre Mpala from Fungurume.

The village has three hamlets, which each have an elder (papa lenze, Papa Guz and Papa Kadimanshi) but there is just one "chef de cellule" for the whole of Ndela 1, Papa Guz.

Most people only live in the village during the rainy season and come from Fungurume, Lubumbashi, Likasi and Kolwezi but the construction of the dwellings is in general better than in many of more permanent villages.

Characteristic of this village is the presence of many different ethnic groups, with a majority of Tshokwe and Ruund.

- *Questions and Issues*

Informal mining. The activity was considered beneficial to the village, and appeared obvious during the discussion that many young people had participated: diggers (some with experience in other mines of the Katanga in Likasi and Kambove[22]), transporters (many bicycles have been confiscated by the mines' police). Concrete examples of how money was spent include: payment of dowry, bicycles, financing of university studies. However, much money was used in a consumptive way to pay for "good food", drinks, women, clothing, beds and foam mattresses and cassette radios. The whole population regrets the informal mining ("yes, yes…") as since its end an economic crisis has replaced its benefits.

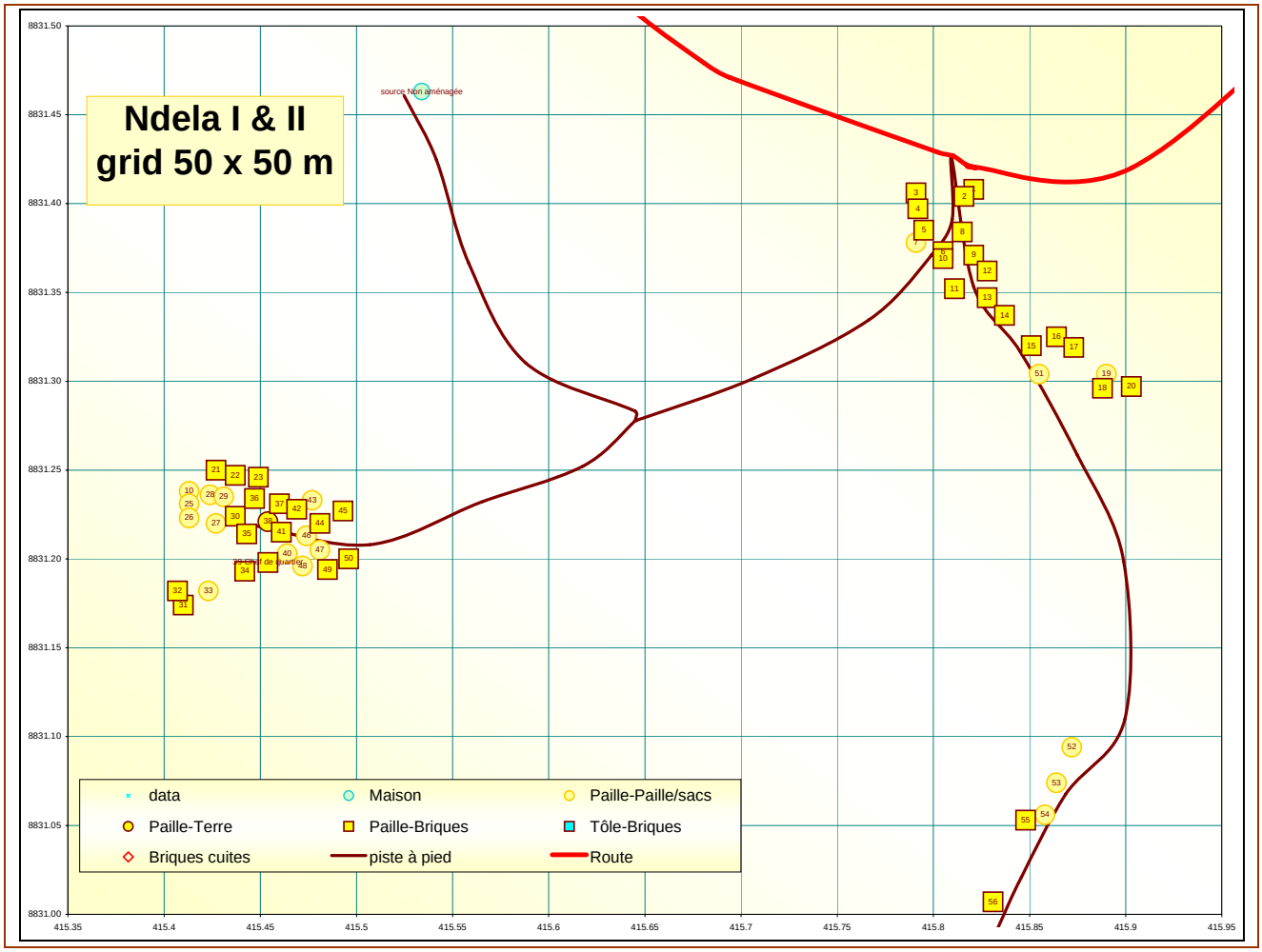
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala	Fungurume	Everybody agrees on this name
Chef de Cité	Kapenda François	Fungurume	
Chef de quartier	Kamiji	Fungurume, quartier Mwela Mpande	
Secretary of Kamiji,	Muteba Masanfya	Kasanga	
Chef de Kasanga	Ngeleke (=Kazadi Mutombo)	Kasanga	"chef de bloc" of Kasanga
Chef de village	Kasanga Johan (= Kazadi Mutombo)	Kasanga	Chief of Kasanga charged with distributing land

Characteristic	Description
Population	57 compounds, Est. 257 people, 12 permanent, 45 migrant families.
Ethnic groups	Many ethnic groups and no majority (in brackets, number of households): Tshokwe (13), Ruund (12), Sanga (7), Lubakat (7), Ndembo (4), Kaonde (3), Kamungu (2), Angola (1).
Languages	Swahili, Luba, Sanga, little French.
Religion	Many different religions: Methodists, Catholics, Pentecostals, Garenganza (Protestants), Tabernacle, Apostolo. There is no church in the village.
Housing	Walls: 30% straw, 2% mud, 66% mud brick, 0% red bricks; Roofs: 98% straw, 2% aluminum.
Water	There are two water points in the village, one is a traditional well[23] (source), the other the Lenge Myaba River (not visited).
Electricity	No electricity
Fuel for cooking	Charcoal and firewood
Radio	National radios: Okapi only no FM radio; International radios listened to are RFI, Zambia, Africa n° 1, VOA, Tanzania, Voice of Germany. People listen to music and news broadcasts.
Television	None
Cell phone	Vodacom, in some spots of the village only. Celtel: none.

[22] Mulumbu (Kwatebala) was considered by these experienced miners as the "cradle" ("berceau") of all mines, the most productive one.

[23] Not clear: the photos show a well, but not the river.

Characteristic	Description
Education	No village school. Nobody goes to Mulumbu. The older children go to Fungurume, (18 km) and they only return during the weekends and holidays. There are a few children in secondary school and one who reads psychology in the Lubumbashi University, but now in the village to earn money to pay his studies.
Health	A trained nurse (level A3) sells some medicines. No one in the village has midwife training. If medical care is needed, people go to Fungurume.
Commerce	No mill. Presence of a blacksmith. No food is sold in the village.
Transport	Trucks pass to buy maize and beans during the harvest season. People do not take the train in Kwatebala because it's too expensive and too slow. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000-1,500 Fc, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans, (3) soy beans, (4) peanuts; but best sold are (1) beans; (2) soy beans, (3) maize (4) peanuts. Marshland crops: a few.
Informal Mining	Many people participated in the informal mining, and people regret that the mining is over.
Animals	
Hunting/Fishing	No fishing. Hunting: only snares around the fields that catch rats.
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Environmental services come to check if people have dug latrines, and the village is clean. Agricultural survey passes to evaluate cultivated surfaces and varieties.
Roads	The road is maintained by TFM.
Prices (harvest → lean season	2003/4 maize low: 100 Fc→ high 300 Fc; beans low: 300 Fc → high 1200 Fc 2004/5 maize low: 180 Fc→ high 700 Fc; beans low: 500 Fc → high 1500 Fc
Local organizations	Rotating mutual assistance groups (*kinkurimba*) for agriculture exist for men and women separately,
Archeology	No information

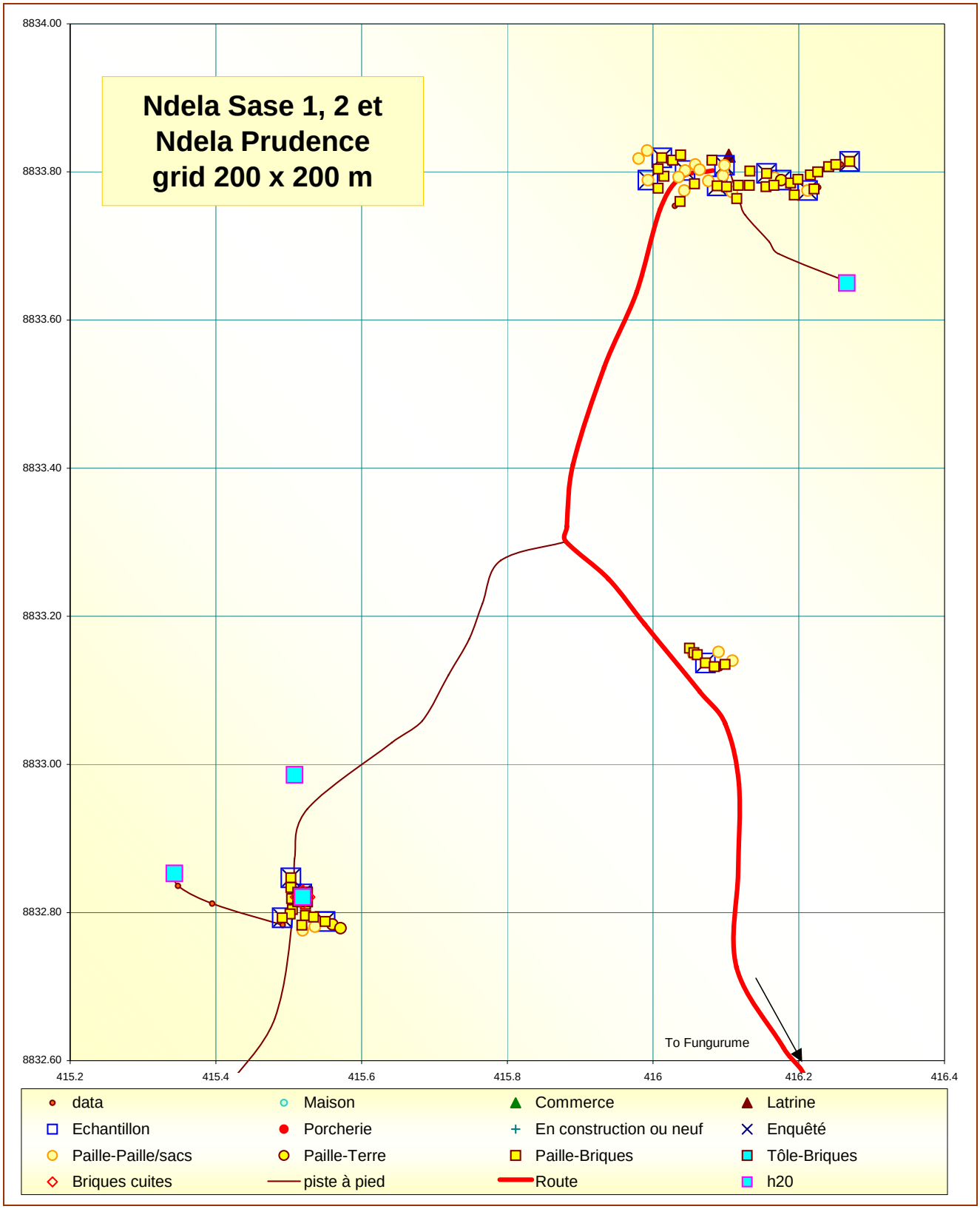

Ndela I & II
grid 50 x 50 m
source non aménagée
data
Maison
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
8831.50
8831.45
8831.40
8831.35
8831.30
8831.25
8831.20
8831.15
8831.10
8831.05
8831.00
415.35
415.4
415.45
415.5
415.55
415.6
415.65
415.7
415.75
415.8
415.85
415.9
415.95

6.22 Ndela Prudence

Explanation of the project- January 20 2006, with about 14 people: 7 men and 7 women.

This village was established near the farm of Ms. Prudence, but as she does not use its inhabitants as agricultural workers anymore, the people, mainly transhumants from Fungurume, come to the village for their own agriculture.

Only a small QandA session was held in the village, during which the project was explained and the population asked questions about employment opportunities and future benefits.



6.23 Ndela Sase 2

Main meeting January 20 2006, with 72 people: 40 men and 32 women.

The village was founded by three Luba from the Kabongo District of Haut Lomani, after the lay off of workers by (SMTF), in 1984. The village is inhabited during the dry season by only one permanent family while the 41 migrant families arrive around September to till the land and stay until after the harvest. Many, but not all, have their houses scattered around Fungurume, where they go after the harvest for what they call “vacances”, holidays. Most people come from the same area in Kabongo, and say they are still in contact with their village, and visit it once per year.

Administratively, and contrary to Ndela I, the village depends on Tenke not Fungurume. The boundary between Tenke and Fungurume is the Sase River.

Chiefs. – As the people in Ndela Sase are mainly transhumant migrants, they know very little of the local organization. Especially the traditional organization is very little known, and though the names of five CdT are given, it appears clearly that none of them have a practical influence in the village.

The village organization is poorly known by its inhabitants, a sign that not many people are concerned with the fate of Ndela Sase[24]. The village apparently depends on the Tenki chef de terre who died a few years ago, and a new chief has not yet been chosen. He is represented by Kalasa, one of the elders of Tenke, who comes to receive the traditional presents of the village to the Chef de Terre (a few buckets of maize).

The village is an important agricultural producer. People work the land in mutual production groups, and hire village contractors to clean and till their fields. A group of 10 can till half a hectare per day. The land is often tilled without the traditional mulching in small ridges, as the soil is very fertile.

- *Questions and Issues*

TFM mine. – Why did TFM wait so long before they start mining, other mines in the area have reopened long since. GK: We do not know, reasons may be technical, political and money. Q. When will the studies of the project start? GK: they are already underway. Q. We want all to benefit from the mining. Can you guarantee that the mine will open in 2008? GK: The Company wants to mine as soon as possible, in order to start earning money, but it is not up to me to guarantee any calendar.

Agriculture. – We need agricultural development: fertilizer and improved seeds, we can pay you back at harvest time. Now that the informal mining is over we need other sources of income. If the project cannot employ all of us, what else can it give to us? GK: Development actions will be spread out over a long period, and need participation of the villagers.

Agricultural land. – There exist various soils, black soil, red soil, sandy clay sols (good for beans) and clay soils. The black soil is best for agriculture. We have used up all potential land in the village area, there is no more good land left.

Relocation. – What will happen if the project needs our land. GK: a compensation and resettlement plan will be applied according to international standards.

Function/fonction	Name/nom	Village/Lieu d’habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	(1) Lukotola; (2) Mulumbu; (3) Salabwe; (4) Mpala; (5) Tenki.	In their respective villages	The 5 land chiefs have performed a ritual for fertility of the land in 1984, and since then no more rituals.
Representative Chef de Terre	Kalasa	Mwanga Kakunta	Receives Milambu (annual gifts) of the village for the land.
Chef de poste	Mapasa	Tenke	
Chef de village	Mpanda Nkumba I	Fungurume	Called the chef de quartier
Representative of Chef de village	Mpanda Nkumba II (son)	Ndela Sase	Son of the chef de quartier

[24] Land chief known in the village.

Characteristic	Description
Population	42 compounds, Est. 189 people, 10 compounds and 45 people, in Ndela Sase 2, 12 permanent, 45 migrant families in Ndela Sase 1.
Ethnic groups	Majority Luba
Languages	Luba, Swahili, French
Religion	Cepeneca, an apostolic church of northern Katanga, no church, only a small chapel in the village.
Housing	Walls: 33% straw, 0% mud, 67% mud brick, 0% red bricks; Roofs: 100% straw.
Water	There is a traditional well (source) of the Sase River where water seeps from under a tree. The water was muddy due to the rains, and an open well in the village.
Electricity	No electricity
Fuel for cooking	Firewood for cooking and for light
Radio	National radios: Okapi only no FM radio; International radios listened to are RFI, Vatican, VOA, Tanzania, Voice of Germany. People listen to music and news broadcasts.
Television	None
Cell phone	Vodacom. Only on the top of the hills near the village.
Education	No village school. The older children remain in Fungurume to go to school.
Health	Red Cross trained villagers (“diperol” in Swahili) are present. If medical care is needed, people go to Lukotola, or if more serious to Fungurume, Kakanda and Likasi.
Commerce	No mill, no trade.
Transport	Trucks from Lubumbashi and from the Kasai pass to buy maize and beans during the harvest season. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000-1,500 Fc, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity. Maize is grown for food, beans are sown for sale. The fields are directly surrounding the village, and not further than 5-10 minutes walking away.
Informal Mining	Participation in informal mining was not admitted, but former miners were present.
Animals	No pigs as they destroy crops, only hens and dogs.
Hunting/Fishing	No fishing. No hunting.
Gathering	
Government services	Agricultural survey passes to evaluate cultivated surfaces and varieties. No vaccinations (polio, vitamin A and de-worming).
Roads	The village is located just next to the road between Ndela and Lukotola. The road was in a reasonable state of repair in January 2006. Ndela 2 is located a few hundred meters to the west in the Sase River. valley.
Prices (harvest → lean season	2003/4 maize low: 100 Fc→ high 250 Fc; beans low: 450 Fc → high 500 Fc 2004/5 maize low: 150 Fc→ high 700 Fc; beans low: 450 Fc → high 1300 Fc
Local organizations	Rotating mutual assistance groups (*kinkurimba*) are popular to boost agricultural production. A choir which includes both men and women.
Sacred sites	As the population is not an indigenous one, they know of no sacred sites. Deaths are buried in Fungurume town, in the municipal cemetery.
Archeology	No information

6.24 Ndela Sase 1

Ndeal Sase 1 and Ndela Sase 2 have assisted together in the village meeting and economic interview which took place in Ndeal Sase 2. The population of this village is estimated as 10 compounds and 45 people.

6.25 Mano Mapia

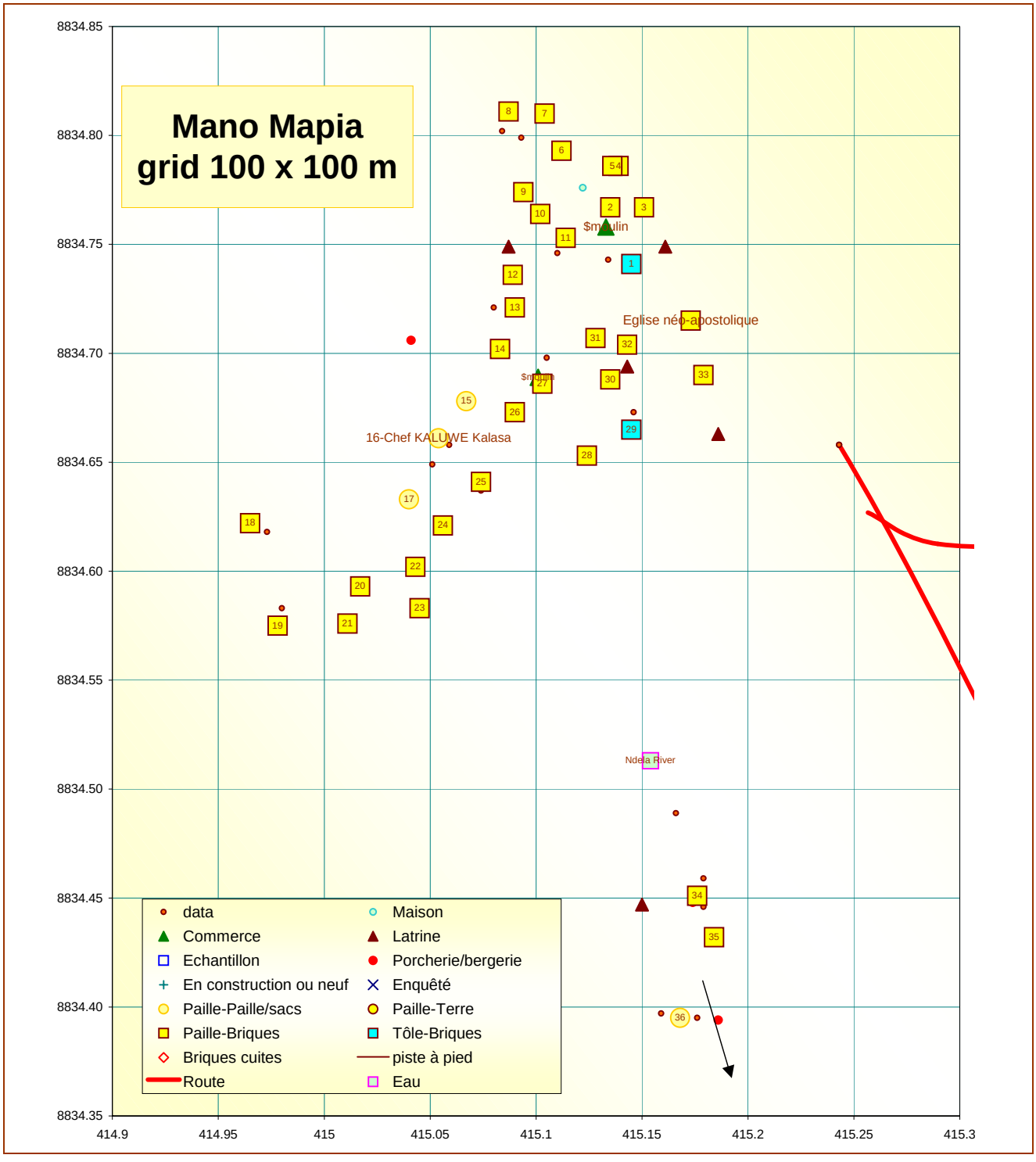
Main meeting March 30 2006, with 31 people: 27 men and 4 women.

The village was founded in 2001 by Kiloba Moïse, an inhabitant of nearby Mwanga Kakunta, and was joined by kinship related farmers who lived in the fields in the area. In 2005, his elder brother joined him and was elected as the village chief. Since a few months, the two brothers have a conflict, and the elder brother, the village chief, has left to another site, close to the village, but – according to the villagers – he will come big as everybody in the village recognizes him as the village chief. As the elder brother is also a CdT, he receives the traditional harvest offerings *mulambu* from the farmers in the surrounding villages.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Kalasa Kaluwe Placide	Outside the village, in the fields	
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Kalasa Kaluwe Placide	Outside the village, in the fields	
Chef de quartier	Kiloba Moïse	Mano Mapia	
Chef de Kiboko	Pande Kiboko (=Pande Sébastien)	Kiboko	Both Secretary of Kamiji, and "chef de bloc" of Kasanga

Characteristic	Description
Population	36 compounds, Est. 162 people, 4 transhumant farmers.
Ethnic groups	1. Majority Sanga 2. Ndembo (2 families) 3. Luba (2 families)
Languages	Sanga, Swahili
Religion	Neo-apostics with a church, Pentecostals (CEM), Catholics, Jehovah witnesses have their respective churches in Lukotola.
Housing	Walls: 11% straw, 0% mud, 89% mud brick, 6% red bricks; Roofs: 94% straw and 6% with permanent aluminum roof.
Water	Source of the Ndela River. Water is clear during the dry season but dirty during rainy season.
Electricity	None, but there are electric generators and car batteries for their radio cassette players.
Fuel for cooking	Firewood mainly, sometimes charcoal.
Radio	National radios: Okapi; Various international radios listened to are RFI, VOA. People listen to music and news broadcasts.
Television	None
Cell phone	Not captured. One villagers owns a cell phone.
Education	No primary school children go to Mwanga Kakunta and to Lukotola. Secondary education in Lukutola and in Fungurume (more than 18 km). Two students in Medicine in Kolwezi.
Health	Two Red Cross trained villagers. Two medical students are actually in the village (to earn money to pay their studies). One local untrained midwife.
Commerce	One small shop, and two mills. Market in Lukotola. Craftsmen: a carpenter, a trained agronomist, one mine drilling assistant.
Transport	The road is in a reasonable state of repair. Traders come to the village during harvest time. Traders charge about 10% of the harvest to transport beans from the village to Fungurume; on bicycle the price is 1,000 Fc/bag of beans and 700 Fc/bag of maize.
Agriculture	*Agriculture*: 1. Maize, 2. Beans, 3. Cassava. Best sold are 1. Beans, 2. Maize. Fields are located all around the village.
Informal Mining	No specific information was obtained.
Animals	Oxen, pigs, goats, hens
Hunting/Fishing	*Hunting*. *Fishing*. – Some fishing in the Ndela River for local consumption, and for selling if the captures are good.
Government services	Sanitary services check the cleanliness of the village and the presence of latrines, veterinary service, various taxes: bicycles, local alcohol, agricultural products, National vaccination day campaigns visit the village (polio, vitamin A and de-worming). Routine vaccination

Characteristic	Description
	only in the health post of Lukotola.
Agricultural labor	Preparing a new field (25x25 ^{m2}) costs 3.500 Fc (7 meka maize), preparing a cleared field 2.500 (5 meka), weeding 1,000 Fc (2 meka) and harvesting and degrainer 25% of the harvest (5 meka per field).
Local organizations	Rotating mutual assistance groups (*kinkurimba*) to boost agricultural production, but also for brick making.
Sacred sites	Lwanzo Lwa mikuba: forge/faire/"cuivre" or "croisettes". A "furnace" , where the local crosses were made. One unspecified cave, located about 1.5 km north of the village.
Archeology	No information



6.26 Kiboko

Main meeting on January 18 2006, with 18 people: 10 men and 7 women. GK explained the project and participated in the QandA session; JK discussed the village questionnaire during a two-hour meeting.

Village established in 1985 (1998) by Pande Sebastien, arriving from Kwatebala Gare, in search of good agricultural land. Most of its inhabitants now are transhumant farmers who live in Fungurume during the dry season. The name “Kiboko” means “hippopotamus” in Swahili.

- *Questions and Issues*

Chiefs. – The recognized chef de terre of the village is Mulumbu Kazadi, from Mulumbu village. But, as the chief is close kin with both the chief of Kafwaya, and the Chef de Terre Mpala, he considers that he can distribute land without asking Mulumbu. Land is not sold, but only the “added value” of agricultural land.

Ethnic groups. – Kiboko is one of the rare villages where the Sanga ethnic group is not in the majority, but half of the heads of household belong to the Tshokwe ethnic group.

Informal mining. The activity was considered beneficial to the village, and favorable to local small trade and sale of agricultural products.

- *Village issues*

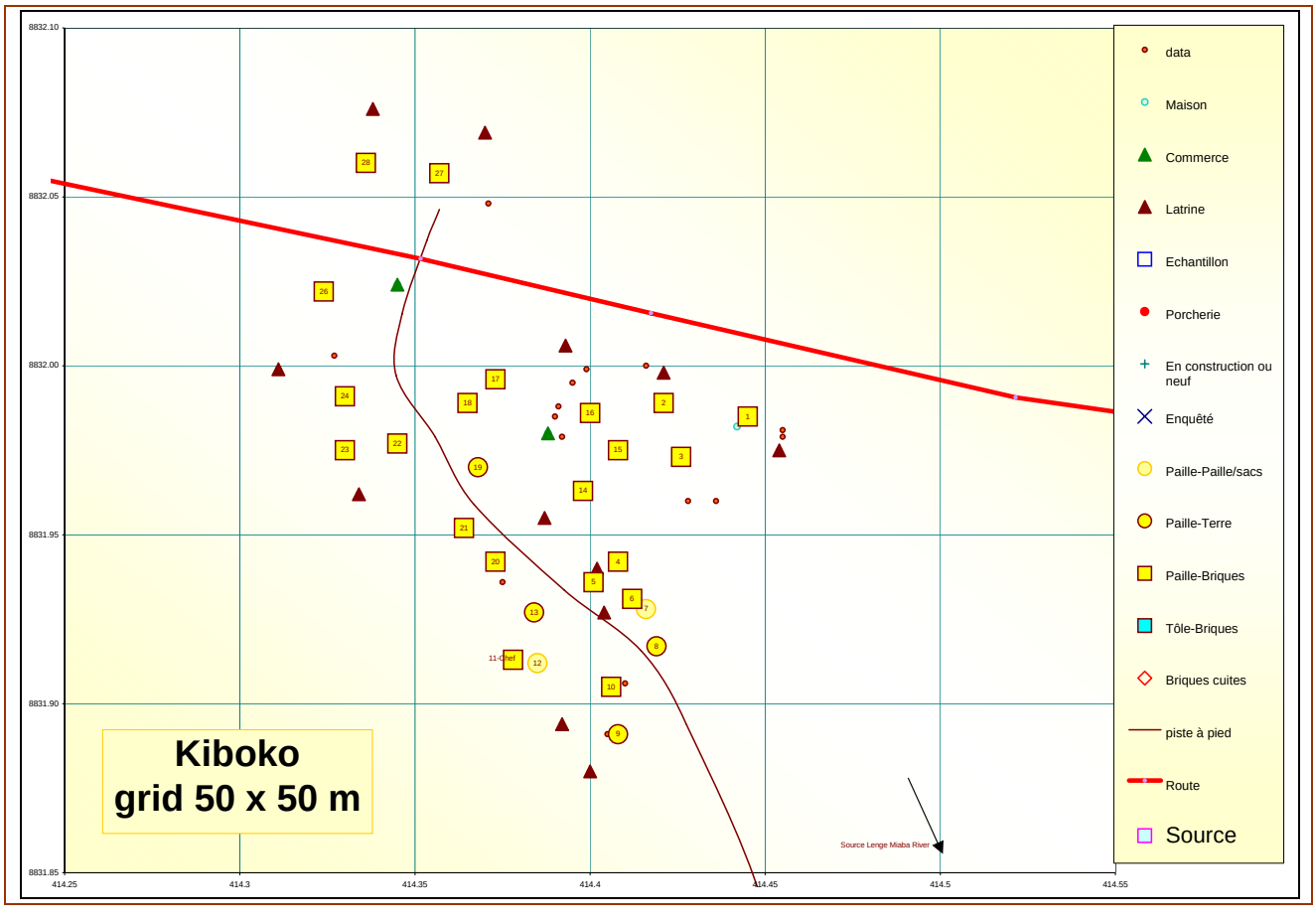
Village limits. – The village is part of the Tenke poste administrative. To the east, the limit is with Kasanga yoano, river without a recognized name, to the west with Mulumbu (Kimpiye River), to the south with kwatebala Gare (no recognized limit), to the north the road with Mano Mapia[25] and Mulumbu Mutomba). To the south there exists no recognized limit with Mwela Mpande Gare.

Function/fonction	Name/nom	Village/Lieu d’habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mulumbu	Mulumbu	No reference to Mwela Mpande or Mpala
Chef de poste	Mapasa Jacques	Tenke	
Chef de quartier	Tshingeji Nestor	Kiboko	
Chef de Kiboko	Pande Kiboko (=Pande Sébastien)	Kiboko	Both Secretary of Kamiji, and “chef de bloc” of Kasanga

Characteristic	Description
Population	28 compounds, Est. 126 people, 10 migrant families.
Ethnic groups	In brackets, number of families: Tshokwe (14), Ruund (4), Sanga (3), Lubakat (2), Ndembo (2), Lwena (1)
Languages	Swahili, Tshokwe, Sanga
Religion	Neo-Apostolics, Pentecostals, Methodists, Catholics. There is no church in the village, but the Neo-Apostolics use a private house, while the others go to Mulumbu.
Housing	Walls: 19% straw, 44% mud, 37% mud brick, 0% red bricks; Roofs: 97% straw, 3% aluminum.
Water	Surface water from the Lenge Nyabe River, an effluent of the Dipeta River.
Electricity	No electricity
Fuel for cooking	Mostly firewood, rarely charcoal
Radio	National radios: Okapi, Zenith; International radios listened to VOA, Zambia, Africa n° 1.
Television	None
Cell phone	Vodacom, Two people in the village own cell phones.
Education	No village school. The children go to Mulumbu, (2 km). No children in secondary education, none in technical school.
Health	No local medical personnel, only one untrained midwife. If medical care is needed, people go to Mulumbu (very expensive, not good) or to Fungurume (16 km): CS Dipeta (high mortality rate), and the private clinics of Justin (has a car which can transport people to Likasi) and Mpwila Mambo (expensive), Catholic mission.

[25] This village Mano Mapia is not the same as the one with the same name (Mano Mapia/Nkonga) on the National Highway, but one of the villages that has not been surveyed.

Characteristic	Description
Commerce	Mill (broken). Presence of a blacksmith. Qualified people: agronomist, teacher, mechanic, mason, but none of them work in his specialty.
Transport	Trucks pass to buy maize and beans during the harvest season. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000, to Lubumbashi 2.500 Fc. Train available in Fungurume (16 km), Tenke (10 km) and Kwatebala Gare (10 km). Bicycles are rented for 500 Fc per day.
Agriculture	Agriculture is the main activity.
Informal Mining	The mining was good for the village: easy commerce, easy money, easy to buy and sell agricultural products and other food. The village participated in transporting and washing the heterogenite: transport 50-150 Fc per 50 kg bag, washing and sorting 100-150 Fc/50 kg bag. “People from Mulumbu worked more than us. They participated in the digging and have made important profit out of the mining”.
Animals	Goats, hens, ducks.
Hunting/Fishing	One villager fishes with a net in the Dipeta. Hunting *shimbiriki*, *mamanambao*, *tungumba*
Gathering	Mushrooms (*buyoka*), charcoal, honey, grass, fruits: *tusongole*, *Fungo*, *masuku*, *Pundu*, caterpillars *masese*(sw) (general), and *tukotu*(sg), *Ntete* (grasshoppers), various medicinal plants.
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Environmental services come to check if people have dug latrines, cleaned around the house, and collect taxes on alcohol 200 Fc per batch.
Roads	The road is maintained by TFM.
Prices (harvest → lean season	2003/4 maize low: 100 Fc→ high 400 Fc; beans low: 500 Fc → high 700 Fc 2004/5 maize low: 150 Fc→ high 700 Fc; beans low: 600 Fc → high 1200 Fc
Local organizations	Soccer team participated in a tournament among local villages; various mutual aid schemes for agriculture.
Sacred sites	No sacred sites in the village itself, only in Kwatebala.
Archeology	Near the Momvya (Mofia) River: rocks carved as tables and chairs.
Cemeteries	A communal graveyard 750 m south of Mulumbu, which serves Mulumbu, Amoni and Kiboko. In an area that may directly be impacted by the project (UTM 35L 413106-8831509).



6.27 Amoni

Main meeting January 17 2006, with 62 people: 35 men and 27 women.

Village established in 1985 by Amoni, who came from Mwela Mpande. He had left his original village due to infighting. The village existed before Mulumbu was created.

The village has a mill and a video club both owned by villagers.

- *Questions and Issues*

Employment. – The village chief is afraid that most of the employment will go to people from Fungurume. TFM recruits in Mulumbu and Fungurume, not in our village. GK: we'll try to propose better sharing of the available jobs between the villages in the concession area. Women: we want not only that our husbands find jobs, but also jobs for ourselves, as women can handle many kinds of light work.

Information. – We have no idea about what is happening in the area, like for the oxen animal traction project of Lukotola. We have the impression that we do not exist in your eyes, Why? GK: there will be a Community Liaison Officer (CLO) who will visit your village regularly to keep you informed.

Relocation. – We still see the brown and yellow stakes in the concession area. Does this mean that our village will be relocated? Gk: no, not villages but possibly individual farmers. No new villages will be created in the project concession area.

Agriculture and animal traction. – Is the animal traction project a private or communal project? GK: In Kasanga it's a communal project. Q. We prefer to work on our own, not in groups. GK: Developmental programs ask for a lot of village participation in order to succeed. The animal traction program is carried out by the mission.

Agricultural inputs. – Q. We want fertilizers and seeds and are ready to reimburse their cost. GK: The team notes but important organization is necessary to provide such things so that all villages in the project area can benefit from it.

Education. It is, for instance, easier to ask for participation from TFM with a school if the village has already built the walls with baked bricks, and only roofing is needed. Q. Do we always have to pay (in-kind) school fees for our children? GK: Probably yes, such is the case in most countries in the world.

Health. Q. Our first priority is health, we do not eat good enough that's why we are often ill.

Water. Q. --> We have seen white people that came looking for water. What was that all about? GK: testing of the water to make sure that the project would not have negative impact on the quality of the drinking water. Q. --> what is the best water for drinking water. GK: probably, in order, drilled well, protected source, unprotected source, deep open well, surface water.

Transport. Q. Project cars never stop to pick us up, not even for medical emergencies. GK: it's forbidden and drivers lose their job if they carry passengers.

Informal mining.- Villagers that participate mainly in transporting heterogenite on their bicycles. Roadblocks with TFM (=mines) police were a nuisance and asked money from heterogenite transporters as well as from peaceful villagers. We thought that after the end of the informal mining everybody would find jobs in TFM, and this is not the case. We have now lost the income of the informal mining, and no food left as the village did not produce enough last year. Money earned from informal mining serves no purpose, as it simply disappears through squandering. It just helped us with resolving some daily problems, like buying salt, fish or oil; Only the "bosses" of the mine, who bought our heterogenite seem to have profited from the activity.

TFM military. – The TFM mines police steals maize from our fields.

- *Village issues*

Chiefs. – The population of Amoni does not recognize Mulumbu as a chief (village chief or CdT) of this village. However, both Mapasa, the chief of Tenke, and Mwela Mpande, the recognized CdT, consider that Amoni is only a quarter of Mulumbu, with a lower grade chief, a "*Kapita*".

Sacred Site. – One sacred tree was identified near the local water well, north of the village. The spirit of the tree may be transferred to another place if necessary. Many things are taboo near the water: to bath, to wash black pots, and others that only our village chief (absent) knows. The sacred tree is also part of the yearly agricultural rituals: the villagers will give samples of seeds, the chief will pray next to the sacred tree and than take the seeds to a crossroads and then throw the seeds to the four directions towards the fields.

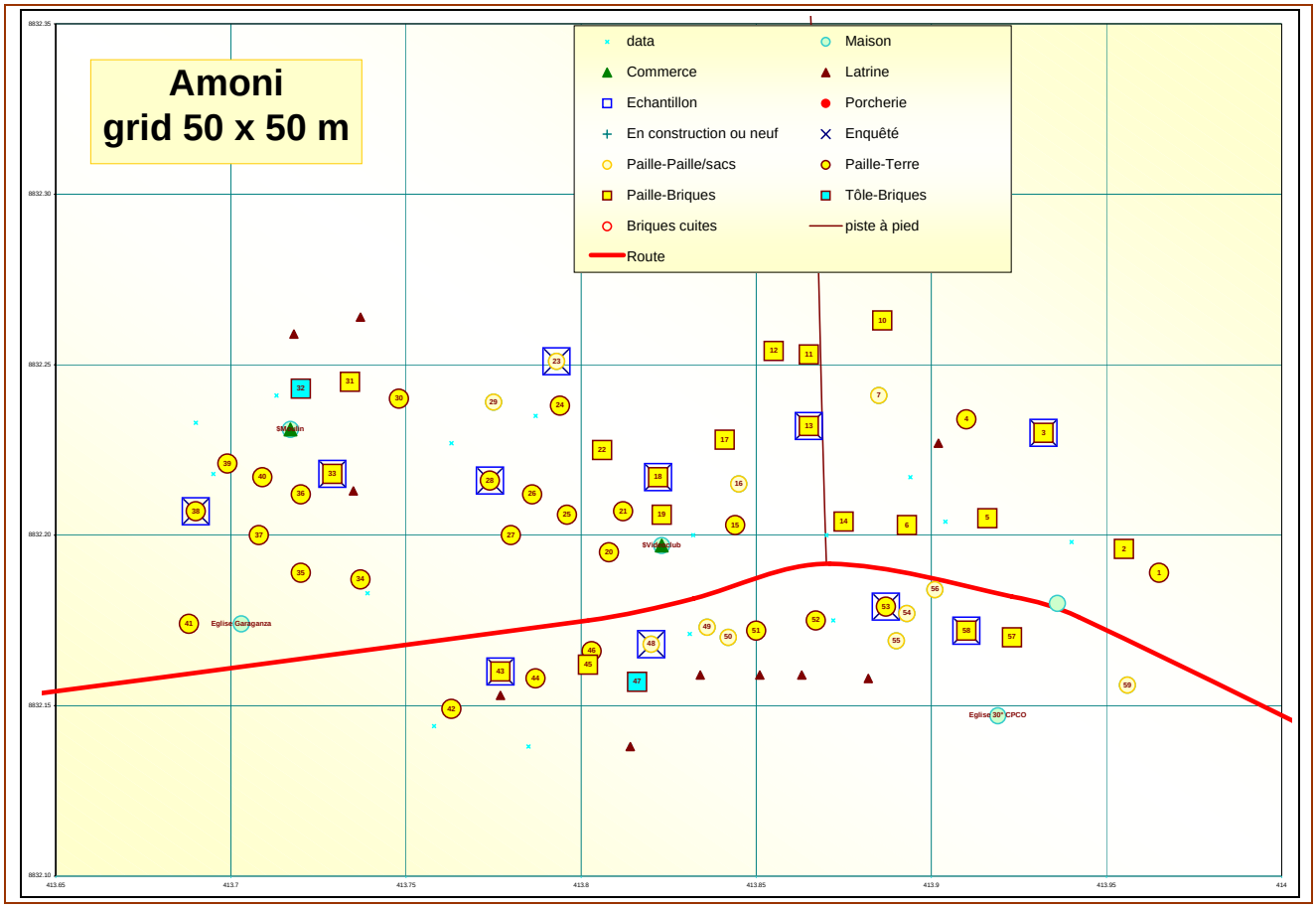
Village limits. – East: Kiboko (the limit is a tree *kaminimu lushama*); west Mulumbu (limit: bend of the road); south: Kwatebala Gare, an undefined bush area is the limit; North: bush area with small hamlets such as Kabulumbu (not seen) and Kiyangu).

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande	Mwela Mpande	Not Mulumbu, according to most people
Chef de poste	Mapasa Mbuya	Tenke	
Chef de quartier	Tshifanga Jean	Amoni	
Secretaire chef de quartier	Umba François	Amoni	
Chef de Amoni	Lumuna Lwimba	Amoni	Not met, was in the field, considered to be a *Kapita* not a village chief by both the *Chef de poste* Mapasa and by Mwela Mpande.

Characteristic	Description
Population	59 compounds, Est. 266 people, 13 migrant families.
Ethnic groups	Sanga mainly with minorities of Lubakat, Tshokwe and Ruund
Languages	Sanga and Swahili, little French
Religion	Catholics, Methodists, Pentecostals. 2 churches.
Housing	Walls: 19% straw, 44% mud, 37% mud brick, 0% red bricks; Roofs: 97% straw, 3% aluminum.
Water	A traditional well near the village, the source of the Diyenge River.
Electricity	No electricity, but two generators for the video club (Entry is 100 Fc /adults and 50 Fc for children).
Fuel for cooking	Firewood (mainly) and charcoal.
Radio	National radios: Okapi; International radios listened to RFI, Zambia, VOA, BBC
Television	None
Cell phone	Vodacom, Celtel, in some spots of the village only.
Distances	Mulumbu 1 km, Fungurume 18-19 km, Tenke 9 km
Education	No village school. The children got to Mulumbu. A child in a primary school[26] costs 5.550 Fc/per annum in money (inscription, uniform and school supplies) and 15 meka of maize for tuition. Many families do not have the money to end their children to school. A few children attend secondary education in Fungurume. One has tried to pass the final examanitaion last year.
Health	Nobody has even Red Cross training. If medical care is needed, people go to Mulumbu (private nurse who is too expensive) or preferably to Fungurume: CS Dipeta, and the private clinic of Justin. Surgery is available in Fungurume, or – if more serious – in the Gécamines hospital of Kakanda.
Commerce	Video club, 1 "etalage" (small shop), maize mill (cost 45 Fc/meka milled or 1-2 cups/meka, according to season), carpenter.
Transport	No transport in the village, only bicycles. At harvest time trucks come to buy maize and beans. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity. Most cultivated are (1) maize, (2) beans. Soy beans, cassava and peanuts are rarely grown. Best sold are (1) beans; (2) maize. ("beans are the dollars of the village"). Fields are to the north and to the south but always close to the village, mostly less than 15 minutes walking. Fruit trees: citrus trees, guavas, papaya, mango trees.
Informal Mining	Our village did not participate in informal mining or the washing of the heterogenite, but young men helped with transport. We were expecting employment in return of our good behavior.
Animals	Goats, hens, ducks, pigeons, dogs.
Hunting/Fishing	No fishing. Some hunting with snares, dogs, lances: towards the north.

[26] This is a theoretical amount, as most parents do not buy uniforms, and very little school supplies.

Characteristic	Description
Gathering	Mushrooms, charcoal, honey, grass, fruits: *musuku*(sw), *fungo*(sw), *pondu*(sw).
Government services	Vaccinations (polio, vitamin A and de-worming) are distributed in the village. Environmental services come to check if people have dug latrines, and cleaned around their houses.
Roads	The road is maintained by TFM.
Prices (harvest → lean season	2003/4 maize low: 100 Fc→ high 450 Fc; beans low: 400 Fc → high 650 Fc 2004/5 maize low: 400 Fc→ high 650 Fc; beans low: 450-500 Fc → high 1200 Fc
Local organizations	Only a soccer team: Amoni sport, there is a soccer field in the village., *Saving groups*: maybe, but if so, people will participate secretly, they do not want those things to be known. Agriculture: only the *mbilé* invitational groups. Parents education: together with Mulumbu. Choirs for the churches.
Sacred sites	The village chief has his ceremonial hut "*miyombo*" in the village, where he performs rituals in case of diseases or lack of rain. A sacred tree next to our water source, who protects the water supply.
Archeology	There exist caves but they are located north of the Mofia River, near the Diyenge River.
Cemeteries	A communal graveyard 750 meters south of Mulumbu, which serves Mulumbu, Amoni and Kiboko. In an area that may directly be impacted by the project (UTM 35L 413106-8831509).



6.28 Mulumbu Mutombo

North of Amoni there exist a small road that crosses various hamlets and one village:

- Kyoni is a small hamlet that appears to be part of Mulumbu, and in which a former personel's chief of SMTF and Trabeco lives most of the year in a permanent house since he was given the land in 1988 by Mulumbu Kazadi. His sons live there only during the agricultural season.
- Muzuri appears as a non-permanent rainy season camp, with just one family living there: Kipanga Muzuri Kwabo).
- Mulumbu Mitombo, the most important village whose chief is Mulumbu Mutombo (=Mutombo Marchal).

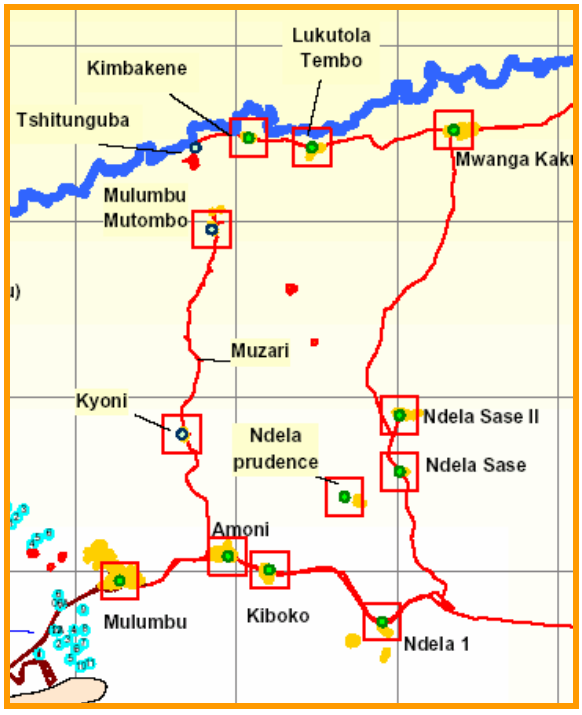
There are at least three commercial farms in the area: Mungabibwa, Diséle (name of a river) and Kalebi (name of a river). Each of these farms uses contract laborers.

The village Mulumbu Mutombo was established in 2004 (or 2005) by workers from the nearby commercial farm of Kalebi. The chief is considered a permanent chief, who pays allegiance to the Mwela Mpande chef de terre, but also shows his importance by having a ceremonial hut behind his dwelling. The latter is the most obvious sign of the permanent status of the village.

Five permanent families and, according to the chief, at least 25 transhumant families live in the area, but 11 families were counted in the village itself on the day of our visit, of which 10 insisted that they lived permanently in Mulumbu Mitombo. All of the dwellings are still built from straw, but the plan is to build permanent dwellings "when the time is right".

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande	Mwela Mpande	Not Mulumbu, according to most people
Chef de poste	Mapasa Mbuya	Tenke	
Chef de quartier	"georges"	Mulumbu Mutombo	
Chef de Mulumbu Mutombo	Mulumbu Mutombo (=Mutombo Marchal)	Mulumbu Mutombo	11 families, or 50 people in the village, 10 families say they are permanent.

The red spots on the map below show the areas where dwellings can be recognized on the satellite photo. The grid is 2 x 2 kilometers.



The village is more heterogeneous than most others: 5 Sanga families, 3 Lubakat, 1 Ruund, 1 Bemba and 1 Tshokwe.

6.29 Kyoni

Kyoni[27] is a small hamlet that appears to be part of Mulumbu, and in which a former personel's chief of SMTF and Trabeco lives most of the year in a permanent house since he was given the land in 1988 by Mulumbu Kazadi. His sons live there only during the agricultural season.

Mr Kyoni does not want to relocate, as he is very satisfied about the quality of the agricultural land (good fertile black soil that does not need fertilizer), the quality off the drinking water, and the proximity of the road.

The hamlet has about 35 hectares of agricultural land, of which 20 hectares are used by Mr. Kyoni. He used to use oxen (obtained from the Lukotola mission) on his fields, but said that he lost them twice, through accidents and illnesses. Though he admits that it is not easy to keep oxen, he is planning to buy a new pair shortly. Three other families (relatives of Mr Kyoni) live in the area, but they each have a house in Fungurme, and live in Kyoni only during the agricultural season.

Informal mining. As Mr Kyoni is a big farmer, he normally uses contract laborers which were difficult to find, when Mulumbu was mining the heterogenite. In spite of this, the opinion in the hamlet is relatively positive: "not bad, it allowed young people to earn some money, and it allowed us to sell our agricultural products on site and against a good price".

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwela Mpande	Mwela Mpande	Not Mulumbu, according to most people
Chef de poste	Mapasa Mbuya	Tenke	
Chef de Kyoni	Mulumbu Kazadi	Mulumbu	

[27] Spelling: not clear if it's Kioni or Kyoni.

6.30 Kimbakene

Short explanation of the project with GK on January 23. Main meeting with JK on February 09 2006 with 9 people: 8 men and 1 woman.

The foundation date of the village is unknown. The deceased chief, Kimbakene, has not yet been replaced, and Kalemba Kikunta acts as chief.

- *Questions and issues*

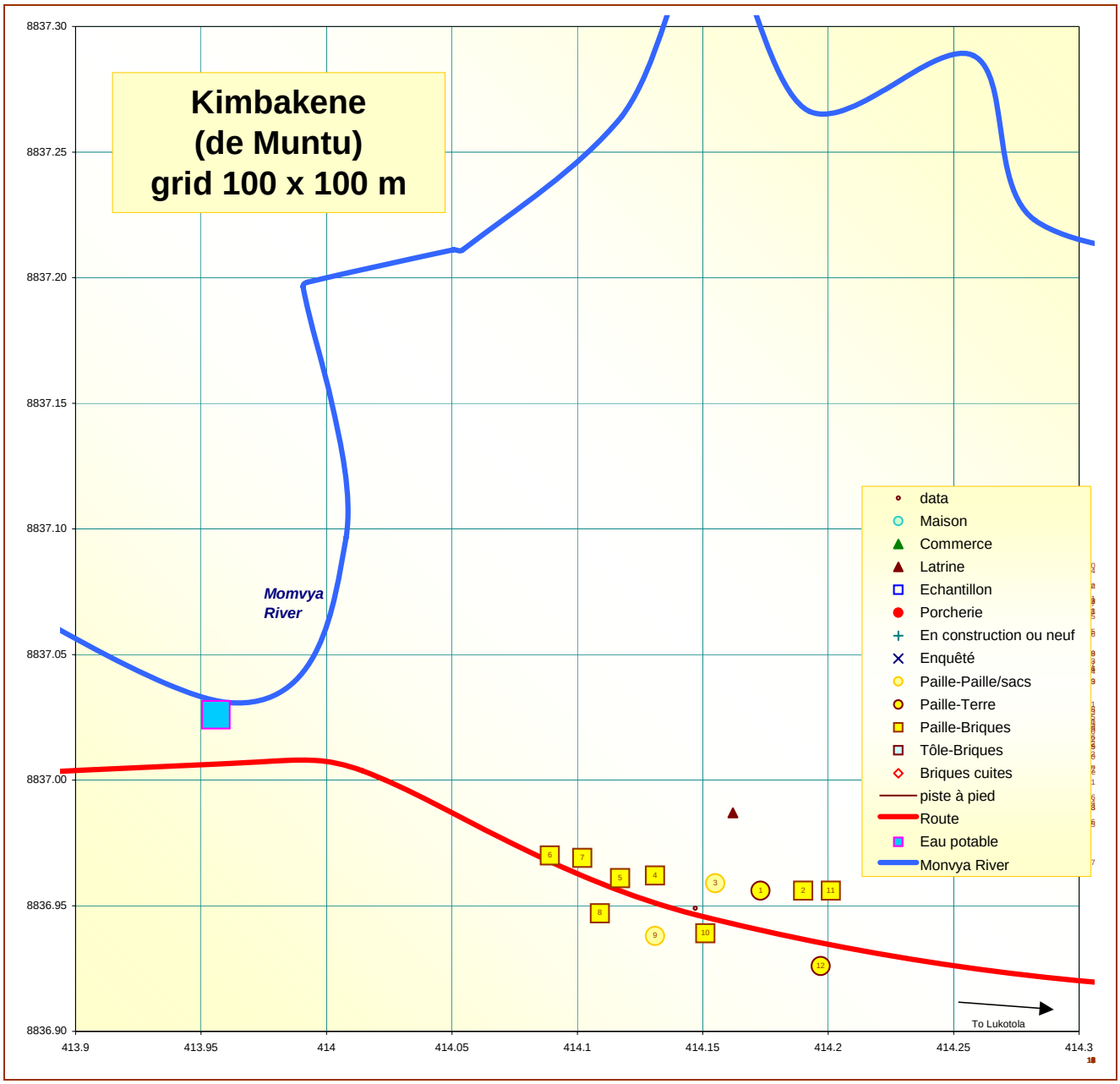
A short explanation of the project resulted in questions about employment and agricultural development: as the project has not yet started, can you provide the village in the meantime with seeds for market garden crops, Irish potatoes and fertilizer for maize.

Women- Ask for assistance with acquiring reading and writing skills, general education (a school in the village) and a hospital.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Tenki (DCD).	Tenki	Died, no successor has yet been found
Chef de poste	Mapasa	Tenke	
Chef de village	Mpanda Nkumba I	Fungurume	Called the chef de quartier
Representative of Chef de village	Kalembe Kikunta	Kimbakene	

Characteristic	Description
Population	12 compounds, Est. 54 people
Ethnic groups	Majority Sanga
Languages	Sanga, Swahili
Religion	Catholics, Pentecostals, church in Lukotola.
Housing	Walls: 17% straw, 17% mud, 67% mud brick, 0% red bricks; Roofs: 100% straw.
Water	Directly from the Momvya River, does not dry up and is usually dirty
Electricity	No electricity
Fuel for cooking	Firewood for cooking only during the dry season, occasionally charcoal.
Radio	National radios: Okapi only no FM radio; International radios listened to are Zambia and Tanzania. People listen to music and news broadcasts.
Television	None
Cell phone	None
Education	No village school. Primary school in Lukotola, no children in secondary school.
Health	No health structures, no villagers with some health training. Basic health care in the Lukotola dispensary, more difficult cases are treated in Fungurume and in Kakanda.
Commerce	No mill, no trade, a small market in Lukotola, other goods and services in Fungurume. Presence in the village of a few technicians: a maintenance mechanic, a driver/mechanic, a welder and a teacher who works in the Lukotola school.
Transport	The station in Tenke is 15 km from the village, in Fungurume 22 km. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000-1,500 Fc, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity. (1) Maize, (2) beans (3) Soy beans, (4) Irish potatoes. Best sold are beans, maize, and maize from the marshlands.
Informal Mining	No information provided.
Animals	Only poultry.
Hunting/Fishing	Fishing in the Mofia River, for domestic use and sometimes sale. Hunting for domestic consumption (near the Mofia River: castors, kasha (antelopes), samba (varan), kangomba (??).
Gathering	
Government	ANR: to arrest recalcitrant villagers, Police: to arrest marauding animals, environment: to collect taxes from

Characteristic	Description
services	the nearby farm of Kalebi, vaccinations (polio, vitamin A and de-worming), population census, “état civil”.
Local organizations	None, only few people practice mutual assistance in farming.
Sacred sites	Kalebi River, an affluent of the Mofia River (Momvia River) is used during the enthroning ceremony of the new chiefs the exact site is called “Kyowa”.
Archeology	The village indicated no such sites.



6.31 Lukotola Tembo

Initial meeting with GK on January 28 with about 20 villagers, for explanation, QandA. Main meeting February 09 2006, with 11 people: 7 men and 4 women.

The village has been founded in 1954 by Lukotola Sengelwa Maurice, a Kaonde from Kambove, who married a local Sanga girl from the chief's lineage. The present chief, Lukotola Tembo (born as Kasongo Tembo) is the eldest son of the first chief. The village is inhabited with relatives of the first settlers, and does not accommodate transhumant farmers from other areas.

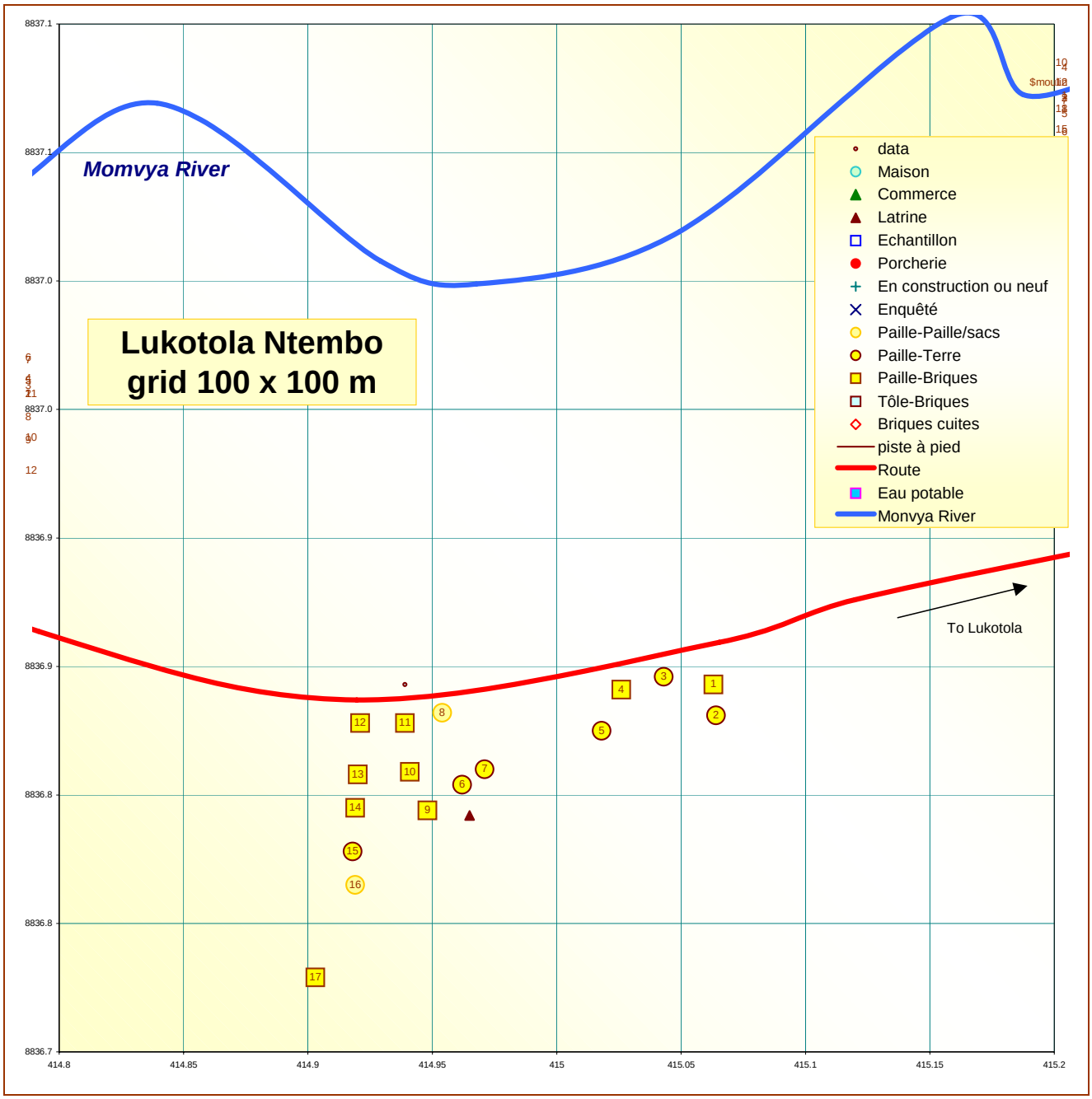
- *Questions and issues*

A short explanation of the project resulted in questions about employment and agricultural development.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Lukotola Tembo (=Kasongo Albano)	Lukotola Tembo	
Chef de poste	Mapasa	Tenke	
Chef de village	Lukotola Tembo (=Kasongo Albano)	Lukotola Tembo	Same as the CdT

Characteristic	Description
Population	17 compounds, Est. 77 people, all permanent
Ethnic groups	All Sanga
Languages	Sanga, Swahili
Religion	CEM (Pentecostals, church in Mwanga Kakunta) and Catholics, (church in Lukotola)
Housing	Walls: 12% straw, 35% mud, 53% mud brick, 0% red bricks; Roofs: 100% straw.
Water	Water is drawn directly from the Mofia River, which is considered clear drinking water but becomes dirty during the rainy season.
Electricity	No electricity
Fuel for cooking	Charcoal is used for cooking.
Radio	Okapi only no FM radio; International radios listened to are Vatican, Zambia, the, Voice of Germany. People listen to news broadcasts. No national radio.
Television	None
Cell phone	Cellphone in some parts of the village, Vodacom not. Two people own cell phones.
Education	No village school. The first two years of primary school are in Mwanga (2 km), older children go to Lukotola (4 km). Two of the children are in secondary education.
Health	No health structures, no villagers with some health training, no trained midwife. Basic health care is available in the Lukotola dispensary; more difficult cases are treated in Fungurume and in Kakanda.
Commerce	No mill, no trade, except an occasional small stall during the dry season. The Lukotola market is expensive, people prefer Fungurume. There is one trader in the village.
Transport	Similar to neighboring villages. The station in Tenke is 15 km from the village, in Fungurume 22 km. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,000-1,500 Fc, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity, few marshland for out of season crops is available.
Informal Mining	No information
Animals	Only poultry
Hunting/Fishing	Fishing: with angle and rod in the Momvya River. Hunting: one villager hunts with dogs (various rats, antelopes, porcupine, antelopes, squirrels, castors) but mainly for home consumption.
Government services	Environment: to collect taxes for animal traction, mill, vaccinations (polio, vitamin A and de-worming).
Roads	The road is in poor repair.
Local organizations	Mutual aid in agriculture only.

Characteristic	Description
Sacred sites	Busodi: the ceremonial hut of the chief, which is also his daily kitchen of the chief. Nobody is allowed to enter this place, except a specially initiated woman. Chiefs only consume food that is prepared in this hut. *Muyombo*: a tree planted for rituals: planted it will bud the next day to confirm that the ancestors have accepted the new chief. Caution: it is possible to visit the hills, but in order to mine, authorizations of the CdT are necessary, and specific rituals have to be performed.
Archeology	Caves called “Kyamakela” are present near the banks of the *Disokila* River (stream), 600 meters south of the village. Sanga hid in these caves during the M’siri wars of the mid 1850s. There are bones and other remnants of human occupation in this cave.



6.32 Mwanga Kakunta

Initial meeting with GK on January 28 with about 20 villagers, for explanation, QandA. Main meeting with JK on February 09, 2006 with 44 people: 25 men and 19 women.

The village was founded around 1954 by Mwanga (=Kakunta Bwengo Antoine), who came from Bunkeyia (200 kilometers east) and married a local Sanga girl. This chief died in 1967/8 and was succeeded by the present chief Mwanga Muyaka.

The influence of the Mission from Lukotola is visible through the important number of houses that are built using baked bricks, promoted by the missionaries as a durable solution: about one-quarter of the houses have an aluminum roof and brick walls. It's the second best village for housing with Kilusonsa, just after the village of the Lukotola. The village has a primary school for the first two grades, after which children attend in Lukotola.

- *Questions and issues*

Employment. – You say that temporary laborers are drawn through a lottery system. When will the recruitment lottery be in our village? Will there be work for women?

Development. – Developmental action will probably favor those villages that are closest to the project facilities. R: Maybe a little bit but our team thinks that it's important to develop the whole area of Tenke – Fungurume as well as all the villages in-between. The populations chose a hospital and a school as their first priorities, followed by electricity (for the men) and clean drinking water (for the women).

Agriculture. – We need help with fertilizer, improved seeds. There is still plenty of land available around our village.

Chiefs. – There are two chiefs: the main chief Kitambo Muyaka[28], and a second chief Kyamadingi[29].

- *Women's observations concerning development*

Main problems in the village. – Low agricultural production, clean drinking water, hospital with a maternity.

Priorities of the village. – Agricultural assistance with seed and fertilizer, organizing the community: "encadrement", hospital.

Priorities of the women. – Agricultural assistance with seed and fertilizer, organizing the community, employment in a company.

Priorities of individual development. – Education, employment, money.

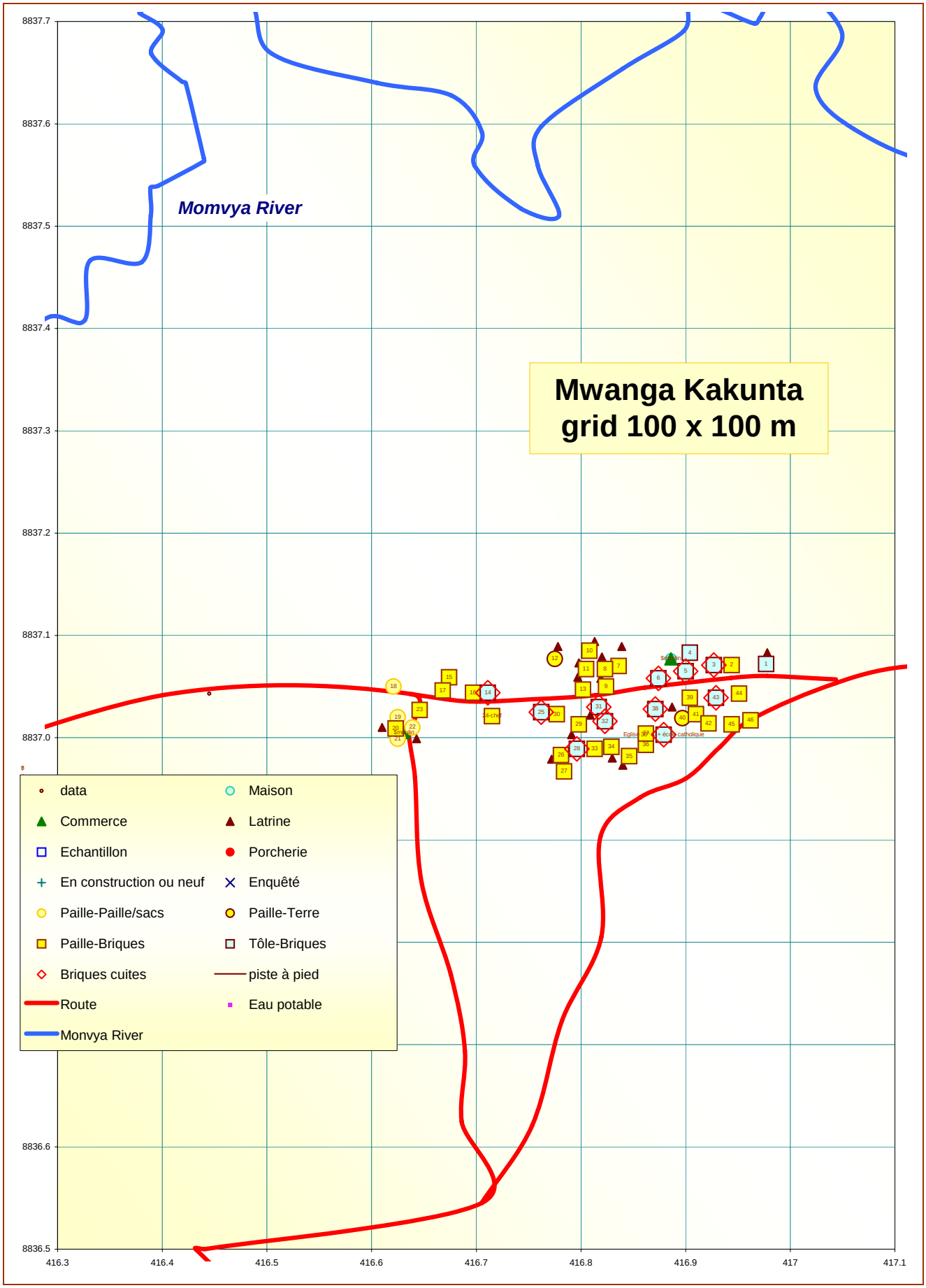
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mwanga Kakunta	Mwanga Kakunta	
Chef de poste	Mapasa	Tenke	
Chef de village			
Representative of Chef de village	(1) Kitambo Muyaka (2) Kyamadingi	Mwanga Kakunta	There are two chiefs in the village

Characteristic	Description
Population	46 compounds, Est. 207 people.
Ethnic groups	Majority Sanga, and a few Kaonde.
Languages	Sanga, Swahili
Religion	CEM (Pentecostals, church which also serves as a school, built with baked bricks and cover with aluminum sheets) and Neo-Apostolics, (church in Lukotola).
Housing	Walls: 9% straw, 4% mud, 64% mud brick, 23% red bricks; Roofs: 26% aluminum, 76% straw.
Water	Water is drawn directly from the Kampekete River, quite far from the village, which is considered not drinkable though clear water, which becomes dirty during the rainy season.

[28] Confusion about the satus of this chief as the successor of the initial Mwanga Kakunta.

[29] Information form other sources indicates that Kyamadingi is the main chief of the village.

Characteristic	Description
Electricity	No electricity
Fuel for cooking	Only firewood
Radio	International radios listened to are RFI, Zambia, Africa #1, the Voice of Germany. No national radio. People occasionally listen to news, training programs and top music.
Television	None
Cell phone	Celtel in some parts of the village, but with difficulties, Vodacom not. Nobody owns cell a phone.
Education	The village school is in the church building, since 5 years, and covers the first two years of primary, older children go to Lukotola (2 km). Several of the children are in secondary education in Lukotola.
Health	A nurse, a Red-Cross trained villager, and 2 trained assistant midwives, though most women give birth in the health post of Lukotola. Basic health care is available in the Lukotola dispensary; more difficult cases are treated in Fungurume and in Kakanda.
Commerce	Two mills, no trade, except an occasional small stall during the dry season. Presence of a tailor, a carpenter, a driver and a schoolteacher. People do their main daily shopping in the Lukotola market.
Transport	Similar to neighboring villages. People mainly use (rented) bicycles or go on foot.
Agriculture	Agriculture is the main activity; people use both animal traction and manual labor. Few marshland for out of season crops is available.
Informal Mining	No information
Animals	6 people in the village individually own a pair of oxen. Pigs, goats, hens, ducks, dogs, all local animals are raised in the village.
Hunting/Fishing	Fishing: with angle and rod in the Momvia River for local use. Hunting: villagers hunt north of the village with dogs and some with rifles mainly for home consumption.
Government services	Environment: to collect taxes for animal traction, mill, controls the presence of latrines, the cleanliness of the village. Taxes are collected for the oxen present.
Roads	The road is in poor repair. The road is used by agricultural traders, and the Catholic nuns from Kansenia.
Local organizations	Mutual aid in agriculture is practiced. There is a parent-teacher organization, a church choir, a soccer team. The oxen kept in the village are privately owned.
Sacred sites	Kalebi River, an affluent of the Mofia River (Momvia River) is used during the enthroning ceremony of the new chiefs “Kyowa”. It’s far (two days walking) to the north. The Kyowa has been explained in other villages, but it’s not always sited in the same area.
Archeology	Caves are present (1) near the Kampekete River (stream), 500 meters to the west; (2) near the Sase River: the Sase Hill: it never rains Ion this hill, at the entry of the cave.


Momvya River
Mwanga Kakunta
grid 100 x 100 m
8837.7
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416.8
416.9
417
417.1
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable
Monvya River

6.33 Mpanga Ntadi

Main meeting with JK on Febrary 09 2006 with 8 people: 5 men and 3 women.

The village has existed since 1981, and was founded by a former inhabitant of Lukotola. The village existed before on another site since about 1954 by Kakunta Bwengo Antoine[30], Mwanga Ntadi, born as Kakunde Ngiayilashi. The present chief, son of the founder, is Mpanga Ntadi formerly known as Kakunde wa Kakunde.

- *Questions and issues*

Agriculture. – We want to develop our agriculture from a hoe based agriculture to a more performing one.

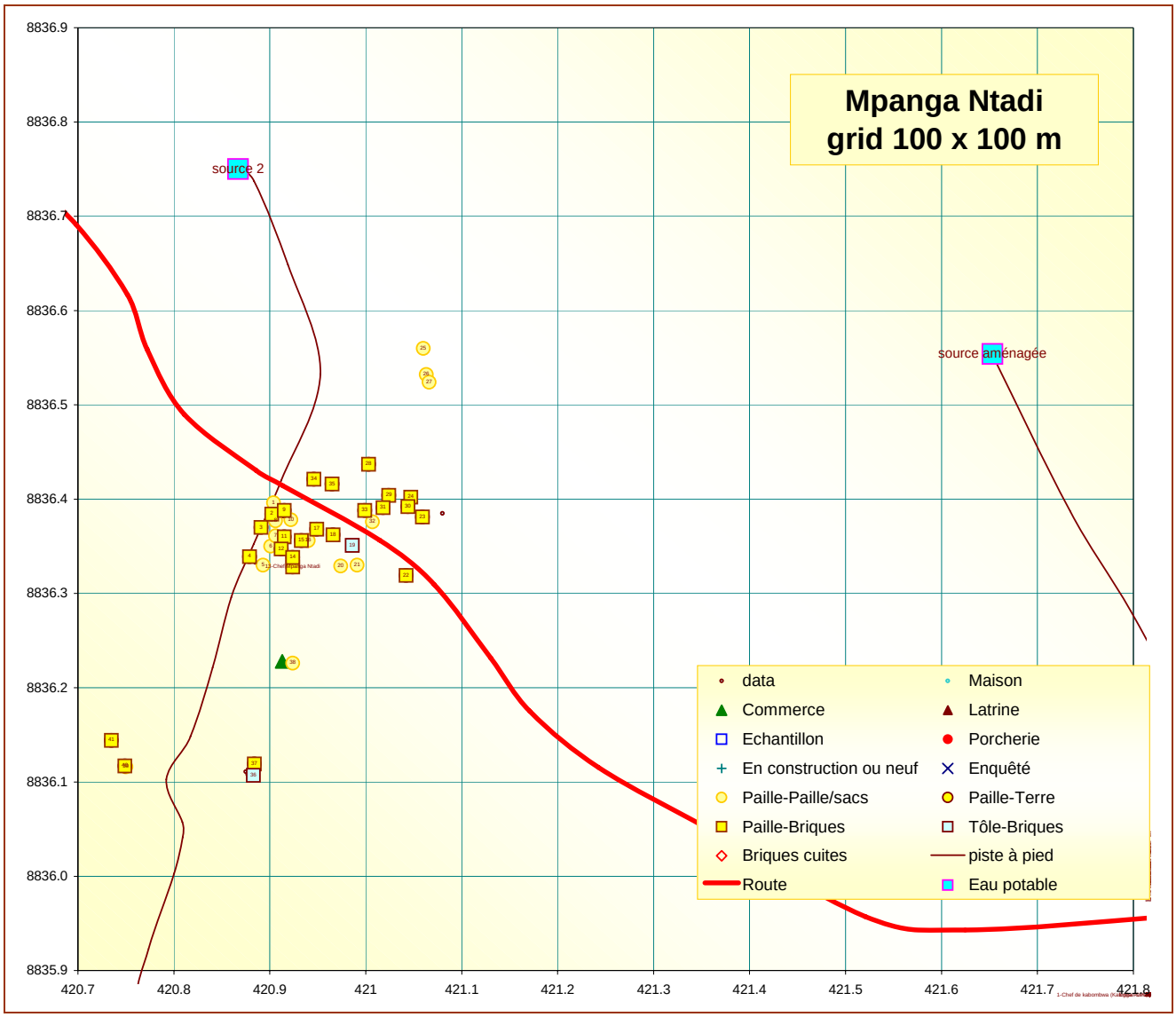
Oxen. – We want help from TFM with the oxen provided by the mission of Lukotola: the oxen centre does not always have the necessary medicines and equipment, and we have to pay their services which are too expensive for us.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Kamungu Mulolwa	Kamungu Mulolwa	Check
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Mpanga Ntadi (Kakunde wa Kakunde)	Mpanga Ntadi	Check si kapita

Characteristic	Description
Population	41 compounds, Est. 185 people, includes 16 families of transhumant farmers.
Ethnic groups	Majority Sanga, 2 Luba , 2 Tshokwe, 1 Ndembo
Languages	Sanga, Swahili
Religion	Catholics, Pentecosts, Tabernacle (Protestant), churches in Lukotola and Fungurume.
Housing	Walls: 36% straw, 0% mud, 64% mud brick, 0% red bricks; Roofs: 5% aluminum.
Water	There is a traditional well (source) of the Kasolondo River. An improved well is present on the Tshinyama River, which is also used by the neighboring village Tshinyama.
Electricity	No electricity, but the electricity line to Lukotola passes through their village.
Fuel for cooking	Firewood only.
Radio	National radios: Okapi only no FM radio; International radios listened to are Zambia, Congo Brazzaville, VOA, Tanzania. People listen to music and news broadcasts.
Television	None
Cell phone	Vodacom in some places near the Mbeba quarry. 1 villager owns a mobile telephone.
Education	No village school. Most children go to Lukotola. Two older children remain in Fungurume in the Lupeto boarding school.
Health	No trained medical personnel present. If medical care is needed, people go to Lukotola.
Commerce	No mill, one food stall. Peddlers come during the harvest season. Shops in Lukotola and Fungurume.
Transport	Trucks from Lukotola, Fungurume, TFM, Kalebi commercial farm, and from the Kasai pass to buy maize and beans during the harvest season. From Fungurume, transport to Kolwezi is 1,000 Fc to Likasi 1,000 Fc, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity. Surface area: (1) maize, (2) beans (3) soy beans (4) sweet potatoes. For selling most important are: (1) beans, (2) maize (3) soy beans (4) sweet potatoes.
Informal Mining	
Animals	Goats, hens, dogs for hunting
Hunting/Fishing	Fishing in the Momvia (Mofia) River for local consumption (net, line). Hunting of small animals
Gathering	

[30] During the interview with GK: the village says it was founded in 1984, during the interview with JK in 1954.

Characteristic	Description
Government services	Environment service checks the cleanliness and the presence of latrines in the village. Vaccinations (polio, vitamin A and de-worming).
Roads	
Local organizations	Rotating mutual assistance groups (*kinkurimba*) are popular to boost agricultural production, also Mbilé where people are invited and paid with food and drinks.
Sacred sites	Mukondo R. (North of the Mofia River): forbidden to fish with a dam; Lubanga River. site for the ritual for the success of the harvest (in September, after the first rains). The Kamunugu chiefs and their offspring are not allowed to cross the Kibamba River[31].
Archeology	Cave in the Mbeba Hill, in the concession area where bats excrements are taken that are used as fertilizer. Kyamakela. Where victims of the wars between Msiri and the Sanga around 1870 are buried.
Cemetery	In the village Lukotola.



[31] In another interview, it was said that the chiefs and their offspring were not allowed to cross the Mukondo River.

6.34 Kinyama

Initial meeting with GK on January 28 with about 10-15 villagers, for explanation, QandA. Main meeting with JK on February 02 2006 with 25 people: 15 men and 16 women.

The village has been founded in 1985 by Mukekwa Matenta a former teacher in Fungurume, who pays allegiance to the Chef de Terre Kamungu Mulolwa. The village is inhabited by migrants from Fungurume, Kolwezi and Kapolowe. The village is also known under the name of Tsinyama.

- *Questions and issues*

A short explanation of the project resulted in questions about employment and agricultural development.

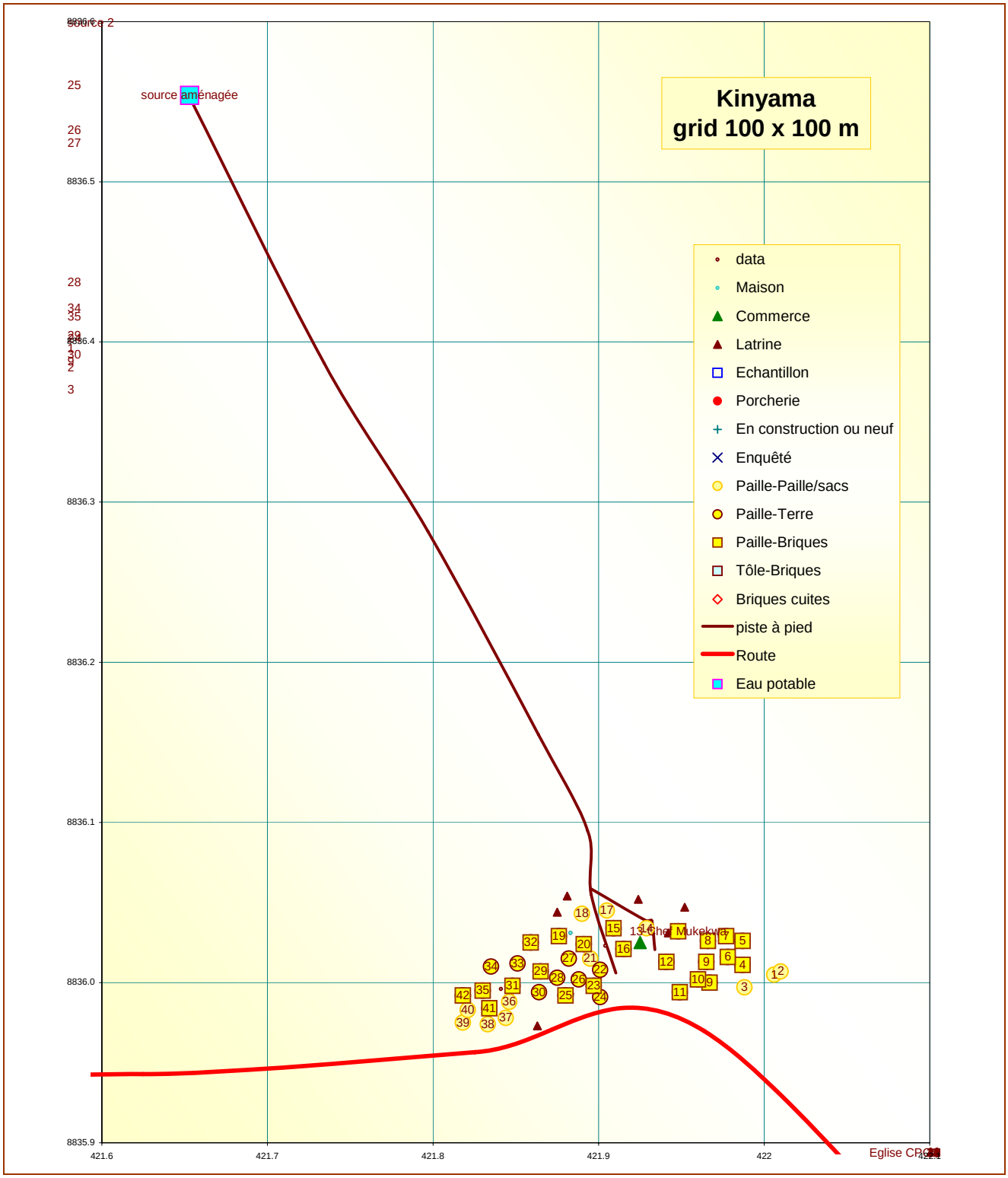
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de poste	Mapasa Jacques	Tenke	
Chef de terre	Kumungu Mulolwa	Kumungu Mulolwa	
Chef de village	Kumungu Mulolwa	Kumungu Mulolwa	CdT and chef de village are the same person
Representative of the Chef de village	Mukekwa Matenta	Tshinyama	Called the chef de quartier (kapita).

Characteristic	Description
Population	42 compounds, Est. 189 people, 21 transhumant families are included.
Ethnic groups	Majority Sanga, 2 Luba and 2 Tshokwe villages
Languages	Sanga and Swahili
Religion	Catholics, Basantu (animistic church), and CEM (Pentecostals),. Churces only in Lukutola.
Housing	Walls: 28% straw, 19% mud, 53% mud brick, 0% red bricks; Roofs: 100% straw.
Water	Cemented well with protected water available all year round.
Electricity	No electricity, no generators.
Fuel for cooking	Firewood for cooking, rarely charcoal.
Radio	No national radios International radios listened to are RFI, Vatican, Africa #1,Okapi, Canada, USA, Japan, RSA, Voice of Germany. People listen to music and news broadcasts, soccer games.
Television	None
Cell phone	Vodacom/Celtel. Difficult.
Education	No village school. The children go to primary school in Lukotola, and later to Fungurume.
Health	No trained health personnel are present, only a traditional untrained midwife. If medical care is needed, or for giving birth, people go to Lukotola, or if more serious to Fungurume, Kakanda and Likasi.
Commerce	1 mill, no trade, only peddlers during the harvest season. Some shopping is done in the Lukotola market.
Employment-positions	One person works for Trabeco, the village chief is an accessory judge[32] in Fungurume.
Transport	From Fungurume (14 km), trains, trucks and cars. Road is usable throughout the year.
Agriculture	Agriculture is the main activity. Main crops are maize, beans, soy beans, peanuts, sweet and Irish potatoes, onions and cassava. Best sold are beans, maize, soy beans and – a risky crop – onions. The fields are directly surrounding the village, and not further than 5-10 minutes walking away.
Animals	Pigs and goats forbidden as they destroy crops; only hens and dogs.
Hunting/Fishing	No fishing. One hunter with dogs and snares for capturing castors.
Government services	PNC (Police) can arrest people. ANR (Security) intelligence agency, a veterinary passes to vaccinate dogs for 3,000 Fc, bicycle owners pay 900-1,000 Fc/year. Children's vaccination campaign (polio, vitamin A, de-worming).
Local organizations	Rotating mutual assistance groups (*kinkurimba*); the creation of a development organization is underway, in order to participate in the Lukotola development program (health, animal traction). Women's church groups.

[32] Juge accesseur.

Characteristic	Description
Sacred sites	The cemetery of the chiefs, where people cannot farm at about 200 meters from the water well where the chief Kaulu Ngombo is buried[33]. The Mbeba (Bemba) Hill, cave with many bats and honey. Very dangerous to go there. Other information indicates that this is not a sacred site, but is used for hunting bats and gathering honey. Kapuba Hill: a hill near the limestone quarry, with a cemetery. Honey is produced, but those who go there without the chief's consent and prior rituals will disappear forever.
Archeology	No information
Cemetery	Kapuba Hill: a hill near the limestone quarry, with a cemetery.

[33] UTM Location of the waterwell : 421660 – 8836560 35L


Kinyama
grid 100 x 100 m
source aménagée
source 2
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable
Eglise CP
8836.5
8836.4
8836.3
8836.2
8836.1
8836.0
8835.9
421.6
421.7
421.8
421.9
422

6.35 Kabombwa

Initial meeting with GK on January 28 with 18 villagers, in Kamungu, for explanation, QandA- Main meeting with JK on February 01 2006 with 27 people: 15 men and 16 women. Focus group meetings with 8 men, 7 youngsters (all men) and 9 women were conducted on January 28 and February 4, 2006.

Though Kabombwa and Kamungu Kitambo are only a few hundred meters apart, the former is part of the Fungurume site, while the latter belongs to Tenke. Kabombwa was founded in 1971 by Kitambala, who left nearby Kamungu in search of good arable land. The population has since become more cosmopolitan: Kamungu, Dilolo, Kansenia, Mutobo, Likasi. Many of the villagers are transhumant farmers. Construction is poor and more than half of the houses that are built with straw only, seem very temporary.

The village says that it has suffered, especially in 2003-4, from the presence of the military in the nearby camp Kasolondo, who have been responsible for stealing from their fields and this has prompted many people to abandon the village.

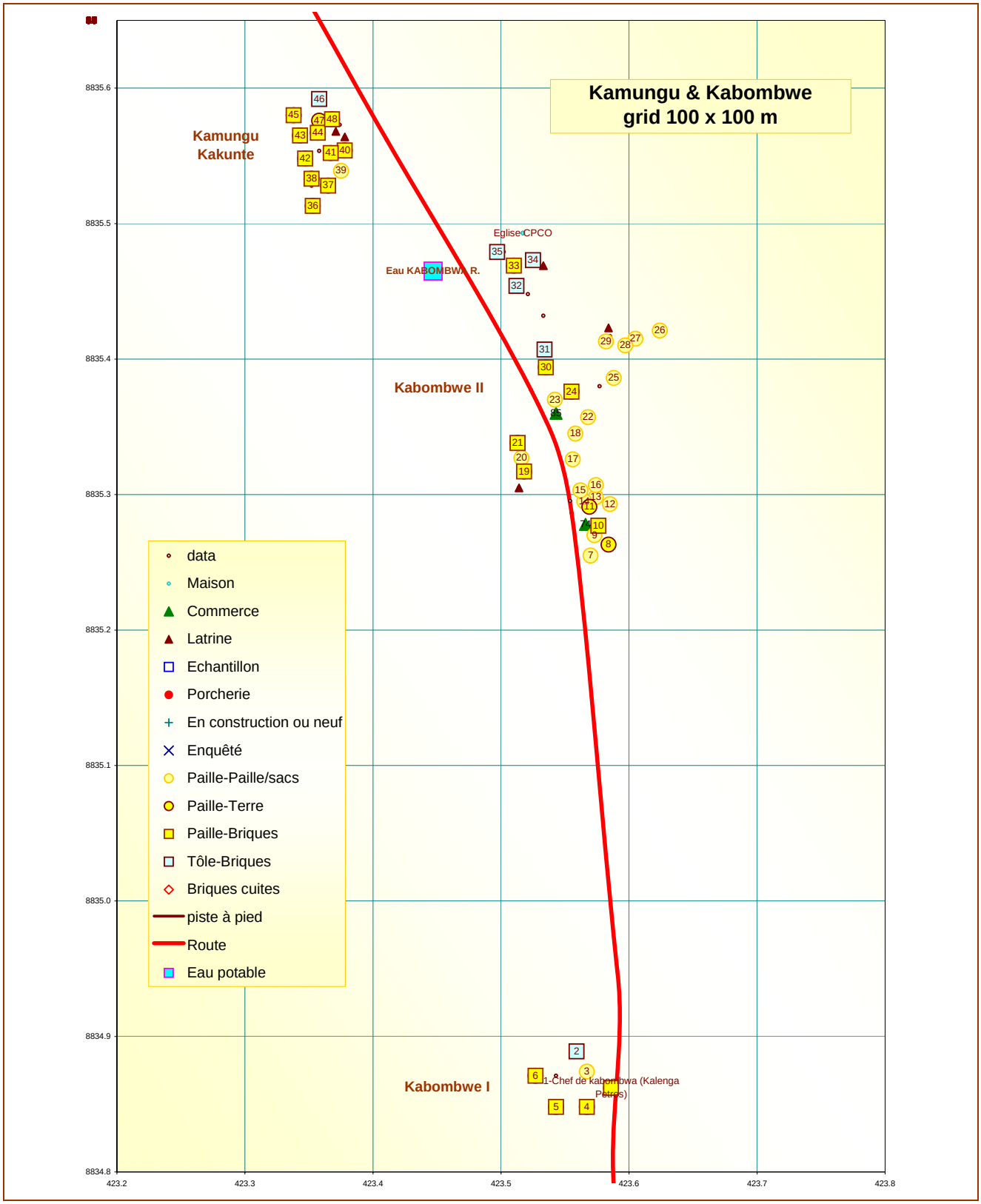
- *Questions and issues*

No specific issues were raised during the village interview with Julienne Kitoto, but concerns about agricultural development and employment were voiced during the focus group discussions in which men of Kabombwa participated.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de cité de Fungurume	Kapenda Lukeka François	Fungurume	
Chef de terre	Kumungu Mulolwa	Kumungu Mulolwa	
Chef de village	Kumungu Mulolwa (=Mialo Frédéric)	Kumungu Mulolwa	CdT and chef de village are the same person
Chef de bloc Qu. Dipeta	Sambwe Fridolin	Kabombwa	

Characteristic	Description
Population	35 compounds, Est. 158 people, 18 compounds are transhumants, all from Fungurume.
Ethnic groups	Majority Sanga, 3 Tshokwe, 1 from each Ruund, Luba and Kaonde
Languages	Sanga, Swahili
Religion	Catholics and Pentecostals, Methodists, a Pentecostal church, the others pray in Fungurume.
Housing	Walls: 51% straw, 6% mud, 43% mud brick, 0% red bricks; Roofs: 86% straw, 14% aluminum.
Water	Kabombwe River, in between Kabombwe and Kamungu. Dirty in the rainy season, little water during the dry season.
Electricity	No electricity
Fuel for cooking	Firewood, rarely charcoal.
Radio	National radios: Okapi only; International radios listened to are Zambia, South Africa. People listen to music mainly and sometimes to news broadcasts.
Television	None
Cell phone	Not captured, no cell phones in the village.
Education	No village school. The younger children in Lukotola, the older children remain in Fungurume to go to school, which causes problems (violence, sexual abuse) if they have to stay on their own.
Health	1 Red Cross trained villager ("diperol" in Swahili), a local untrained midwife. Health care not in Lukotola (which is only 4 km), but in Fungurume.
Commerce	1 mill, people go to Fungurume.
Transport	Trucks from Lubumbashi and from the Kasai pass to buy maize and beans during the harvest season.
Agriculture	Agriculture is the only activity. Main crops are maize, beans, soybeans, few grow peanuts, sweet and Irish potatoes, and onions. Best sold are beans, maize, soybeans.
Informal Mining	
Animals	No pigs as they destroy crops; only hens and dogs.
Hunting/Fishing	No hunting. No fishing as no river is present.

Characteristic	Description
Gathering	
Government services	The mill owner pays 6.000 Fc for taxes. Standard vaccinations (polio, vitamin A and de-worming) in the village. Other vaccinations in the Fungurume health centers.
Roads	
Agricultural labor	Preparing a new field cost 7.000 Fc + cost of uprooting trees, preparing a cleared field 3.500, weeding 1,000 Fc and harvesting 10% of the harvest.
Local organizations	Mutual agricultural assistance through *Kinkurimba*, and *Mbilé*. A choir for the CEPECO church.
Sacred sites	A cemetery for the lepers that died in the village is located near the field of the chief, which means that water from the nearby Kabulambe River cannot be drunk. The Kapoba Hill has honey, which cannot be accessed without permission of the chief.
Archeology	Mbeba has natural galleries (caves?), which are traditionally part of the nearby Kamungu village, but can also be used by the people from Fungurume.


Kamungu & Kabombwe
grid 100 x 100 m
Kamungu
Kakunte
Kabombwe II
Kabombwe I
Eglise CPCO
Eau KABOMBWA R.
1-Chef de kabombwa (Kalenga Petros)
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable
8835.6
8835.5
8835.4
8835.3
8835.2
8835.1
8835.0
8834.9
8834.8
423.2
423.3
423.4
423.5
423.6
423.7
423.8

6.36 Kamungu Kitambo

Initial meeting with GK on January 28 with 18 villagers, in Kamungu, for explanation, QandA- Main meeting on February 01 2006 with 27 people: 15 men and 16 women. Focus group meetings with 8 men, 7 youngsters (all men) and 9 women were conducted on January 28 and February 4, 2006.

Though Kabombwa and Kamungu Kitambo are only a few hundred meters apart, the former is part of the Fungurume site, while the latter belongs to Tenke.

Kamungu is an old village in the area but relocated to the present site only in 1990.

- *Questions and issues*

Chiefs. – Part of the village still lives in a hamlet in the bush, between the actual site and the airport. The chieftaincy is not completely clear and there is strife between the local chief Kamungu Kitambo and the regional chief, considered by outsiders as an important Chef de Terre, Kamungu Mulolwa[34], whose village is located north of Fungurume airport.

- *Village boundaries*

The village is limited by the village Kabombwa to the south and the Kinyama River to the north and the Fungurume to Mulumbu road in the south.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Kamungu Kitambo (Kabamba Jérôme)	Kamungu Kitambo	
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Kamungu Kitambo (Kabamba Jérôme)	Kamungu Kitambo	
Representative of Chef de village	Kyabu Charles	Kamungu Kitambo	

Characteristic	Description
Population	13 compounds, Est. 59 people, 5 transhumant families
Ethnic groups	Majority Lsanga, one of each Luba, Tshokwe and Ruund
Languages	Sanga, Swahili
Religion	Catholics, Pentecostal and Tabernacle (Protestant). Pentecostal church in Kabombwa, others in Fungurume.
Housing	Walls: 8% straw, 8% mud, 85% mud brick, 0% red bricks; Roofs: 92% straw, 8% aluminum.
Water	Surface water from the Kabombwa River, dirty during the rainy season.
Electricity	No electricity, but power line to Lukotola crosses the village.
Fuel for cooking	Firewood only, rarely charcoal.
Radio	National radios: none cited; unspecified international radios. People do not listen much to the radio.
Television	None
Cell phone	None
Education	No village school. The children go to Lukotola. None in secondary education.
Health	No Red Cross trained villagers ("diperol" in Swahili) are present. One local untrained midwife in Kabombwa. Medical care in Lukotola. Women go to Fungurume a few weeks before scheduled time to give birth. A cholera epidemic has made 5 victims in the village in 2004. It was followed by an educational campaign by doctors and water purification tablets were distributed.

[34] Kamungu Mulolwa has not been visited due to its position outside the main concession area and to lack of time. The project may have some impact on the village through Fungurume airport, which is not far from the village center.

Characteristic	Description
Commerce	A mill in Kabombwa.
Transport	Trucks from Lukotola, Fungurume, TFM, Kalebi commercial farm, and from the Kasai pass to buy maize and beans during the harvest season. From Fungurume, transport to Kolwezi is 1,000 Fc to Likasi 1,000 Fc, to Lubumbashi 2.500 Fc.
Agriculture	Agriculture is the main activity.
Informal Mining	No signs of direct involvement in informal mining were observed.
Animals	Goats, ducks, hens, hunting dogs.
Hunting/Fishing	Fishing by women who use dams on the Kabombwa River. Hunting during the dry season.
Gathering	
Government services	Yearly vaccinations (polio, vitamin A and de-worming). Secret service (ANR, who can arrest people and take them to Lukotola. FAC (Army camp near the airport) used to terrorize the local population.
Roads	
Agricultural labor	Preparing a new field cost 4.000 Fc (10 meka maize), preparing a cleared field 3.500 (5 meka), weeding 1,000 Fc (1.5 meka) and harvesting 10% of the harvest (1 meka per bag or per 10 meka).
Local organizations	There exists a small organization, AKD, created to participate in the animal traction project with the Lukotola Development Committee.
Sacred sites	Kapuba Hill. – A Hill rich with honey. Special authorization from the chief is necessary for people who want to go there, if not their hands will be caught between the rocks when they steal honey. Kinyoka – near the Mofia River, where the chiefs are buried.
Archeology	No archeological sites are known by the village.

6.37 Kamungu Mulolwa

Initial short explanation visit with MH and GK on 25 April-. Main meeting with GK and JK on April 30 with 19 villagers: 13 men and 6 women, for explanations and QandA.

The villager were at first reluctant about participating in the study, as (1) they feared that such a meeting would lead to them being relocated, (2) they felt that though the airport was on their village land they had never been included in the project's ceremonies. Later during the interview it appeared that the fear of resettlement was due to the presence of an expatriate commercial farmer in the village, who had "taken" ever more land from the village.

After explaining that the survey was part of the baseline for the project and the basis for developmental programs to be developed progressively for the region, the people in the village decided that they wanted to participate and the chief also agreed.

Kamungu is one of the older villages in the area. They say that they descend from Ilunga Mbidi Kaluwe, a Luba elephant hunter who arrived at the source of the Tshilongo River and settled there. From there on, his descendents have spread and founded several branches in the area, one of which is the Kamungu branch. The village could not explain how the family changed from the Luba ethnic group to the Sanga ethnic group.

The village moved from the site of the actual graveyard to the Kapuba Hill around 1920-1930, and then to its present location probably just before the Second World War.

The chief of the village is one of the more important CdT of the areas, and he claims that he has given land to Mwela Mpande and Lukotola, who now should pay tribute to him but do not do so. Villages that do belong to his realm are Lukotola, Kamungu Kitambo, Kabombwa, Kinyama, and Kiba.

- *Questions andh issues*

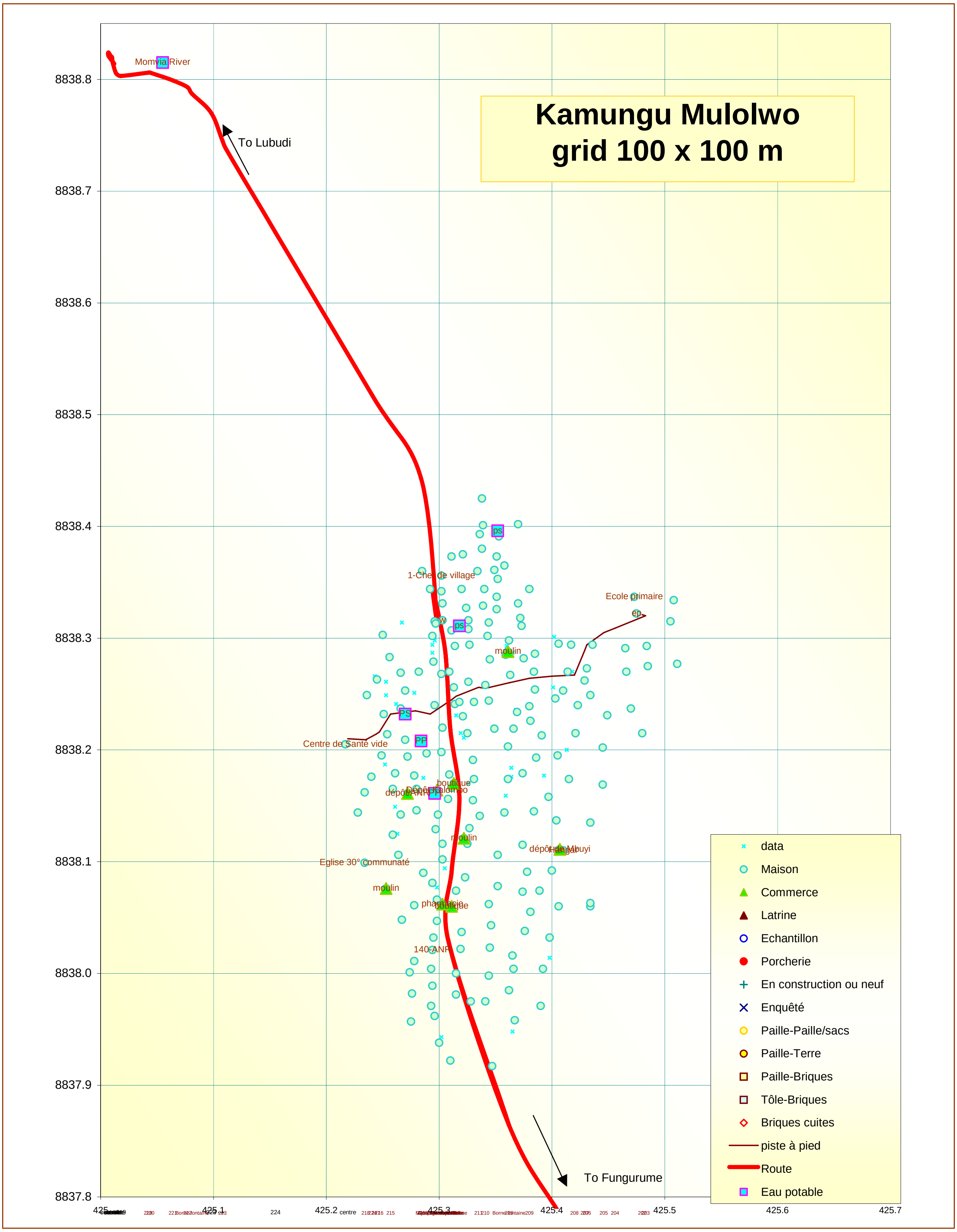
As the people had heard during the first visit that TFM would fund a development project in the area with grants over the time of its presence in the area, they asked on the second visit, four days later, why nobody had come to help them finish the health center. They had been building it with the help of the Catholic mission. This was a new opportunity to explain that, though the development program would have limited funds, its strength would be its long duration, and that its purpose was the sustainable development of the region, in which the population and the project would work together.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Kamungu (Myalo Kamungu Frédéric)	Kamungu Mulolwa	
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Kamungu (Myalo Kamungu Frédéric)	Kamungu Mulolo	
Representative of Chef de village	Kazadi Mutoni	Kamungu Mulolo	

Characteristic	Description
Population	191 compounds, 860 people. All permanent residents.
Ethnic groups	Majority Sanga, a few Luba, Ndembo, Luba Kasai, Maniema
Languages	Sanga, Swahili
Religion	Pentecostal, Catholics, and Methodists. There is a Pentecostal church building in the village while the two other religions pray in the school building.
Housing	Mostly brick walls and straw thatched roofs.
Water	Surface water from the Mofia River during the dry season and from 6 tradition wells that dry up during the dry season.
Electricity	No electricity, but one electric generator and public video in the village. Other people use car batteries they charge in Fungurume to power there radio-cassette players
Fuel for cooking	Firewood mainly, less often charcoal.
Radio	National radios: Fungurume not, but Okapi yes. International radios are RFI and Zambia. People who have radios listen to it for news and music and inform the other people from the village.

Characteristic	Description
Television	None
Cell phone	None
Education	Village school - now has 4 classes, which was funded with the assistance of the Catholic Mission from Fungurume. There are 61 pupils. For further education children go to Lukotola (7 km, which they walk in the mornings and evenings) or in Fungurume where they have to be housed. Two children only are in secondary education in Fungurume.
Health	A building has been created recently with mud bricks and a corrugated roof with assistance of the Catholic CDD[35]. The village is waiting for the completion of the building, its equipment and personnel, but say that they do not know the status of the project. One of the villagers is a nurse with an incomplete training, and three Red Cross trained medics, who all provide the population with some simple medicines. There are three traditional midwifes, none of whom has received any formal training.
Commerce	There are two shops in the village, one of which well provided with foods, medicines, cigarettes, cosmetic products, and spare parts for bicycles. Three cereal mills, a blacksmith and a carpenter.
Transport	A commercial farm, owned by a Belgian expatriate, has a big farm in the village. People work on this farm as daily laborers for 500 Fc/day during the agricultural season. This farm has trucks that use the road, which is blocked in the direction of Lukotola/Tenke, but apparently open in the direction of Lubudi. People rent bicycles for 500 Fc/day to go to Fungurume, or are transported on a taxi-bicycle for 750 Fc.
Agriculture	Agriculture is the main activity, but 10 people are employed by the nearby commercial farm. Main crops are maize, peanuts, beans, soybeans and cassava, but beans and soybeans are most profitable for selling.
Informal Mining	No information given by the village, which was far from the mining area.
Animals	Goats, pigs, hens.
Hunting/Fishing	A few men are hunters, and there are shotguns present in the village. They and others use snares around their fields. People fish in the Momvya River, but mostly for local consumption: "*keni* [sg]" (sardines), *kabambale* [sw] (catfish), *makoki* [sw] (tilapia).
Gathering	Various leaves that are used as potherbs (in sanga): *Musebo* [sg], *Mpulilwa* [sg], *Ngeleso* [sg], *Mubaba* [sg], *Bowa* [sg] (mushrooms). Charcoal to sell in Fungurume. Various fruits: *sokolobwe* [sg], *masuku*, [sg]..
Government services	
Agricultural labor	
Local organizations	
Sacred sites	The Kamungu chiefs are not allowed to cross the Mukondo and Kibamba rivers. At the start of the agricultural season, the chief makes a small field in the form of a mound, and all villagers sow a sample of their seeds on this mound. The area where this is done is not considered to be a sacred site.
Archeology	No archeological sites are known by the village.
Graveyards	The main cemetery is located on the site of the former village.

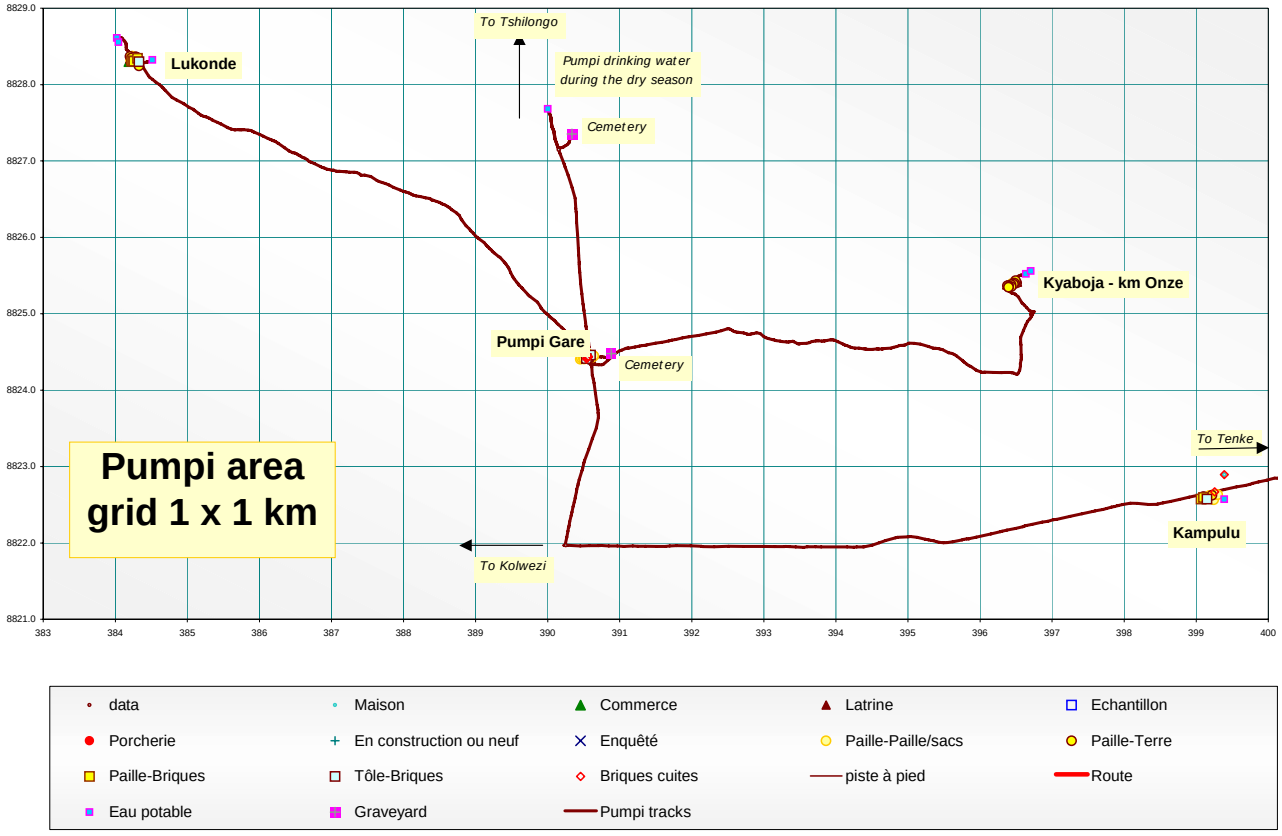
[35] Comité Diocésain de Développement, and the Fungurume parish.


Kamungu Mulolwo
grid 100 x 100 m
To Lubudi
To Fungurume
Momvia River
1-Chef de village
Ecole primaire
Centre de Santé vide
Eglise 30° communauté
moulin
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable
8838.8
8838.7
8838.6
8838.5
8838.4
8838.3
8838.2
8838.1
8838.0
8837.9
8837.8
425
425.1
425.2
425.3
425.4
425.5
425.6
425.7

7 Pumpi Area

Four villages are located around the Pumpi area: Lukonde, a traditional village, Pumpi Gare, a former station now inhabited by the one remaining rail worker, one local family and more than 35 households of (former) informal miners and traders; Kyboja, a transhumant agricultural village with three resident families, and Kampulu, a village founded before the informal mining boom, but composed of various migrants from Tenke and other areas who have come for mining.

The villages in this area have been surveyed in April 2006, after the mining had been stopped and at a moment in the agricultural season when most transhumants had returned to their permanent residence.



data	Maison	Commerce	Latrine	Echantillon
Porcherie	En construction ou neuf	Enquêté	Paille-Paille/sacs	Paille-Terre
Paille-Briques	Tôle-Briques	Briques cuites	piste à pied	Route
Eau potable	Graveyard	Pumpi tracks		

7.1 Lukonde

Main meeting with GK and JK on April 26 with 19 villagers: 10 men and 9 women, for explanations and QandA.

Lukonde is one of the older villages in the area, and existed already at the start of the colonial era: both the traditional conqueror Msiri and the Belgian colonialist founded the village in the present area in the nineteenth century. Several former chiefs are buried in the graveyard.

They say that they descend from Ilunga Mbidi Kivungu[36], a Luba. After the Luba, the Ruund and the king Msiri have conquered the area (in the nineteenth century). The present chief, though a Sanga, derives his power from this chief. The mixture of these various ethnic groups has led to the origin of the Sanga ethnic group.

The village used to be located near the national highway, but settled in the area, 7 kilometers inland in 1987 because of various conflicts at the former site.

The chief of Lukonde is the only chief in the project footprint who does not depend on the Nguba "Chef de groupement", but on the chef de groupement Mutobo, another of the six "chefs de groupement" that form the Bayeke chieftaincy. The villages that belong directly to the the Lukode Chef de Terre are Lukonde, Pumpi Gare and Bwimbe (not visited). Each of these three villages is headed by a kapita, a quarter chief designated by Lukonde.

- *Questions and issues*

The village had already discussed the project with a project representative. Several villagers worked for the project as daily laborers, upgrading the road between the National Highway and Pumpi Gare.

Discussions about traditional punishments in the area yielded the following description: In former days a thief was burned to death on the Kipungu mountain or his ears and fingers will be cut; an adulterer who sleeps with a nursing woman will also be burnt on this mountain, as sexual intercourse with a nursing mother will turn her milk and kill the baby. A "Simple" adulterer who is caught will become the servant for the rest of his life.

The informal mining seems to have been profitable to the village: a digger could earn as much as 20 to 50 thousand FC (40-100 USD) per week. This money was mostly spent on clothing, radios, bicycles and food. Many people were engaged in the mining. The chief was building a big new house but it could not be finished when the informal was stopped in March 2005. Even the simple school building had been made possible with money from the informal mining. Only men engaged in the activity, as the chief had forbidden women to participate.

The village regrets that the informal has been stopped, and though a few villagers have been recruited for the road upgrading people have a wait-and-see attitude towards the developments that TFM will provide them. There were no complaints about any violence used by the police during the eviction.

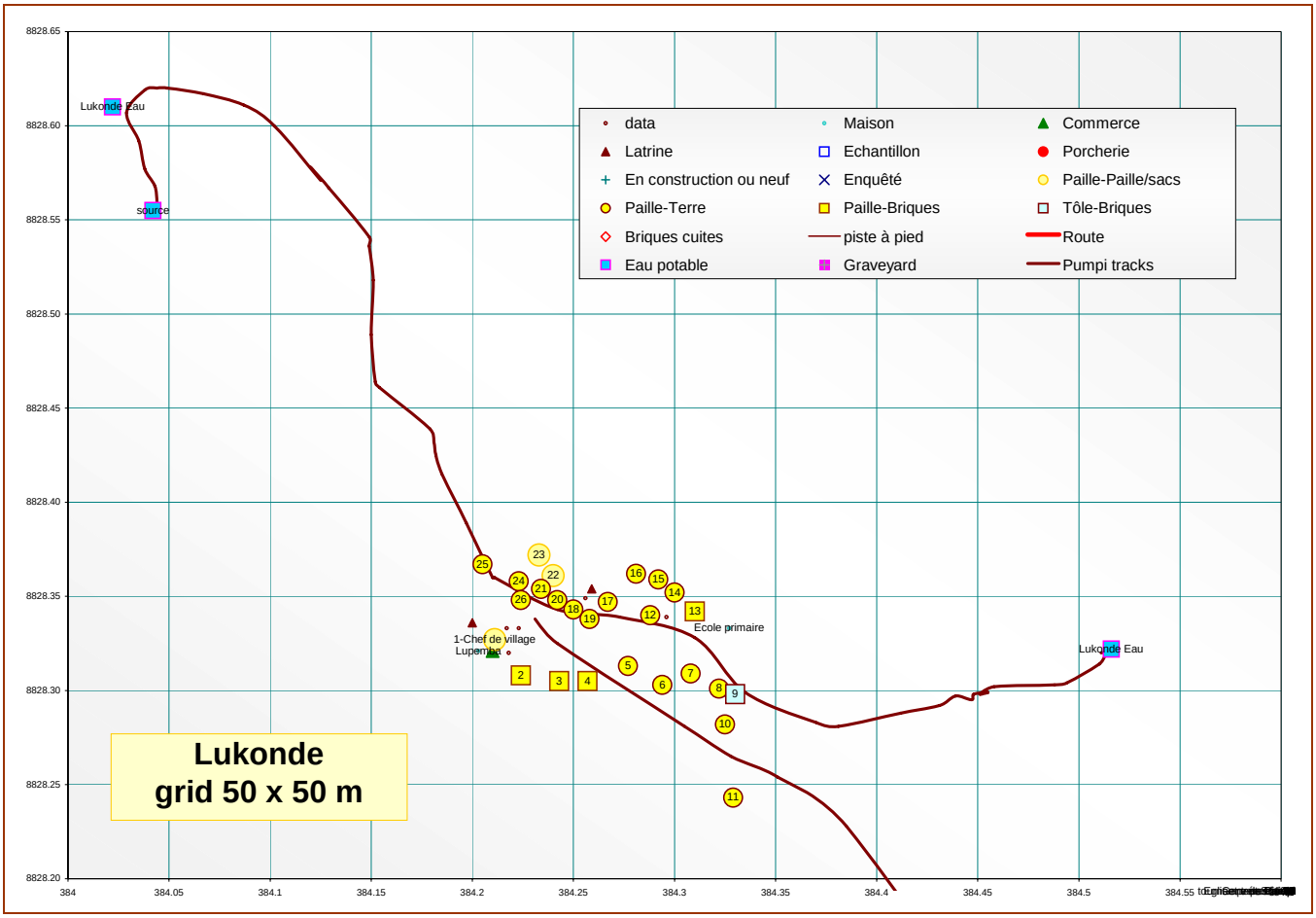
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Kasongo Mwisobele	Mutobo	
Chef de terre	Lubondo Mukupo Ilunga Mbidi	Lukonde	
Chef de poste	MWADIA Mvita	Kansenia Mission	
Chef de village	Lubondo Mukupo Ilunga Mbidi	Lukonde	
Representative of Chef de village	Kisumpa Stéphane	Lukonde	Quartier head

Characteristic	Description
Population	26 compounds, Est. 117 people
Ethnic groups	Majority Sanga, other are Hemba and Kaonde
Languages	Sanga, Swahili
Religion	Catholics (church in Bwibe). Pentecostals (church in Pumpi Gare),
Housing	Walls: 12% straw, 69% mud, 19% mud brick, 0% red bricks; Roofs: 96% straw, 4% aluminum.

[36] Ilunga Mbidi Kivungu in Lukonde and the Ilunga Mbidi Kaluwe cited in the village Kamungu are probably close relatives, even brothers.

Characteristic	Description
Water	Surface water from the Lukonde River, and the Mushinsky source taken where it joins of the Lukonde River. All water used is surface water.
Electricity	No electricity, but one electric generator.
Fuel for cooking	Firewood only.
Radio	National radios: RGM, the local radio from Kolwezi and the Okapi radio. International radios are RFI, Africa n°1, Germany and Zambia. People who have radios listen to it for news and music.
Television	The chief has a TV set but there are no broadcasts to be captured.
Cell phone	Vodocom can be captured fairly well and there is one cell phone in the village (200 Fc/minute).
Education	A village school started this year with 1 class. There are 25 pupils. For further education children go to Kansenia (50 km) or Kisamfu (12 km) or Kolwezi (72 km). Two to three families are able to send their children to school outside the village. Two girls go to secondary school in Kansenia.
Health	No medically trained people exist in the village, only a traditional midwife, whose only modern practice is the insistence on using new razor blades to cut the umbilical cord of the newborn babies. A private nurse in Kisankela (6 km), a dispensary in Kisamfu, and a hospital in Kansenia present the closest possibilities for medical care. The chief is a well-known traditional healer who treats “all diseases of the body and the mind”. His patients come from everywhere to be treated, and some remain in the village after treatment.
Commerce	There are neither shops in the village, nor cereal mills. There is a local blacksmith.
Transport	A road that is actually manually upgraded by TFM reaches the village. Trains do not stop anymore at the nearby Pumpi Gare.
Agriculture	Main crops are maize, beans, sweet potatoes and cassava, but beans and maize are most profitable for selling. Market garden crops are possible on the wetlands, but transport to the markets in Tenke, Fungurume and Kolwezi is unavailable.
Informal Mining	Important (see introduction). The mining was stopped by the Mines’ Police in March 2006.
Animals	Goats (only the chief) and hens.
Hunting/Fishing	Hunters use their dogs and a lance. Game is rare in the area according to the chief, according to others there is more game in the bush west of the village. Fishing is practiced for domestic use in the small streams around the village. People use a traditional poison “*Bubaa*” to kill the fish.
Gathering	Gathering concerns wild yams (*Bilungu*[sg], *Bihama*[sw]), various fruits: *Masuku*[sw], *Fungo*[sw], *Ntungulu pori*[sw], *pundu*[sw]; mushrooms, and potherbs like *Mubaba*[sg]. According to the chief, there are no unique useful plants on the copper hills[37].
Government services	The nuns from the Catholic mission come every two months for vaccinations and infant care. Visits from the Chef de poste de Tenke; the agricultural officer taxes the small cattle 500 Fc/year, the demographic officer who for 1,200 Fc records and delivers certificates for the newborn children.
Agricultural labor	Preparing a new field cost 2.500 Fc, preparing a cleared field 2.000, weeding 1,000 Fc. There is no fixed rate for harvesting.
Local organizations	Informal groups for mutual agricultural assistance “*kinkurimba*”.
Sacred sites	The source of the Mushinji River. cannot be visited by women, as people with goiter, people who die with a swollen belly, by suicide through hanging, babies from girls who never had their periods are buried near this spring. The Kamapole River, where one cannot fish with baskets as one will only capture chawris and not fish.
Archeology	None
Graveyards	There is a graveyard on the road to Kisankela for the chiefs and the general population, another outside the directly impacted on the road to Tshilongo (GPS 35L 390336-8827353), and a third one, *kambabuluku* where the chiefs alone are buried.

[37] Kajinga Butchi[sg], Mupampa[sg], Kipomba Bajiki[sg] are medicinal plants that indicate the presence of copper in the soil, but they can be found both on the copper hills and in the surrounding bush.


Lukonde Eau
source
data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable
Graveyard
Pumpi tracks
1-Chef de village
Lupemba
Ecole primaire
Lukonde Eau
Lukonde
grid 50 x 50 m
8828.65
8828.60
8828.55
8828.50
8828.45
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8828.35
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384
384.05
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7.2 Pumpi Gare

Main meeting with GK and JK on April 26 and 27 with 26 villagers: 13 men and 13 women, for explanations and QandA.

The village Pumpi Gare was created in 1945, for the railroad, but since 1996 the trains do not stop anymore. Only one person still works for the SNCC railway company in the village to maintain the station.

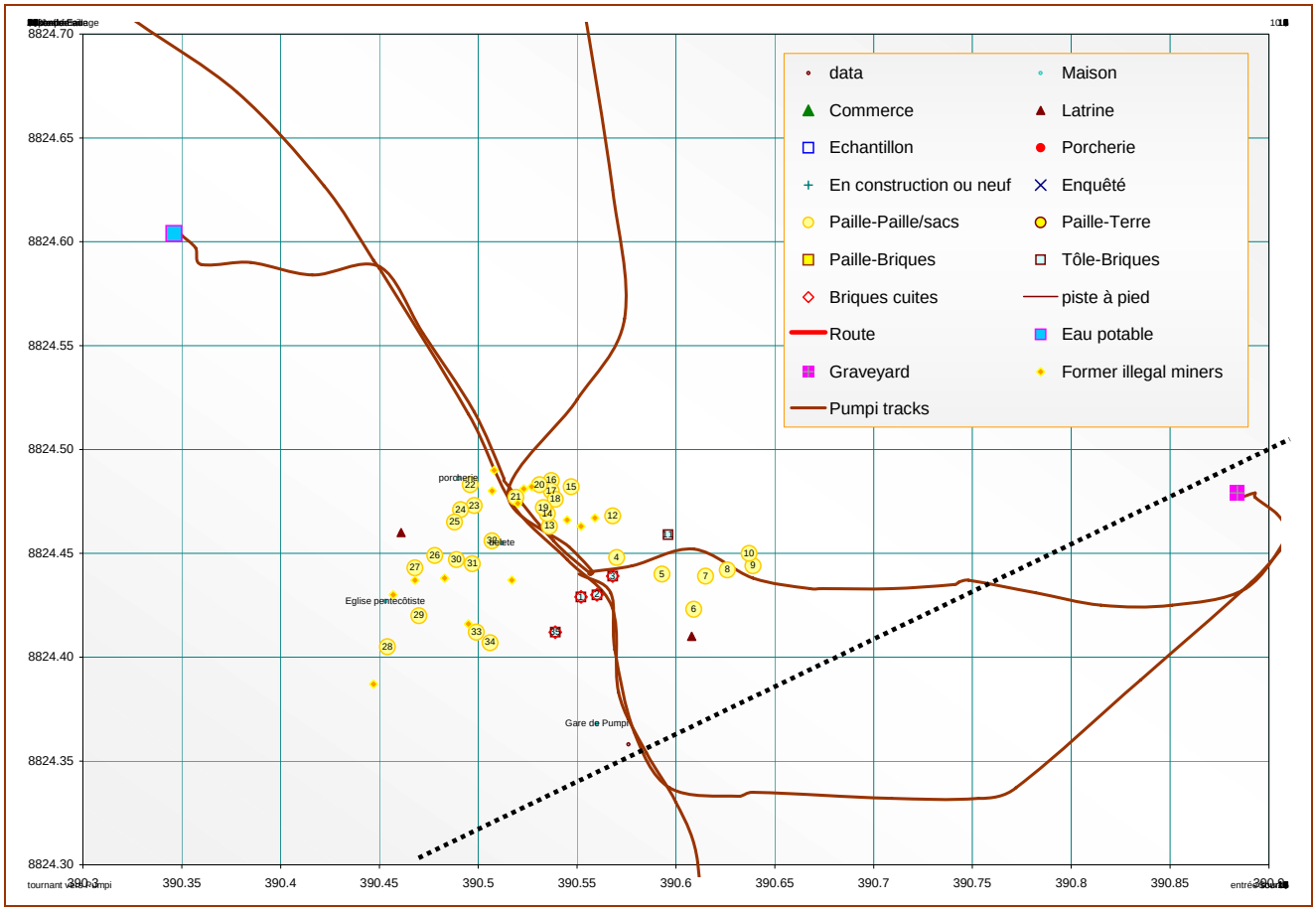
Pumpi Gare has been an important center for the informal mining, which was stopped in March 2006. The village itself is only composed of three buildings for the station, and one mud house. All other dwellings in the village are provisional and made with sacks during the mining period. There are still 38 ex-miners present, who are waiting for the first occasion to restart their digging. In fact some still have bags of heterogenite and cobalt for sale (3,500 Fc/sac).

- *Questions and issues*

The village, though small, asked the project to build a school, to assist with agricultural development, and was curious to know if the TFM developmental program would be carried out by the government or by the company (→ piloted by an international NGO).

The village regrets that the informal mining has been stopped, as more than 500 people were engaged in this activity. During the survey villagers were working for the project for the road upgrading. There were no complaints about any violence used by the police during the eviction.

Function/fonction	Name	Village/Lieu d'habitation	Remarks
Chef de groupement	Kasongo Mwisobele	Mutobo	
Chef de terre	Lubondo Mukupo Ilunga Mbidi	Lukonde	
Chef de poste	MWADIA Mvita	Kansenia Mission	
Chef de village	Lubondo Mukupo Ilunga Mbidi	Lukonde	
Representative of Chef de village	Ilunga Mangi	Pumpi Gare	Quartier head


data
Maison
Commerce
Latrine
Echantillon
Porcherie
En construction ou neuf
Enquêté
Paille-Paille/sacs
Paille-Terre
Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable
Graveyard
Former illegal miners
Pumpi tracks
8824.70
8824.65
8824.60
8824.55
8824.50
8824.45
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390.55
390.6
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390.7
390.75
390.8
390.85
Eglise pentecôtiste
Gare de Pumpi

7.3 Kyaboja - Onze

Main meeting with GK and JK on April 27 with 26 villagers: 13 men and 13 women, for explanations and QandA.

Kyaboja was founded in 1977 by Pita Tshizau, a Ndembo from Kambove who lived in Pumpi. It developed through the migration of his children and in-laws. In 1992, one of the villagers, Kinkatana Fabien, decided to move to the main road and created the village Kampulu. Since 2004, the village was intensely used by informal miners from elsewhere, who left after the informal mining was stopped in March 2006. The remnants of 50-100 shacks are still visible in the village. The miners left the village without any fight with the mining police or any incident.

At the time of the visit, only a few families were present, among them four permanent dwellers and seven transhumant families from Kampulu and Tenke.

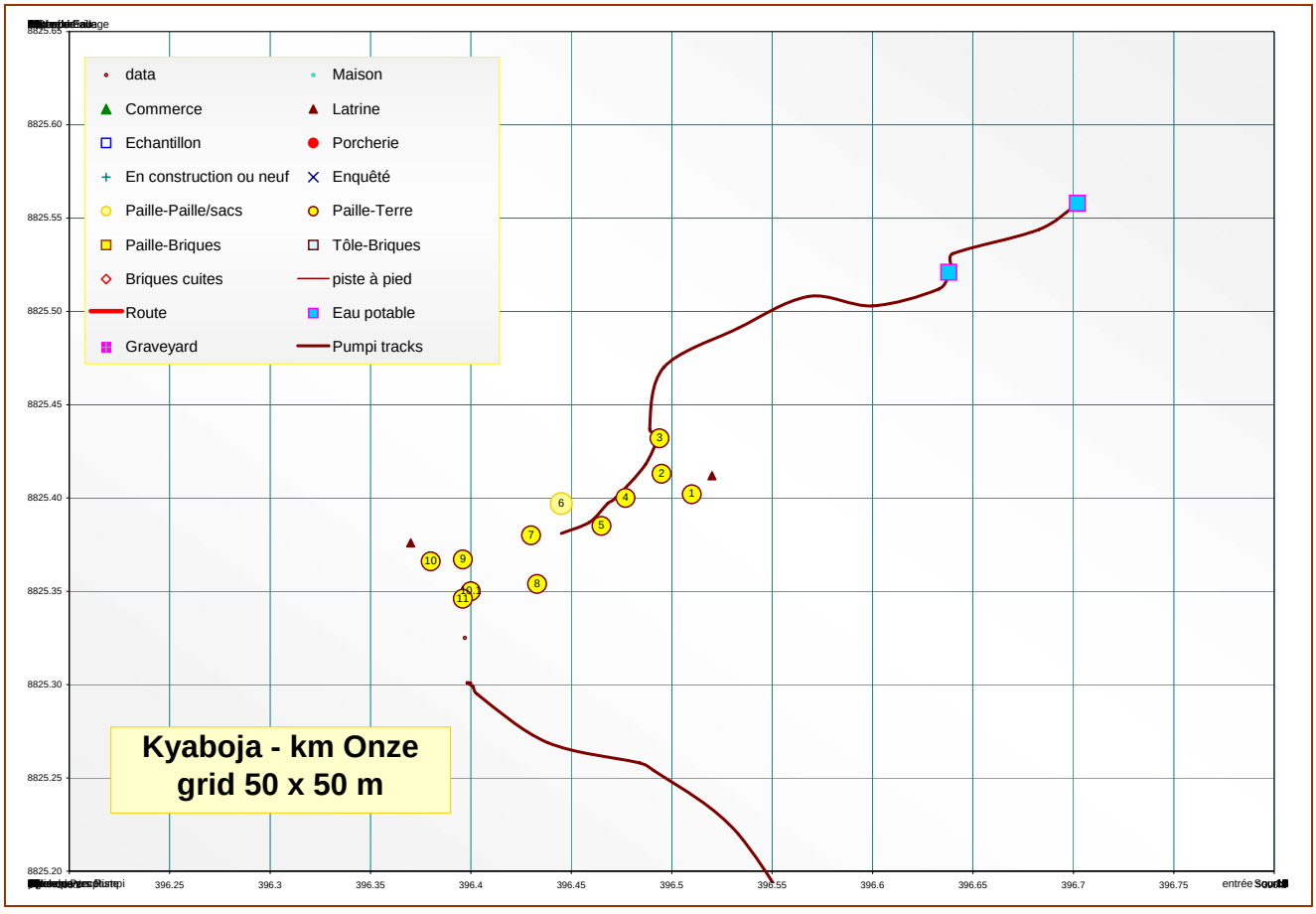
- *Questions and issues*

The villagers were worried about eventual relocation (R.→please continue farming as usual), compensation (R.→yes, but only for damage caused by TFM). Employment (→ The socio-economic team is not in charge of recruitment).

Function/fonction	Name	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba or Kasongo Mwisobele	Mutobo	Confusion in the village as it is located between the chiefdoms of Nguba and Mutobo. Usually they refer to Nguba in case of difficulties.
Chef de terre	Mureza	Sangana	
Chef de poste	Mapasa	Tenke	
Chef de village/quartier	Kayinda Busepa Floribert	Kampulu	

Characteristic	Description
Population	11 compounds, Est. 48 people, 8 transhumant families
Ethnic groups	1. Kaonde, 2. Sanga
Languages	1. Swahili 2. Kaonde, 3. Sanga
Religion	Pentecostals, Zambe Malamu (Protestant), Jehova Witnesses, Tabernacle (Protestant), animists (Basantu). No chapels in the village.
Housing	Dwellings of mud (92%) and straw (8%), all with a straw thatched roof.
Water	From the Kabwe River, deep surface water that is available all year round. Water from the more nearby Kyaboja River is not used anymore since people found that it caused digestive problems.
Electricity	No electricity.
Fuel for cooking	Firewood only, rarely with charcoal.
Radio	National radios: Okapi radio. International radios are RFI, Africa n°1, Germany and Zambia. People who have radios listen to it for news.
Television	None
Cell phone	Vodacom is available, but there are no cell phones in the village.
Education	No school, Four children go to school in Tenke (11 km) where they have to pas the night. No children in secondary education.
Health	No health facilities in the village.
Commerce	No trade, all items are bought in Tenke.
Transport	There exists no direct road between the hamlet and the main village Kampulu which is only 4 km away. Over the road, via Pumpi Gare, the distance is 21 km.
Agriculture	Maize, beans and marshland crops. Beans are the major crop for selling. The numerous rats in the area who eat the crops has led to the abandonment of cassava cultivation.
Informal Mining	Important (see introduction). The mining was stopped by the Mines' Police in March 2006.
Animals	Hens.
Hunting/Fishing	One person is hunting for his own use but also for selling in case of bigger animals. Women and children fish in the Kabwe River for domestic use only.

Characteristic	Description
Gathering	No information
Government services	Government services, which come to gather various taxes.
Agricultural labor	Preparing a new field cost 3,000 Fc, preparing a cleared field 2,500, sowing is 500 Fc, weeding 1,000 Fc. There is no fixed rate for harvesting and transport: more than 25% of the harvest in case of beans[38].
Local organizations	Only mutual assistance.
Sacred sites	The local population recognizes no sacred sites.
Archeology	None
Graveyards	People use the same graveyard as Kampula, in the village Sangana. Twins are buried in secret near road crossings.



[38] 3 meka (about 8 kg) for a 25 kg bag is paid for harvest, transport and threshing of beans. No rate exists for the maize harvest.

7.4 Kampulu

Main meeting with GK and AK on April 27 with 40 villagers: 25 men and 15 women, for explanations and QandA.

The village was founded in 1972 by Kayinda Floribert, from Kambove in search of an area where they could farm. Most of the villagers are Sanga. They belong to two different CdT (land chiefs): Mureza and Katumpula, who both live in the village Katumpula. Mureza seems to be the more important one, and he was said to plan shortly to install himself in the nearby site of Sangana, an ancient village 5 kilometers along the national highway, where the cemetery is located.

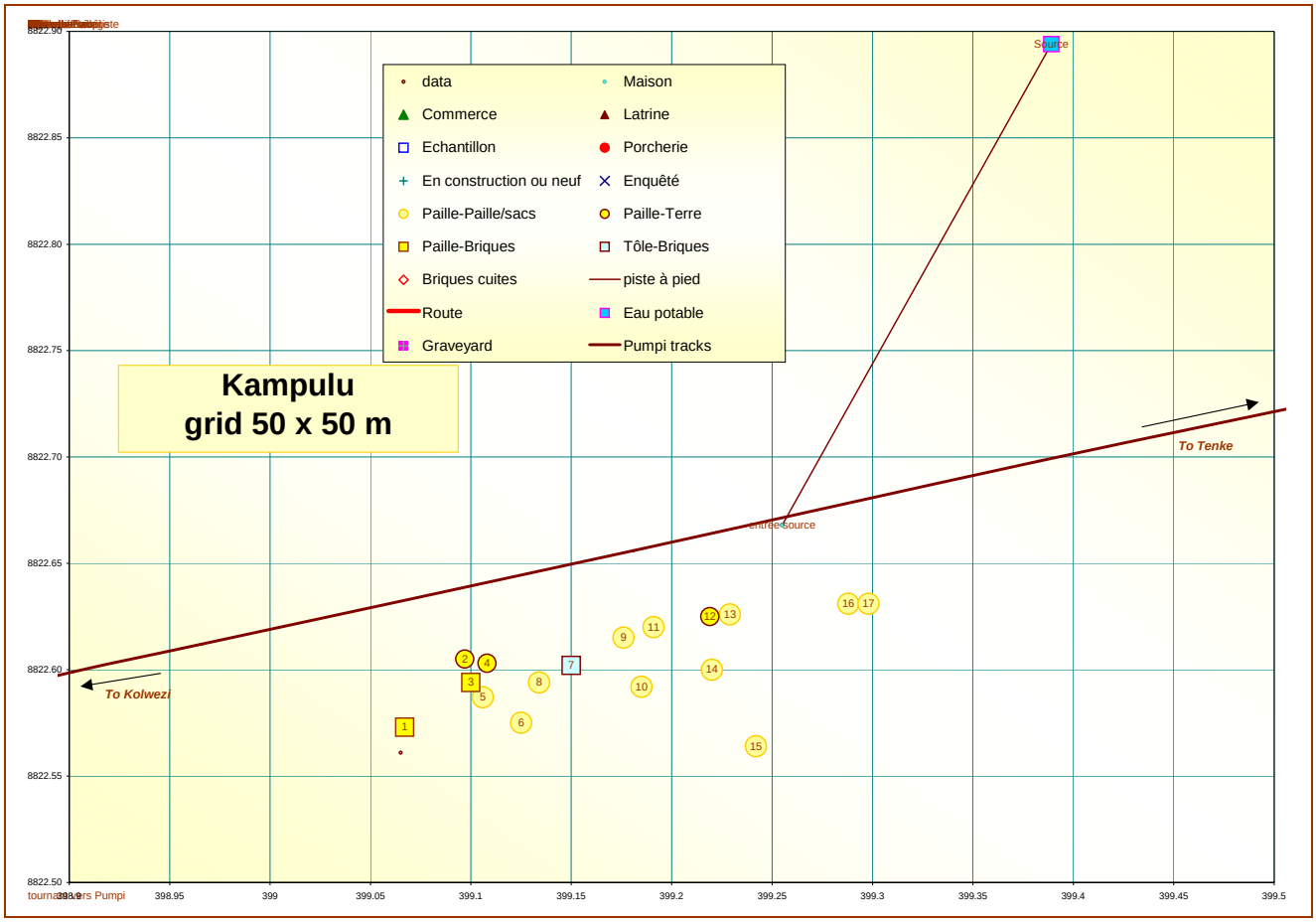
- *Questions and issues*

The village participated in the informal artisanal mining and regret that this activity has ended: it was easier then to earn money; goods were available in the villages. Several people had abandoned agriculture and now, in April, it is too late to create new fields. They regret also that there had been no compensation by the project for the forced departure of the miners. The village also recognizes that the artisanal mining created problems such as hygiene in the village and the prostitution of both young boys and girls.

Function/fonction	Name	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mureza and Katumpula	Katumpula	Two different chiefs are recognized
Chef de poste	Mapasa	Tenke	
Chef de village/quartier	Kayinda Busepa Floribert	Kampulu	

Characteristic	Description
Population	17 compounds, Est. 74 people
Ethnic groups	1. Kaonde, 2. Lubakat, 3. Lwena
Languages	1. Swahili 2. Kaonde
Religion	Pentecostals, Jehovah witnesses. A Pentecostal chapel in the village.
Housing	Dwellings of mud (12%), mud bricks (18%) and straw (71%), one house has a tin roof.
Water	Water from the source of the Kampula River.
Electricity	No electricity nor electric generators.
Fuel for cooking	Mostly with charcoal, which is a major trade in the village, more rarely with firewood.
Radio	National radios: Okapi radio. International radios are RFI, Africa n°1, Germany and Zambia. People who have radios listen to it mainly for news.
Television	None
Cell phone	Vodacom is available, but there are no cell phones in the village.
Education	Initial primary education in Kabwe (3 km, first two years of primary school), after that in Tenke (7 km) go to school in Tenke (11 km) where they have to pass the night. No children in secondary education.
Health	One Red Cross trained local healthy worker. Simple medical care in Tenke, hospitals in Fungurume and in Kolwezi.
Commerce	No trade, all items are bought in Tenke. Presence of a blacksmith and a carpenter. Basic items such as salt, candles and cigarettes are sold by private persons.
Transport	Located on the National Highway. Transport to Kolwezi generally costs 1,000 Fc, to Likasi 2,000 Fc, and to Lubumbashi 3,000 Fc.
Agriculture	Maize, beans, peanuts, sweet potatoes. Maize and beans are also the major crops for selling. The 2005/6 agricultural season was considered reasonably good, but too wet for the second bean crop, "*kimbalama*". The fields are located north of the village, in Kyaboja (cf. chapter 7.3). Migrant farmers from Tenke are rare.
Charcoal	Charcoal burning is a major activity in the village. The charcoal is sold to the passing trucks.
Informal Mining	Important (see introduction): young men in the mines, women for the trade and washing of the heterogenite. The mining was stopped by the Mines' Police in March 2006.
Animals	Hens.
Hunting/Fishing	No hunters, but some people plant snares around their fields. People hunt during the burning of the bush. "There is game, but there are no hunters". No fishing.

Characteristic	Description
Gathering	Charcoal is the only gathering product that is sold outside the village. Important products, that are sometimes sold are mushrooms, “munkoyo” roots used in local beer brewing, and caterpillars.
Government services	Government services, which come to gather various taxes. The taxes for charcoal making are 7,500 Fc per year. Communal service, come to verify the presence of latrines for each household. National vaccination days.
Agricultural labor	Preparing a new field cost 4,500-5,500 Fc, preparing a cleared field 2,500 Fc, weeding 1,000 Fc.
Local organizations	Mutual agricultural assistance, women’s church group “Mama Kipendano”.
Sacred sites	The local population recognizes no sacred sites, but refers to the Chef de Terre, who may know them.
Archeology	Old pottery is found in the following places: Mpembwe (to the south), Kituma Kubi (clay pots, in one of the effluents of the nearby Sangana River; Sakwa (to the south, near the Kando farm).
Graveyards	General garveyard in the former village Sangana, chiefs have a special graveyard, near the Mwikuu River, about 12 km to the south.



8 Urban and Semi-Urban Areas

8.1 Lukotola

Main meeting with GK and JK on January 24, 2006 with 64 people: 55 men and 9 women.

The village has existed since 1972 in the present location, and was before that located since the 1940s a few kilometers to the east. The village chief, Lukotola, is also considered to be the Chef de Terre, but others, outside the village, consider that the chief of nearby Kamungu is a more powerful Chef de Terre.

Lukutolo is the only village in the area where there is an effective developmental program, sponsored by the local Catholic mission run by Spanish brethren.

The village owns a (Catholic) primary school, a secondary vocational school, a health center with a doctor, a community house, piped water from a protected source, an oxen training center, a regular market and numerous churches.

A house building program of the mission, where house building by villagers is supported with loans (refundable with crops) and technical assistance, is effectively changing the face of the village, which now has 25 percent of its main dwellings made with permanent materials: baked bricks, aluminum roofing and often cemented walls and floors.

The village attracts many permanently residing migrants through its infrastructures and the quality of the soils, and may easily develop into the third urban center of the concession area, besides Fungurume and Tenke. The end of the informal mining has also led young people to return to Lukotola, and they often brought with them new villagers. The local attitude towards migration is mixed: some want the village to grow more, others want the benefits (of the mission and also of the TFM) for themselves.

However, according to the health post nurse[39], there has been a high infant mortality in 2005, for unknown reasons, which has pushed people to leave the area.

The food situation in 2005/6 has been difficult: too many people had not grown food because of the mining, and TFM has bought up much maize. “That is excellent, but TFM has to help us even more”. Replying to our question, the villagers say “this year (2005/6) we have increased our cropped areas 2-3 times compared to other years”.

- *Organization of the village*

Lukotola, unlike most of the other villages, has a town like structure with one main chief and several secondary chiefs, who govern as quarter heads.

Chiefs. – There are up to five chiefs[40], beside the main chief Lukotola in the village, although not everybody agrees on this number. They each command part of the population and were used during developmental activities such as the laying of water pipes and for participation in the construction of the school. They each govern part of the village agricultural land, and migrants into the village join a specific chief.

Chiefs are said to have only few traditional tasks left: some villagers say they have none and others indicate that for the local population the rituals they perform still are important.

The village has an official local court composed of a “greffier” (clerk of the court) appointed by the territorial government of Lubudi on a proposition of the Bayeke chief of Bunkeya, the chief of Lukotola, and three other judges who are appointed by the chiefs of Lukotola, Ndela and Kamungu.

- *Committee de Développement Rural Lukotola (CDRL) ADSL*

The CDRL exists since 1998, and is an officially recognized association that has been set up with assistance of the Catholic mission of Lukotola. The CDRL has 54 members and six founding members. Its actions include the local health center, a maize mill, a communal field of two hectares. Its members have to get involved actively through baking bricks, repairing the local roads, cleaning up of the “town”, and participate in meetings.

[39] This mortality was globally confirmed (but not statistically significant) by the socio-economic survey which counted seven deceased children in 59 families in 2005.

[40] (1). KIBOKO Kazdai Antoine, (2). Mwanza Katonga Placide; (3) Salabwe Mangi Edmond; (4) Kamungo Wamazo Emile; (5) Sanka Mangembo Gilbert; (6) Salabwe Kilundiu Pierre.

- *Health center*

The Catholic health center has existed for more 25 years, but has been supported only by the local church before the arrival of the Spanish mission. Since October 2004, Dr. Sumba Mwana Ngongo Serge has been recruited as a permanent qualified doctor. Major medical problems are malaria, pulmonary diseases, diarrhea and sexually transmitted infections. Major functional problems are the lack of purchasing power of the patients (who often pay in kind) and the competition of charlatans, self medication and the impact of animistic churches like Basantu who try to heal through sorcery.

- *Questions and Issues*

Q. *Gepfe*. What is the role of your team Gepfe? (→Understand and protect the local population, help ensure that TFM does not make mistakes),

Q. *Employment.* How can the village develop, if there will be only a few recruitments by TFM? (→the impact will be in the whole concession area, and the benefits will have to be shared in a equitable way).

Q. *Local employment.* Qualified laborers are those who are from rich families, what about the other families? (→the project will start with qualified personnel from elsewhere, as none is available here. Later through better education and internal training, more qualified personal can be provided locally).

Q. *Local development.* We want specific programs for indigenous people here, others for the migrants. (→Our survey shows that most of you have been migrants at one point in your life. Programs will concern the whole population).

Q. *Agricultural development.* How will you develop our agriculture? (→ the mine will have to start before profits can be made and programs financed. All programs will need participation of the villagers in order to succeed).

Q. *Animal traction project.* The animal traction project of the Catholic mission only services the chief's family and his family, not us? (→Gepfe advises TFM to finance development actions that are not *mulambi* (traditional offerings) to the chief, but affect the greatest number of people).

Q. *Electricity.* Can the project provide the village with electricity? (→We don't know if that's possible.)

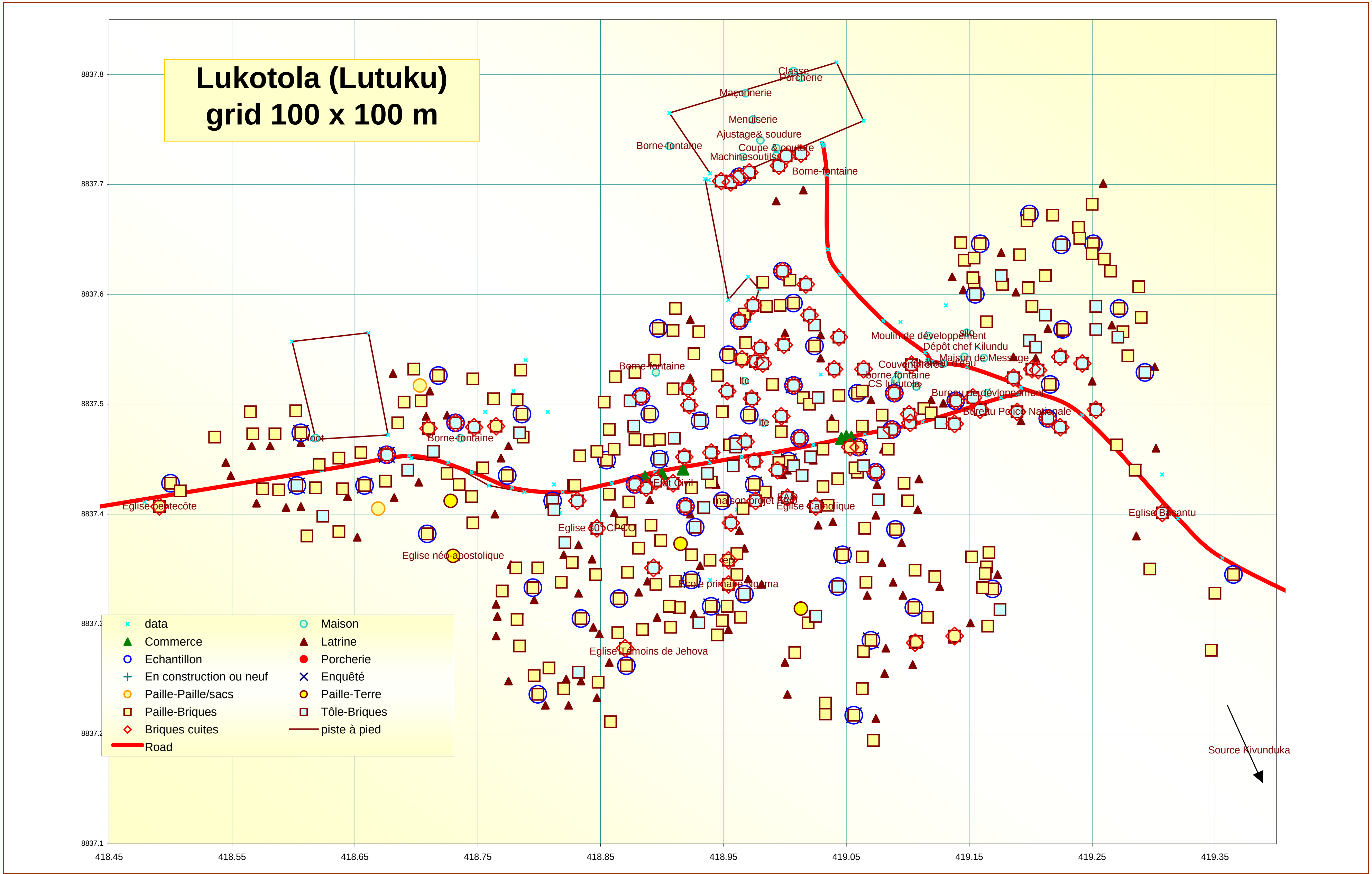
Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Lukotola	Lukotola	"We have good relations with the CdT Kamungu, Mwela Mpande, Mpala, but they do not have influence in our village"
Chef de poste	Mapasa Jacques	Tenke	
Chef de village	Lukotola	Lukotola	Called the "Mulobwe"
Chefs de quartier	5 other chiefs	Lukotola	Also called "Mulobwe", they organize different parts (clans?) in the village

Characteristic	Description
Population	320 compounds, Est. 1440 people.
Ethnic groups	Majority Sanga (47 of 53 families), followed by Lubakat (4) and Ruund (3)
Languages	Sanga, Swahili, French
Religion	Catholics, Pentecostals, Methodists, Jehova Witnesses, Basantu animists: 6 church buildings.
Housing	Walls: 1% straw, 1% mud, 70% mud brick, 28% red bricks; Roofs: 62% straw and 38% aluminum sheets.
Water	A protected source provides water to a water tower from where it is piped to four faucets in the village.
Electricity	Electricity in the mission and for the health post, one electric generator which serves a public video house.
Fuel for cooking	
Radio	National radios: Okapi only between 6 and 8 AM. No FM radio; international radios listened to are RFI, Tanzania, Africa #1. People listen to music and news broadcasts.
Television	None
Cell phone	Celtel in some places, Vodacom: difficult.
Education	Primary school with six grades: 10 groups for 7 classrooms, Secondary school up to the 4th grade;

Characteristic	Description
	vocational school at the mission (carpentry, welding, sewing, masonry).
Health	Health center with a qualified doctor, a qualified nurse, (A2 level). The Local Development committee, subsidized for 75% by the Catholic mission, created the center. For X-rays, surgery, laboratory tests patients need to go to Fungurume. Basic medicines are available, but not always in sufficient supply.
Commerce	Five shops, a mill financed by the Development Committee. Only simple products are sold in the local market. Two villagers own a second hand truck since 2005. Goat meat is sold in the market; beef occasionally at the Catholic mission.
Transport	Trucks pass in the village to buy maize and beans during the harvest season. It costs 500 Fc to go to Fungurume on a bicycle taxi. From Fungurume, transport to Kolwezi is 1,500 Fc to Likasi 1,500 Fc, to Lubumbashi 2.500-3;000 Fc.
Agriculture	Agriculture is the main activity. The animal traction program has sold a pair of oxen to a minority of villagers, who have significantly improved their production and income. Traditional farming (mulching and ridges) works best without fertilizer and improved seed, while flat plowing, together with fertilizer and improved seed can multiply production 4-5 times. The fields are directly surrounding the village, and not further than 5-10 minutes walking away. There is only a limited amount of marshland (kinyanga) around the village.
Informal Mining	Young people participated in informal mining, but have now returned to the village
Animals	Cattle, goats, hens, ducks, pigeons, Guinea fowl.
Hunting/Fishing	Presence of professional hunters (north and east of the village) who hunt with dogs, lances and some own riffles, and of fishermen in the Momvya River: who use rods, basket traps (“nasse”), rods with multiple hooks, fishnets. Names of fish mentioned are *kenyi* (a kind of big sardine), *ndomo ndomo.*
Gathering	
Government services	Civil registration office (état civil), Police, ANR (secret police), Agricultural service in charge of land measurements, topography, land disputes. According to the villagers, the government wants to impose mandatory crops to each farmer: cassava, beans, soybeans and peanuts[41]. Yearly vaccination days: for polio, vitamin A and de-worming. Standard vaccination at the local health center. Environment: they come to the village to fine people whose compound is not cleared or who do not have latrines (7-10,000 Fc), mills (7.500 Fc/year), charcoal making.
Roads	The road is open the whole year round and used by the missionaries, TFM vehicles and traders during the rainy season.
Prices (harvest → lean season	2003/4 maize low: 70-80 Fc→ high 320-350 Fc; beans low: 120 Fc → high 700 Fc 2004/5 maize low: 300-350 Fc→ high 650-700 Fc; beans low: 500-550 Fc → high 1000Fc
Local organizations	CDR Lukotola, an officially recognized NGO in charge of development in charge of health, cereal mill and a communal field of 2 hectares. (cf. main text); Mothers association (in charge of preparing meals when the village receives official visitors). Parents organization for the primary and secondary school.
Sacred sites	There exist secret sacred sites that you will never know, even if you live to be a hundred years old. That site is magically protected, you will stop and never attain it. The Kabafuwich River, near the village, where two big trees grow that were used for “truth tests” with sorcerers: the sorcerer has to put his hand in hot water, if the water burns his hands, he is considered guilty and the village will kill him. A small hill[42] where one cannot climb without getting lost, but only those that are aware of the existence of this hill.
Archeology	An important cave “kyamakela”, where the population was hidden during the 18th century wars in the Lubwana hills to the NW in the direction of the Mwela Mpande village

[41] People don’t like peanuts: yields are low, difficult to sell, and many problems with cheating merchants.

[42] A villager explains that two of his brothers were hunting gazelles in the area have seen a clean town, with washed clothing drying. Without realizing how, they crossed the river towards that town. As they were not aware that the site was taboo, they were able to come back. The chief says, that even he, the village chief, is not allowed to visit the site.


Lukotola (Lutuku)
grid 100 x 100 m
Classe
Porcherie
Maçonnerie
Menuiserie
Ajustage& soudure
Coupe & couture
Machinesoutils
Borne-fontaine
Borne-fontaine
Borne-fontaine
Borne-fontaine
Moulin de développement
Dépôt chef Kilundu
Maison de Message
Borne fontaine
CS lukutola
Bureau de dévloppement
Bureau Police Nationale
Eglise pentecôte
Eglise néo-apostolique
Eglise 30° CPCO
Etat Civil
Eglise Catholique
Ecole primaire Ngama
Eglise Témoins de Jehova
Eglise Basantu
Source Kivunduka
data
Commerce
Echantillon
En construction ou neuf
Paille-Paille/sacs
Paille-Briques
Briques cuites
Road
Maison
Latrine
Porcherie
Enquêté
Paille-Terre
Tôle-Briques
piste à pied
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8.2 Mpala

Initial meeting with GK on January 30 with 07 villagers, for a discussion with the CdT, Mr. Mpala. Main meeting with JK on February 06 2006 with 14 people: 12 men and 2 women.

The village chief is the most important Chef de Terre in the area, probably together with Mwela Mpande. This village was already an important village before Fungurume started to grow in the late 1940s. The present chief has been in office since 1972, and says that he is the 31st in a line of chiefs of Mpala.

The creation of the village dates back to a forgotten era. The first people came from Angola, the Kimbundu, who were later chased away by the Bayeke. According to the chief, nowadays there are still many people who settle in the village, as well as refugees from Kalemie and Mulumbu (informal miners that were expelled).

- *Questions and issues*

Chiefs. – The Chef de Terre of Mpala considers that his area includes the area claimed by Mwela Mpande (he is my brother), and refutes the rights of Lutanda to any traditional function. Some rights are given to what he may consider to be secondary "Chef de Terres": Mwela Mpande, Kafwaya and Lukotola, but Lutanda is a clear enemy: "who took the money from the white man, and never shared anything with me".

Chief's power. "I am the one who delayed the rains this year, it's only after I performed the traditional rituals that it finally started raining". Recognized chiefs, equal to his own stature are Kamungu Mulolo, Mutaka Mwelwa and Koni, of whom it can be said that they are not concerned by the concessions area.

Mining. "There exists a roaming spirit in the Fungurume hills. This spirit will obey me if I ask him with a pure heart to deliver the riches of copper to the white man. But I'm also capable of laying a curse on the mountains, so that no mining operation will yield any copper."

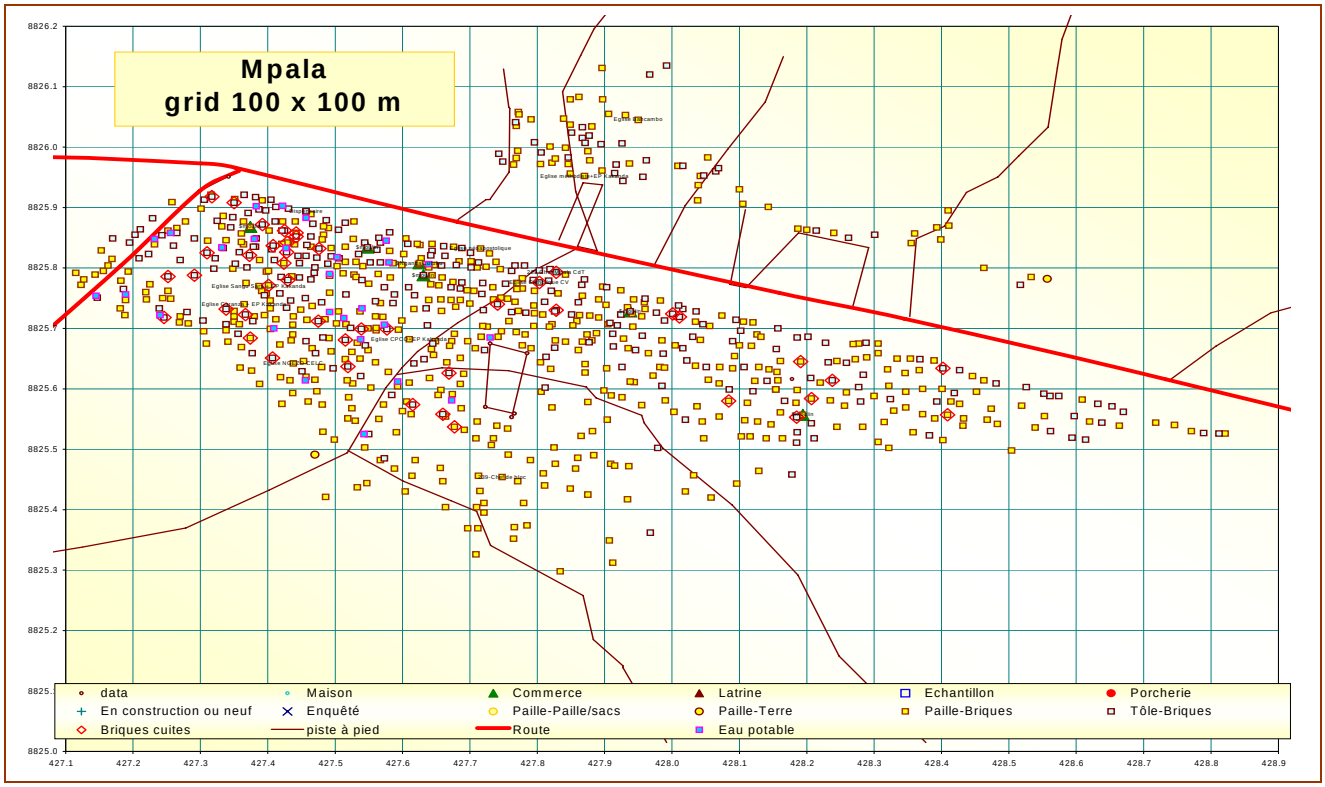
Land tenure. – "In the old days, a CdT would give land to strangers, and accept their gratitude (offerings, or Mulambu) in return. This does not exist anymore and I'm forced to ask money when I give (land for construction) to new comers so they can build their house."

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala Kibanga Sase	Mpala	
Chef de cité de Fungurume	Kapenda Lukeka François	Fungurume	
Chef de village	Mpala Kibanga Sase	Mpala	Mpala is both CdT and village chief

Characteristic	Description
Population	748 compounds, Est. 4762 people, a few transhumant farmers are present but difficult to evaluate their numbers.
Ethnic groups	In sample of 27 families: 10 Tshokwe, 8 Sanga 6 Kaonde, 2 Luba, 1 Ndemba, 1 Ruund.
Languages	Swahili, Sanga, Tshokwe
Religion	Many different religions: Methodists, Neo-Apostolics, Pentecostals, Catholics, local churches and movements like the Kitawala, Kishila, Sangu Sara, Garangaze.
Housing	Walls: 0% straw, 0% mud, 94% mud brick, 6% red bricks; Roofs: 64% straw and 36% with permanent aluminum roof.
Water	There exists a cemented well, which always keeps a little water, but is not very clean. Most other traditional wells dry up during the dry season.
Electricity	No electricity, but there are three generators with the owners of local Lutuku (alcohol) outlets.
Fuel for cooking	Charcoal mainly, more often than firewood.
Radio	National radios: Fungurume FM radio and Okapi; Various international radios listened to are RFI, Africa #1, Swaziland. People listen to music and news broadcasts, and local information.
Television	None
Cell phone	Vodacom and Celtel. Many people own cell phones (about 5% of the households according to the survey).
Education	There exists a primary school, but it does not have its own building, and classes are spread out over 4-5 churches. Secondary education in Fungurume.

Characteristic	Description
Health	No official health structure. Medicines are sold in small unofficial outlets. Red Cross trained villagers ("diperol" in Swahili) are present, as well as untrained midwives. If medical care is needed, people go to Lukotola, or if more serious to Fungurume, Kakanda and Likasi.
Commerce	5 mills, a local bar, but no shops in the village. There carpenters and blacksmiths. All other trade takes place in Fungurume.
Transport	The National Highway crosses the village, but the road is in a very bad state of repair.
Agriculture	*Agriculture*: 1. Maize, 2. Cassava, 3. Beans, 4. Peanuts, 5. Soybeans, 6. Irish potatoes. Best sold are 1. Beans, 2. Peanuts, 3. Maize, 4. Soybeans 5. Irish potatoes. Note: a wider choice of products than cited in other villages of the concession area.
Informal Mining	No specific information was obtained.
Animals	Pigs, goats, hens, ducks, pigeons.
Hunting/Fishing	*Hunting*. – Area around the village: castors, *kangomba*, "hares", "wolves", wild cat *shimba*, and snakes for direct consumption, and if big enough, for selling. *Fishing*. – Dipeta River. One species of fish, "*Kisulu*" appears magically in great number every five years and is then sold.
Government services	Sanitary services check the cleanliness of the village and the presence of latrines, IPMEA[43], veterinary service, various taxes: bicycles, local alcohol, agricultural products. No vaccinations (polio, vitamin A and de-worming). Routine vaccination only in the health posts of Fungurume.
Agricultural labor	Preparing a new field cost 3,500 Fc (10 meka maize), preparing a cleared field 2,500 (5 meka), weeding 1,000 Fc (1.5 meka) and harvesting 25% of the harvest (5 meka per bag of 25 meka!).
Local organizations	Rotating mutual assistance groups (*kinkurimba*) to boost agricultural production, but also for brick making. Choirs and groups for women (CEM *Asafa*, *Inyonyo*; Sisters of the Neo Apostolics). A soccer team participates in a competition in Fungurume.
Sacred sites	*Muninga cave.* On the road to Lukotola, where the "*Tipoyi*" ornaments made of "*Konji*" skins of the chief are kept after his enthroning. *Katumba.* – A lake of the Dipeta River where one cannot draw water with black pots. *Kibanda*. – In a clear forest, a place called "*zanzela*" with many snakes. If one cries because of seeing the snakes, they will bite. Kelangile River. – It's forbidden to take a bath in the upper part of the river, if not one will disappear.

[43] Industries Petites et Moyennes Entreprises et Artisanats: Government service in charge of small-scale industries and shops. Main activity in the villages: collecting taxes from small traders and craftsmen.


Mpala
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Paille-Briques
Tôle-Briques
Briques cuites
piste à pied
Route
Eau potable

8.3 Mitumba Bloc

An initial meeting was held in September 2005, the socio-economic survey in December 2006, and the village interview (by JK) on March 29, 2003.

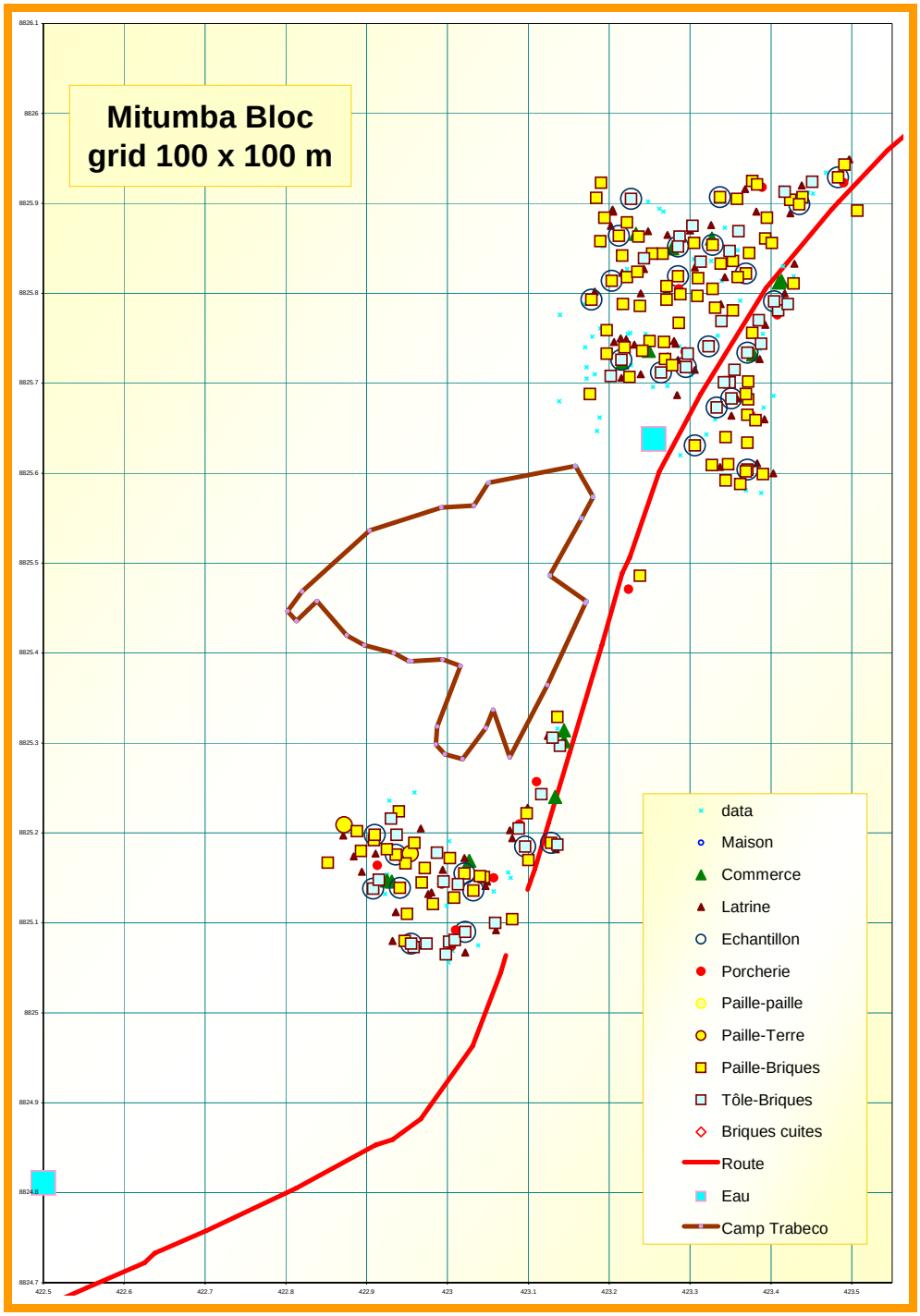
The Bloc is located just outside of Fungurume, which belongs to Mwela Mpande. It is built around the Trabeco camp and a military camp that has not been surveyed. As it is part of Fungurume, no specific meeting has been organized.

Mutumba Bloc is part of the Mwela Mpande quarter of Fungurume. Most inhabitants are former workers from SMTF, TFM and Trabeco. The village was created in 1942, as a worker's camp, by the union Minière. Later, the authorities have added administrative services for the workers of Union Minière and its successor, Gécamines. Most of them had been settled in the village by their employers, while the CdT, Mpala had allocated them land. Fields are south of the road. There is sufficient land available in the village, but the population complains about a lack of fertilizer and of improved seeds.

Function/fonction	Name/nom	Village/Lieu d'habitation	Remarks
Chef de groupement	Nguba	Nguba	
Chef de terre	Mpala	Mpala	
Representative Chef de Terre	Kalasa	Mwanga Kakunta	Receives Milambu (annual gifts) of the village for the land.
Chef de poste	Mapasa	Tenke	
Chef de Quartier	Kamiji Lwendela	Fungurume, Quartier Mwela Mpande	
Chef de bloc	Kamiji Ikumba Noé	Mitumba Bloc	

Characteristic	Description
Population	152 compounds, Est. 740 people, not including the military in the camp, that refused to be counted. The military have since left the camp.
Ethnic groups	Majority Kalwena (Ruund, Tshokwe, Ndembo)
Languages	Swahili, Kalwena, Sanga
Religion	Catholics, Methodist, Neo Apostolics, Zambe Malambu, Pentecostals; there are 6 churches in the village.
Housing	Walls: 0% straw, 1% mud, 99% mud brick, 0% red bricks; Roofs: 68% straw and 32% aluminum. No red bricks in the village. Housing index: 0.97.
Water	One cented source, with a good yield, and water faucets with water provided by TFM.
Electricity	Connected to the grid. Presence of generators.
Fuel for cooking	Charcoal is the major fuel used.
Radio	National radios: Zenith local FM radio Fungurume, and Digital Congo, and the Monuc radio (Okapi) and the; international radios listened to are RFI, VOA, Zambia. People listen to music and news broadcasts.
Television	Television is used with VCR for showing movies.
Cell phone	Vodacom and Celltel are both captured. Ù of the household own phones according to the SE survey.
Education	The Garengaza primary school of Fungurume has organized the first 4 grades in Mitumba, after which children attend the various
Health	No local health personal in the village, except for a traditional midwife. Nearby Fungurume has facilities. Some women deliver their babies on the way to Fungurume, as there are no facilities in Mitumba.
Commerce	Only a few stalls with some simple food items, candles, matches, salt, smoked fish are present, and two cereal mills. All other supplies have to come from Fungurume.
Transport	Mainly by cars and by trucks: Kolwezi 2,500 Fc, Likasi 1500-2000 Fc, Lubumbashi 3,500-3,700 Fc.
Agriculture	Main crops: maize, beans, soybeans, cassava, peanuts. Main crops for selling: beans, soybeans, peanuts.
Animals	Pigs, goats, hens.
Hunting/Fishing	Some fishing in the Dipeta River, is practiced for home consumption but also for selling.
Government services	ANR (national intelligence) is present in the village and covers the whole area. Environmental service who collect taxes for latrines. National vaccination days are present for vaccinations (polio, vitamin A and de-worming). Regular

	vaccinations and infant healthcare are available in Fungurume.
Roads	The National Highway, which is in a very poor state.
Agricultural labor field of 25 x 25 m	Preparing a new field cost 2.500 Fcc, preparing a cleared field 2.000 (5 meka), sowing 1,000 Fc, weeding 1,000 Fc, and harvesting 1.5-2 meka of cereal per field
Local organizations	Rotating mutual assistance groups (*kinkurimba*). A choir which includes both men and women. A group of farmers is actually thinking about creating an official organization to improve animal production, but nothing has been done so far.
Sacred sites	No sacred sites are reported by the local population.
Archeology	No archaeological sites are reported by the local population.
Cemetery	Fungurume



8.4 Fungurume

A short meeting with 3 of the 4 quarter heads of Fungurume took place on December 7 2005. The discussion centered on relocation (note: no relocation of people living inside the staked area is planned.) Employment: opportunities are limited.

The Chef de cité indicates as the main problems of his cité the following items:

- Uncontrolled urbanization, though a cadastral law exists and should be applied[44]. A land title in Fungurume costs about 20,000 Fc[45].
- Poverty of the population because of firm belief in sorcery, squandering of the harvest because of the need of money, and very small revenues of the local population.
- Local alcohol such as the distilled *Lutuku* is formally forbidden but an important source of income for the women.
- Employment: job seekers should not have to wait in front of the TFM gate in order to obtain a job: a sad and humiliating sight.
- Informal mining has been favorable to commerce. It was started by foreigners, but after on the locals became involved. It led to lack of work in the fields, and the result is the shortage of food that is observed this year. Now that the miners have gone, and the weather is good, this years' harvest is promising.

The area of Fungurume, legally, is "extra-customary", which means that not the traditional law but the administrative law prevails in the cité. There exists a cadastre in Fungurume, but it is not sufficiently applied. Urbanization is still mostly uncontrolled, in spite of the existence of urbanization laws, which are not applied. People need to register their property or land, but, as the title costs about 20,000 Fc, many people try to avoid this.

The "chef de cité" recognizes many problems in the cité.

1. Uncontrolled urbanization.
2. Mentality of the people as expressed in:
    a. belief in sorcery.
    b. use of traditional medicine and witch doctors for the treatment of diseases.
    c. poor conservation of the harvest (people tend to sell too much food at harvest time, when prices are cheap, and have to pay back – or borrow – during the agricultural season, keeping them in a poor and often indebted bondage.

[44] This regulation can be applied in order to avoid the extension of the town of Fungurume further into the concession area.

[45] In this report the Franc Congolais (Fc) is valued at roughly 500 Fc to the USD. The street value in January 2006 was between 430-450 Fc to the dollar.

8.5 Tenke

A short introductory meeting took place with representatives of the local authorities before the survey of the population started. This meeting was led by the TFM LCO Francis Kalasa, and included: *Chef de poste*, chef ANR, head of the local police, head of the mines' police.

The *chef de poste* indicates as the major problems in his area:

- Absence of governmental schools.
- Poor state of the health posts.
- State of the roads.
- Absence of a budget to run the "*Poste administrative*" (all taxes are given to the Lubudi district, who may return 10 percent to the poste).
- No transport facilities (except 2-3 bicycles) for the government services.

9 Focus Group Discussions

Focus groups discussions were held in four sites, representative of four different implications in the project: (1) Fungurume, site of the actual TFM base, (2) Tenke administrative headquarters of the area where moist of the mining will take place, Mulumbu, the village most impacted by the project facilities, and Kamungu Kitambo, a small village near the planned limestone mine, where the population will be impacted in a minor way.

- *Focus group discussions*

	Village	Service	Name
Feb 3-06	Mulumbu	Focus Group Young Men	sample of young men of various backgrounds
Feb 3-06		Focus Group Migrants	People that have settled in Mulumbu more or less permanently since a number of years
Feb 3-06		Focus Group Adult Men	A few of the elderly of the village, among whom the village chief Mulumbu Kazadi
Feb-8-06		Focus Group Women	Village women of varying social and economic status
Jan 29-06	Kamungu Kitambo	Focus Group Women	Women of various backgrounds (local and transhumant), a discussion without defining developmental priorities
Feb 3-06		Focus Group Young Men	Young men of various backgrounds (local and transhumant)
Feb 3-06		Focus Group Adult Men	Men of various backgrounds (local and transhumant)
Feb 3-06	Fungurume	Focus Group Women	Market tradesr, education, health and 2 farmers, quite educated
Feb 7-06		Focus Group Young Men and Women	Very young mostly, even 2 still attending primary school, a few adults and one young female widow
Feb 7-06		Focus Group Adult Men	Important market traders, quartier chiefs, commercial farmers and a few men of modest background
Feb 3-06	Tenke	Focus Group Women	Women present were active in agriculture, education and health centers
Feb 7-06		Focus Group Young Men	Not so very young and quite affluent men, mostly engaed in trade
Feb 7-06		Focus Group Adult Men	Important market traders, quartier chiefs, commercial farmers and a few men of modest background

9.1 Methodology

Through local administrative serices invitations were sent out stipulating the kind of representatives (educational, commercial, health service related, agricultural, religious) wanted for an informal group discussion. Groups were typically composed of 10-15 persons. The meetings with men were done with GK and FS, while for the women, JK, who has a great experience with such meetings, directed the meeting and did the translation. Except for part of the meeting with the men in Fungurume, all meetings were in Swahili, as this is clearly the only language that the local population masters in such a way that it can clearly express its feelings, sentiments, worries and expectations.

The meeting format included:

1. Short description of the mining project and its implications for the population by GK.
2. Brief individual presentation of each of the participants.
3. Detailed presentation of the private history of three randomly chosen people in the audience.
4. Discussion about any of the elements that were addressed during the private presentations, or other elements that would come up during the discussions.
5. An exercise in which people would write down (1) major problems and difficulties, (2) major priorities for community development, (3) major priorities for individual development and in the case of women (4) major priorities for women.

9.2 Focus Group Discussions in Fungurume

Focus group discussions in Fungurume concerned men, women and young people. Each meeting lasted about 2.5-3 hours.

▪ Fungurume Women

Among the items discussed:

- As parents frequently move to new villages it is necessary to have new schools, new fields and sufficient time and resources to wait for the new harvest; difficult to raise children in case one of the parents die.
- Children are needed in the fields and often there is no food to leave them in town and this causes many children to have to leave school early.
- A problem finding fields near Fungurume, some have to go 10 – 20 kilometers away, and/or wait several years before land is found. Land around Fungurume was cultivated using fertilizer and does not yield acceptable crops without it. Land rents at about 80 pots of maize, (equivalent to 10-20 percent of the production) considered a normal price.
- Men decide about everything in the marriage. At harvest time the good collaboration between spouses often stops, as men need the money from the crop for their own use. Women try to circumvent this by having their own money earning activities, of which only part of the benefits are given to the men.
- Informal mining: was good for the economy and the small trade practiced by women, one teacher tells that even in the schools it was noticed that people had less difficulties paying attendance fees. The absence of informal mining is bad for our business.

Problems: (1) poor agricultural production; (2) water; (3) health services

Village priorities (1) employment; (2) a school; (3) facilities for women

Women's priorities (1) Literacy classes; (2) employment for women; (3) stability and peace within the household

Individual priorities (1) Nutrition centre; (2) hospital and (3) agricultural inputs as fertilizers and seeds

▪ Fungurume Men

The meeting with men from Fungurume included important representatives of the traders, a few large farmers, former civil servants, etc. mostly quite affluent people. They complain of lack of agricultural land near Fungurume, as the use of fertilizers has impoverished land near the "cité" and along the railway to Tenke, where people used to farm. It's easy to find land, but one has to go 10-20 kilometers from Fungurume, and live near the fields. Land is not paid for (contrary to what the women say). Actually few farmers apply fertilizers. Though fertilizer is wanted by everybody, they all agree that the Gécamine's procedure of reimbursing fertilizer at harvest time – which lasted until about 1985 – did not work as most people did not pay[46]. One farmer asked for the extension of the oxen project of the Lukotola mission to Fungurume, so that they could also benefit from agricultural development.

Fungurume's problems concern the market place, the lack of schools, decent hospital, electricity, and the state of the roads. Development should come through agriculture, and there is an underlying desire to obtain credit[47]. One teacher tells that they have the baked bricks to build a school but lack cement and aluminum sheets for the roofing.

Street children are a rising problem, which churches try to address, but they need help from TFM's project.

Informal miners. We thought that TFM would replace the informal mining by important recruitments but you say that that's not the case. We are worried about our young people.

Problems: (1) Health services; (2) drinking water; (3) schools

Village priorities (1) Agricultural inputs: fertilizers and improved seed; (2) electricity and road repair; (3) new market and TV antenna.

Individual priorities (1) Animal husbandry; (2) housing improvement; (3) Micro developmental projects

[46] Fertilizer was considered too expensive, 80 buckets (meka = 2.5-3 kg) for a bag of fertilizer. 4-8 bags are needed (300-600 buckets), and the resulting harvest may be only 400 to 800 buckets more than without fertilizer. In 2005 a 50 kg bag of fertilizer cost about 120 buckets of maize, and it was difficult to make a profit.

[47] As Katanga and the Congo have recently known a period of hyperinflation, the notion of saving, credit and interest are not yet easily accepted. The economy is still mostly based on barter maize and beans for necessary items, no savings goups exist, and if money is urgently needed people sell belongings such as bicycles, which they bought as an investment.

- **Fungurume Young people**

Young people in Fungurume were mostly of school age in secondary and university education, except for one elder man. The discussion about the importance of sorcery took up a lot of time, and the participants noted that [the fear of] sorcery is one of the driving forces of society, which blocks many endeavors, and has a negative influence on development. “Whenever I’m too rich, others will accuse me of sorcery.” The link between jealousy and sorcery was apparent. Religion for some is a weapon against sorcery. Even in hospitals, doctor and nurses send patients to traditional healers whenever they feel that a disease cannot be treated in the hospital.

Problems for the young concern: money to pay their studies, poor schools with only theoretical education, lack of information (no radio, TV, internet), young marriages “to fight boredom” and agriculture, which requires too much investment for a very poor return. The young argue with their parents about type and cost of their studies, participation in agriculture, choice of their partners, young marriages, unwanted pregnancies[48], lack of assistance by the parents for the newly wed and so on.

Problems: (1) Schools; (2) health services; (3) electricity and water

Village priorities (1) Agriculture and animal husbandry; (2) mining; (3) communication (radio and TV)

Young people’s priorities (1) free time activities; (2) guidance (encadrement) and education; (3) [developmental] projects

Individual priorities (1) Peace and happiness; (2) satisfaction about spiritual moral and material needs and (3) liberty and independence

[48] Young girls that become pregnant as well as their boyfriends are regularly repudiated by both families.

9.3 Focus Group Discussions in Kamungu Kitambo

Focus group discussions in Fungurume concerned men, women and young people. Each meeting lasted about 2.5-3 hours.

▪ Women

Discussions with women concerned the decision-making within the married couple. Although the Sanga society is a matriarchal one, men make all the decisions involving money. Most women cultivate on a common field with their husbands, who will decide on the sale of products. Men are responsible for the education of the children and the clothing for the wife and children. In the modern economy, women tend to have some of their own activities, such as preparing local drinks, and will keep most of the profits, sometimes lying to their husbands about the money they earn.

Credit is a major problem. For each bucket of maize received during the rainy season, 4-5 buckets have to be repaid at harvest time. Some families even have to flee the village at harvest time, as they cannot reimburse the debts contracted.

Stability of the marriages. – Marital life is stable[49] (as was confirmed more or less explicitly in other villages) and 90 percent of the couples never divorce. Adultery is said to be a major problem, while in polygamic couples the wives often live in different villages. Age at first marriage may be as young as 15 years according to common belief, but in interviews appears to be around 18-20 years for girls, and 20-24 years for men.

Problems: (1) Poor agricultural production; (2) education; (3) health services

Village priorities (1) Fertilizer and improved seeds; (2) a school; (3) employment

Women's priorities (1) Agriculture and animal husbandry; (2) women's organizations and (3) literacy training

Individual priorities (1) School; (2) hospital and (3) employment

▪ Men

The confusion that reigns about the power and role of the local chiefs: "This is an incomprehensible part of the Sanga culture", which is counter productive. The latest meeting about the role of chiefs in May 2005 in Kakanda, organized by the chief of Nguba, "has not resolved much, as the meeting was manipulated by some". The role of a traditional chief is considered to be a minor one.

Transhumants need to have a good house in the village where they work, but they are not part of the village community. Frictions between young and old in the village concern the behaviour of the young, unwanted pregnancies of the girls, limits of agricultural land, refusal of the young to participate in communal projects.

Problems: (1) Lack of fertilizer; (2) clean drinking water; (3) animal husbandry

Village priorities (1) Hospital; (2) a school; (3) employment

Individual priorities (1) Corrugated iron roofs on our houses; (2) a decent house for the chief and (3) seeds

▪ Young people

Young people marry quite young but parents often do not agree if the girl is from another ethnic group. The bride price nowadays is the equivalent of 100-150 USD, but payment is often incomplete the day of the wedding. After their marriage, they belong the first year to the boys' family but start their own fields during the second year. Parents help through the African solidarity principle, but life can be difficult if jealousy about personal achievement is rising. Problems with brothers arise when inherited land has to be shared[50]. Within the married couple, disputes are linked to children's diseases explained by sorcery, debts and drinking of local alcohol.

A successful villager has a big field and uses fertilizer, has a house with a permanent roof in Fungurume, has a large stock of maize, pays contract laborers to prepare his fields and owns a mill and a motor pump (for his market garden crops). A poor man will have no land and is obliged to work in the field of others to survive. All young people complain about their difficulties to save money.

Problems: (1) health; (2) food shortage as food is also our money and we pay with maize; (3) lack of fertilizer

Village priorities (1) development (organizations, training, extension services, saving and access to credit); (2) hospital; (3) a school

Individual priorities (1) fertilizer and improved seeds; (2) employment and (3) motor pumps

[49] The stable marital life in the area may be responsible for the relatively low rate of AIDS in the area compared to neighboring countries in Southern Africa (about 5 percent according to some sources). Premarital sex and especially birth outside wedlock are badly looked upon, and also favor stable family life. The not so extremely young age at first marriage and absence of children out of wedlock also indicates a restrained society

[50] One participant said laughingly: "My maize and my wife, they both are my property."

9.4 Focus Group Discussions in Mulumbu

Focus group discussions in Mulumbu concerned men, women and young people. Each meeting lasted about 2.5-3 hours.

▪ Women

None of the women present in the meeting were born in the village, and most had arrived only recently. Only one woman was a local, born in Mwela Mpande. Women explained that men decide on where the couple lives. They admit unanimously that though it is sometimes difficult to live far from their kin, a clear advantage of living in a new village without parents of either spouse is the possibility to live more independently. Women say that major causes for leaving a village are too many unexplained diseases and too much mortality as well as bad water. Sacred sites and taboos are less well respected as before, especially by Christians, but still play an important role: it is taboo to wash a dirty pot near the river, to cut wood, pound cereals or sweep the floor during the nighttime, for women to climb on hills. Women cannot visit one of the nearby rivers (with a secret name, but towards the north beyond the Mofia River and probably outside the direct project's footprint).

Women complain about the power of their husbands, though they give him the right to speak, they ask him also to listen to them when they express their opinion. Women who cannot bear children are badly looked upon, and their husbands tend to take another wife. Women oppose polygamy and accept it only under duress because they have to. Women also do not admit easily that they are bachelors or have had children out of wedlock but prefer to call themselves either divorced or widowed. Divorced women are also badly looked upon as other women think that they are after their husbands. In the case of divorce, it's always the man who repudiates his wife, and not the other way around. In Tenke, divorced and childless women reacted in a similar way, but said that widows have a more positive reputation and gain compassion.

Problems: (1) health post; (2) official recognition of the village school; (3) manual labor in the fields

Village priorities (1) Agricultural extension, and assistance; (2) school; (3) hospital

Women's priorities (1) Women's alphabetization; (2) community organizations; (3) freedom of speech for women

Individual priorities (1) Women's education (2) employment; (3) community organizations

▪ *Migrant men*

Land acquisition. – It's not difficult to obtain land. The migrant chooses a plot and asks the village chief, or the village chief points out an available plot. A gift to the chief is not mandatory. The first year is the most difficult year, when you need to have your own crop to survive, or hope to earn food through regular contracts. The soil around Mulumbu is excellent, rotation of beans and maize is necessary but some use the land forever without fallow! There is good land also in Lukotola, Kando, Tshilongo, Mukabé, but not around the Route Nationale Fungurume to Tenke. Mulumbu is easy, and the chief does not press you to pay for your land[51].

Informal miners. They tended to steal food in the fields. There was too much money in the villages: spouses did not know what their partners earned which led to disputes and adultery. "At least eight governmental services were present in the village and created their own penalties", "Men were just whipped, not tortured, nobody was put in jail…"Small boys would push loaded bicycles for 50 Fc on the slope of a hill called "Bic rouge", red pen, because of its steepness. There was too much money in the village, and everybody spent without thinking about tomorrow". "We are glad it's over know, as chaos was about to reign in the village". The village smelled of hashish, and the chief had already decided to move his village to the north of the Mofia River.

Marital problems. – Adultery is an issue. Women sometimes want their own field and an income of their own. Women have to live in separate villages if in a polygamous marriage. Children after a divorce usually reside with their mothers.

Problems for migrants. – Migrants have problems in the village if they show disrespect for local customs, and practice sorcery (very important) between them and the village, but also within families, often leading to deaths. If the villagers discover that a migrant uses fetishes or voodoo, he will be killed.

The main problem is how to earn money either through (1) employment or (2) agriculture ("we have oxen in Mulumbu, but no fertilizer nor improved seeds").

[51] Those in the Lukotola-Kamungu area who do not pay the Chef de Terre will find out that he will come, point his finger to their maize which will then immediately dwindle.

Sorcery:

According to the villagers, the mountains still want to see the white man's blood before they will give up their copper. Many locals are convinced that white men will die before the mine opens.

Water sources[52] are protected by spirits who reside in trees and plants that grow next to the source. If ever they are removed, the water dries up.

Other problems surrounding sorcery are dealt with through the local Mpuma, the medicine man or witch doctors, who will take care of the punishment of the perpetrator[53].

Problems: (1) Employment and lack of money; (2) transport;(3) shops

Village priorities (1) Hospital; (2) school; (3) drinking water

Individual priorities (1) Good food[54]; (2) good clothing; (3) means of communication

- **Elder Men**

Only four elderly men participated in the meeting, but they were among the important locals, among whom Mulumbu the chief, but not Kyabondo, the rival chief. During the open-ended discussion the following topics were raised:

- Low agricultural production, the isolation of the village and the difficulties in transporting sick people to a hospital. The village favors in-migration, which is good: people that lose their jobs in companies come for agriculture to our village and help it to develop.
- Informal miners: positive aspects were the trade, the money. Negative aspects: the fighting, the problems with police and other authorities, drug abuse, caused by the miners (*pombofuko* = "moles"), fear to descend into the deep mines, too much stealing. Informal mining increased the antagonism between the two rival chiefs Mulumbu and Kyabondo. In conclusion, the elder people say that they are happy that it's over.
- Tensions between fathers and their children concern leaving school, stealing, refusal to work in the fields, making debts. "Weddings imposed by the parents are rare nowadays, which is a good thing."
- The local courts in the area treat especially matters of (1) land dispute between villagers, (2) swindle and fraud, (3) adultery (*busharat*), (4) debt problems (5) sorcery (*buloji*).

Problems: (1) lack of agricultural inputs and tools; (2) sorcery: fear of sorcery of those who own something; (3) lack of money circulating in the village

Village priorities (1) Hospital and agricultural inputs; (2) schools; (3) drinking water

Individual priorities (1) Collaboration with the "white men" [of TFM] (=developmental assistance); (2) need to have responsible people in charge of the company; (3) confidence between members of the local population and development agents ([of TFM]).

- **Young people**

For the young of Mulumbu, the informal mining was an important activity, which helped them acquire[55] desired items. Not only the mining, but also services such as providing drinking water, restaurants, call boxes and trade generated income for the community. In family relations, young people like to leave their home early. They are afraid about sorcery by their parents, who may be jealous about the success of their children. Other problems are related to the ethnic group of the spouse.

Problems: (1) lack of employment; (2) developmental assistance; (3) lack of money circulating in the village

Village priorities (1) Hospital and drinking water; (2) schools and shops; (3) electricity and good roads

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[52] Many taboos surround the village water points: no bathing, no clothes washing, no washing of cooking pots with leftover food, etc. Similar indications of the importance of water wells were observed in Amoni (where the sacred tree near the source was shown) and in the interview with the women from Mulumbu.

[53] As one traditional healer, since then converted to Christianity, told the team: you have to play with a mixture of truth and lies in order to gain confidence from the people. But this man apparently had to move to another town every six months, because "people got used to him".

[54] This was explained by one of the attendees as "primo mendugari, segundo philosophari", a variation of the Latin proverb "Primum vivere, deinde philosophari": "live first, then philosophy".

[55] A radio cassette player, a car battery and a bicycle, another had bought a mobile phone and set up a call box, a third one had also bought a mobile phone, now used in a call box in Lubumbashi, a bicycle, and a big radio, now kept by his uncle.

Individual priorities (1) agricultural inputs and seeds; (2) housing equipment such as radios, television, couch, video; (3) shops in the village; (4) animal husbandry

9.5 Focus Group Discussions in Tenke

The *chef de poste* of Tenke opens the meeting of the women, and asks them to participate in a positive way. After the explanation of the main characteristics of the project by the socio-economic team, he leaves the meeting.

▪ Women

Women present were active in agriculture, education and health centers. Items discussed during the meeting included:

Agriculture transhumance. Leaving Tenke during the rainy season to reside near the fields is difficult, as one either has to leave the children alone or with a young tutor in town or take them to the fields and so force them to abandon school. While in the field, a simple disease can be dangerous, as hospitals are far away and sanitary conditions poor. Houses that are left in Tenke deteriorate during the rainy season.

A married couple most often has a common field, except incases of polygamy. Women have issues with their husbands about drunkenness, adultery and polygamy.

Child mortality is important and caused by bad food, and sorcery (all women present agree). In hospitals children are often treated by blood transfusions, as soon as a simple eye inspection indicates that they are anemic. Families often seek help from traditional doctors, though some say that such doctors “cannot replace lost blood” of anemic children.

Taboos. – An example is the infanticide that was formerly committed when the first tooth of children was in the upper jaw. Such is not the case anymore, but these children still suffer from many taboos and are stigmatized.

Problems: (1) poor agricultural production; (2) hospital; (3) education

Village priorities (1) Fertilizer and improved seeds; (2) laboratory and doctor for the health center; (3) a good school

Women’s priorities (1) money and credit; (2) literacy training in evening classes; (3) assistance for women’s organizations

Individual priorities (1) assistance and training; (2) different kinds of employment; (3) assistance for women’s organizations

▪ Men

During this meeting the men asked many questions, in a similar way as in Fungurume. They asked assistance of the TFM in creating fields, buying crops from villagers, were jealous about the perceived preferential recruitment in Fungurume compared to Tenke, and worried about recruitment of those that only spoke Swahili and not French.

Informal mining. – Is it possible to recruit and train our young men so they become trained artisinal miners. GK: We’ll consider it. Such a project exists in Kolwezi.

Education. – We heard that TFM will build a school in Tenke, what do you know about that? Other schools want also assistance → Education is an important priority, and our team wants the benefit of the project to be spread out over as many communities as possible.

Problems: (1) Clean drinking water; (2) electricity; (3) poor state of the roads

Village priorities (1) Schools; (2) hospital; (3) agricultural inputs: fertilizers and seeds

Individual priorities (1) Building material on credit; (2) employment; (3) animal traction (oxen)

▪ Young people

Problems: (1) Clean drinking water; (2) basic infrastructures: roads, hospital, school; (3) TV and radio antenna

Village priorities (1) Hospital; (2) a good technical school; (3) financing community development programs

Individual priorities (1) Full employment building for all inhabitants of Tenke; (2) possibility to send children to school at an early age; (3) a micro credits and loans system.

10 Key Person Interviews

The table in the following section gives an overview of the key persons met and the focus group discussions. The information obtained in this interview has been disucussed in the sections related to the corresponding expertise of the key persons (education, health, administration, agriculture); no specific details are provided in this section, except for the interview with the railway company in Tenke.

- **Summary table of key persons interviewed**

	Ville/town	Service	Nom/name	Fonction/function	Téléphone	Function
Jan 26-06	Tenke	Dispensaire SNCC Dispensary	KONGOLO Bogani	Infirmier A2	non	*Health post SNCC*
Jan 26-06	Tenke	Dispensaire SNCC Dispensary	KOTOKA BIBIKAWA	Accoucheuse A3		*Health post SNCC*
Jan 26-06	Tenke	EP SNCC Primary School	KASONGO NTOMBE MATONGOLE	Directeur d'école		*Primary School SNCC*
Jan 26-06	Tenke	Ecole secondaire mixte Catholique Secondary School	KAZEMBA Dieudonné	Prof D'anglais, préfet de discipline	non	*Catholic Secondary School*
Jan 26-06	Tenke	CS Saint François Xavier Secondary School	KIKAKA Morton	Infirmier A1, responsable	081.050.9691	*Catholic Health post*
Jan 26-06	Tenke	EP Orthodoxe "Lumière du Christ" Primary School	NAWEZI MUINUNGA Athanase	Directeur d'école	081.006.5006	*Orthodox Primary School*
Jan 26-06	Tenke	SNCC	MESE NGOIE MULEYA Jacob	Chef de Station		*Railway chief for Tenke*
Jan 26-06	Tenke	Poste Administratif de Tenke	MAPASA BUY WAKILWA Jacques	Chef de poste	081.214.7522	*Administrator of Tenke*
Jan 27-06	Tenke	Institut Technique Commercial Orthodoxe "Lumière du Christ"	MUJUNGA MWANDU David	Préfet	099.702.1439	*Orthodox Secondary Administrative school*
28-janv-06	Lukotola	Mission Catholique Catholic Mission	Frère Jean Antonio de la Purificatiobn	Frère animateur agricole		*Catholic Mission of Lukotola*
			Kilunda Pierre	Dresseur de bœufs		*Oxen trainer*
Jan 30-06	Nguba	Chef de Groupement + notables	KAYUMYA MBULA Nicolas	Chef de groupement	081.002.3546	*Chief de Groupement and elders*
Jan 30-06	Fungurume	Zone de Santé Health-District	Dr. Laurent AKILIMAH (MCZ)	Médecin Chef de Zone	081.406.8354	*Chief of Health District*
Jan 30-06	Fungurume	Zone de Santé Health-District	Dr. Alain KAIJ (MSZ)	Médecin Supplémentaire de Zone	099.704.0591	*Adjunct Chief Health District*
Feb 1-06	Fungurume	Education	MULOMB M. TSHNIGAMB	Inspecteur chef de pool territoire de Lubudi	081.403.4546	*Chief inspector Education Lubudi Territory*
Feb 1-06	Fungurume	Education	André TSHUMA MUHANOLENU MUENE	Inspecteur Itinérant de l4EPSP, Lubudi I, Fungurume	081.073.8513	*Itinerant Inspector of Education, Lubudi, Fungurume*
Feb 2-06	Fungurume	EP TUKAN KAMANE Primary School	MUDIMBA KASONGO Henri	Directeur de l'Ecole	sans	*Head of the oldest primary school in Fungurume*
Feb 2-06	Fungurume	Institut Lupeto Secondary School	BUKASA-MWAMBA MWANABUTE	Préfet	081.405.1960	*Director of Catholic Secondary school*
Feb 3-06	Mulumbu	Ecole primaire	KUMBA jean	Directeur de l'Ecole	sans	*Director of the primary school of*

	Ville/town	Service	Nom/name	Fonction/function	Téléphone	Function
						Mulumbu
	Fungurume	All 7 primary and 69 secondary schools have been interviewed by a Gepfe team member				
5-févr-06	Mpala	Chef de Terre	Mpala	Chef de Terre	sans	*Chef de terre*
	Lutanda	Chef de Terre	Lutanda	Contested Chef de terre and sworn enemy of Mpala		
	Mwela Mpande	Chef de Terre	Mwela Pande	Widely recognized as one of the two major chefs de Terre, with Mpala		
	Lukotola	Village chief/chef de terre	Lukotola	Recognized by some as a chef de terre		
5-févr-06	Fungurume	Chef de Cité	François Kapenda	Chef de Cité de Fungurume	081-453-1615	
6-févr-06	Fungurume	CS Dipeta	ILUNGA Makwonda	Pharmacienne	sans	*In charge of the pharmacy and the major health post, Doctor not met*
6-févr-06	Fungurume	Agronome de la cité *Government Agronomist*	KAPENDA Sakawa King	Agronome	081-007-7565	*Government Agronomist, in charge of compensation issues*

10.1 – Development Project of Lukotola

Lukotola is the only site in the project area that benefits from active development work. A Catholic mission was created 25 years ago in 1981, but it was only when the mission got support from Spanish brethren in 1984/5, that its actions could develop. The mission has two Spanish brethren and two French development workers.

In the mission Brother Jean Antonio de la Purification, chef Kuilundu Pierre (in charge of the animal traction training) and Dr. Sumba Mwana Ngongo Serge were met.

The developmental actions of the mission concern agricultural development, house building, vocational training and health, all with strong participation of the local population. Raising the local agricultural production, the main livelihood of the population, was chosen by the mission as its first field of action. After investigating various options, animal traction was chosen as a sustainable way of doing so. Oxen that were already raised in the nearby commercial farm of Biano were being preferred over mechanical means and over donkeys. With financial assistance from Spain, the initial oxen were bought and sold against credit in the villages together with the necessary material (plow, cart, harrow). The principle of the repayment, which is in-kind, is that the people use directly the extra production they can obtain with their oxen which is used as an investment.

The TFM project has provided additional assistance to the animal traction project to purchase additional oxen to promote animal traction in the villages in the Direct Concession Area.

Once a committee of participating farmers is created, a village sends three people who learn how to handle the oxen, and has to create a new field of at least 4 hectares that they will use during the first year. The production of this field will be used to pay back the loan to the mission. The first year the value of the equipment given (plough, harrows, ..) is paid back, the second year the oxen. The total price is about 3,000-4,000 pots of maize (depending on what was bought), which corresponds to the annual production of 4 hectares: the extra land that is cultivated when acquiring the oxen permits largely to repay the loan in two years.

Other development projects related to the Catholic mission are:

- A vocational school with training in masonry, carpentry, agriculture and animal husbandry, and home economics, but all pupils are trained in basic agricultural techniques. The entry conditions are: primary school leaving certificate, having 18 years and passing a test in calculation and French. Tutorage fees are paid in kind: 40 pots of maize for three years. The school has 24 girls and 76 boys. Pupils who drop out before they obtain the officially recognized diploma, do so because of family problems (all) and pregnancies (girls).
- Subsidized sale of fertilizer. A project, where fertilizer was provided and then paid back at harvest time did not succeed, but if ordered in advance, the farmers can pay the fertilizer in-kind with maize or beans.
- Promotion of the cultivation and use of soybeans. The local population has difficulties adopting soybeans as an item in their daily diet.
- A cereal bank, where people sell their cereals after the harvest. The stock of cereals is sold later in the season, and the profits are shared between those farmers who invested and the cereal bank. Typically a farmer is directly paid two-thirds of what he brings in and one-third is kept as an investment. When during the lean season the maize bought at 150 Fc/kg is sold at 400-500 Fc/kg, the benefit (minus costs for the bank) is returned to the farmer.
- Promoting a development committee in Lukotola since ten years with the following actions:
    - Cereal mill.
    - Animal traction agriculture.
    - Cereal bank.
    - Health center, with a resident doctor since September 2004.
    - Primary school.
    - Piped water project.

The cereal mill is the profit-making endeavor, and these profits are used in the health center. The communal savings bank integrates the moneys generated by both the cereal mill and the health center.

The guiding principle is that nothing is given for free but that the population is always required to participate. That is not easy, and when in 1987 the piped water project was proposed, the village refused initially to help digging the necessary trenches for the pipes.

When farmers are not able to repay the oxen, the development committee takes them back. In general people have few problems with the first repayment but the following ones are more difficult. That's the reason why the repayment period has been shortened from three to two installments. Recently, oxen have been given to small development committees, created in the smaller villages. Among the surveyed villages, this was the case in Kasanga and in Kamungu.

The issues with animal traction concern – besides the repayment of the initial investment for the oxen and corresponding tools – animal diseases (the veterinary specialist of the development committee participates in the health monitoring), and the need to have an integrated approach to animal traction agriculture. In fact, without improved seeds or fertilizer, yields of plowed fields are less than with similar traditional agriculture, but with all the right inputs, they can be up to 3.5-4.5 tonnes per hectare, or at least double the yield of what is obtained in traditional agriculture with fertilizer and improved seeds.

The development committee sells in-kind, fertilizer and improved seeds. In 2005 the price was 75 pots of maize for 25 kilograms of seeds and 50 meka of maize for 50 kilograms of NPK fertilizer.

10.2 SNCC: Société Nationale des Chemins de Fer du Congo

Tenke functions[56] as a railroad hub for the SNCC, the Congolese National railroad company, which has a line Lubumbashi-Likasi-Tenke to Kolwezi and to Lubudi. The hub in Tenke has 150 salaried persons, who are either housed by the company in the SNCC camp or receive a premium and are housed independently in Tenke village. All personnel in the company works on assignment, no locals are recruited.

The financial situation of the company, which is government run, has 3,641 kilometers of tracks, and has existed since 1929. Salaries are irregularly paid. Early in 2006, the salaries from August 2004 were being paid. Employees keep on working, in spite of the bad conditions. They still enjoy free housing in the camp, free education in the company school, free medical care in the company health post, free water, free electricity, free travel for them and their dependents on the train, and child support. Not all of these advantages are actually functional, but without an alternative, people continue working.

Retirement. –Officially, people retire, but in practice it often takes years before an official decision is taken, so people prefer to keep on working. As a result, the average age of employees is high: 55 years. Retirement is paid to the husbands and women can only benefit from it after the death of their husbands.

Agriculture. – Railway workers generally engage in agriculture, to provide at least a basic food supply. If they cannot work the fields themselves, their spouses or paid locals do it. Railway workers have no difficulties finding land: they either ask a village chief or a CdT, prepare a small gift, and return the land to the original owner after they leave.

Informal mining. – As the railroad runs through the area that was exploited by the informal miners, it was tempting for the railway personnel – who were often not paid – to assist the miners in transporting the heterogenite. “Now that the miners have been chased away, problems remain: former informal miners, instead of having received transport from TFM to help them return to their villages, have remained in Tenke, and have turned into thieves.”

[56] Information provided by the “chef de station” Mesengue Muleya Jacob.

11 Some Historical Elements

The power derived from the Bayeke chief, recognized by his representative, the Nguba "*chef de groupement*" tends to replace the older traditional powers.

The Bayeke kingdom is the last of the traditional kingdoms in the Katanga area, and Msiri, a warrior who came from Tanganyika, founded it between 1870 and 1890[57]. Msiri helped the Sanga to defend themselves against the invasions of the Luba, but when he later succeeded to the Sanga chief, the Sanga resisted being governed by a foreigner.

By 1869, Msiri had established the kingdom of Garenganze in Katanga, undermining the authority of the Lunda ruler Kazembe. By the 1880s he had established authority over much of the former Lunda Empire. Msiri's conquest state revenues were based on an ivory monopoly, the copper trade, and slavery. By 1880, Msiri's kingdom had reached its greatest extent.

As the kingdom of Msiri became more important, and began to represent more ethnic groups, (like the powerful Luba and the Ruund) the influence of the Sanga diminished. Msiri did, however, integrate the local chiefs into his power structure and asked every group to send him a young woman to marry. Subsequently, he entered into a family relationship with the various populations in his kingdom. His harem of more than 500 women was also assigned a political role, as the women became the official liaison persons between Msiri and the local communities.

De Coster, (1996) states that the Sanga were among the unhappiest tribes within the Msiri kingdom and they precipitated his downfall.

This important role of the women is still very present today: the powerful chief of Mpala usually receives guests in the presence of his wife, who often intervenes and consults the chief. In many village meetings undertaken for this study, women played a very powerful role, and were often more adamant about issues and knowledgeable than men.

[57] See for instance the PhD thesis of Pieter De Coster (1996) from the University of Leuven: "De eerste Europese ontdekkingsreizen in Katanga 1797-1897. http://www.ethesis.net/katanga/katanga_inhoudstafel.htm. Another reference states "The Nyamwezi trader Msiri arrived at Kazembe and used firearms to gain political power among the Lamba and the Sanga." (http://www.bartleby.com/67/1539.html)

12 Demography

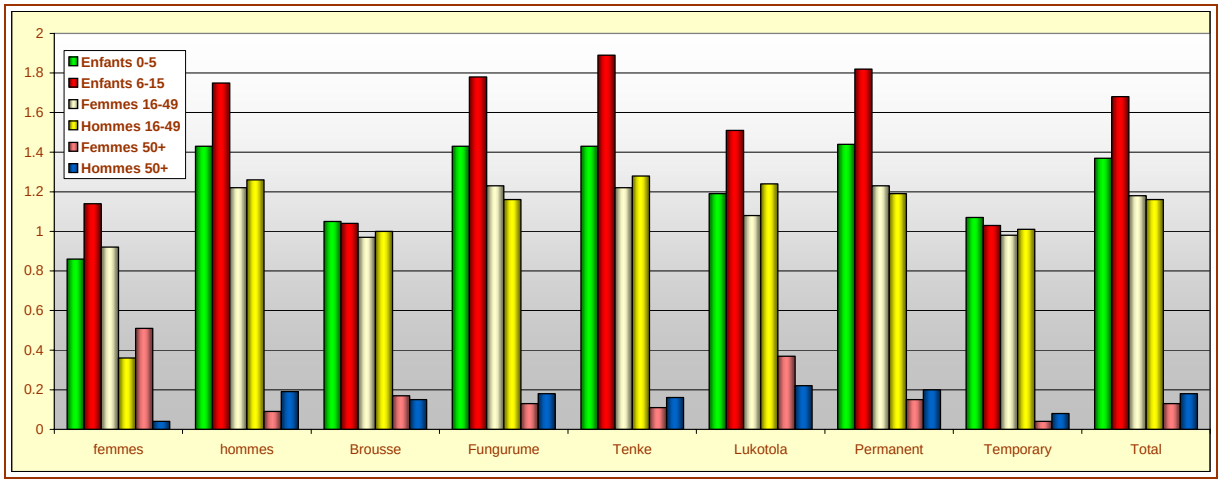

Figure 1. – Age distribution of the population (number of persons per household) according to sex, location and residential status (2006 survey results, weighted for sample density in each of the villages).

12.1 Matrimonial Status

Table 1. – Marital status of the head of household. / Etat matrimonial du chef de famille

	Women *Femmes*	Men *Hommes*	Rural *Brousse*	Fungurume	Tenke	Lukotola	Per-manent	Temporary *Temporaire*	Total
Married - *marié(e)*	0.5%	95.7%	79.1%	87.6%	84.4%	81.0%	87.0%	79.2%	85.7%
Divorced - *divorcé(e)*	42.7%	0.4%	6.5%	3.3%	9.7%	5.2%	4.2%	8.6%	4.9%
Widow(er) - *veuf(ve)*	44.7%	0.2%	7.9%	4.0%	4.5%	12.1%	5.2%	2.6%	4.8%
Bachelor - *célibataire*	12.1%	3.7%	6.5%	5.1%	1.3%	1.7%	3.6%	9.6%	4.6%
% polygamic unions - *polygamie*	0	12%	15%	11%	14%	13%	12%	14%	12%
n=	995	8440	1390	6215	1540	290	7740	1565	9305

Notes: (2006 survey results, weighted for sample density in each of the villages.

12.2 Origin of the Households

A striking characteristic of the villages is the very small number of people that were actually born in the villages: less that 10% of those living in a village were actually born in that village. This percentage is slightly higher in the rural villages than in town, but not much more, and very different from what is seen in other areas of the Congo, Africa and the world.

Table 2. –Origin of head of household, reasons for coming to the actual village of residence and duration of stay in years (Origine and raisons de venire s'installer dans le village actuel).

	Women *Femmes*	Men *Hommes*	Rural *Brousse*	Fungurume	Tenke	Lukotola	Permanent	Temporary *Temporaire*	Total
Born in the village *Depuis naissance*	6.3%	7.3%	10.5%	5.8%	8.3%	12.3%	7.9%	3.0%	7.1%
Married in the village *Depuis mariage*	0.5%	1.7%	5.4%	0.6%	1.4%	3.5%	1.5%	1.9%	1.6%
Land *Terres*	23.6%	36.4%	64.0%	28.2%	32.6%	40.4%	32.3%	47.9%	34.9%
Parents and relatives *Suivre parents*	55.0%	25.4%	16.7%	32.3%	26.4%	29.8%	31.8%	12.4%	28.7%
Employment *Chercher l'emploi*	5.2%	11.4%	1.2%	14.5%	6.3%	5.3%	10.5%	12.4%	10.8%
Assignment *Affectation*	7.9%	8.7%	0.8%	9.3%	13.9%	5.3%	10.0%	1.9%	8.7%
Informal mining *Creuser Cuivre*	5.2%	5.7%	3.5%	6.3%	6.3%	0.0%	3.9%	14.2%	5.6%
Trade *Commerce*	1.0%	4.5%	0.8%	4.2%	6.9%	3.5%	2.2%	14.2%	4.2%
Refugee *Déplacé de guerre*	0.0%	2.4%	0.8%	2.8%	1.4%	0.0%	2.4%	0.7%	2.2%
Loss of employment *Après un licenciement*	1.0%	2.0%	1.9%	1.9%	0.7%	7.0%	2.0%	0.7%	1.8%
Average years of stay *Années de residence*	16.9 y	11.4 y	8.7 y	13.1 y	11.0 y	10.2 y	13.4 y	4.9 y	12.1 y
n=	955	7400	1290	5340	1440	285	6940	1335	8275

Notes: Several replies possible, sum may be more than 100%.
2006 survey results, weighted for sample density in each of the villages.

Different reasons are stated for having chosen to come to the present villages:

- Access to agricultural land and a familial relationship with the local population were stated as the most important reason for all groups concerned.
- Search for employment and informal mining, two potential reasons for coming to the area were not very commonly indicated. Employment, however, was more frequently a reason in Fungurume (14.5 percent), and informal mining was cited among the recent migrants (14.2 percent).
- Assignment of SNCC railway workers among the population in Tenke, and of various civil servants in Fungurume.

A sizeable minority of about 30 percent of the population has been living in the same village for less than five years. The commonly observed picture of rural villages with a resident population in place for generations, and an urban population of recent migrants is completely false in the area.

During the key person interviews people often expressed their desire to live separately and independently from their kin and neighbors of whom they fear too much influence on their lifestyle and can be potential enemies through witchcraft. Other reasons for moving cited were too many diseases and deaths, the quality of the drinking water and the land, and accusations of sorcery. These data confirm that people are not closely attached to their present villages.

- Women as household heads have the longest duration of residence (average 16.9 years).
- The percentage of recent migrants is more in the rural (average 8.7 years) than in the urban areas (13.1 years).

- The category of temporary rural inhabitants includes the transhumant farmers of which 40 percent have been coming to the village for more than five years.
- 23 percent of urban dwellers, 14 percent of rural dwellers and 30 percent of the women have been living in the same location for more than 20 years.

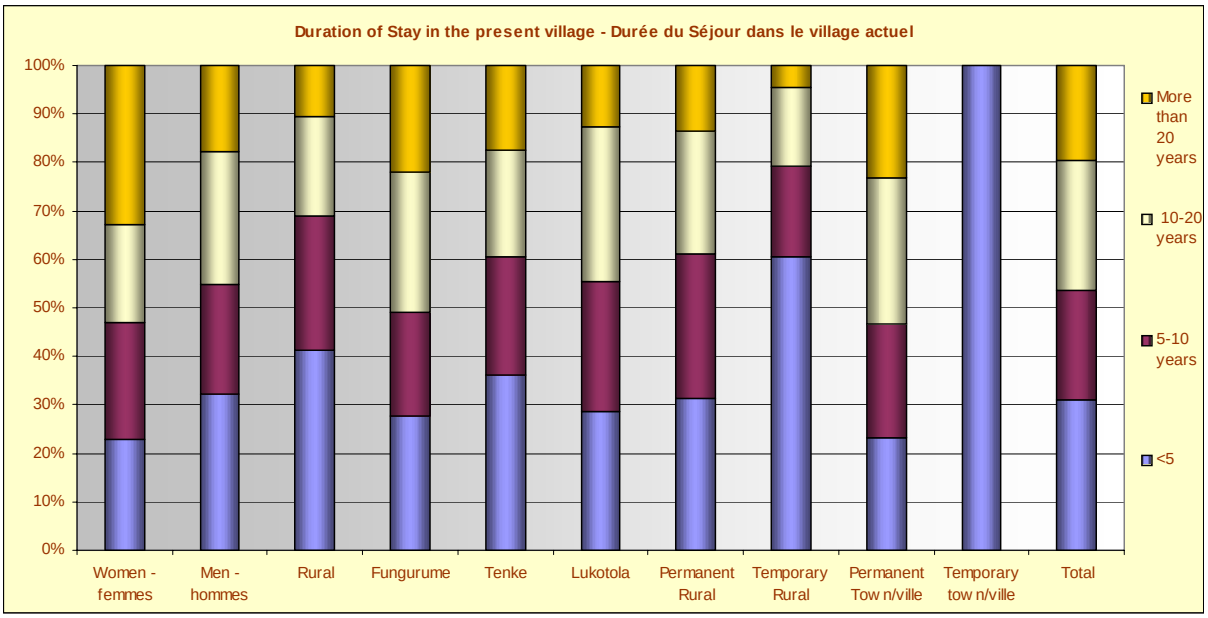

Figure 2. – Length of stay in the actual village of residence. (weighted for sample density in each of the villages). (2006 survey results, weighted for sample density in each of the villages).

- *Geographic origin*

Data on geographic origin are more difficult to interpret as there was confusion over name changes and changed boundaries. For instance the Lualaba region now refers only to the three westernmost districts: Dilolo, Sandoa and Kapanga.

A reasonable estimate is that about two-thirds (64 percent) of the people come from the Lubudi and its neighboring territories:

- About 20 percent of the households are from the concession area and its immediate vicinity.
- 30 percent more from the Lubudi territory 5 percent from Kolwezi and 9 percent Likasi/Kambove.
- The remaining from the neighboring communities account for 13 percent (Haut Lomani 7 percent and Haut Katanga 6 percent).
- Lualaba is well represented at 16 percent, mostly Ruund and Tshokwe. The 5 percent from Tanganyika are often refugees.
- Only few (3 percent) admit coming from other parts of the DRC.
- (1 percent) from the neighboring countries Angola and Zambia.

12.3 Ethnic Groups

Table 3. – Ethnic group of the head of household according to sex and village of residence.

	Sex/Sexe		*Location*					
	Women Femmes	Men Hommes	Rural		Fungurume	Tenke	Lukotola	Total
			Permanent	Temporary				
Sanga	46%	35%	69%	42%	28%	45%	80%	36%
Lubakat	12%	23%	6%	20%	27%	14%	5%	22%
Ruund	11%	11%	6%	3%	13%	9%	5%	11%
Tshokwe	13%	6%	6%	16%	6%	8%	0%	7%
Others	18%	25%	14%	19%	26%	24%	10%	24%
Total (n=)	1135	8560	1250	450	6375	1580	295	94925

Notes: 2006 survey results, weighted for sample density in each of the villages.

Sanga are the majority ethnic group in the rural areas, especially among the permanent dwellers[58], as well as Lukotola and Tenke. Fungurume is clearly different, with more non-locals and from more different areas.

[58] 69 percent of the permanent rural dwellers, not shown in the table above.

13 Ethnographic Notes

13.1 Election of a New Chief

Mwela Mpande. – The person who has been elected by the ancestors to become a chief will at that moment have a peculiar feeling: nothing will work for him anymore, he will be pursued by a series of events showing his bad luck, and he will be pushed to return to his village. The spirits and the ancestors will tell the elders from his area that he has come back, and that he is unhappy. They will assist him in becoming chief. Once a chief dies there are different possibilities for choosing a successor that may take place at the same time:

1. The former may have proposed somebody as his successor, though he cannot be sure that this choice will succeed. This "grandson", in order to befit, has to step into the footprint of the former chief, and both have to fit. The spirit of the deceased chief will help the chosen successor in his quest for power.
2. The ancestors may decide themselves who will be the next chief, and the village elders will assist.

Kamungu. – The election of a new chief is a long and complicated process. The family and the candidate within the family have to be chosen by the elders of the village. Each of these choices has to be confirmed by the ancestors. Snares will be set out and if three times a female animal is caught, the choice is accepted by the ancestors. Once the process in the village has been completed, the "chef de groupement" has to make the choice of the new chief official, which he will do during a visit to Nguba, with a gift for the chef de groupement.

Mpanga Ntadi. – In the Kalebi River, a seasonal affluent of the Monvia River, there is a place called "*kyowa*" a kind of rock, where new chiefs have to go. If they invoke their ancestors, water will flow from the rock to confirm that the chief is a genuine one. The chief will wash himself with this water. Chiefs that derive their power from Kamungu are, according to this village: Kamungu Kitambo, K. Musundu, K. Mulolwa, K. Mwela Mpande and K. Masengo. Other chiefs have a "*Kyowa"* in other places where they perform similar rituals: for the Salabwe chief in Mutobo, Mulumbu chief in Mukwemba, the chief Lukotola in Ngule. Only the Kalebi River is within the concession area, between the villages Mulumbu Mutombo and Kimbakene.

The Kamunugu chief does not have the right to cross the Kibamba River.

"Busodi" is the ceremonial hut of the chief, which is also his daily kitchen. Another name for this hut is "*mbala*". Nobody is allowed to enter this hut, except a specially initiated woman. The days the woman has her menstrual periods, she has to be replaced by a young virgin girl who has not yet had her periods.

Chiefs only consume cooked food that is prepared in this hut and only chiefs can enter this hut to consume food. If a chief travels to another village, he will normally only eat prepared food in the *Busodi* of that village. The presence of a *busodi* is also an indication that the chief of a certain location is a traditional village chief, and not a simple administrative *kapita*.

13.2 Sorcery

Kamungu. – "Children die, and elder people are often accused. However, young people use "*fetiches*" (voodoo) to become rich and then do not respect the conditions and then die from the consequences. Some "*fétiches*" may ask the souls of 500 babies, and in order to obtain these souls, he who uses them has to become a sorcerer, and killer."

13.3 Brideprice and Dot

- *Luba*

Among the Luba (information from Ndela Sase):

Prédot:: 7-10 hens, 2 goats, a 20 liter bottle ("Dame-Jeanne") of palm wine,

For the mother in law: a 6-yard cloth + head scarf, a shirt and a pair of shoes

For the father in law: A jacket and a hat, a bicycle[59]

The total cost is always less than 200 USD. Marriages are stable, divorces rare and not easily accepted. Women marry at a young age, from 15 years on.

Luba, in contrast to the Sanga, are both a patriarchal and patrilocal society.

- *Sanga*

Among the Sanga (information from Kamungu)

- For the father in- law: 75,000 FC, 3 meters of cloth for a suit + 1 pair of new shoes.
- For the mother in law: 2 cloths of 6 yards each + head scarf, 2 bed sheets.
- For the kitchen: basin + cooking pot + spoon.
- A goat.

The total cost of this wedding was about 100,000 Fc or 200 USD. The quality of the cloth (local tissue, imported wax) makes the difference. In 1990, people gave the same things, only the amount of money was less: 4,000 Fc only.

Often, part of the dot will be paid at a later time. In the example cited, only 40,000 Fc had been paid so far. Part of the dot has to be repaid

- *Ruund*

Among the Ruund (information from Postolo)

- One or two goats.
- For the father in law: cloth for a suit + 1 pair of new shoes.
- For the mother in law: 1 cloth + head scarf, 2 bed sheets.
- For the kitchen: basin.
- Munkoya (local beer).
- 3-4 crates of Simba beer and soft drinks.
- 10,000 – 20,000 Fc in cash.

The total cost of a wedding is estimated at 100-150 USD.

Stability of the weddings: among 16 women present, 3 women had divorced and remarried. Children born belong to the ethnic group of the father.

[59] A new bicycle costs in 2006 about 35.000 Fc, to which 10,000 Fc has to be added to equip it for use for transporting charges.

14 Taxes

In the villages the following annual taxes are paid:

- Bicycle tax: 1,000 Fc/year.
- Dwelling's tax (taxe parcellaire) 450 Fc/year/household.
- Market tax: depends on the quantities sold 50-100 Fc/day.
- Electoral card: is not mandatory, but police often asks a fine of 500 Fc if people do not have their electoral card.
- Goats, pigs, dogs: each 420 Fc/year.
- If people do not have a latrine, they are fined 2.500 Fc in the villages but up to 10,000 Fc in Fungurume, plus 5,000 Fc for bail.
- Mills 6.000 Fc/year.
- Commercial farms pay various taxes. E.g., in Mulumbu 15.000 Fc/year for the Kasana fermette (farm) of 72 hectares (measured) by the team).
- 200 Fc per batch of alcohol (Munkoyo or Lutuku) are taxed by the government and paid through the chef de quartier (cf. Kiboko meeting).
- Industries Petites et Moyennes Entreprises et Artisanats: Government service in charge of small scale industries and shops. Their main activity is the collection of taxes from small traders and craftsmen.

15 Hunting and Gathering

During the interviews, various names of gathered products and hunted animals were given. As it was not the aim of the socio-economic survey to include a scientific study on plants and animals, these names are given as elements for further study and scientific determination.

15.1 Names of Plants and Fruits

- mushrooms (Buyoka[sw], Mboa[sg]).
- fruits such as *Masuku*, *Fungo*, *Sokolobe*[sw] *Kasongele*[sg], *songwa songwa*.
- *mantongolo* (*Aphromomum* sp.?).
- honey (*nsari*[sw], *buuki*[sg]), (known by all but not commercially gathered by most).
- Yams *bahima*[sw], *kilungu*[60sg] and *mavuma*[sg].
- Artisans make bamboo beds and simple chairs ("*papa Yambi*" = welcome daddy).

Kiboko. – Mushrooms (*buyoka*), charcoal, honey, grass, fruits: *tusongole*, *Fungo*, *masuku*, *Pundu*, caterpillars *masese*[(sw)] (general), and *tukotu*[(sg)], *Ntete* (grasshoppers), various medicinal plants.

Medicinal plants are listed below:

Local name	Preparation	Treatment of:	Village
– Musafwa	Fresh leaves pounded with water	Diarhea	Kiboko
– Kapepe	Fresh leaves boiled with salt	Cough	Kiboko
– Kibubuu	Boiled roots	Kilonda Ntumbo (a specific diarrhea with loss of appetite)	Kiboko
– Kiyana Bofu	Boiled roots	Anemia	Kiboko
– Mutupa	Sap mixed with porridge	Provokes diarrhea and is used in the treatment of syphilis	Kiboko
– Sakontwe	Boiled leaves are strained, sap + egg are drunk	Anemia and stomach pain	Kiboko

[60] Not clear if these yam varieties are wild or only cultivated.

15.2 Names of Animals

The following list has been derived from various village interviews.

	English	French	Swahili	Kisanga	Eaten
Fish	Fish	Poisson	-	-	-
	Caterpillars	Chenilles	*Tunkubio*	*Tunkubio* *Misase* *Tukoto*	X 0 0
	Insects (like wasps)	Insectes (guêpes)	*Manyenzi*	*Mangenzi*	X
Animals	Macaca monkey	Macaque	*Macacca*	*Korue*	X
	Antilope		*Pongo*	*Gurungu*	X
	Gazelle		*Nkasha*	*Kasha*	X
	Rat (small)			*kanse*	X
	Rat (big)		*Mama nambao*	*Rukuumbi*	X
	Rat	Rat des roseaux	*Shimberiki*	*Nsenji*	X
	Bat	Chauve souris	*Popo*	*Mujima*	Rare
	Mole	taupe	*Pombofuko*	*Mfuko*	X
	Boa snake	Serpent boa	*Boa*	*Rumengo*	Rare
	Wild cat	Chat sauvage	*Shimba*	*Shimba*	X
	Squirrels	Écureuils	*?*	*Kampandua*	X
		Mangouste		*Karangkara*	X
	Castor			*shimbiriki*	

In Amoni the following names are cited – (all in Swahili): Castor "*shimbiriki*", rat *mamanambao*", gazelle "*kasha*", antelopes "*gulungu*", cochon "*gulube*".

Kiboko: *shimbiriki*, *mama nambao*, *tungumba* (kind of antelope) in the forest around the village.

Mpanga Ntadi. – *shimbiriki*, *mama nambao* and *écureuil*

Kamingu Kitambo. – shimbiriki (castor), *mama nambao* (rat), *kangomba (*antelope*), kalulu (*hare);

Kimbakene – hunting near the Momvia River: castors, kasha (antelopes), samba (varan), kangomba

16 Notes on Agriculture

- *Soil properties*

Mulumbu: all land is very good and has a good production. We distinguish red soil (*biloba bitshila*) and black soil (*biloba bifita*). Black soil is more fertile. There exist also sandy soil (*biloba mutshanga*), e.g., near Tshilongo, which is not very fertile. The area between Fungurume and the Airport has very rich soils. According to the CdT of Mwela Mpande, there is excellent agricultural land near Tshilongo.

Mwele Mpande. The "*biloba mutshanga*" present near the National Highway is not a very good soil. The best soils are the red soil (*biloba bitshila*) and the black soil (*biloba bifita*). The signs of a good soil are (1) earthworms, (2) grasses like *mimpenende* (*Claviceps purpurea*?) and *mpumbulo*. Also land where gumbo (okra) grows well has good soil. To keep the soil fertile it's a good way to mix maize and beans. Another possibility is to start with *kimbalama*: land is only cleared in January, in the middle of the rainy season, and the first crop is simple beans. After this first year one can grow maize or maize and beans for 6-7 years. The signs of diminishing fertility are yellowing of the plant and bad yields. After 6-7 years, one can plant cassava, which will occupy the land during three years, and after that one starts once again with beans using the *kimbalama* technique. According to the CdT it's not the maize per se, that fatigues the land, it's the duration. But the CdT agrees that often after a crop of beans the fertility of the land is better.

Ndela Sase. – One can tell that the soil is fertile by the looking at what grows on it: when grass grows very well on it, the soil is good; where trees grow, the soil is fertile. Along streams, the soil does not easily dry up and it's easier to grow crops during dryer years. The black soil is the best. Others soils are red, clay/sand (good for beans), and clay soil. The soils in the valley of the Sase River are black and among the best. All land available has now been used, and there is none available for newcomers. The land used by the people from Ndela Sase (all migrants from Kabongo, and former workers of SMTF) had been given to them by the former land chief, Tenki.

Kamungu. – Land can be used without fallow for more than 10 years. Techniques to keep the fertility include mulching, crop rotation, use of *kimbalama*[61].

- *Mulumbu farm visit.*

– (1) On the road to Salabwe. – Live in Tenke, use the land here for 6 years: an extended family of three males plus three females plus three small children. Grow 3.5 hectare plots of maize beans and 0.5 hectares for *kimbalama* (mid season beans). They received the land from Mwanga Bijimba, CdT[62] of the village with the same name. Every year they pay a rent of 15 meka maize as "rent" to the Mwanga Bijimba chief. Last year's yields were 18 meka beans plus 70 meka maize per 25x25 square meter plot.

Soil types: (1) Mutshanga ya kutshanga: sand mixed with clay. Considered a very good soil; (2) Bulongo bowosi (black soil); bulongo bikunda (red oil). Between Tenke and the National Highway there is soil of poor quality: Bulongo bubutrese (slippery soil (sol glissant), and Mutshanga (sandy soil).

Had harvested 4 hectares of maize and maize beans:

- 320 meka beans of which 290 were sold
- 62 bags of 30 meka of maize, mostly not sold

The value of this crop would be at harvest time:320*450 Fc+1860*150 Fc= 423,000 Fc and at the lean season time: 320*1300+1860*700= 1.718.000 Fc. Per hectare in between 106,000 (250USD) and 430,000 Fc.

– (2) A couple from Lubumbashi, who had received the land from Kyabondo (the 2nd chief of Mulumbu) and paid 10,000 Fc plus some clothing to him. They had chosen the plot because of the presence of trees (to make charcoal), and the fertility of the soil they called simply "black soil" and "red soil". They have used the land for the last three years).

– (3) Two women from Kolwezi. They had received the land from Mulumbu Kazadi (1st chief of Mulumbu), for free and had chosen the field themselves because of its perceived fertility. They have both used the land for six years.

[61] It has been difficult to obtain an exact idea on how people farm land over the years, how they apply rotations and how they use the temporary rest of *kimbalama* (the fields that are opened in the second part of the rainy season), but it seems that often *kimbalama* serves as a sort of fallow period.

[62] Chef de Terre: traditional owner/priest of the land and often also the traditional village chief.

17 Cost of House Building

Kwatebala Gare. The Mbile groups are used for agricultural work, but also in house building. The standard rates for house building are:

- 1 mud brick 5 Fc, a baked red brick 20 Fc
- Bundle of straw for roofing is 200-250 Fc
- For a simple house of 3 meters by 2.70 one needs about 10,000 Fc:
    - 400 bricks x 5 Fc = 2,000 Fc
    - Mason 5,000 Fc
    - Carpentry and straw roofing 3,000 Fc

The size 2.70 is used, as it can be used for aluminum sheets:

Kamungu Kitambo. – For a standard size hous of (with two rooms):

- 1 mud brick 10 Fc, a baked red brick 50 Fc
- Bundle of straw for roofing is 200 Fc
- Aluminum roof of 3 meters (“tôle”) costs about 7,000 Fc
- Wooden door 10-15,000 Fc
- For a simple house of 3.20 x 6 meters one needs about 24,000 Fc:
    - 800 bricks x 10 Fc = 8,000 Fc
    - Mason 8,000 Fc
    - Carpentry and straw roofing 8,000 Fc
    - Carpentry and aluminum roofing 165.000 Fc + cost of labor and transport

18 Areas of Jurisdiction of the Different Chefs de Terre

18.1 Mwela Mpande

Area where the CdT reigns: East: limited by Buyobia, North Momvia River: by Mutobo (Kansenia); North-east (Sase River): Lukotola and Kamungu; East of the Fungurume hill: Mpala; South: Mutaka Mwelwa. Over 90 percent of the concession area is thus within the land that Mwela Mpande claims.

18.2 Lutanda

Area where the CdT reigns: Zakeo, Lutanda, Kilusonsa, Apostolo, Kwatebala Gare, Mulumbu.

18.3 Mulumbu

The small villages around Mulumbu are all governed by the chief Mulumbu: Kiboko, Amoni, Mwanga, Lukotola, Mwela Mpande Gare.

18.4 Mpala

The concession area including the part claimed by Mwela Mpande, but “Mwela Mpande is my brother” I have to respect him.

18.5 Mutaka Mwelwa

Not met, the chiefdom of Mutaka Mwelwa, and the fact that the villages Mutaka II and Mutaka Mwelwa are part of his chiefdom are widely recognized.

19 Human Development Indicators for Katanga

The following table represents some key human development indicators for the Katanga Province[63].

Indicator	Value	Reference
Population	6 374 537 inhabitants	Statistiques OMS – Journée Nationale de la Vaccination, octobre 2002
Surface area	496 877 km²	Superficie des Sous-Regions, Zones et Villes du Zaïre," Institut Géographique du Zaïre, Avril 2002.
Population density	13 / km²	
IDPs (August 2003)	412 000	Affected Populations in the Great Lakes Regions, 15 August 2003, OCHA
Life expectancy:	44.7 years	Enquête nationale sur la situation des enfants et des femmes, MICS 2 /2001 – UNICEF, Kinshasa, 2002
Infant mortality	135/1000	
Infant and child mortality	227/1000	
Access to drinking water	27.6 %	
Acces to a proper toilet	47.7 %	
Food insecurity	35.2 %	
Polio immunization coverage	58.4 %	
Malnutrition	17.4 %	
Adult illiteracy	29.8%	Affected Populations in the Great Lakes Regions, 15 August 2003, OCHA
Children accessing 1st year of primary education	17%	

[63] http://www.rdc-humanitaire.net/sprofilpays/katanga.htm

20 Survey Instruments

20.1 Main Socio-economic Questionnaire (2 pages)

This questionnaire has been submitted to all selected families: 1/5 in the rural villages, between 1/10 and 1/50 in the urban sites.

Date : / / 2005 Village : **Enquêteur :**

1. **NOM et PRENOM du chef de ménage :** **N° de la maison :**

Préciser si le répondant est différent du chef de ménage ❑ Ego (le chef de famille) ❑ Epouse ❑ Autre adulte de la maison (>15 ans) ❑ voisin ❑ père ou mère

❑ Homme	❑ Femme	**Age :**	**Nombre d'épouses :**	**Etat matrimonial :**	**Résidence :**	❑ Permanent	❑ temporaire

2. **Depuis quand habitez-vous ce village et, si immigré, pour quelle raison et d'où êtes vous venu ?**

❑ Depuis la naissance	❑ Depuis mon mariage	❑ Après un licenciement	❑ Suivre parents	Date d'arrivée :
❑ Chercher des terres	❑ Chercher du travail	❑ Faire du commerce	❑ Affectation de service	❑ Venu avec Employeur
Province/District/Village d'origine :				Groupe ethnique :
Lieu d'habitation avant de venir à T-F :				Religion

3. **Combien êtes-vous dans la maison ?** **… personne(s)**
Enfants et adultes de chaque catégorie qui dorment et mangent tous les jours chez vous, depuis 6 mois au moins

Hommes 50 et plus: (avant 1956)	Hommes 16-49 ans : (1956- 1990)	Femmes 50 et plus (avant 1956)	Femmes 16-49 ans : (1956- 1990)	Enfants 6-15 ans : (1990-1999)	Enfants 0-5 ans : (2000-2005)
NE PAS INCLURE dans le total les enfants venus au village pour les vacances			INCLURE les enfants partis pour les vacances		

Parmi les hommes âgés de 16 à 49 ans, combien ont ? : **… sont ?**

Salaire TFM :	Salaire non TFM :	Un commerce régulier :	Chercheurs d'emploi :	Ne cherchent pas :

4a. **Certains de vos enfants sont-ils élèves ou étudiants ?** Concerne tous les enfants habitant à la maison + les enfants directs qui fréquentent ailleurs

❑ Sans enfants en âge scolaire	❑ Ne vont pas à l'école (6-15 ans)	❑ Ecole primaire	❑ Secondaire inférieur (jusqu'en 3e)	❑ Secondaire sup. (4-6e)	❑ Université ou grande école	❑ Enseignement technique (tout genre)

4b. **Niveau d'éducation des adultes :** **Considérant la dernière classe réussie**

Niveau Mari	❑ sans	❑ primaire incomplet	❑ primaire complet	❑ Secondaire incomplet	❑ Secondaire complet	❑ Université	❑ Enseignement technique
Niveau Epouse	❑ sans	❑ primaire incomplet	❑ primaire complet	❑ Secondaire incomplet	❑ Secondaire complet	❑ Université	❑ Enseignement technique

5. **Quelle est la profession (activité principale) du chef de ménage ?** si plusieurs, indiquer un numéro d'ordre

❑ Agriculteur	❑ Eleveur	❑ Agent de l'état	❑ Ouvrier/employé	❑ Commerçant	❑ Retraité
❑ Chasseur	❑ Pêcheur	❑ Artisan	❑ Petits boulots	❑ Creuseur/mineur	❑ Sans profession
❑ Maraîcher	❑ **Nom de l'entreprise :**		**Métier/qualification :**		

Observations et précisions……

6a. **Qui, dans votre ménage, a travaillé (ou travaille)?** Nombre de personnes et durée (en années) pour chaque employeur

❑ **Jamais travaillé**	❑ Gecamines	❑ Trabeco	❑ SMTF/TFM	❑ Autre société étrangère	❑ Autre société Nationale	❑ Chemin de fer	❑ Gouvernement fonction publique
Nombre de personnes							
Durée en années							
Année de départ							

6b. **Quelles sont les sources de revenu du ménage pendant l'année écoulée?** **Quand il y en a plusieurs, indiquer un numéro d'ordre**

❑ Agriculture traditionnelle	❑ Cultures de rente (Tabac)	❑ Chasse	❑ Pêche	❑ Petits boulots
❑ Boissons locales	❑ Cultures maraîchères	❑ Élevage	❑ Travail salarié non minier	❑ Commerce
❑ Retraite	❑ Artisanat	❑ *Creusage*	❑ TFM	❑ Sans revenus
❑ Loyers	❑ Charbon de bois	❑	❑	❑
Elevage : présence et nombre	❑ Bœufs	❑ Porcins	❑ Caprins	❑ Volaille	❑ Sans bétail/volaille

7. **Qualité de la maison principale** (observation directe)			❑ Propriétaire	❑ Locataire :	Loyer mensuel	kF
Toiture	❑ Tôles	❑ Paille	❑ Terre	❑ Toit provisoire	**(bâches, plastiques)**	
Murs	❑ Terre (+piquets)	❑ Briques terre	❑ Briques cuites	❑ Semi-dur (terre + ciment)	❑ Dur (parpaings + ciment)	
	❑ Paille	❑ Tôles	❑ Planches (partiellement)			
Sol	❑ Tout en terre	❑ Partiellement cimenté	❑ Complètement cimenté	❑ Carrelage	❑	

7b. **Que possédez-vous comme meubles ?**	❑ Sans meubles	❑ Salon en rotin	❑ Salon en bois	❑ Bois + coussins	❑ Salon moderne rembourré, couvert de tissu		
Comme lit ? (CdM)	❑ Lit local	❑ Lit manufacturé	❑ Matelas paille	❑ Matelas coton	❑ Matelas éponge	❑ Natte	❑ Carton/ Rien

7c. **Latrines** Vérifier visuellement !	❑ Sans latrines	❑ Latrines plein air	❑ Latrines entourées	❑ Latrines couvertes	❑ Partagées	❑ Non partagées	❑ WC intérieur avec chasse d'eau
Utilisez-vous une (ou des) moustiquaire(s) ?	❑ Non	❑ ONG	❑ Achetée ailleurs	❑ Imprégnée	❑ Utilisée par les 0-5 ans		

8a. **Est-ce que dans votre maison :**

Quelqu'un touche un salaire du			❑ Quelqu'un touche une pension/retraite ?	❑ Un parent de la ville vous envoie régulièrement de l'argent ?	❑ Sans salaire, ni pension ni qq. qui envoie de l'argent
❑ Gouvernement	❑ Entreprise locale	❑ Entreprise étrangère			

Observations et précisions……

8b. **Que possédez-vous comme équipement ?** **(seulement matériel fonctionnel ou réparable sans intervention ou coût, sinon indiquer « en panne »**

❑ Charrue	❑ Pousse-pousse, chariot, charrette à bras	❑ Machine à coudre	❑ Téléphone Mobile
❑ Motopompe	❑ Fusil de chasse (*bunduki*)	❑ Vélo	❑ Lampe à pression Coleman
❑ Electricité SNEL/Voisin	❑ Moulin à maïs/manioc	❑ Aucun équipement	❑
❑ Radio qui fonctionne	❑ Télévision	❑ Charrette à bœufs	❑
❑ Moto ou Mobylette	❑ Voiture	❑ Autre* (valant > 50.000 FC/100 $)	❑
❑ Groupe électrogène	❑ Bétail (ensemble plus de 100$)	❑ Marchandises en stock (commerce)	❑ Sans équipement

* (meubles, équipement pour l'entreprise, etc.)

8c. **Quelqu'un, dans votre ménage, participe-t-il à une caisse d'épargne ?**		❑ Oui	❑ Non	Montant de l'épargne de l'année dernière ou montant versé régulièrement ?		FC
….. à une tontine ?	❑ Non	❑ Oui	❑ hebdomadaire	❑ tous les 15 jours	❑ mensuelle	
❑ Tontine des récoltes		Montant de la cotisation:	F C	Montant du « tour » de tontine :		F C

Main socio-economic questionnaire (page 1 of 2)

8d. **Avez-vous vendu (ou gagné) pour plus de 100.000 FC /200$ ces douze derniers mois, grâce à la vente de (…… aux salaires de) ? :**
Indiquez éventuellement le montant, même s'il est inférieur à 100.000 FC

❑ Tabac comme culture de rente	❑ Produits d'élevage	❑ Produits miniers	❑ Salaires et compensations TFM
❑ Produits maraîchers	❑ Produits des champs	❑ Artisanat/petits boulots	❑ Commerce
❑ Autres salaires	❑	❑	❑ Rien gagné de > de 100.000 F

9a. **Avez-vous acheté des médicaments (remèdes) au cours des six derniers mois ? Où ?**

❑ Pharmacie villageoise	❑ Hôpital ou dispensaire	❑ Pharmacie Fungurume/Tenke	❑ Marché/boutique	❑ Rien acheté

9b. **Y a-t-il eu un (ou des) décès dans votre ménage, au cours des 12 derniers mois ?** **Notez avec précision le sexe et l'âge (années ou mois) au moment du décès**			❑ Oui	❑ Non
Sexe M / F Age :	Sexe M / F Age :	Sexe M / F Age :		
9b. **Y a-t-il eu une (ou des) naissance(s) dans votre ménage, au cours des 12 derniers mois ?** **Notez le sexe et la date de naissance (mois et année) pour chaque nouveau-né**			❑ Oui	❑ Non
Sexe : M / F Né en : 200_	Sexe : M / F Né en : 200_	Sexe : M / F Né en : 200_		

10a. **Avez-vous voyagé vers une grande ville depuis un an ?**	❑ Lubumbashi	❑ Likasi	❑ Kolwezi	❑ Autre:	❑ Non
Dans quel but ?					

10a. **Avez-vous mangé du poisson ou de la viande au cours de la journée d'hier ?**			Combien de repas avez-vous mangé hier ?	____ repas
❑ Sans viande ni poisson	❑ Du gibier/chenilles etc.	Espèce ?:		
❑	❑ De la viande d'élevage	Espèce ?:		
❑ Du poisson pêché localement (produits des rivières locales)		❑ frais	❑ fumé ou séché	
❑ Du poisson venant d'ailleurs	❑ frais	❑ fumé ou séché	❑ en boîte	❑ congelé

11a. **Questions importantes à poser aux femmes uniquement : insister auprès du CdM pour qu'il fasse venir une femme pour y répondre**

Est-ce qu'il y a des enfants âgés de 1 à 4 ans dans votre maison ?	❑ Oui	❑ Non
Est-ce qu'un de ces enfants a eu la diarrhée au cours : des 7 derniers jours ? **soit, plus de trois selles liquides dans la journée**	❑ Oui	❑ Non
Est-ce qu'un de ces enfants a été malade au cours : des 7 derniers jours ? **soit, avec de la fièvre et couché pendant au moins une demie journée**	❑ Oui	❑ Non
Est-ce qu'un de vos enfants de moins de 10 ans souffre d'une maladie de la peau comme la gale	❑ Oui	❑ Non

12a. **Maladies (si plusieurs malades prendre la personne avec la maladie considérée comme la plus grave)**

Est-ce que quelqu'un a été malade depuis 3 mois :		Quand	Maladie		Sexe :	Age	
Traitement médical cherché **mettre numéro d'ordre**	❑ Sans	❑ Traditionnel à domicile	❑ Chez guérisseur tradipraticien	❑ Hôpital/centre de santé par docteur/infirmier	❑ Médicaments sans avis médical	❑ Autre endroit	❑ nsp
Pourquoi ces traitements	❑ Près de la maison	❑ Efficace pour cette maladie	❑ Confiance en ce traitement	❑ Coût du traitement ❑ Hôpital non efficace	❑ On peut payer plus facilement	❑ Maladie peu grave	❑ nsp
Pourquoi sans traitement à l'hôpital	❑ Trop cher à l'hôpital	❑ Hôpital trop loin	❑ Croyances religieuses	❑ La maladie n'était pas grave	❑ Les traitements ne sont pas efficaces	❑ Autre	❑ nsp

13. **Où puisez-vous votre eau de boisson? Eau(x) de boisson consommée(s) :**

❑ Château d'eau et bornes fontaines	❑ Forage	❑ Puits cimenté (avec margelle)	❑ Puits simple	❑ Source aménagée avec eau protégée	❑ Source non aménagé	❑ Rivière/marigot

14. **Agriculture** (cocher la case si la culture est cultivée CETTE ANNEE, entourer la lettre C si cultivé , A si acheté et V si Vendu) — Unité de base : ❑ 10 carré ❑ 25 carré

Manioc	C – A – V	Maïs	C – A – V	Haricots	C – A – V	Soja	C – A – V
Banane	C – A – V	Arachides	C – A – V	Maraîcher (ail, oignon, tomate)	C – A – V	Graines concombre	C – A – V
Pommes de terre	C – A – V	Patates douces	C – A – V	Pistaches/Voandzou	C – A – V	Sorgho	C – A – V
Tabac	C – A – V		C – A – V		C – A – V		

Surface ext.	Total……..……Unités	❑ ***Propriétaire traditionnel***	❑ Titre foncier	❑ Métayage	❑ Location/prêt	❑ Loyer annuel :

15. **Ici s'efforcer à obtenir toutes les sources de revenu du ménage, au cours des 12 derniers mois, avec un maximum de précision**
(indiquez TOUJOURS le montant EN KF, ne pas faire des calculs, mais noter 20 x 300 pour vingt pots vendus)

❑ Manioc	❑ Maïs	❑ Haricots	❑ Soja	❑ Maraîcher
❑ Banane	❑ Arachides	❑ Patates douces	❑ Graines de concombre	❑ Sorgho
❑ Tabac	❑	❑ Pistaches/Voandzou	❑	❑
❑ Salaire	❑ Artisanat	❑ Petits Boulots	❑ Grd Commerce (boutique)	❑ Creusage mines
❑ Revenu Projet TFM	❑ Boissons	❑ Bois & Charbon	❑ Petit Commerce	❑ Autres Vivres
❑ Chasse	❑ Pêche	❑ Cueillette/Collecte	❑ Bœufs	❑ Petit Bétail
❑ Produits Maraîchers	❑	❑	❑	❑

16. **Bénéficiez-vous de projets de développement ou participez-vous dans de tels projets**	❑ Oui	❑ Non
Si oui, lesquels		

18. **Si vous avez un besoin urgent d'argent (maladie, voyage, deuil) où allez vous emprunter de l'argent ?**

19a. **Quelles sont vos attentes du projet minier TFM ?**	**Question répondue par M - F**
Personnel	
Pour le village	
19b. **Quelles sont vos craintes du projet minier TFM ?**	
Personnel	

Main socio-economic questionnaire (page 2 of 2)

20.2 Detailed Demographic and Economic questionnaire (2 pages)

This questionnaire has been submitted to every second one of the selected families.

Date : **Mars 2006** **Village :** **Nom Enquêteur :**

NOM du chef de ménage : N° de la maison :

Préciser si le répondant est différent du chef de ménage ❑ Ego (le chef de famille) ❑ Epouse ❑ Autre adulte de la maison (>15 ans) ❑ voisin ❑ père ou mère

#	Relation au Chef de ménage	Nom et Prénom et post nom *(selon orthographe CNI)*	Etat matrimonial	Sexe	Age/date de naissance	Activité principale & handicap éventuel	Niveau scolaire	Résidence sur place ou nom du village	Vu sur place
1	Chef de ménage								
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

Relation avec chef de village : exemple sa femme sera Ep. 01, ses enfants 1x2, sa deuxième femme, avec le numéro d'ordre n, sera toujours ép. 01 ; leurs enfants 1*6 etc.

Chez vous, qui (mari ou femme) s'occupe principalement des activités suivantes? Qui est responsable de (*donne l'argent pour*)?
Cette question ne concerne que les ménages composés – au moins – d'un mari et de son épouse

Activité	❑ Personne qui s'en occupe et en est responsable				❑ Autre(s)
Question répondue en présence :	*Enfants*	❑ de l'homme	❑ de la femme	❑ des deux	
• Défrichement des champs	❑ Enfants	❑ Homme	❑ Femme	❑ Les deux	❑ Main d'œuvre
• Entretien des cultures vivrières	❑ Enfants	❑ Homme	❑ Femme	❑ Les deux	❑ Main d'œuvre
• Achat de viande ou poisson	❑ Enfants	❑ Homme	❑ Femme	❑ Les deux	
• Achat de médicaments	❑ Enfants	❑ Homme	❑ Femme	❑ Les deux	
• Scolarité des enfants (inscription, écolage)	❑ Enfants	❑ Homme	❑ Femme	❑ Les deux	❑ L'employeur
• Fournitures scolaires	❑ Enfants	❑ Homme	❑ Femme	❑ Les deux	❑ L'employeur

Chasse et pêche

Chasse			**Qui chasse :**	❑ Hommes	❑ Femmes	❑ Enfants
❑ Pas de chasse	❑ Fusil	❑ Fusil prêté		❑ Lance	❑ Arc et flèche	❑ Pièges
❑ Vente viande fraîche	❑ Vente viande fumée	❑ Autoconsommation		❑	❑	❑

A qui appartiennent les ressources aquatiques concernées (selon personne interviewée) : _____

Pêche			**Qui pêche :**	❑ Hommes	❑ Femmes	❑ Enfants
❑ Pas de pêche	❑ Pirogue	❑ Filet/épervier		❑ Nasse	❑ Hameçon-ligne	❑ Barrage
❑ Vente poisson frais	❑ Vente poisson fumé	❑ Autoconsommation		❑	❑	❑

A qui appartiennent les ressources aquatiques concernées (selon personne interviewée) : _____

Exploitation minière :	❑ Oui	❑ Non	***Lieu de l'exploitation*** :

Quel éclairage utilisez-vous ?	❑ Bois	❑ Electricité	❑ Lampe tempête	❑ Lampe Coleman	❑ Bougie	❑ Lampe locale	❑ Sans
Quel combustible pour la cuisine		❑ Gaz	❑ Pétrole	❑ Bois	❑ Charbon de bois	❑ autre	❑

Detailed demographic and economic questionnaire (page 1 of 2)

SECTION 3 - DEPENSES DU MENAGE

Fournir la liste des principales dépenses du ménage en 2005, en Francs Congolais par an, sur la base de la classification suivante :

❑ Santé et soins :	❑ Logement (réparations, autres):
❑ Frais de scolarité :	❑ Frais de logement et ration
❑ Fournitures scolaires :	❑ Habillement
❑ Transport :	❑ Intrants agricoles : (semences, engrais)
❑ Nourriture et condiments	❑ Sel, savon, mazout et bougies
❑ Boisson et tabac	❑ Cérémonies familiales et funérailles
❑ Eglise et quêtes	❑ Mariages et dots
❑ Equipements maison et cuisine	❑ Assistance aux parents et famille
❑	❑

SECTION 4– USAGE DES RESSOURCES NATURELLES COMMUNAUTAIRES

Où les membres de votre ménage se procurent-ils le bois de chauffe :

A qui appartiennent les terrains concernés :

Où les membres de votre ménage se procurent-ils le bois de construction/clôture/les plantes pour toiture :

A qui appartiennent les terrains concernés :

Les membres de votre ménage ramassent-ils des herbes médicinales ou autres plantes utiles ? OUI / NON

Si OUI, où :_____

A qui appartiennent les terrains concernés (selon personne interviewée) : _____

Detailed demographic and economic questionnaire (page 2 of 2)

20.3 Transhumant Farmers and Agricultural Questionnaire (1 page)

This questionnaire has been submitted to transhumant households in the field and households that are potentially affected by relocation.

Date ….. Avril, 2006 — Enquêteur ……

Nom : — **Village** — **N° GPS**

❑ Homme	❑ Femme	❑ âge	**Nombre d'épouses**	**Etat matrimonial**
Village où vous résidez normalement				

2. **Depuis quand habitez-vous ce village et, si immigré, pour quelle raison et d'où êtes vous venu ?**

❑ Depuis la naissance	❑ Depuis mon mariage	❑ Après un licenciement	❑ Suivre parents	Date d'arrivée :
❑ Chercher des terres	❑ Chercher du travail	❑ Faire du commerce	❑ Affectation de service	❑ Venu avec Employeur
Province/District/Village d'origine :			Groupe ethnique :	
Lieu d'habitation avant de venir à T-F :				

3. **Combien êtes-vous dans la maison ?** **Enfants et adultes de chaque catégorie qui dorment et mangent tous les jours chez vous, depuis 6 mois au moins**					**… personne(s)**
Personnes dans le ménage (inclut les personnes en ville plus les personnes au champ)					
Hommes 50 et plus: (avant 1956)	Hommes 16-49 ans : (1956- 1990)	Femmes 50 et plus (avant 1956)	Femmes 16-49 ans : (1956- 1990)	Enfants 6-15 ans : (1990-1999)	Enfants 0-5 ans : (2000-2005)
Personnes présentes au champ					
Hommes 50 et plus: (avant 1956)	Hommes 16-49 ans : (1956- 1990)	Femmes 50 et plus (avant 1956)	Femmes 16-49 ans : (1956- 1990)	Enfants 6-15 ans : (1990-1999)	Enfants 0-5 ans : (2000-2005)
NE PAS INCLURE dans le total les enfants venus au village pour les vacances			INCLURE les enfants partis pour les vacances		
Parmi les hommes âgés de 16 à 49 ans de votre ménage en ville, combien ont ? :				**… sont ?**	
Salaire TFM :	Salaire non TFM :	Un commerce régulier :	Chercheurs d'emploi :	Ne cherchent pas :	

4a. **Certains de vos enfants sont-ils élèves ou étudiants ?** Concerne tous les enfants habitant à la maison + les enfants directs qui fréquentent ailleurs

❑ Sans enfants en âge scolaire	❑ Ne vont pas à l'école (6-15 ans)	❑ Ecole primaire	❑ Secondaire inférieur (jusqu'en 3e)	❑ Secondaire sup. (4-6e)	❑ Université ou grande école	❑ Enseignement technique (tout genre)

5. **Quelle est la profession (activité principale) du chef de ménage ?** si plusieurs, indiquer un numéro d'ordre

❑ Agriculteur	❑ Eleveur	❑ Agent de l'état	❑ Ouvrier/employé	❑ Commerçant	❑ Retraité
❑ Chasseur	❑ Pêcheur	❑ Artisan	❑ Petits boulots	❑ Creuseur/mineur	❑ Sans profession
❑ Maraîcher	❑ **Nom de l'entreprise :**			**Métier/qualification :**	

Observations et précisions……

Qualité de la maison au champ

			Date de construction		
Toiture	❑ Tôles	❑ Raphia	❑ Paille	❑ Toit provisoire	
Murs	❑ Terre simple	❑ Briques simples	❑ Planches (partiellement)	❑ Semi-dur (terre + ciment)	❑ Dur (parpaings + ciment)
	❑ **Paille / Raphia**	❑ **Tôles**			
Sol	❑ Tout en terre	❑ Partiellement cimenté	❑ Compl. cimenté	❑ carrelage	❑

Couchage au champ	❑ Lit local	❑ Lit manufacturé	❑ Matelas paille	❑ Matelas coton	❑ Matelas mousse	❑ Natte	❑ Carton/sol

Qui vous a donné/prêté /loué les champs	Depuis quelle année :
Etes-vous parenté avec le village, et si oui, comment ?	
Qui est le chef de terre responsable de vos champs	chef de village/quartier

Qui travaille vos champs ?	❑ Chef de ménage	❑ Epouse	❑ Enfants	❑ Main d'œuvre du villlage où sont les champs	❑ Main d'œuvre village-cité de résidence	❑ Autre

Qualité de ces terres 1 : Très Mauvais 2 :Assez Mauvais 3 : Moyen 4 :Assez Bien - 5 :bien
Ce terrain est **bien** adapté aux cultures suivantes
Ce terrain est **Mal** adapté aux cultures suivantes
Quel est le nom de ce genre de sol/terrain (Nom et description)
Mois d'arrivée au champs cette année :
Avez-vous des champs à d'autres endroits Oui/Non, Où :
Mais consommé : de mon champ je dois acheter

Agriculture Surface en culture en 2005/6 — Unité de base : ❑ 10 carré ❑ 25 carré

Manioc	Maïs	Haricots	Soja
Banane	Arachides	Maraîcher	Graines concombre
Pommes de terre	Patates douces	Pistaches/Voandzou	Sorgho
Tabac			

Surface Champs	Total……Unités	❑ ***Propriétaire traditionnel***	❑ Titre foncier	❑ Métayage	❑ Location/prêt	❑ Loyer annuel :
Surface En réserve	Total……Unités	❑ ***Propriétaire traditionnel***	❑ Titre foncier	❑ Métayage	❑ Location/prêt	❑ Loyer annuel :

Observations

Pouvez-vous nous indiquer vos surfaces cultivées, la production, la vente et l'achat de vos principales cultures

Culture	Surface en 2005	Production en 2005	Production vendu	Meka achetés
Maïs				
Haricots 1ere culture				
Haricots kimbalama				

Transhumant farmers and agricultural questionnaire (page 1 of 1)

20.4 Aids Awareness Questionnaire (1 page)

This questionnaire has been submitted to grown-ups between 16 and 49 years of age whenever available in the interviewed households. The male enumerators interviewed the men, the female enumerators the women.

C:\Documents and Settings\GJA KOPPERT\Bureau\Katanga\Questionnaires FG\Questionnaire Sida TFM.doc

Questionnaire VIH

Ce questionnaire est strictement confidentiel et anonyme vos données personnelles ne sont pas utilisées dans les rapports

Village :	N° maison
Date :	Enquêteur :

❑ Homme	❑ Femme	❑ Age		
Etat matrimonial	❑ Célibataire	❑ Marié	❑ Concubinage	❑ Ami(e) fixe

Qu'est ce que c'est le SIDA ?
Comment le Sida se transmet ?
Comment se protéger ?

Avez-vous déjà utilisé des préservatifs		❑ Oui	❑ Non	❑ Sans réponse
Origine des préservatifs	❑ Gratuit par le Projet	❑ Par le partenaire	❑ Achat	❑ Sans réponse

Avez-vous déjà vu en sidéen ?	❑ **Oui**	❑ **Non**	
Peut-on reconnaître un sidéen ?	❑ **Oui**	❑ **Non**	
Comment :			

Avez-vous déjà eu une formation sur le sida ?	❑ **Oui**	❑ **Non**	
Par qui :			

(Nous ne voulons pas savoir les résultats de votre test de Sida)			
Avez-vous déjà fait le test de Sida	❑ **Oui**	❑ **Non**	

Si la personne désire recevoir un échantillon de préservatifs, on peut les donnes			
Paquet de préservatifs distribué	❑ **Oui**	❑ **Non**	

Aids Awareness questionnaire (1 page)

20.5 Socio-Economic Village Questionnaire (2 pages)

This questionnaire served as a guide in the village focus-groups interviews, and besides the information it calls for any other interesting village or general socio-economic information was discussed and recorded.

GEPFE **QUESTIONNAIRE SOCIO-ECONOMIQUE « VILLAGE » :TENKE FUNGURUME**

Date J-M-A……/……../2006 **Nom de l'enquêteur**……

Village – …… Personne(s) interviewée(s) ……

Arrondissement –…… **Numéro du village** ……**Team** ……

Fonction	Nom	Lieu d'habitation
Chef de groupement		
Chef de terre		
Chef de poste ou chef de cité		

Est-ce qu'il a de l'immigration vers le village actuellement ? **Oui ☐/Non ☐**	Est-ce que la population du village diminue par l'exode rural ? **Oui ☐/Non ☐**
Pourquoi …… ……	Pourquoi …… ……

Principaux groupes ethniques	***Principales langues parlées***	***Indiquez l'ordre d'importance de ces religions***	
1. ……	1. ……	☐ Chrétiens	☐ Animistes
2. ……	2. ……	☐ Musulmans	☐ Autre ……
3. ……	3. ……		

Principales sources d'approvisionnement en eau

☐ Source	☐ Puits de surface	☐ Forage	☐ Rivière et eau de surface	☐ Borne/fontaine - adduction d'eau

Est-ce qu'il y a dans le village ?

☐ Électricité publique	☐ Télévision publique	☐ Vidéo public	Nbr. de groupes électrogènes …….	Nbr. d'installations solaires ……..

La réception radio est		☐ Bonne	☐ Moyenne	☐ Mauvaise/absente
La réception télévision est		☐ Bonne	☐ Moyenne	☐ Mauvaise/absente
Téléphone portable		☐ Bonne	☐ Moyenne	☐ Mauvaise/absente

☐ Écoute-t-on régulièrement la radio Oui / Non	☐ Regarde-t-on régulièrement la télévision? Oui / Non	
Toitures des maisons :	☐ Toitures sont surtout en tôles ondulées	☐ Toitures sont surtout en matériel local

Sources d'énergie pour faire la cuisine

☐ Bois	☐ Pétrole	☐ Gaz en bouteilles	☐ Autre ……

Écoles présentes dans le village ou si absentes, à quelle distance et dans quelle ville peut-on en trouver

École	☐ Aucune	☐ Primaire	☐ Secondaire (1-3)	☐ Secondaire (4-6)	☐ Enseignement technique
Distance		A ……. km	A ……. Km	A ……. Km	A ……. Km
Ville		A ……	A……	A……	A……

Structures médicales présentes dans le village ou si absentes, à quelle distance et dans quelle ville peut-on en trouver

Structure	☐ Aucune	☐ Hôpital	☐ Case de santé	☐ Pharmacie	☐ Centre de santé développé
Distance		A ……. Km	A ……. Km	A ……. Km	A ……. Km
Ville					

Commerces présents dans le village Jours de marché…… Marché principal fréquenté……

☐ Marché journalier	☐ Marché hebdomadaire	☐ Boutique
☐ Eglise	☐	☐ étale / Kiosque
☐ Menuisier	☐ Forgeron	☐ Moulin
☐ Autres	☐	☐ Aucun marché ou boutique

Socio-economic Village questionnaire (1 of 2 pages)

Transport disponible dans le village

☐ Gare ferroviaire	☐ Gare routière : billet	☐ Passage journalier de taxis de brousse
☐ Occasions irrégulières	☐ Autre ……	☐
☐ Prix voyage Kolwesi	☐ Prix voyage Likasi	☐ Prix voyage Lubumbashi

État des routes vers la ville principale de la région Nom de la ville : Kolwesi & Likasi

☐ Route goudronnée	☐ Route latérite entretenue	☐ Piste passable en toute saison
☐ Mauvaise piste	☐ Piste coupée en saison pluvieuse	☐ Autre ……

Classer les activités suivantes selon leur importance (0 = absent ; 1 le plus important, etc.)

☐ Agriculture traditionnelle		☐ Cultures de rente (tabac)		☐ Chasse		☐ Pêche	
☐ Commerce		☐ Élevage		☐ Travail salarié		☐ Activités industrielles (salariés)	
☐ Creusage mines artisanal		☐ Cultures maraîchères					
☐ Bœufs	☐ Moutons	☐ Chèvres	☐ Canards	☐ Poules	☐ Pintades	☐ Pigeons	

Coût de la main d'œuvre au village, pour les activités suivantes et pour un champ de 25x25 m

Du défrichement d'une terre non cultivée récemment jusqu'au semis	Préparation d'un champ déjà cultivé jusqu'au semences incluses	Désherbage et sarclage du champ	Récolte mais/ haricots / soja /arachide
En Francs	En Francs	En Francs	En Francs
En jours	En jours	En jours	En jours

Présence active dans le village de services de l'état chargés des services suivants (depuis un an, au moins)

☐ Tabac	☐ Services d'élevage	☐ Services Agricole	☐ Vaccination
☐ Pesé des enfants et PMI	☐ Garde chasse	☐ Garde pêche	☐ Autre ……

Existe-t-il dans le village des associations ou des GICs (Groupement d'intérêt Commun) qui s'occupent de

☐ Entraide en agriculture traditionnelle	☐ Cultures de rente	☐ Chasse	☐ Activités génératrices de revenu
☐ L'éducation	☐ La santé	☐ L'épargne	☐ Pêche
☐ Sport	☐ Chorale – activités artistiques	☐	☐ Associations des ressortissants résidant en ville
☐ Associations des hommes	☐ Associations des Femmes	☐ Associations des jeunes	

Noms des associations ou des GICs (Groupement d'intérêt Commun) dans le village :

Sites sacrés

Lieu d'enterrement des décédés :

Y a-t-il des cimetières spéciales pour bébés, accidentés, chefs….

Informations concernant la pêche dans la zone

Y a-t-il des pêcheurs dans le village **Oui/Non**

Le poisson est utilisé pour (plusieurs réponses possible)

☐ La consommation domestique	☐ Le commerce

Informations concernant l'élevage dans la zone traversée par le pipeline

Y a-t-il des éleveurs dans le village

☐ Éleveurs transhumants	Qui : ……	Quels mois : Entre …… et ……
☐ Éleveurs locaux :	Qui : ……	

Observations

Socio-economic Village questionnaire (2 of 2 pages)

20.6 GPS Observations in the Villages (1 page)

GPS readings of houses, latrines and landmarks were taken in the village for the purpose of (1) drawing an unbiased sample of the households (2) mapping the village with the main characteristics of the houses.

Village: MUTAKA MWELWA Questionnaire GPS Date : 29/11/2005

Toit: P(aille) R(aphia) T(ôles) 0 (rien) – Murs: T(erre), B(riques), Bc:briques cuites, S(emi dur) D(ur), P(aille), 0 (rien) – Sol: T(erre), P(art. cimenté), C(imenté), K(arrelage) 0 (rien) – Latrine: lte(entouré) lpc(plein ciel) ltc (couverte) Q: en construction

Case	Gps	ethnie	Nb	Toit/mur/sol	Observations
01	321			PBT	MAKAYO
01.1	322			PTT	Maison 2e femme.
02	323		TSH	PBT	
02.1	324			POT	
—	325			PTT	Ltct
03	326			PBT	
03.1	327			POT	
—	328			OBT	Lte
04	329			PPT	
—	330			OOT	LPC
05	331			PBT	
06	332			PBT	AUGUY ILUNGA-JOSEPH
—	333			PBT	Maison d'accueil pour les Visiteurs
07	334			PTT	
08	335			PBT	
09	336			PTT	
10	337			PBT	
—	338			ORT	Lte
11	339			PBT	KALENGA KADISAKILO
—	340			POT	
12	341			PBT	
—	342			PBT	Eglise 30e CPCO
13	343			PBT	
13.1	344			PTT	Cuisine
14	345			PBT	
14.1	346			PTT	Séchoire TABAC
14.2	347			POT	Sechoire TABAC
15	348			PBT	
—	349			OBT	Lte
16	350			PBT	MONGA
16.1	351			PBT	
—	352			PBT	Ltct
17	353			PBT	
17.1	354			PTT	
18	355			PBT	1
19	356			PTT	
[illegible]	357			PTT	Abandonnée
20	358			PBT	
—	359			ORT	Lte
21	360			PBT	ELIE

GPS observations in a village. The compounds 6-11-16-21 have been surveyed, compound 1 could not be met

21 Abbreviations and Local Terms Used

25x25	The standard measure for a plot of agricultural land is 25 x 25 m^2. People also often use hectares to describe the size of the land.
CdG	Chef de Groupement, Traditional authority who governs the village and land chiefs in almost the entire project area
CdT	Chef de Terre, Land Chief, traditional keeper of the land; is the village chief in the village where he lives.
Chef de cité	Main local administrative chief in the urban area ("cité" of Fungurume, including the villages Mpala, Kafwaya, Mwela Mpande Gare and Kasanga.
Chef de poste	Main local administrative chief in the area of Tenke
Contract	In local terms, contracted labor, in agriculture for a 25 x 25 ^{m2} plot of land.
Croix rouge	Local people who have received some basic health training through the Red Cross
DCA	Direct Concession Area (Initial planned project footprint)
DRC	Democratic Republic of Congo
Fc	Franc congolais, Congolese francs. At the time of the study the rate varied between 430 and 450 Fc for a US dollar.
GP	Good Practice
IFC	International Finance Corporation, Washington, USA
Kapita	Chief of a hamlet, of a lower grade than a village chief of a land chief.
Kimbalama	Second (mid-rainy season) crop of usually beans.
Kinyanga	Marshland crops (cultures maraîchères).
MD	Medical doctor
Meka	Standard measure for cereals, beans and other agricultural products. Weighs approximately 2.6-2.8 kg.
PRA	Participatory Rural Appraisal
QandA	Questions and Answers session
RDC	République Démocratique du Congo
SE	Socio-economic (as in SE survey)
SMTF	Société Minière Tenke – Fungurume, predecessor of TFM
SNCC	Societé Nationale des Chemins de fer du Congo
STD/STI	Sexually Transmitted Diseases, Sexually Transmitted Infections
TFM	Tenke Fungurume Mining
Trabeco	Traverses en Béton du Congo: Concrete railway sleepers factory in Fungurume.

APPENDIX B4.2-I

ARCHAEOLOGICAL RECONNAISSANCE AND TRIAL TRENCHING AT TENKE-FUNGURUME
REPORT AND RECOMMENDATIONS (1997)

AUTHOR:
DONATIEN MUYA WA BITANKO KAMWANGA

ARCHAEOLOGICAL RECONNAISSANCE AND TRIAL TRENCHING AT TENKE-FUNGURUME

REPORT AND RECOMMENDATIONS

A. REPORT

Thanks to a grant from "Golder Associates Limited" (United Kingdom) we have carried out archaeological research in the Tenke-Fungurume mining concession.

It is therefore a pleasure for me now to thank Golder Associates, who have provided me with the opportunity to get back in the saddle after being away from the field for 7 years.

I also owe a great debt to the staff of Tenke-Fungurume Mining at both Lubumbashi and Fungurume. They put me in contact with both expatriate and Congolese research workers in different scientific fields. This led to fruitful exchanges which protected me from the paralysing isolation which I would otherwise have experienced had I been working alone. The staff also provided me with workers whose almost immediate understanding of my concerns helped my work progress efficiently.

I. Locations and duration

The research was carried out in the Tenke-Fungurume mining concession, more specifically in the Dipeta valley between the source of the latter and the camp known as the "Commercial" camp.

On the basis of topographic and hydrographic data we expected to reconnoitre and investigate 6 locations which we baptised Dipeta-Goma North (DGN), Dipeta Source (DS), Dipeta-Kalwesi (DKL), Dipeta Shimbidi North (DShN), Dipeta Konka (DKK) and Dipeta Shimpidi (DSP)[1]. A seventh location was added to these first six. This, known as "Pumping Hill" (CP), was included on the basis of information provided to us which suggested that the hill was a traditional cult site (see sketch).

The work lasted more than 20 days, from the 19 June 1997 to the 11 July of the same year.

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[1] The identification codes are provided in brackets.

II. Choice of site

Three reasons justified our investigation work in the Tenke-Fungurume region. First of all, the pre- and proto-historic literature made no mention at all of any archaeology in the sector in question. The second reason related to verbal communication concerning the discovery of a skeleton, pearls and sherds of pottery in a termite mound at Fungurume during the 1970s[1]. Finally, evidence of stone age and iron age activity has been identified along the Mofya river, a watercourse not far from Tenke.[2]

In addition to these primarily archaeological reasons there was a fourth - the permanent destruction of any archaeological sites as a result of the extractive activity soon to be undertaken in the Tenke-Fungurume area.

III. Objectives and Purpose

The surveys were carried out in order to identify and document sites which might be affected by mining or mining related activities. In terms of archaeology, the objectives are to:

1. Detect archaeological sites in the Tenke-Fungurume region with a view to adding to the prehistoric and protohistoric map of Katanga.

2. Identify stone age and iron age sites for future more extensive excavation.

3. Conduct ethnographic investigations into metalworking in order to obtain a better understanding of any iron age discoveries.

IV. Team

Throughout the work the team consisted of Muya wa Bitanko Kamwanga - Project Manager - and Messrs Kamota Kbunda, Saidi Mayembe and Selemani Kapaya, all employees of Tenke-Fungurume Mining. This basic team was reinforced from time to time by 4 other workers, also from Tenke-Fungurume Mining: Messrs Kalala Tumbwe, Kasongo Mujinga, Kabwit Mwenze, and Mwepu wa Mwepu.

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1 Nkulu, R. Verbal communication (Mr Nkulu is an archaeology technician at Lubumbashi Museum).

2 Anciaux de Faveaux (A.), 1965. The Prehistory of Katanga. Quarterly Bulletin of the Indigenous Social Problems Research Centre (CEPSI) (Centre d'Etude des Problèmes Sociaux Indigènes), 69, pp. 71-76.

V. Progress of the work

1. Reconnaissance

This reconnaissance, carried out on the ground, took place on the dates and at the locations indicated below:

20 June 1997: Dipeta-Goma North (DGN): reconnaissance on the two banks of the Dipeta.

29 June 1997: Dipeta-Kalwesi (DKL): along the right hand bank of the Dipeta starting from the old village of Kalwezi to the confluence of the Dipeta and Kalwezi rivers.

3 July 1997: a) on the top of Goma North hill,
b) along the northern arm of the source of the Dipeta, and across the ground between this arm and the Dipeta[1].

5 July 1997: Kalwezi: on the left bank of the Dipeta.

6 July 1997: Konka:
a) across the ground between the Dipeta and the Konka
b) on the left bank of the Dipeta
c) on the left bank of the Konka.

8 July 1997: Kwatebala (Shimpidi): on the 2 banks of the Shimpidi river and on the right bank of the Dipeta.

9 July 1997: Kwatebala (Shimpidi): continuation of reconnaissance on the right bank of the Dipeta.

10 July 1997: a) Pumping Hill: the summit and the base of the hill.
b) on the left bank of the Dipeta opposite the Commercial District.

In each area reconnoitered we covered an area of between 25,000 and 50,000 m^2 on average.

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[1] The source of the Dipeta is in fact the termination of several arms.

2. Trial trenches

Trial trenching was carried out wherever reconnaissance took place, except on the left bank of the Dipeta opposite the Commercial District, owing to lack of time.

The surface was generally stripped in 20 by 20 cm units. Excavation stopped either when we reached bedrock, or when an archaeological horizon followed an overburden generally not more than 100 cm thick.

Each trench measured 1 m x 1 m.

At Dipeta-Goma North we opened up 3 trenches which were identified as DGN1, DGN2 and DGN3. The first 2 trenches were excavated to a depth of 200 cm; we stopped at a depth of 150 cm in DGN3. The three trenches were excavated from the 20 to the 21 June 1997, and from the 23 to the 28 June 1997.

The site identified as Dipeta Source (DS) was excavated from the 26 to the 28 June 1997. We also opened up three trenches there: DS1, DS2 and DS3. The latter was excavated to a depth of 155 cm, the other 2 down to 30 cm.

On the 29 and 30 June 1997 we opened up and excavated only trench DKL1 (at Kalwesi). Excavation continued on the 4 and 5 July 1997, this time accompanied by our usual team. We halted the excavation at a depth of 210 cm.

At Konka we opened up 2 trenches identified as DKK1 and DKK2. Excavation was carried out on the 6 and 7 July 1997; it was halted at a depth of 100 cm in DKK1 and 110 cm in DKK2.

On the 8 and 9 July 1997 we were engaged in excavating the 2 trenches at Shimpidi (Kwatebale). Identified as DSP1 and DSP2, the two trenches were excavated down to 110 cm and 120 cm respectively.

The last trial trench was excavated on the 10 July 1997 at "Pumping Hill" (CP). This trench was excavated down to a depth of 60 cm.

VI. Results

1. Finds

a. Reconnaissance

Every area surveyed yielded worked stones. In addition to the stone artefacts, the right bank of the Dipeta at Kwatebala yielded a sherd of pottery decorated with oblique lines. At Konka we also found an undecorated ceramic sherd on the right bank of the Dipeta in addition to worked stones. Finally, we discovered slag at Dipeta-Goma North and Kwatebala.

b. Trial trenches

The trial trenches yielded no pottery. Conversely, slag and pieces of burnt earth were exposed in trenches DGN, DKL1 and DShN1, with fragments of pipes and large blocks of burnt earth in DShH1, together with worked stones in all the areas trenched.

2. Identification

a. Stone Age

The stone artefacts recovered at first site all belong to the Late Stone Age (LSA), except at DGN, where there were indications of Acheulian in addition to Late Stone Age. At the moment we are unable to provide a better identification of the latter.

b. Iron Age

There is undoubtedly Iron Age material in the Dipeta syncline, particularly at Dipeta Shimbidi (DShN1). However, at this stage there is nothing to indicate whether our finds should be placed in one or other of the two stages of the African Iron Age, by which are meant the Early Iron Age and the Later Iron Age.

3. Age and environment

We obtained pollen samples with a view to obtaining information on the flora of known prehistoric and protohistoric periods. Also, where appropriate, we collected wood charcoal to obtain a 14C date for the industries identified.

Our colleague and friend, Professor Mwaka Mbeza, of the University of Lubumbashi, has undertaken to investigate the pollen samples for us. We are indebted to him. In the case of the wood charcoal we would appreciate it if Golder Associates could have these samples dated for us in one of the specialist laboratories in Europe (Gronigen/Holland, Hanover/Germany, Gif/France, etc.).

VII. Miscellaneous: Ethnographic investigations

We turned to ethnography in order to discover or obtain a better understanding of some aspects of archaeology, in particular that of the Iron Age.

On the 22 June 1997, while I was questioning some inhabitants of Fungurume on the possible existence of a burial ground in their area, the presence of a skeleton buried in a termite mound in the "Barrier District" was reported to me. All the inhabitants in the vicinity of the termite mound confirmed this information to me. I then sought out Chief Mpala. The latter agreed that the skeleton should be exhumed provided that he, the Chief, was paid, because a ceremony would first have to be performed.

The skeleton was not recovered as no money was available to pay the Chief.

On the 6 July 1997 I visited Chief Lutanda. After having questioned him about metalworking activity in his chiefdom, the Chief answered that it would take a long time to talk to him about it. In my mind this meant that we would have to pay the chief. I had to forego the interview owing to lack of research funding.

Archaeological overflying of the Tenke-Fungurume mining concession has revealed stone age and iron age sites. In addition to this, one of the ethnographic investigations provided us with the information that there is a skeleton in a termite mound in the very centre of Fungurume.

B. Recommendations

1. Excavations

a. Sites trenched

Three of the sites trenched, DGN, DShN and DKK, require systematic investigation before extractive working begins.

DGN is the only site in the Dipeta valley which has yielded traces of the Acheulian. At the present time Kamoa, 70 km to the north west of Kolwezi, is the only deposit in the Democratic Republic of the Congo where the Acheulian is known with certainty. Kamoa lies about 150 km from Tenke, to the south east. It is therefore desirable that DGN should be excavated systematically. On the one hand this will help to determine the length of time for which there has been a human presence in the Dipeta valley, and on the other hand it will provide a better picture of the Acheulian in the Democratic Republic of the Congo in general, and Katanga in particular.

DShN.
Three sites (see above) have shown signs of metalworking activities, but DShN would appear to be the richest.

DShN lies at the centre of the three groups of known iron age sites in Katanga: Naviundu to the South, dated from the 4th century AD; the Upemba Depression to the North, dated from the 5th century AD to the 17th century AD, and finally, Kamoa in the West, dated from the 8th century AD to the 16th Century AD. Systematic excavation of DShN would undoubtedly supplement the protohistoric map of Katanga, but above all would help to provide a better understanding of both iron age technological styles in Katanga and trade routes within the region at the time.

DKK
The Late Stone Age has been identified in almost all the sites trenched, but at first sight at least, DKK would appear to be the richest.

Prehistoric literature abounds with Katangese sites of the Late Stone Age (L.S.A.), but there are very few sites which have been subjected to systematic excavation. At the present time only 3 sites have been properly excavated: Kamoa, Sanga and to a lesser extent

Kamilamba[1]. The first site is in the west of Katanga, the other 2 in the North. Apart from Kyobobo station in the Katangan Boot (we trenched this site in 1992[2]), DKK is the only Late Stone Age site identified in the southern part of Katanga.

Kyobobo has not yet been excavated systematically. DKK should therefore be excavated, if only to determine its attribution. Specifically, only systematic excavation can show what the DKK industry should be attributed to, by which we mean, does the DKK industry belong to the Tshitolian of the Western Congo, or the Late Stone Age of Eastern and Southern Africa?

b. Excavation of the skeleton

In the 70s a skeleton accompanied by pearls and pottery was found buried in a termite mound at Fungurume. This material has never been published. It would be extremely instructive to excavate the skeleton reported to us during the course of our last stay at Fungurume. We do not in fact know in what position the skeleton has been buried, and whether or not it is accompanied by any grave furniture. Neither do we know the reason(s) why the dead person was buried in a termite mound - social distinction or disease? (Some inhabitants of Fungurume told us that it was the custom in the region to bury Chiefs in termite mounds; others gave us to understand that someone who had died from a "queer" disease could also be buried in this way).

2. Team

The same team as worked with us during the reconnaissance work and the trial trenching, that is a total of 8 to 10 people.

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1 Cahen D., 1975. The archaeological site at Kamoa (Shaba Region, Republic of Zaire). From the Early Stone Age to the Iron Age. Annals of the Royal Museum of Central Africa (Annales du Musée Royal de l'Afrique Centrale), Series 8, Human Sciences, no. 84, Tervuren.

Muya K., 1985. The prehistory of Eastern Zaire. A synthesis. Doctoral Thesis, Catholic University of Louvain. Duplicated.

2 Muya, K. "Some sites in the Shaba Boot, Zaire". To be published in Nyame Akuma, 1997, no. 47.

APPENDIX B4.2-II

REPORT OF INVESTIGATION INTO CULTURAL RESOURCES (2006)

AUTHOR:
DONATIEN MUYA WA BITANKO KAMWANGA

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LIST OF ATTACHMENTS

1 BACKGROUND

The Tenke-Fungurume Mining (TFM)[1] Company entrusted me with the task of identifying the cultural resources located in its concession, under the terms of reference of *"Etude d'impact Environnemental et Social (EIES) pour un projet d'exploitation minière et de traitement de cuivre et cobalt dans la Province du Katanga, République démocratique du Congo"* [Environmental and Social Impact Assessment (ESIA) for a mining operations and copper-cobalt processing project in Katanga Province, Democratic Republic of the Congo].

2 Location and Duration

The fieldwork was performed in the Tenke-Fungurume Mining (TFM) Concession located between S 10°30' and E 026°20'[2]. Beginning April 11, it was completed on the 20th of the same month, consisting of 10 days of fieldwork in total.

The laboratory portion (processing the data, preparing the text of the report, creation of the map and index) took an additional 10 days.

3 Objectives

TFM requested that the identification of cultural resources focus on archaeology and ethnography.

With respect to archaeology, I was required to locate any remains of historic and/or cultural value, particularly in the zones likely to be affected by mining operations (site destruction or disturbance of stratigraphy).

With respect to ethnography, TFM requested that I locate cemeteries, sacred sites, cult sites and ceremonial or ritual sites. In this instance, the concern was not merely to establish a link but to establish a dynamic link between these sites and the local populations, to avoid depriving local populations of their heritage because of mining operations, and to prevent development of a bias against the potential for sustainable development offered by TFM activities.

[1] From this point onward, we shall use TFM.

[2] Approximate coordinates.

4 Challenges

I encountered a variety of issues affecting the realisation of the fieldwork. The first of these issues related to transportation. For instance, since vehicles typically arrived late, it was unusual for me to get into the field before 8:30 a.m., and it could happen that I only began the work at noon!

This transportation problem was exacerbated by a non-urgent approach to appointments held by some community leaders. There was also the fact that some of these leaders did not exhibit good will with respect to being interviewed; they clearly expected to be substantially rewarded for their efforts.

Lastly, we found ourselves hampered by the scrub vegetation. Before I left Lubumbashi, I took care to get information about the condition of the vegetation at Fungurume. It was indicated to me that since the rains had been rather rare, the grasslands had begun to dry out and that accordingly, my work should not encounter hindrance. My experience was the contrary.

5 Strategies

In order to conform to the project schedule, in the face of the challenges encountered (see above), I chose to conduct the two lines of investigation, archaeological and ethnographic, with the accent on the latter. This was justifiable in that I had previously, in 1997, conducted investigations and surveys over a large portion of TFM Concession, and in any case, the grasslands prevented the performance of proper archaeological work in the allotted time. (Appendix B4.2-I).

To save time, I contacted Mr. Mambwe Madindi on the subject of archaeology, as he was one of my workers in 1997. He is currently employed by the topographic department of TFM. I questioned him about the status of the sites on which we worked nearly 10 years prior; among other things, I asked him whether he and his colleagues had found worked or polished stones, pottery, scoria or metal objects similar to those taken to the National Museum of Lubumbashi in 1997 and which I had shown to them.

With respect to ethnography, we implemented a plan that saw us meet, in advance, with the people (community leaders and Chefs de terre) who were the most likely to be able to inform us about the political-administrative organization of the region; this also saved us time.

6 Method and Techniques

For the purposes of archaeology as much as out of ethnographic interest, I interviewed the following chiefs[3]:

- Mpala
- Lutanda and Kafwaya.
- Mulumba, Salabwe and Mwela Mpande[4].

I did not conduct interviews at Tenke and Lukotola. In the first case, this occurred simply because the seat of leadership has remained vacant since the death of the last Tenke. Although Chief Lukotola and I had made an appointment to meet, he was unable to receive me on the day of the meeting, as he was in mourning on the proposed date of the meeting, and throughout the days that followed, and until I left Fungurume.

Interviews were based on a questionnaire; we saved the responses on a notebook; we also took photographs.

Archaeology

On the strength of interview data, I did nothing other than the field survey. I performed no digging due to the obstacle posed by the scrub and, in addition, there was the possibility of trenching without reaching the bedrock, given the lack of time.

Ethnography

To the extent possible, at the end of each interview, I visited the sites described to me as sacred sites, cult sites (shrines), ceremonial sites or cemeteries; I also photographed each site and collected supplementary information about each of them while in the field.

[3] We have grouped the chiefs according to family ties.

[4] See Attachment 2 for the coordinates of the various chiefdoms. Chief Mwela Mpanda and ***name missing*** were not interviewed in their villages, but at Chief Mulumbu's, which explains why we do not have the coordinates of their villages.

7 Description of Work Performed

Archaeology

We conducted investigations in one location on the Mpala Territory, at two locations in the Lutanda – Kafwaya zone and at one location at Chief Mulumbu's[5].

At Mpala, investigation took place in the fields, beside the path leading from the Katumba pool formed by the confluence of the Dipeta and Kalangile Rivers (MPL). We covered an area of approximately two hectares. The site was baptised MPL.

Over the Lutanda Territory, the first investigation was performed here and there, and on either side of the path leading to the Lenge Miaba cemetery (LTD1), with the area explored covering approximately three hectares. We named the site LTD1. A second investigation of the site was conducted in the vicinity of the old Kafwaya village, within a radius of roughly 200 meters; the site was named LTD2.

Finally, the last investigation was carried out about one kilometer from Mulumbu village, on the left bank of the Kimungu River. The surface area surveyed was estimated at ½ hectare. We named this site MLB.

Ethnography

In Chief Mpala's sector, we visited, one after the other, one cemetery, one cult site and one site said to be sacred.

We should indicate that during the interview, Chief Mpala mentioned a second sacred site. We did not visit that site. It happens that all visits required that the chief be present on the site for a ceremony, but he was unable to travel there due to his age and for reasons of health.

In Chief Lutanda's area, we visited two cemeteries (respectively named Lenge Miaba and Maoma), one cult site and four sacred sites (Pungulume Hill, Muta cave or grotto, Kabakishi River and the Maoma gallery forest.

Finally, at Chief Mulumbu's, we were allowed access only to a cult site although the existence of a cemetery was indicated during the interview. We were not allowed to enter the cemetery, as Chiefs Mulumbu, Salabwe and Mwela Pande gave it to be understood that it would have been necessary to have provided them earlier warning,

[5] Chief Mulumbu showed only his cult site. There are many cult sites in the areas falling under the care of Chiefs Salabwe and Mwela Pande. We did not visit them, as the chiefs met with us at Mulumbu's and not at their own locales.

as any visit to the cemetery required group consensus and long ceremonies to request favors of the spirits. Note that Chiefs Salabwe and Mwela Pande each also have one cult site but that these sites were not visited simply because these two chiefs were interviewed at Chef Mulumbu's and not at their own locales.

8 Description of Sites and Discussion of Findings

Archaeology

Investigation did not allow us to identify an archaeological presence testifying to Stone Age existence. On the other hand, metallurgical evidence was encountered, some near the old village of Kafwaya (LTD2), and some in the vicinity of Mulumbu village, on the left bank of the Kimungu River (MLB). In both cases, we recovered scoria, fragments of burned malachite and samples of burned earth. No trace of a forge or vent was observed; but, at Kafwaya a block of burned earth showed a concavity hardened and blackened by fire; this could represent a flux orifice for liquid metal.

Upon examination, the material from Kafwaya and Mulumbu represent pre-modern iron works; this is a tentative proposal, pending a survey of both locations.

Ethnography

Cemeteries

The Mpala cemetery is located near the old village abandoned in 1951 following numerous deaths. The cemetery was for the use of the chiefs and some of its most illustrious citizens; among others, it contains the remains of Chief Mpala's predecessor and his elders foremost citizens.

We wanted to know whether this cemetery held any particular meaning. "None", was his response, "Save for the witchdoctors and/or fetishists who go by to remove funerary items (earthernware pots, metal tools, etc.) left on the tombs."

With respect to the Lutanda Territory, the cemetery known as Lenge Miaba is found near Kadila Nzolo hill, north-west of Kwatebala station. The cemetery is reserved for the use of chiefs and the most notable of the Lutanda family. Two great chiefs, Lutanda Lukotola and Mwana Bute have been laid to rest there. It was indicated to us that the current Chief Lutanda will someday be buried at Lenge Miaba.

The Maoma cemetery is contained within a meander of the Nkoka River, and the place has been colonized by a bamboo forest adjoining a gallery forest. This is the oldest cemetery in the Lutanda Territory. It holds the remains of three very ancient chiefs: Kafwaya Lumuna, Kafwaya Mulonda and Kafwaya Kyabu. The Maoma

appears to be one of the most highly respected places in the Lutanda Territory because it is the final resting place of three chiefs and moreover, is contiguous with a gallery forest.

The two cemeteries in the Lutanda Territory are intact, although they are somewhat hemmed in by corn and bean fields; we were told that only brush fires attack them.

Cult Sites

At Mpala, the cult site referred to as Kipanda in the vernacular tongue, consists of a tree encircled with wooden pickets forming a circle of approximately one meter in diameter; it is included in the Chief's land holdings and is located about 15 meters distance from his residence.

As at Mpala, the cult sites of Lutanda and Mulumbu are both located in the chief's land holdings, not far from his residence. In these two cases, they consist of a doubled construction of an enclosure of branches and straw forming a belt around a second construction. We were not permitted to visit the interior of the enclosures, so we do not know what the interior constructions consist of or what they contain. As was the case at Mpala, the two cult sites are known as Kipanda.

Sacred Sites

The sacred site at Mpala bears the name Katumba. It consists of a pond or pool at the confluence of the Dipeta and the Kalangile. An underground current apparently traverses the bottom of the pool. In times past, infants afflicted with anomalies (first teeth consisting of upper incisors, for example, or paralysis of the lower limbs - poliomyelitis) were thrown into it. It was forbidden to boat, bathe or fish in that waterbody. Like the Dipeta River which provides the outflow, the pond is characterized by a gallery forest. At the point of exit from the pond, the Dipeta forms rapids where the population bathes.

The Katumba is still there: children are no longer thrown into it, but bathing, fishing and boating are still not practiced. The place is still more or less venerated.

At Lutanda, the foremost sacred site consists of a hill known as Mpungulume by the native people; TFM geologists have baptised the hill "survey 10"[6]. We climbed it; it resembles a truncated pyramid. During our ascension, the summit was littered with two gourds, traces of candle wax, a whitish powder, traces of indigenous beverage, stone blocks, and cabalistic signs traced on the ground.

[6] Personal communication with M. Nzita, TFM geologist.

Our information indicates that this hill is used nowadays as a cult site for a modern sect, while in the past it had never fulfilled a religious function. It was traditionally considered sacred, as it was believed to harbor spirits, which forbade going there.

My interview subjects (Chiefs Lutanda and Kafwaya and their foremost citizens) responded with modulated answers when asked whether, in their minds, the hill was still a sacred site, from which it came out that the Mpungulume Hill was considered deconsecrated.

Known as Muta, the cave or grotto appears on the west flank of Mambilima Hill, not far from the bridge on the Nkoka River; since access was difficult, we made our observations from a distance. The sacred character of the grotto rests in the belief that spirits inhabited it, just as they inhabited the gallery forest of the Konka River nearby. The legend also reports that it was possible to see white clothes at the grotto entrance and that when one approached the grotto, they disappeared.

These days the grotto has lost its sacred character. In fact, “drillers” have penetrated it in search of ore-bearing rock, specifically copper and cobalt.

The Kabakishi River, also considered a sacred site, flows into the Kalumba at about 40 minutes walking distance north of the bridge on the Kalumba. The river is sacred because it is said that any attempt to fish there is doomed to failure. The belief goes that each fish caught there is automatically transformed into mother-of-pearl or pearl. The sacred character is also a consequence of the dense gallery forest bordering the river, as gallery forests by definition are the habitat of spirits and a reservoir of medicinal plants. The environment of the Kabakishi has remained wild, at least at the location where the river joins the Kalumba.

Finally, the Maoma also has a sacred character. It is so, in part because of its function as a cemetery, but also because it is found on the edge of a gallery forest. The place is wild, although the surrounding terrain is cultivated.

Ceremonial or Ritual Sites

The chiefs were unanimous: "Ceremonies were and are practiced, but there have never been fixed sites. Everything happens in the shrub, in a wooded highlands or a gallery forest, preferably in front of an imposing tree. We used them in the past and still use them to conduct ceremonies during epidemics, famines, war…” In short, *ceremonies are conducted when the people are faced with incomprehensible situations requiring recourse to the supernatural, given the lack of a rational solution* (the emphasis is ours). No chief would permit us to inspect a site devoted to ceremonies.

Investigation yielded nothing regarding the Stone Age. On the other hand, we located two deposits with evidence of the Iron Age.

Chiefs Lutanda, Kafwaya, Mulumbu, Salabwe and Mwela Pande and their foremost citizens were not surprised by the news of the Iron Age vestiges. For them, this material represents the traces of one of the activities practiced by their ancestors. They had never personally witnessed this type of activity; it belonged to a past they had never known; they recall this activity because it was transmitted to them through the oral tradition; this was not a heritage concern.

In short, the metallurgical remains discovered at Lutanda and Mulumbu represent only archaeological interest; they do not form part of the cultural resources of the indigenous population. This is not surprising, as it is up to archaeologists to intensify and deepen the study of archaeological sites and to protect them against destruction, whether this be by mining or otherwise. It would be desirable to do so, and to proceed with a week of surveys at both Iron Age sites. The work could be performed next July after brush fires have cleared the scrub.

The TFM Concession contains cemeteries, sacred sites and cult sites. Do these sites represent a cultural heritage for the local populations?

The various cult sites certainly give every evidence of participation in cultural heritage; the same is true for the Maoma and Lenge Miaba cemeteries. On the other hand, for the Mpungulume Hill, Muta grotto and Katumba pond, three points indicated to us as sacred appear to relate more closely to memory than to heritage; the same is true for the Mpala cemetery. The Mpungulume Hill seems to be used by the members of a sect and Muta grotto by freelance drillers in search of ore; for its part, the Katumba pond no longer fulfills the same function of the Tiber at the foot of the Tarpinian rock; finally, the Mpala cemetery is abandoned and visited only by witchdoctors.

The Kabakishi River is intriguing: is it sacred because of its fish that metamorphose into pearls once caught or because it flows within a natural environment? We did not see a single fish, at least not at the place shown us. On the other hand, we were struck by the calmness of the site; it is so impressive that the place seems full of mysteries. Could this atmosphere be the real cause for the sacred nature attributed to the river, in the past and presently?

The sacred sites constituted by the Maoma and the Kabakishi Rivers require protection, the first for its two-fold content (gallery forest and cemetery), and the second for its gallery forest.

9 CONCLUSIONS AND RECOMMENDATIONS

The archaeological overview of the TFM Concession has shown that the investigation zone does not harbor Stone Age relics. On the other hand, the zone has exhibited vestiges of the Iron Age. Upon first examination, the data collected appear to pre-date modern times.

We conducted investigations in 1997 in the TFM Concession (Appendix B4.2-I). One of the archaeological vestiges discovered belonged to the Stone Age, while the others belonged to the Iron Age. Our report recommended that one site, DSHN in this case, should be subject to an archaeological dig. We could have been able to perform that work this year, but time ran out, and the shrub posed an obstacle.

Irrespective of the above, the two visits (1997 and 2006) to the TFM Concession demonstrated that the perimeter explored is sparse, from an archaeological point of view. The DSHN, LTD2 and MLB sites would require intense digs but due to their location, these sites have no effect on the activities of the TFM Company, at least in the immediate future.

With respect to ethnography, sacred sites and cemeteries were identified; however, some of these are invoked in the nature of a debt to remember, rather than as heritage, while others are critically important components of heritage awareness. The former are not a concern for mining operations; the latter however, must be taken into consideration.

All the cult sites resemble what Iron Age archaeologists refer to as “ephemeral ovens”, which were destroyed after use. It is clear that the cult site is intimately related to the siting of the chief’s residence, and was destroyed upon vacating the village.

In conclusion, while certain sacred sites and cemeteries deserve to be preserved due to their heritage value for local populations, some are simply sites which provoke memories; their fate should depend mainly on good judgement. Protection may be limited to a fence consisting of a small brick wall bearing words inspired by the Chiefs and the general public.

Lubumbashi, April 15, 2006.

Donatien MUYA wa BITANKO Kamwanga

ATTACHMENT 1

VILLAGES

Villages[7]

1. Lukotola[8]

S 10°30’55	S 10°30.953’
E 026°15’24	E 026°15.582’

2. Lutanda

S 10°39’19	S 10°39.300’
E 026°14’13	E 026°14.212’

3. Mpala

S 10°37’18	S 10°37.337’
E 026°20’25	E 026°20.393’

4. Mulumbu

S 10°33’45	S 10°33.722’
E 026°11’55	E 026°11.897’

[7] Coordinates are provided only for villages whose leaders collaborated with our work or who seemed willing to do so.

[8] Here and elsewhere we have used the coordinates provided by the Magellan GPS Pioneer (left hand column) and the Garmin Geko 201 (right column).

ATTACHMENT 2

AREAS INVESTIGATED

Investigation

1. LTD1 (Lutanda Territory, path to Lenge Miaba cemetery).

    a. Path environment

    S 10°35’30 S 10°35.540’

    E 026°14’45 E 026°14.887’

    b. Lenge Miaba Cemetery

    S 10°35’33 S 10°35.545’

    E 026°13’54 E 026°13.891’

2. LTD2 (Lutanda Territory, old Kafwaya village)

    a. S 10°36’44 S 10°36.738’

    b. E 026°14’24 E 026°14.392’

3. MLB (Mulumbu Territory)

    a. S 10°33’34 S 10°33.599’

    b. E 026°11’34 E 026°11.687’

4. MPL (Mpala Territory, path between Katumba pond and the old cemetery)

    a. Pond

    S 10°37’07 S 10°37.138’

    E 026°20’20 E 026°20.321’

    b. Cemetery

    S 10°36’14 S 10°36.266’

    E 026°20’56 E 026°20.905’

ATTACHMENT 3

CEMETARIES

Cemetaries

1. Lenge Miaba (Lutanda Territory)

S 10°35’33	S 10°35.545’
E 026°13’54	E 026°13.891’

2. Maoma (Lutanda Territory)

S 10°37’29	S 10°37.460’
E 026°14’43	E 026°14.736’

3. Mpala (Mpala Territory)

S 10°36’14	S 10°36.266’
E 026°20’56	E 026°20.905’

ATTACHMENT 4

SACRED SITES

Sacred sites ("Nsanza ya bakisi" in Sanga or Kisanga, local language)

1. Kabakishi (river, Lutanda Territory)

S10°36’58	S 10°36.988’
026°13’21	E 026°13.358’

2. Katumba (pond, Mpala Territory)

S 10°37’07	S 10°37.138’
E 026°20’20	E 026°20.321’

3. Maoma (Lutanda Territory)

S 10°37'295	S 10°37.460’
E 026°14’43	E 026°14.736’

4. Mpungulume (hill, Lutanda Territory)

S 10°36’31	S 10°36.501’
E 026°17’47	E 026°17.770’

5. Muta (cave or grotto, Lutanda Territory)

S 10°37’16	S 10°37.237’
E 026°14’51	E 026°14.847’

ATTACHMENT 5

CULT SITES

Cult Sites ("Kipanda" singular, "bipanda" plural, in Sanga or Kisanga, local language)

1. Lutanda

S10°39’19	S10°39.300’
E026°14’13	E026°14.212’

2. Mulumbu

S10°33’45	S10°33.722’
E026°11’55	E026°11.897’

3. Mpala

S10°37’18	S10°33.337’
E026°20’25	E026°20.393’

APPENDIX B4.2-III

CULTURAL RESULTS OF THE SOCIO-ECONOMIC VILLAGE STUDIES

Table 1 Cultural Results of the Socio-economic Village Studies in the TFM Concession Area

Town	Characteristic	Description
Kafwaya	sacred sites	Mahoma. – site where chiefs are buried, within the concession area, no fields are allowed there, in a bend of the Kongka River. Kabakishi River – A river near Kwatebala Gare, rich in fish, but if people go there without the authorization of the chief, they only catch pearls (sambo) and chauwris (butshanga), they even risk to die. Senegalese people who had tried to fish the pearls have all died. Mululu Mpunga. A sacred tree “arbre de la malediction”. The chief has to take the medicinal bark before other people can touch it, if not it does not work. The sacred rock of Fungurume. – Ka Mpungulume or Tu Fungurume. The specific site of this hill cannot be mined, Only the chief of Kafwaya has the power to go there and ask the spirits. The remaining area around this hill, the kimbiri, can be mined without any danger.
	archaeology	Towards the south there is site where copper was smelted and the traditional crosses “lwanzo lwa mikuba” were made. Other mines are present in the concession area, but some mines have been destroyed by the illegal miners.
	cemetery	There are several different cemeteries: 1) for babies before they have teeth, 2) for violent deaths, for 3) for twins and their parents, 4) for chiefs, 5) for all others, 6) old cemeteries. Coordinates UTM 35L (418399 8823556) refer to the entry of the main cemetery.
Zakeo	sacred sites	Cemetery 300 meters north of the village, abandoned graves "all around the village".
Lutanda	sacred sites	The site where fertility rituals for the harvest are carried out are not sacred sites, because the Chef de Terre can easily find other replacement sites
	cemetery	There are two cemeteries in Lutanda: 1) twins and their parents (coordinates UTM 35L 415252-8822720), 2) for all others (coordinates UTM 35L 413540-8822036). The Lutanda cemetery is used by the villages Lutanda, Kimilombe, Manomapia, Postolo and Kilusonsa
Kilusonsa	sacred and archaeological sites	Interdiction to smoke in the village, to drink or to sell alcoholic beverages. Pentecostal village of the "30° communauté Pentecôtiste au Congo". Sacred sites, other than the graveyard, are not known by the village Caves are present near Mulumbu
Mutaka II	sacred sites	Tree in the village "Kikabilo", where the most important rituals (kupupa) are held Kyowelo River, where new chiefs are enthroned. (toward the south, and outside the project area).
	archaeology	14 kilometers to the south is a site Kabwe Lunono between two mountains and a river, where one can see stones where the ancestors use to prepare their meals
Mutaka Mwelwa, Q. Kibangu	sacred sites	There is a place "Muyombo" to the east, where secret rituals are performed relating to the ancestors. If ever this place is destroyed, the spirits will take revenge and results will be serious.
	archaeology	There are remains of iron smelting ovens to the south, used by the ancestors. 35 kilometers to the south, near Kela, there are caves that were used by the ancestors for hiding

Table 1 Cultural Results of the Socio-economic Village Studies in the TFM Concession Area (continued)

Town	Characteristic	Description
Kabwe Dikuku	sacred sites	The Fungurume mountain (Kam Pungulume in Sanga) is a sacred mountain, and one cannot climb this mountain. Several whites and locals have been killed on this mountain: three illegal miners are said to have tried to dig into this mountain and have died and we do not want to go there anymore. Women cannot go on that mountain. Kabakishi River near Kwatebala, which is protected by the spirits of the ancestors.
	cemetery	Coordinates: UTM 35L 401562-8823392. The cemetery is used by the villages of Kabwe Kakese, Kabwe Dikuku and Kampulu.
Mwela Mpande Gare	sacred sites	Kabakishi River (cf. Kafwaya). Where traditional ceremonies were held and chawris would appear out of the soil.
	archaeology	No specific sites, see sacred sites
	cemeteries	One general cemetery with parts reserved for twins, chiefs, people deceased through disease and through violence. General location: (GPS UTM 35L 421512-8827449)
Kwatebala Gare	archaeology	Old village Kiyalaka, where people lived before the arrival of the railway in1929 near the cemetery of the babies.
	cemeteries	Three cemeteries that are separated by several km: 1) babies before the have teeth (UTM 35L 413870-8827883; (UTM 35L) on the road to Kwatebala Hill ; 2) general population (UTM 35L 415843-8827408) on the road to Kafwaya; 3) Graveyard for important chiefs 1.5 kilometers northeast of the village (UTM 35L 413870-8827883)
Mulumbu	sacred sites	Women do not climb hills. There are female spirits on the hills that may become jealous. Water sources are protected by strict rules.
	cemeteries	A communal graveyard 750 meters south of Mulumbu, which serves Mulumbu, Amoni and Kiboko. In an area that may directly be impacted by the project (UTM 35L 413106-8831509)
Shungu (Mwanga Muteba)	sacred sites	Kyama Kela hill cave, used during the Msiri wars in 1850-1900 In the Kalebi seasonal river, where at kyowa “ritual bath for the chiefs”. Kitantulo: near the Kalebi farm where the chiefs performs local ceremonies
Salabwe	sacred sites	Kyama Kela hill cave, used during the Msiri wars in 1850-1900 Musanza Wa Mulenge: rain making rituals where ancestors are asked.
	archaeology	Dibwe Dia Kalamba: a rock (stone?) near the Lungeyi River. When the Lubu in the old days warred with the Sanga, this rock barred their progression.
Mulumbu Kyasa (Kiasa or Kiansa)	sacred areas	Kyama Kela hill cave, used during the Msiri wars in 1850-1900 Clothing would appear and disappear on the Lungeyi River (?).
	archaeology	In the Kalebi seasonal river, where at kyowa “ritual bath for the chiefs”. Near the Kinanga river there exists a hole, where two statues are located that people have not been able to take away.
Kasanga	sacred sites	None according to the men. Women: there is a place, pamikisi, where we leave a sample of the seeds we are going to use at the start of the rainy season. Not every year, only every second year. The village chief has his ceremonial hut “miyombo” in the village, where he performs rituals in case of diseases or lack of rain.
Ndela Sase 2	sacred sites	As the population is not an indigenous one, they know of no sacred sites. Deaths are buried in Fungurume town, in the municipal cemetery.

Table 1 Cultural Results of the Socio-economic Village Studies in the TFM Concession Area (continued)

Town	Characteristic	Description
Mano Mapia	sacred sites	Lwanzo Lwa mikuba: forge/faire/"cuivre" or "croisettes". A "furnace" , where the local crosses were made. Un unspecified cave, located about 1.5 km north of the village.
Kiboko	sacred sites	No sacred sites in the village itself, only in Kwatebala
	archaeology	Near the Momvya (Mofia) River: rocks carved as tables and chairs.
Amoni	sacred site	One sacred tree was identified near the local water well, north of the village. The spirit of the tree may be transferred to another place if necessary. Many things are taboo near the water: to bath, to wash black pots, and others that only our village chief (absent) knows. The sacred tree is also part of the yearly agricultural rituals: the villagers will give samples of seeds, the chief will pray next to the sacred tree and than take the seeds to a crossroads and then throw the seeds to the four directions towards the fields.
Kimbakene	sacred sites	Kalebi River, an affluent of the Mofia River is used during the enthroning ceremony of the new chiefs the exact site is called "Kyowa"
Lukotola Tembo	sacred sites	Busodi: the ceremonial hut of the chief, which is also his daily kitchen of the chief. Nobody is allowed to enter this place, except a specially initiated woman. Chiefs only consume food that is prepared in this hut. Muyombo: a tree planted for rituals: planted it will bud the next day to confirm that the ancestors have accepted the new chief. Caution: it is possible to visit the hills, but in order to mine, authorizations of the Chef de Terre are necessary, and specific rituals have to be performed.
	archaeology	Caves called "Kyamakela" are present near the banks of the Disokila river (stream), 600 meters south of the village. Sanga hid in these caves during the Msiri wars of the mid 1850s. There are bones and other remnants of human occupation in this cave.
Mwanga Katunta	sacred sites	Kalebi River, an affluent of the Mofia River is used during the enthroning ceremony of the new chiefs "Kyowa". It's far (two days walking) to the north. The Kyowa has been explained in other villages, but it's not always sited in the same area.
	archaeology	Caves are present 1) near the Kampekete river (stream), 500 meters to the west; 2) near the Sase river: the Sase hill: it never rains Ion this hill, at the entry of the cave
Mpanga Ntadi	sacred sites	Mukondo River (North of the Mofia River): forbidden to fish with a dam; Lubanga River site for the ritual for the success of the harvest (in September, after the first rains). The Kamunugu chiefs and their offspring are not allowed to cross the Kibamba River. (In another interview, it was said that the chiefs and their offspring were not allowed to cross the Mukondo River.)
	archaeology	Cave in the Mbeba hill, in the concession area where bats excrements are taken that are used as fertilizer. Kyamakela: Where victims of the wars between Msiri and the Sanga around 1870 are buried
	cemetery	In the village of Lukotola

Table 1 Cultural Results of the Socio-economic Village Studies in the TFM Concession Area (continued)

Town	Characteristic	Description
Kinyama	sacred sites	The cemetery of the chiefs, where people cannot farm at about 200 meters from the water well where the chief Kaulu Ngombo is buried (Juge accesseur.) The Mbeba (Bemba) Hill, cave with many bats and honey. Very dangerous to go there. Other information indicates that this is not a sacred site, but is used for hunting bats and gathering honey. Kapuba Hill: a hill near the dolomite quarry, with a cemetery. Honey is produces, but those who go there without the chief's consent and prior rituals, will disappear forever.
	cemetery	Kapuba Hill: a hill near the dolomite quarry, with a cemetery.
Kabombwa	sacred sites	A cemetery for the lepers that died in the village is located near the field of the chief, which means that water from the nearby Kabulambe River cannot be drunk. The Kapoba hill has honey, which cannot be accessed without permission of the chief.
	archaeology	Mbeba has natural galleries (caves?), which are traditionally part of the nearby Kamungu village, but can also be used by the people from Fungurume.
Kamungu Kitambo	sacred sites	Kapuba Hill. – A hill rich with honey. Special authorization from the chief is necessary for people who want to go there, if not their hands will be caught between the rocks when they steal honey. Kinyoka. – near the Mofia River, where the chiefs are buried.
Kamungu Mulolwa	sacred sites	The Kamungu chiefs are not allowed to cross the Mukondo and Kibamba rivers. At the start of the agricultural season, the chief makes a small field in the form of a mound, and all villagers sow a sample of their seeds on this mound. The area where this is done is not considered to be sacred site.
	graveyards	The main cemetery is located on the site of the former village.
Lukonde	sacred sites	The source of the Mushinji River can not be visited by women, as people with goiter, people who die with a swollen belly, by suicide through hanging, babies from girls who never had their periods are buried near this spring. The Kamapole River where one cannot fish with baskets as one will only capture chauris and not fish.
	graveyards	There is a graveyard on the road to Kisankela for the chiefs and the general population, another on the road to Tshilongo (GPS 35L 390336-8827353), and a third one, kambabuluku where the chiefs alone are buried.
	graveyards	One on the road to Tshilongo (GPS 35L 390336-8827353) surrounded by Mitombetombe trees, one for the twins and the chiefs in a secret site , and one for those who died an accidental death on the road to Kyabodja (GPS 35L 390884-8824479).
	graveyards	People use the same graveyard as Kampulu, in the village Sangana. Twins are buried in secret near road crossings.
Kampulu	sacred sites	The local population recognizes no sacred sites, but refers to the Chef de Terre, who may know them.
	archaeology	Old pottery is found in the following places: Mpembwe (to the south), Kituma Kubi (clay pots, in one of the effluents of the nearby Sangana River; Sakwa (to the south, near the Kando farm).
	graveyards	General graveyard in the former village Sangana, chiefs have a special graveyard, near the Mwikuu R., about 12 kilometers to the south.

Table 1 Cultural Results of the Socio-economic Village Studies in the TFM Concession Area (continued)

Town	Characteristic	Description
Lukotola	sacred sites	There exist secret sacred sites that you will never know, even if you live to be a hundred years old. That site is magically protected, you will stop and never attain it. The Kabafuwich River, near the village, where two big trees grow that were used for "truth tests" with sorcerers: the sorcerer has to pit his hand in hot water, if the water burns his hands, he is considered guilty and the village will kill him. A small hill (A villager explains that two of his brothers were hunting gazelles in the area have seen a clean town, with washed clothing drying. Without realizing how, they crossed the river towards that town. As they were not aware that the site was taboo, they were able to come back. The chief says, that even he, the village chief, is not allowed to visit the site.) where one cannot climb without getting lost, but only those that are aware of the existence of this hill.
	archaeology	An important cave "kyamakela", where the population was hidden during the 18th century wars in the Lubwana hills to the NW in the direction of the Mwela Mpande Village
Mpala	sacred sites	Muninga cave. On the road to Lukotola, where the "Tipoyi" ornaments made of "Konji" skins of the chief are kept after his enthroning. Katumba. – A lake of the Dipeta River where one cannot draw water with black pots Kibanda. – In a clear forest, a place called "zanzela" with many snakes. If one cries because of seeing the snakes, they will bite. Kelangile River. – It's forbidden to take a bath in the upper part of the river, if you bathe you will disappear.
	cemetery	Fungurume