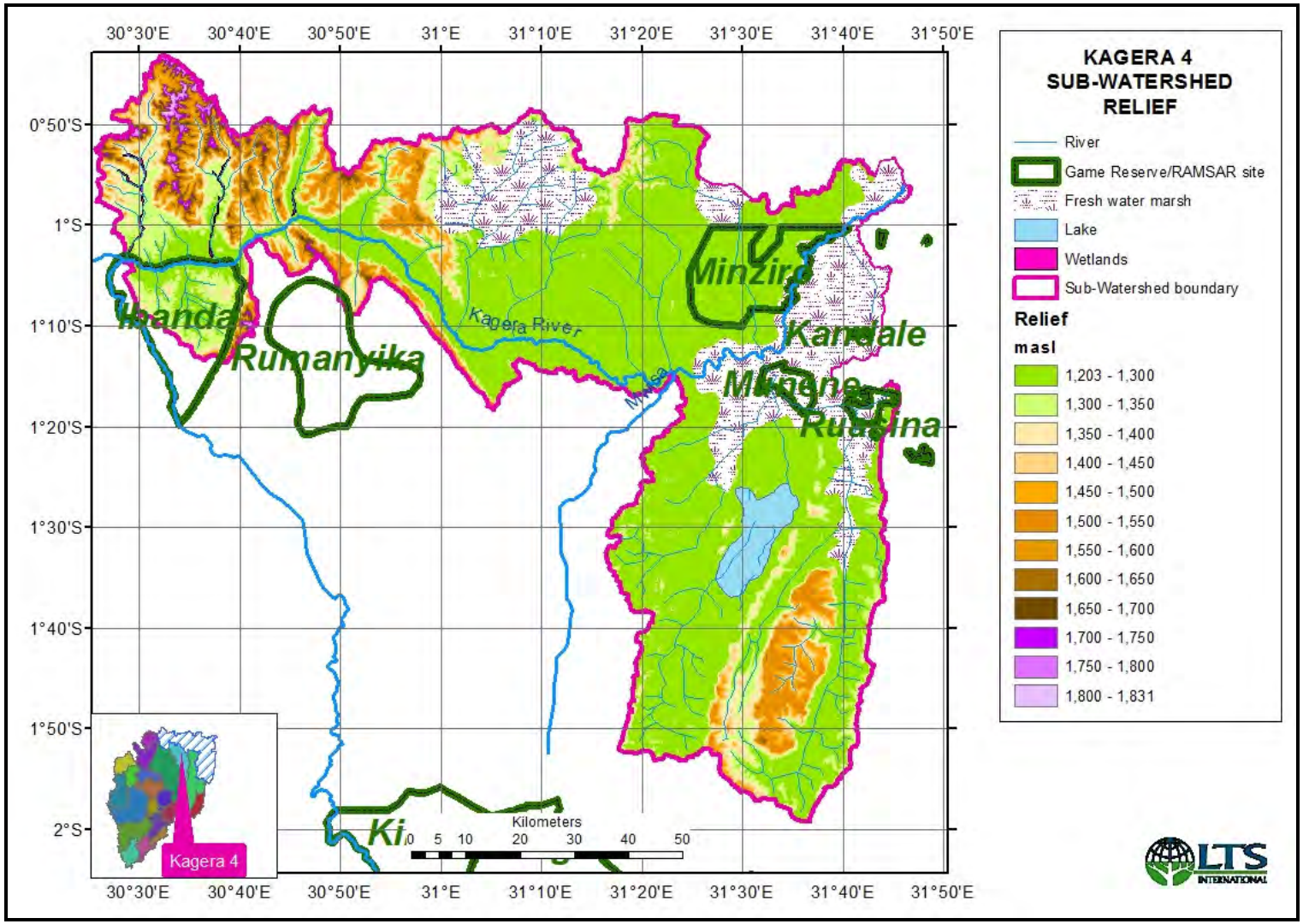
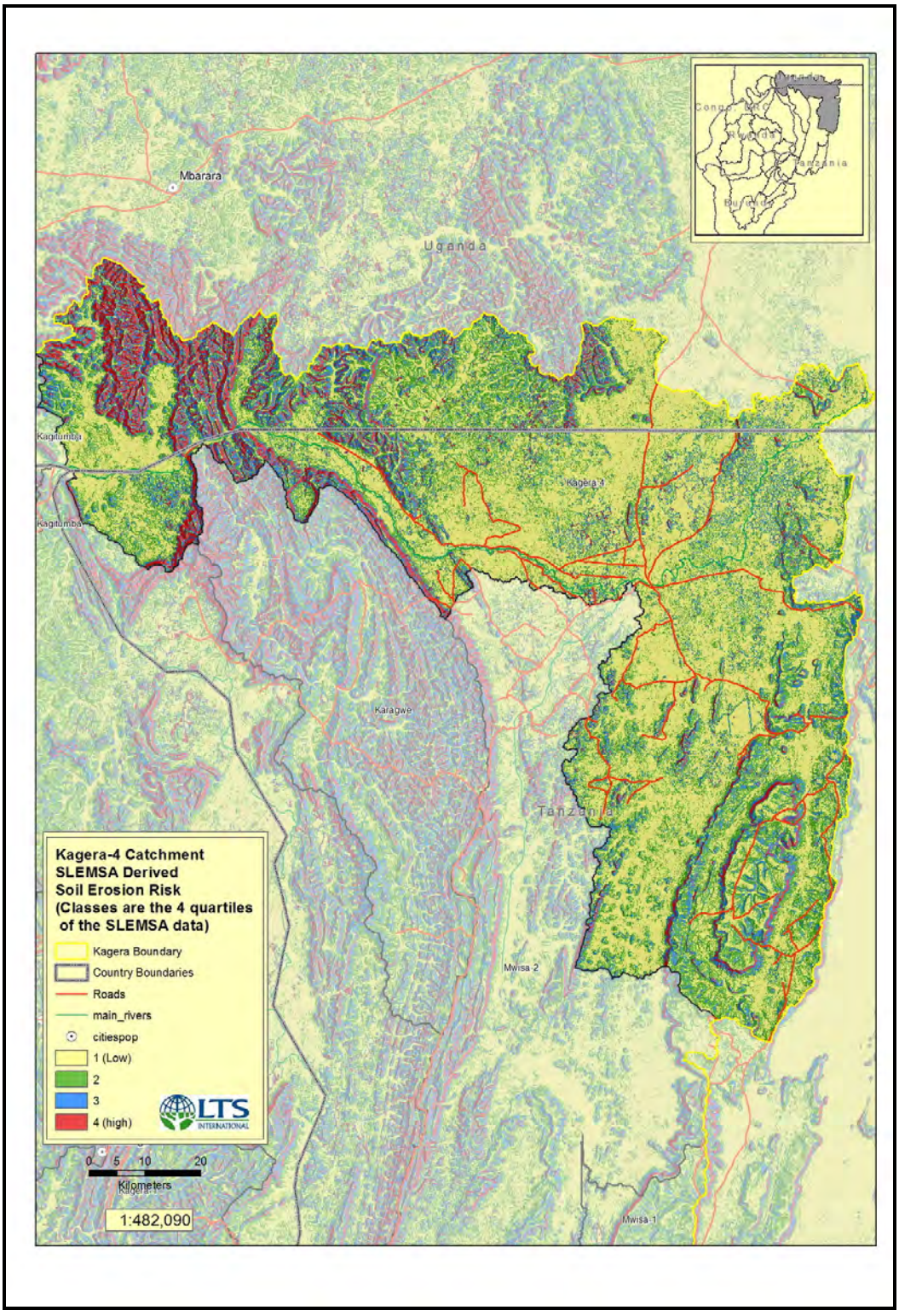
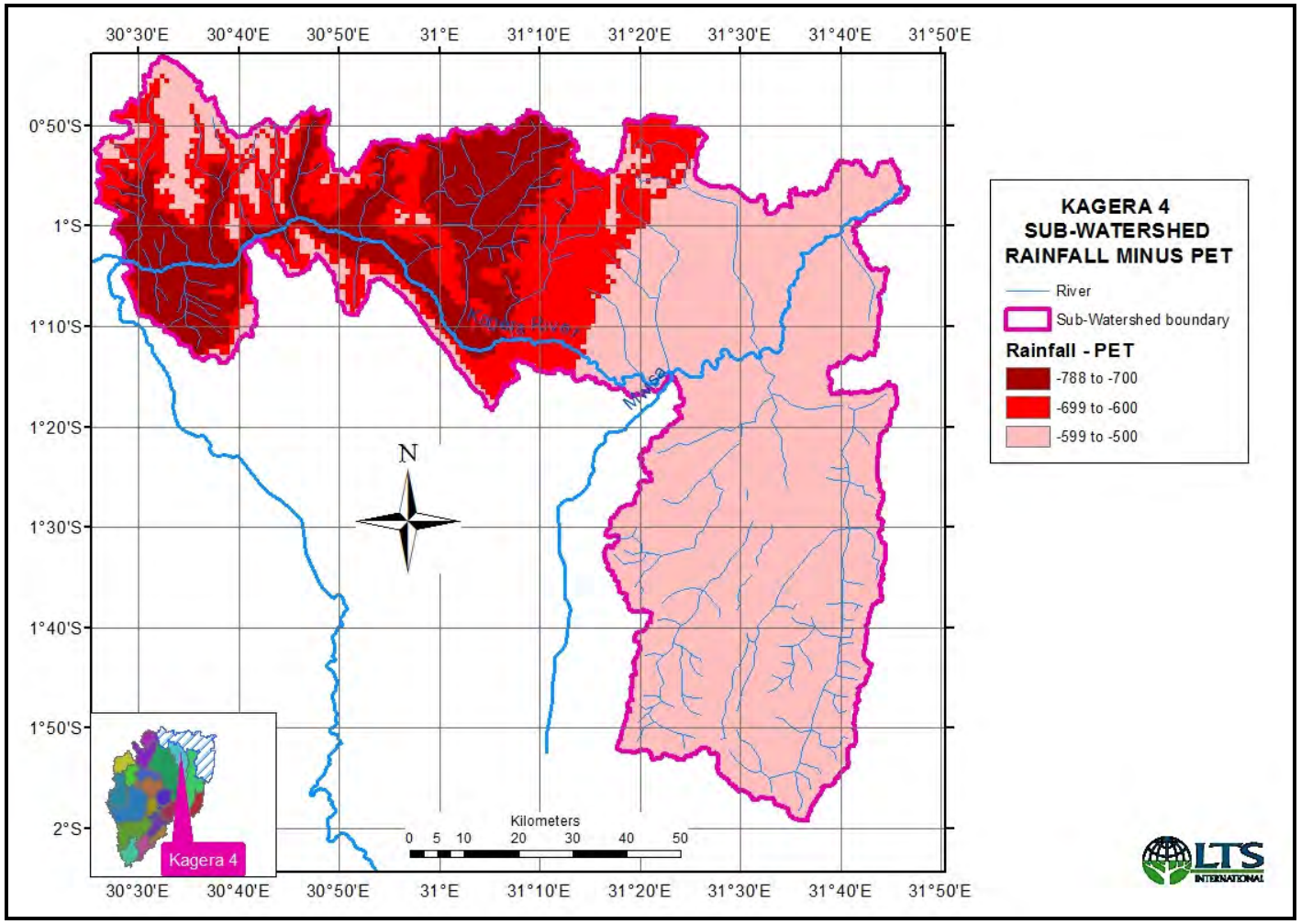
Map 51. Kagera 4 Sub-Watershed Relief



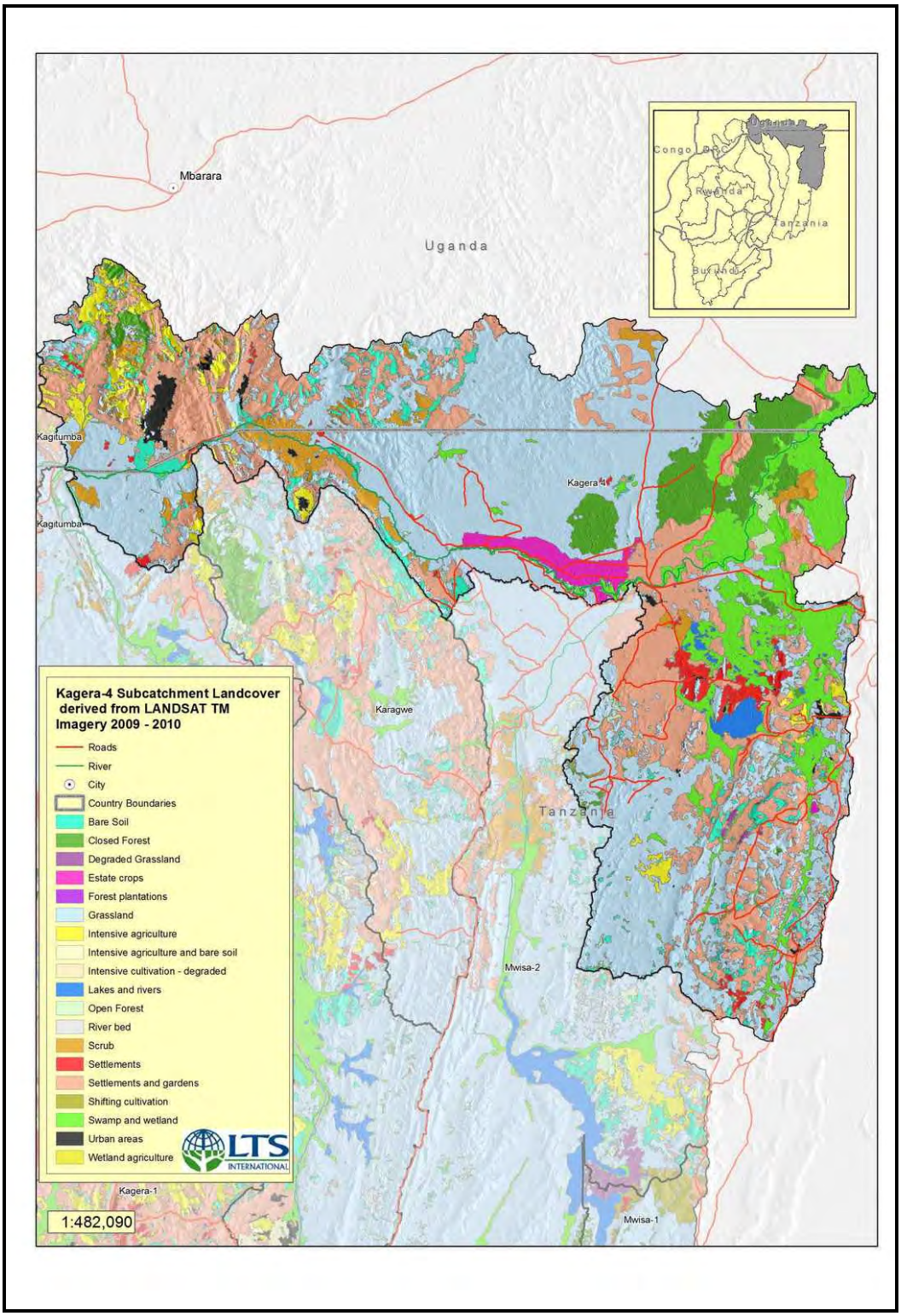
Map 52. Kagera 4 Catchment Soil Erosion Risk



Map 53. Kagera 4 Sub-Watershed Rainfall minus PET



Map 54. Kagera 4 Sub-Catchment Landcover



10. Kagitumba Sub-watershed

10.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
118.8	14.6	29.1	312.4	61.5	125.9
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
51.5	0.0	2.0	150.8	2.1	17.0
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
6.93	11	11.89	4.23	9	9.3
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
8	1.9	3.2	17.6	6.6	10.3
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
267.9	388	347.4	251.9	372.1	325

(b) Land Use/Landcover

Kagitumba - Landcover	Hectares	% of Total
Settlements and gardens	115,100.1	43.5
Intensive agriculture	73,452.7	27.7
Grassland	29,174.1	11.0
Settlements	22,446.8	8.5
Bare Soil	6,918.1	2.6
Shifting cultivation	5,860.5	2.2
Forest plantations	4,461.0	1.7
Urban areas	4,321.7	1.6
Swamp and wetland	1,634.0	0.6
Open Forest	872.9	0.3
Wetland agriculture	315.8	0.1
Scrub	311.6	0.1
Lakes and rivers	19.2	0.0
TOTAL	**264,888.5**	**100.0**

10.2 Description of the Sub-watershed

10.2.1 Specific nature of Sub-watershed

The Kagitura River has its headwaters on the Congo-Nile divide. It is divided into two very different physiographic units with sharp environmental contrasts: a deeply dissected highland zone in its headwaters, and lowlands with subdued relief and gentle slopes in its lower half. Its joins the Kagera River at its outlet.

10.2.2 Key Issues

(a) Upper Watershed

- High population pressure, accelerated soil erosion, landslides leading to heavy siltation of stream and rivers;
- Degradation of wetlands and encroachment of river banks;
- Seasonal flooding

(b) Lower Watershed

- Overgrazing of grasslands and consequent livestock feed deficits;
- Lack of accessible water supplies for humans and livestock; Uncontrolled bush burning;
- Fuelwood deficits
- Soil nutrient mining, low fertility, acidification and aluminium toxicities;

10.2.3 Characterization of Sub-watershed

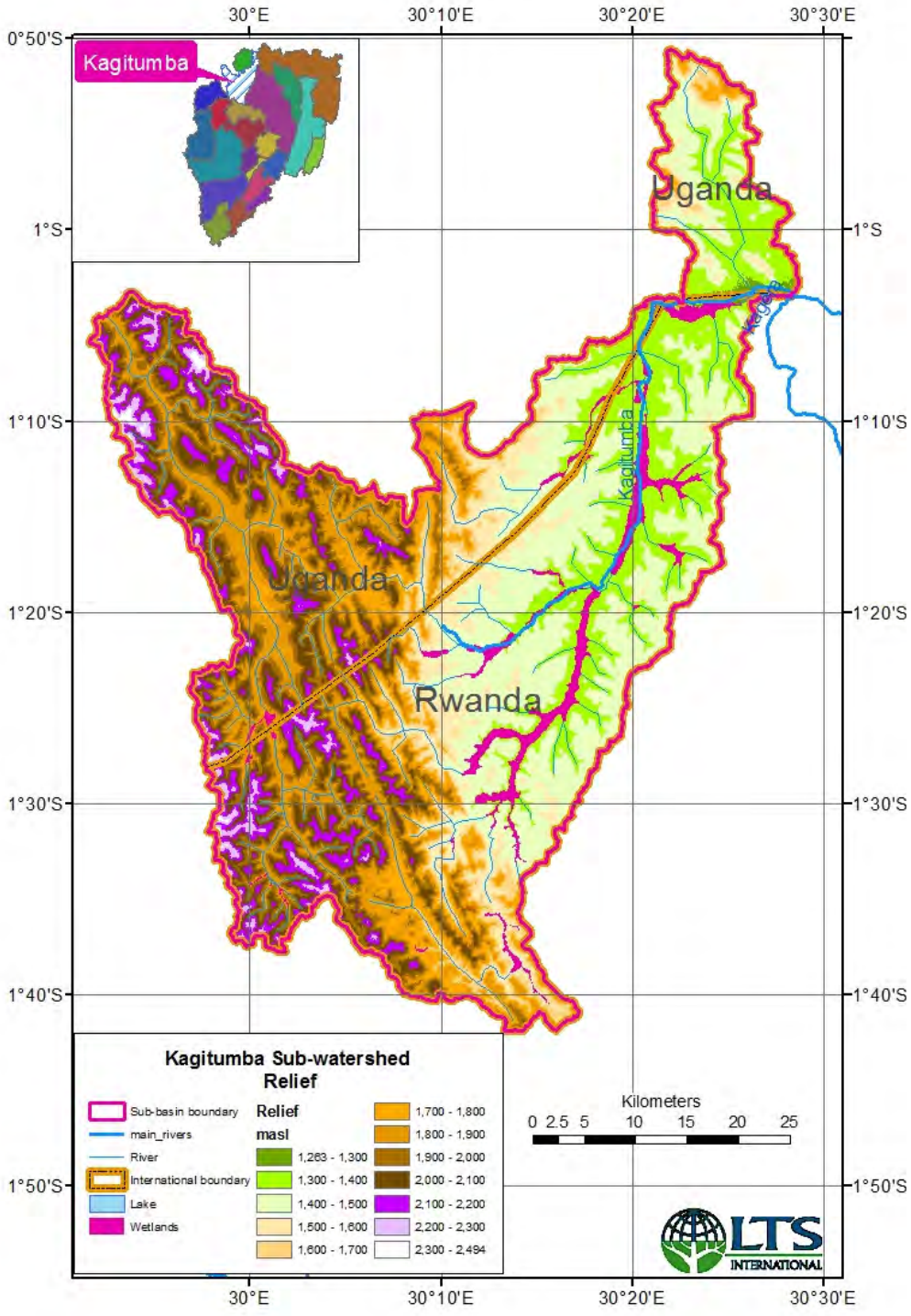
The sub-watershed covers some 264,890ha and is located in the northwest of the Sub-basin.

The upper watershed lies between 1,600 and 2,300masl and is deeply dissected. The lower watershed lies between 1,200 and 1,500 masl. Severe to very severe soil erosion risk is extensive in the upper watershed but low in the lower watershed. Rainfall is between 1,200 and 1,600mm/yr in the upper watershed and from 1,000 to below 800mm/yr in the lower watershed. PET exceeds rainfall across the Sub-watershed: by 200mm/yr in the upper parts to 800mm/yr in the lower parts. Green water follows a similar pattern: from 300mm/yr in the upper parts down to 100mm/yr in the lower parts.

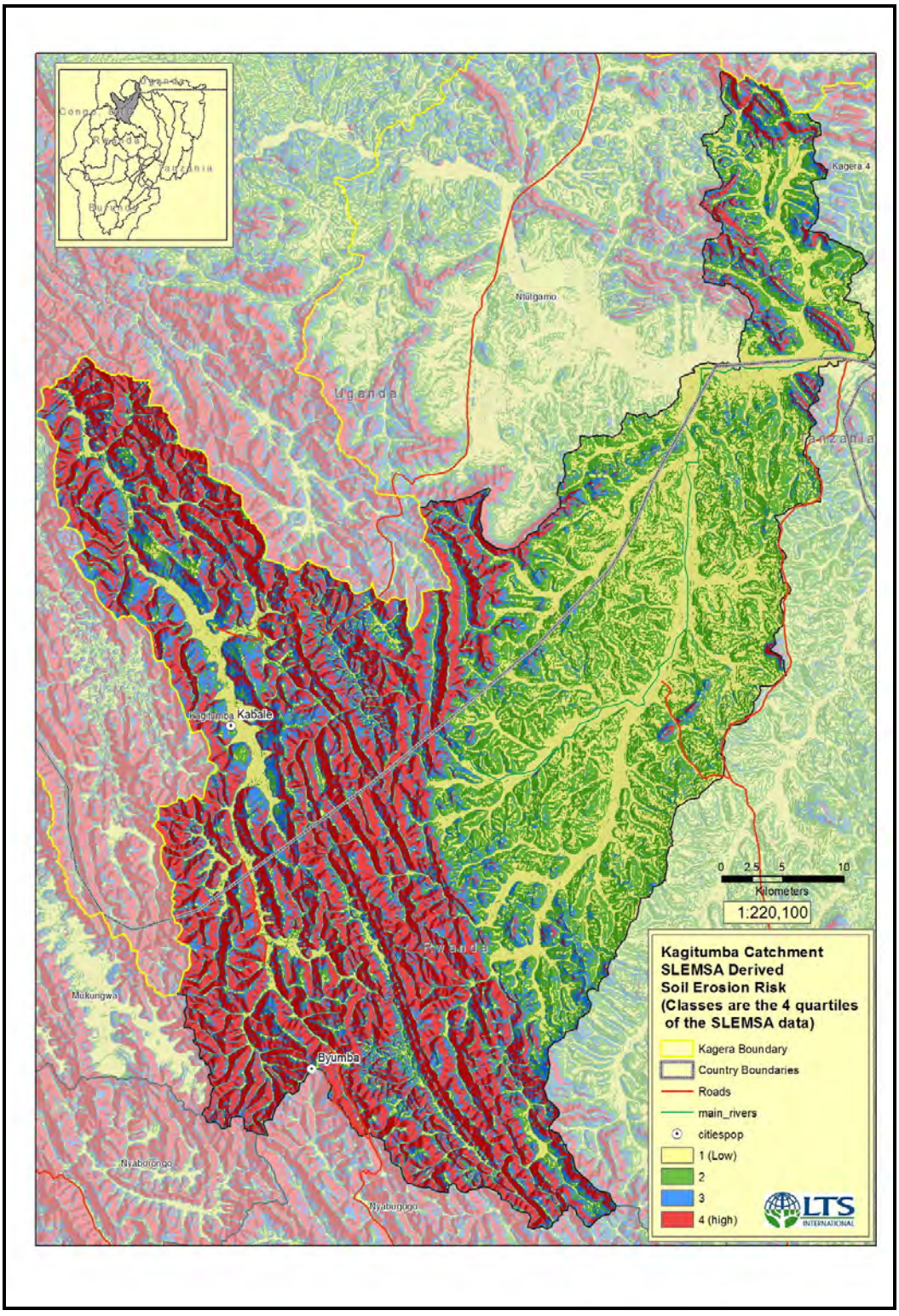
Population densities range from 500 to 1250 ppk2 in the upper watershed and 250 to below 125ppkm2 in the lower watershed. Intensive agriculture and gardens cover some 80 percent of the area with shifting cultivation just 2 percent. Grassland is located in the lower watershed and covers some 11 percent. Wetlands are sparse and cover less than 1 percent of the area.

The Nile Divide Farming System is found above 1,800masl in the upper watershed together with the High Plateau Farming System down to 1,550masl. In the lower watershed is found the Kagera Piedmont Farming System which grades into the savanna Lowlands systems below 1,400masl. .

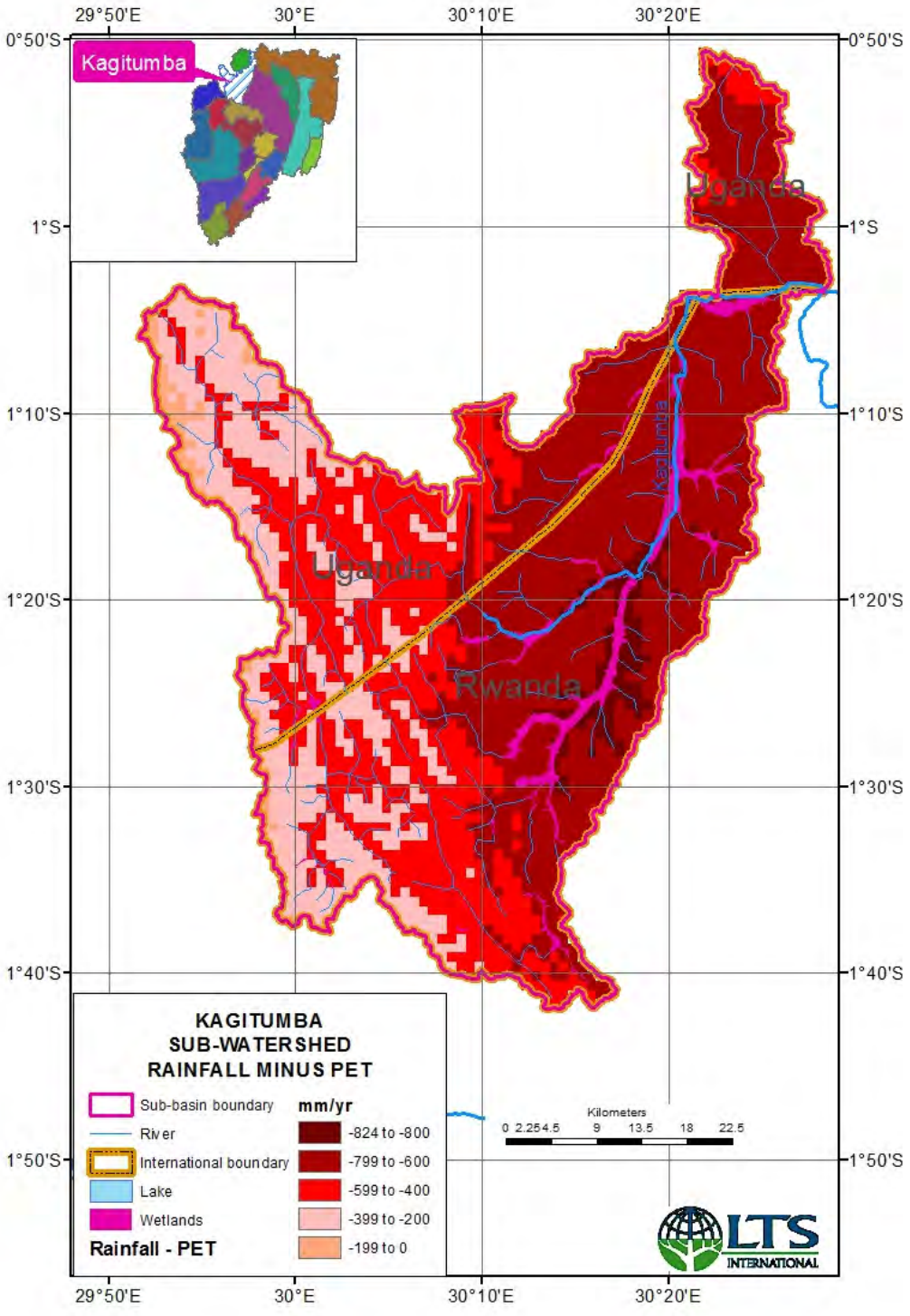
Map 55. Kagitumba Sub-Watershed Relief



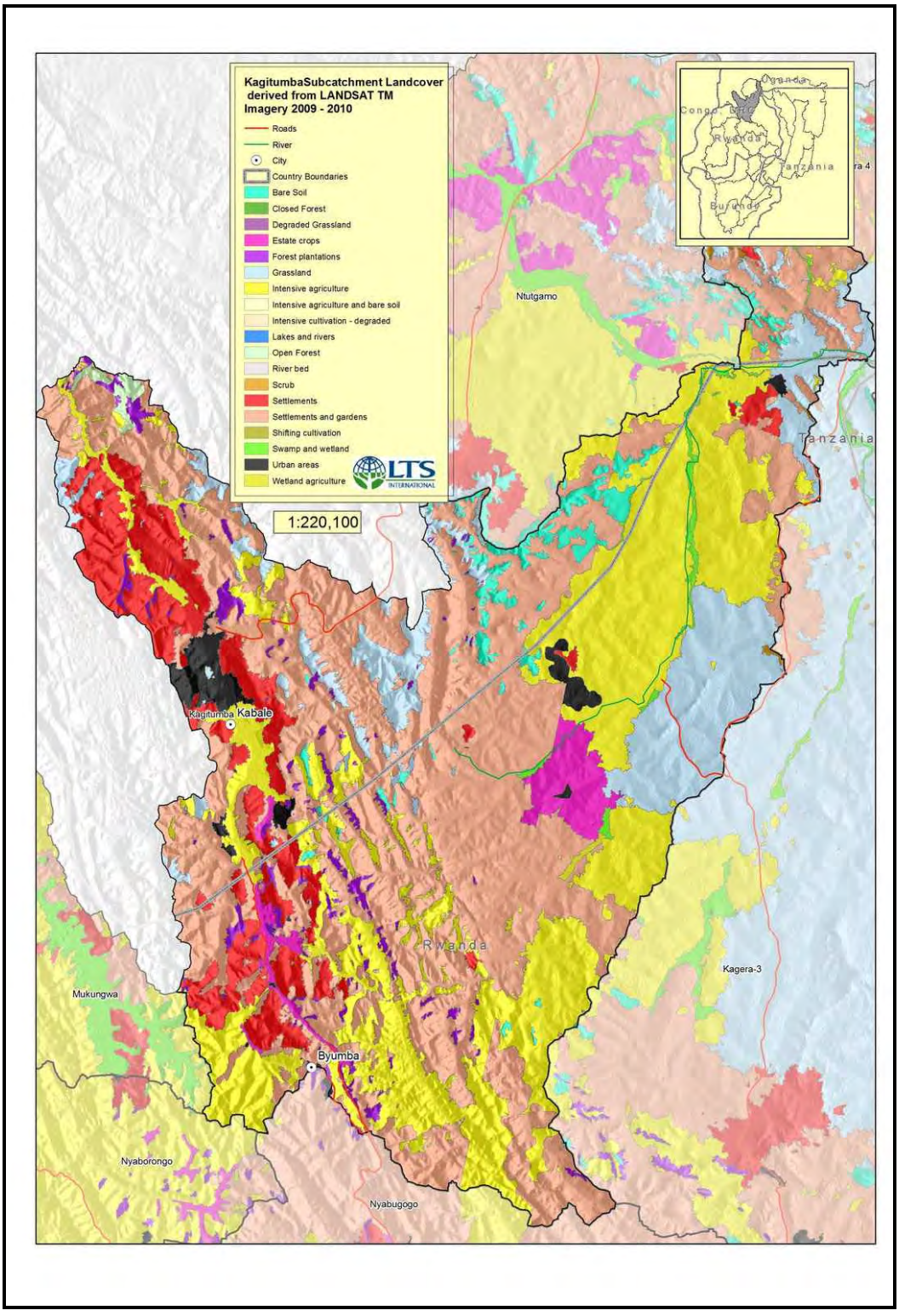
Map 56. Kagitumba Catchment Soil Erosion Risk



Map 57. Kagitumba Sub-Watershed Rainfall minus PET



Map 58. Kagitumba Sub-Catchment Landover



11. Karagwe Sub-watershed

11.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
170.9	48.2	57.9	360.5	161.8	186.2
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
73.6	0.9	6.9	172.0	11.4	44.1
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
4.63	8	7.96	4.6	7	7.39
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
15.9	10.5	10.6	22.8	17.5	17.2
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
323.9	483	378.2	315.4	448.4	376.6

(b) Land Use/Landcover

Karagwe - Landcover	Hectares	% of Total
Grassland	106,309.4	40.0
Settlements and gardens	92,316.8	34.7
Intensive agriculture	19,898.1	7.5
Bare Soil	19,365.8	7.3
Closed Forest	9,900.3	3.7
Swamp and wetland	7,022.4	2.6
Open Forest	3,309.4	1.2
Scrub	2,977.9	1.1
Settlements	2,592.0	1.0
Lakes and rivers	1,636.7	0.6
Intensive agriculture and bare soil	363.3	0.1
Forest plantations	12.1	0.0
TOTAL	**265,704.2**	**100.0**

11.2 Description of the Sub-watershed

11.2.1 Specific nature of Sub-watershed

It is located entirely within Tanzania sandwiched between the Mwisa to the east and the Kagera to the west. The Karagwe River joins the Kagera River at its outlet. It is a relatively deeply dissected upland between the Karagwe and the Mwisa plains to the west and east.

11.2.2 Key Issues

- Deforestation and uncontrolled fires;
- Lack of water supplies for humans and livestock;
- Soil nutrient mining, declining soil fertility, declining agricultural production and increasing food insecurity;
- Unreliable rainfall and soil moisture deficits.

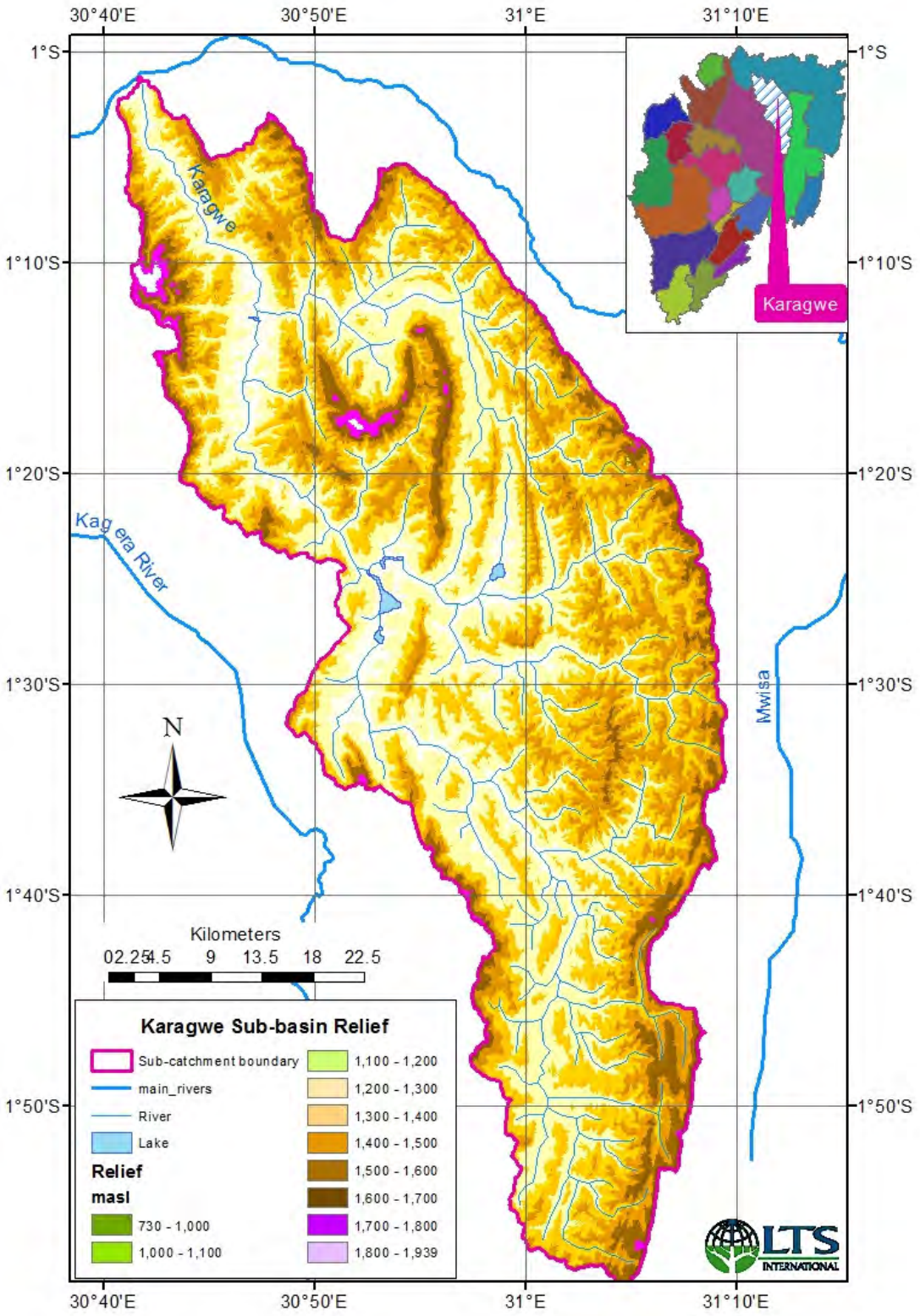
11.2.3 Characterization of Sub-watershed

The Sub-watershed is located in the central part of the Sub-basin and extends some 265,710ha. It lies between 1,200 and 1,900masl and comprises a series of deeply dissected north-south tending parallel ridges. Some 51 percent of the area is subject to severe to very severe risk of soil erosion.

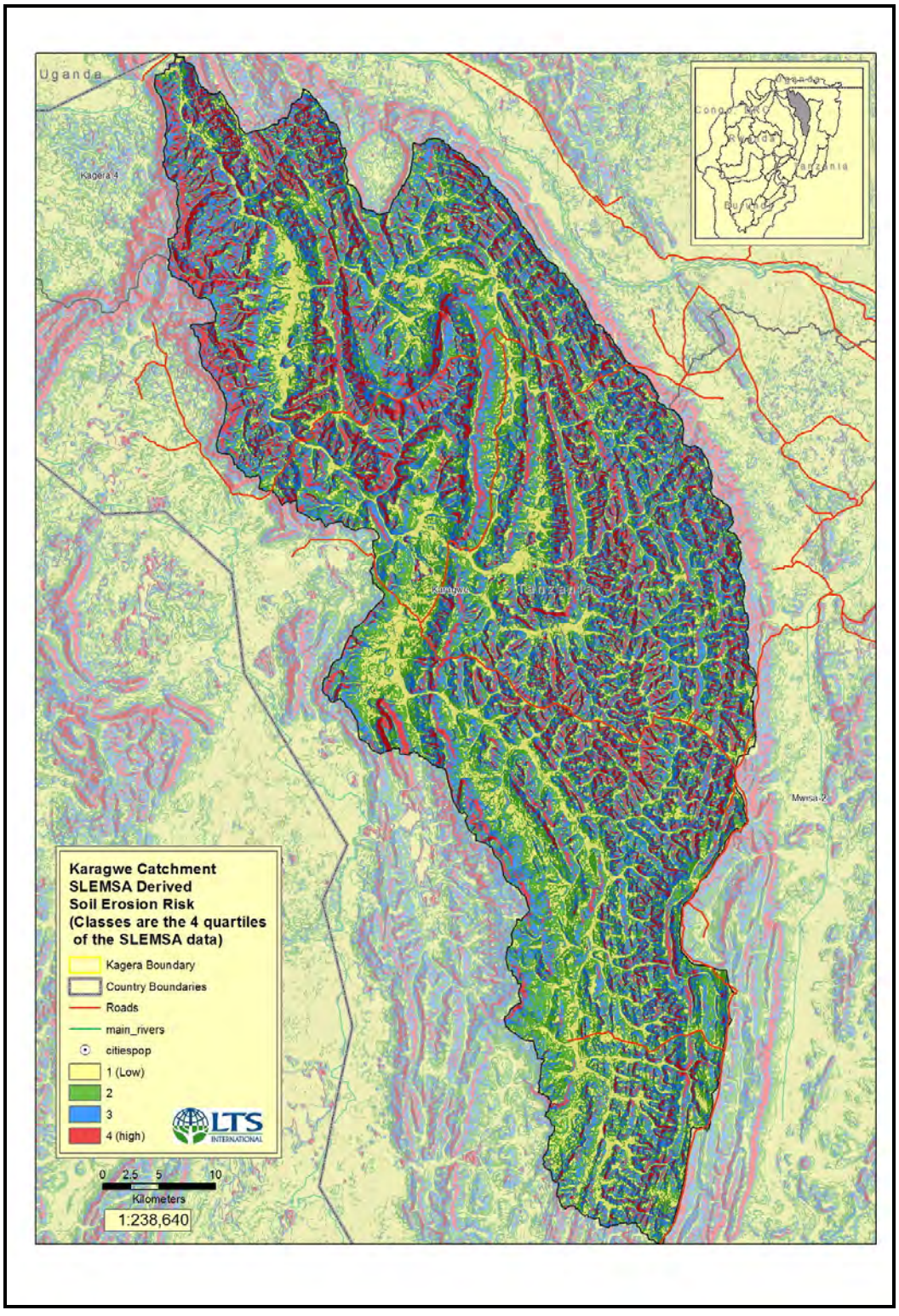
Mean annual rainfall is 1,000 to 1,200mm/yr. However PET exceeds rainfall by 800mm/yr in the western part and by 300mm/yr in the eastern parts. Green (soil) water is only 150mm/yr. Rainfall is variable and soil moisture deficits during the growing season occur. Soils are acidic ferralsols which under constant cultivation and nutrient mining are subject to declining fertility, thus exacerbating the impact of the soil water deficits on crop and pasture production.

Some 41 percent of the area is covered with savanna grassland and shrub land, whilst 42 percent is covered with intensive agriculture and gardens. Wetlands and lakes cover 3 percent and forests 5 percent of the area.

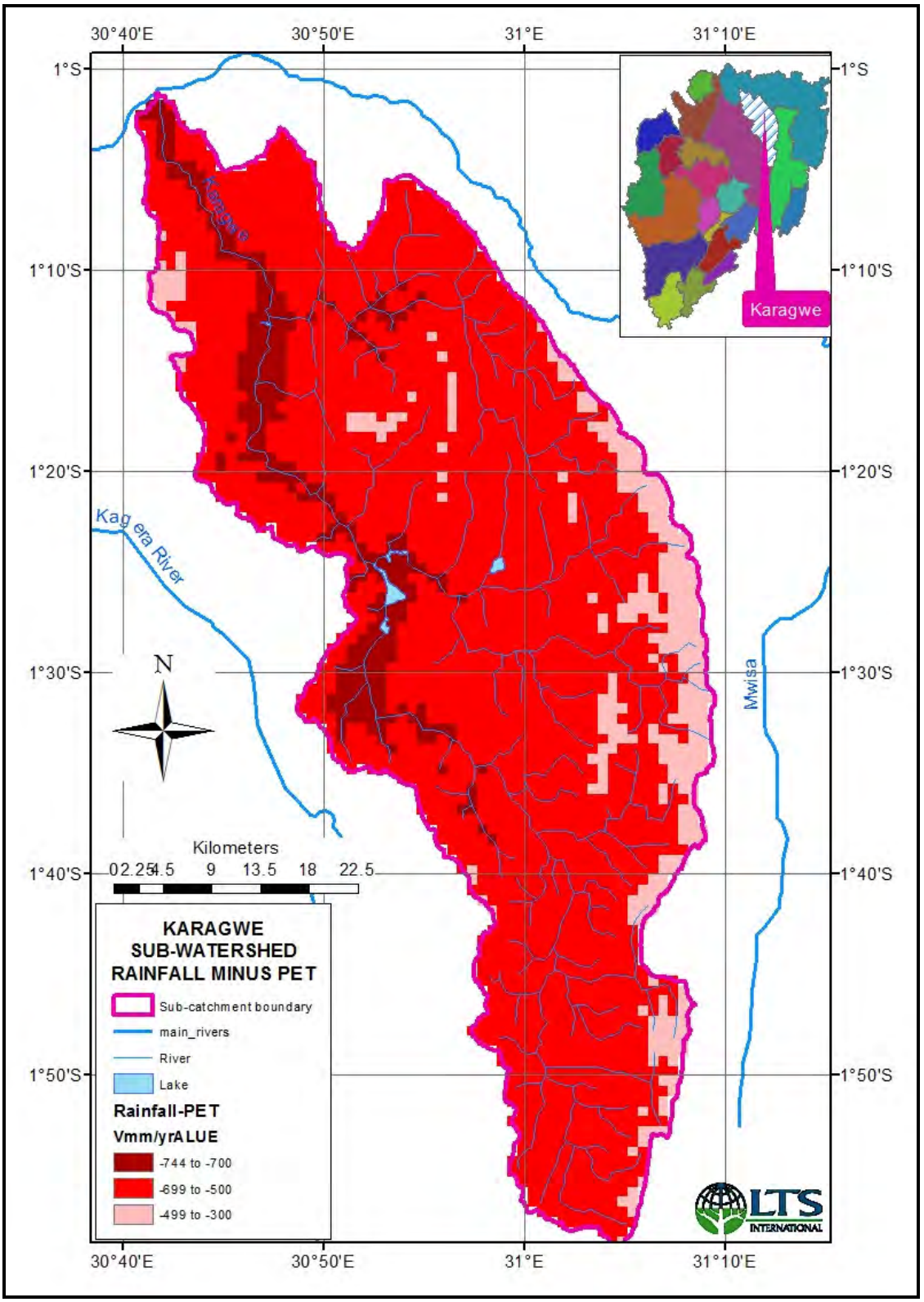
Map 59. Karagwe Sub-Basin Relief



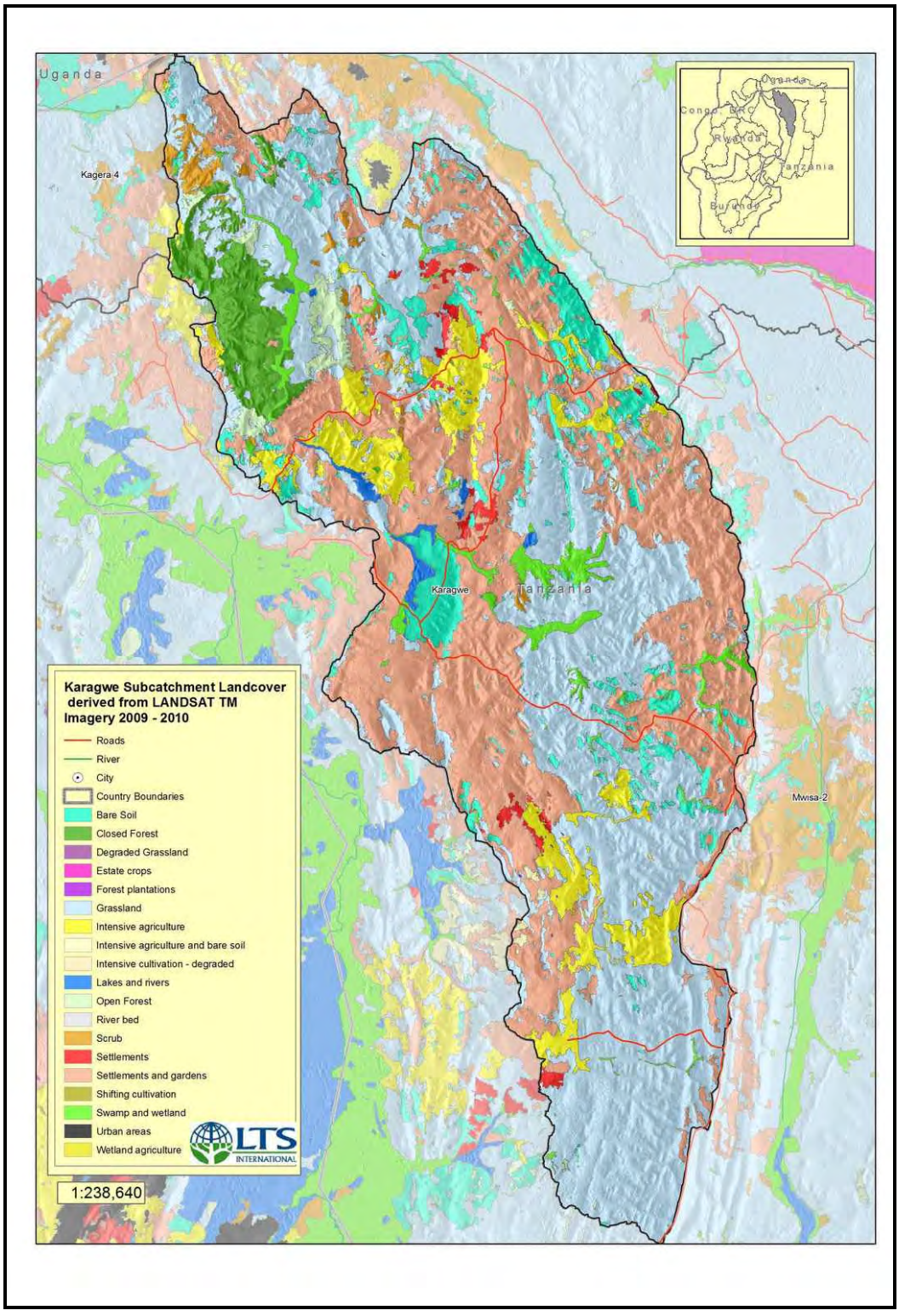
Map 60. Karagwe Catchment Soil Erosion Risk



Map 61. Karagwe Sub-Watershed Rainfall minus PET



Map 62. Karagwe Sub-Catchment Landcover



12. Kirundo Sub-watershed

12.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
410.4	216.4	229.2	531.8	291.5	322.8
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
196.0	69.8	79.7	259.2	108.7	121.7
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
4.93	8	7.98	6.2	9	8.61
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
7.4	4.7	4.8	9.5	6.3	6.5
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
396.7	493.4	452.3	487.7	585	544.3

(b) Land Use/Landcover

Kirundo - Landcover	Hectares	% of Total
Settlements and gardens	32,240.7	29.4
Settlements	19,319.0	17.6
Intensive agriculture	16,236.3	14.8
Lakes and rivers	12,070.9	11.0
Bare Soil	10,595.3	9.7
Urban areas	7,451.5	6.8
Intensive agriculture and bare soil	6,159.7	5.6
Swamp and wetland	4,553.4	4.2
Grassland	569.7	0.5
Forest plantations	400.7	0.4
Totals	**109,597.2**	**100.0**

12.2 Description of the Sub-watershed

12.2.1 Specific nature of Sub-watershed

The Sub-watershed is located almost entirely within Burundi. The streams drain into Lake Gweru which in turn feeds into the Kagera River above its confluence with the Ruvubu.

12.2.2 Key Issues

- Acidic and infertile soils, steep slopes with high erosion risk;
- Loss of soil fertility and instability of radical terraces
- High sediment loads in rivers and sedimentation in wetlands
- Livestock feed deficits
- Agricultural encroachment of wetlands

12.2.3 Characterization of Sub-watershed

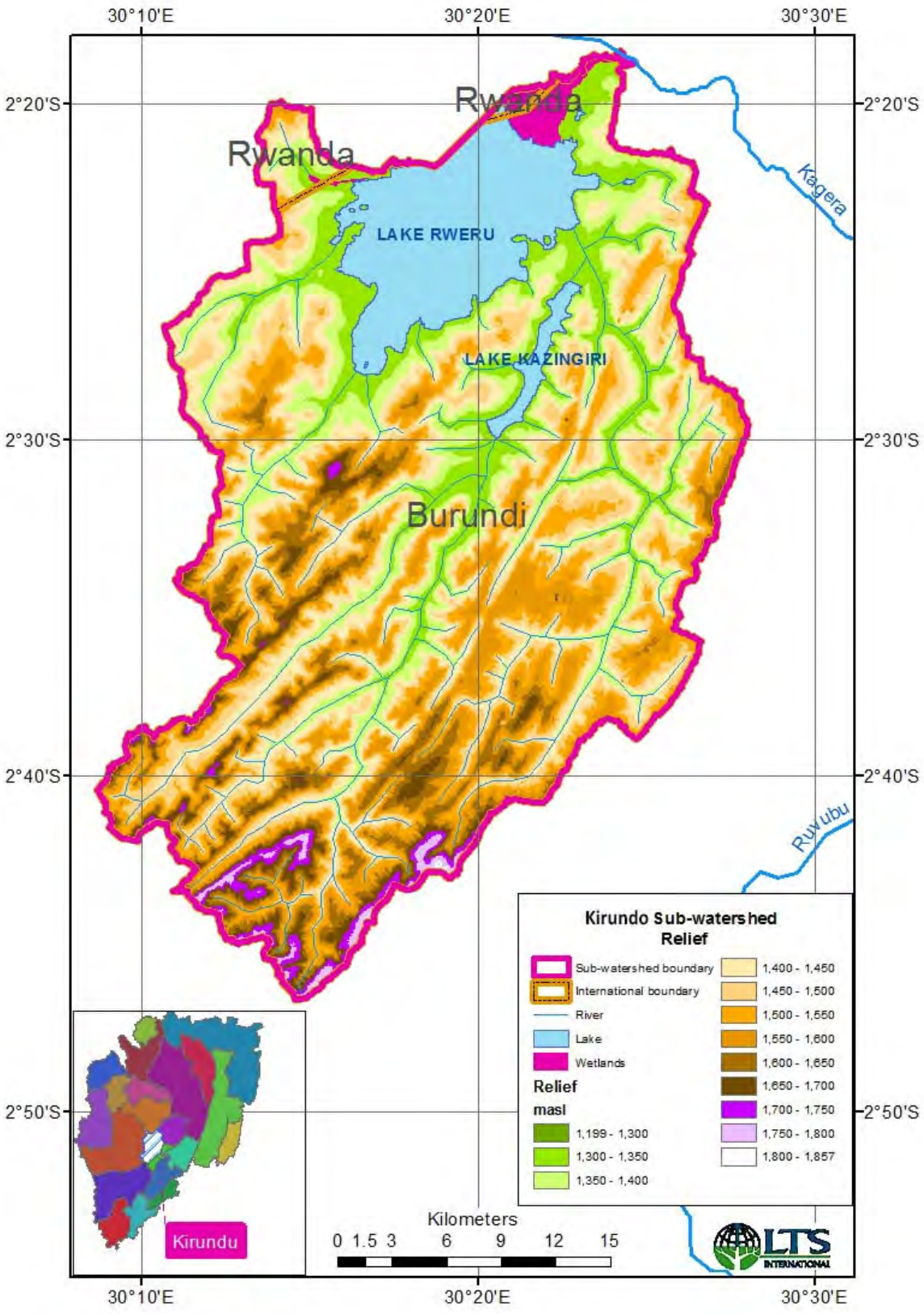
The Sub-watershed is some 109,604ha and is located in the south central part of the Sub-basin.

It lies between 1,200 and 1,800masl and is relatively dissected in the upper two thirds of the Watershed. Some 46 percent of the area has a severe to very severe soil erosion risk.

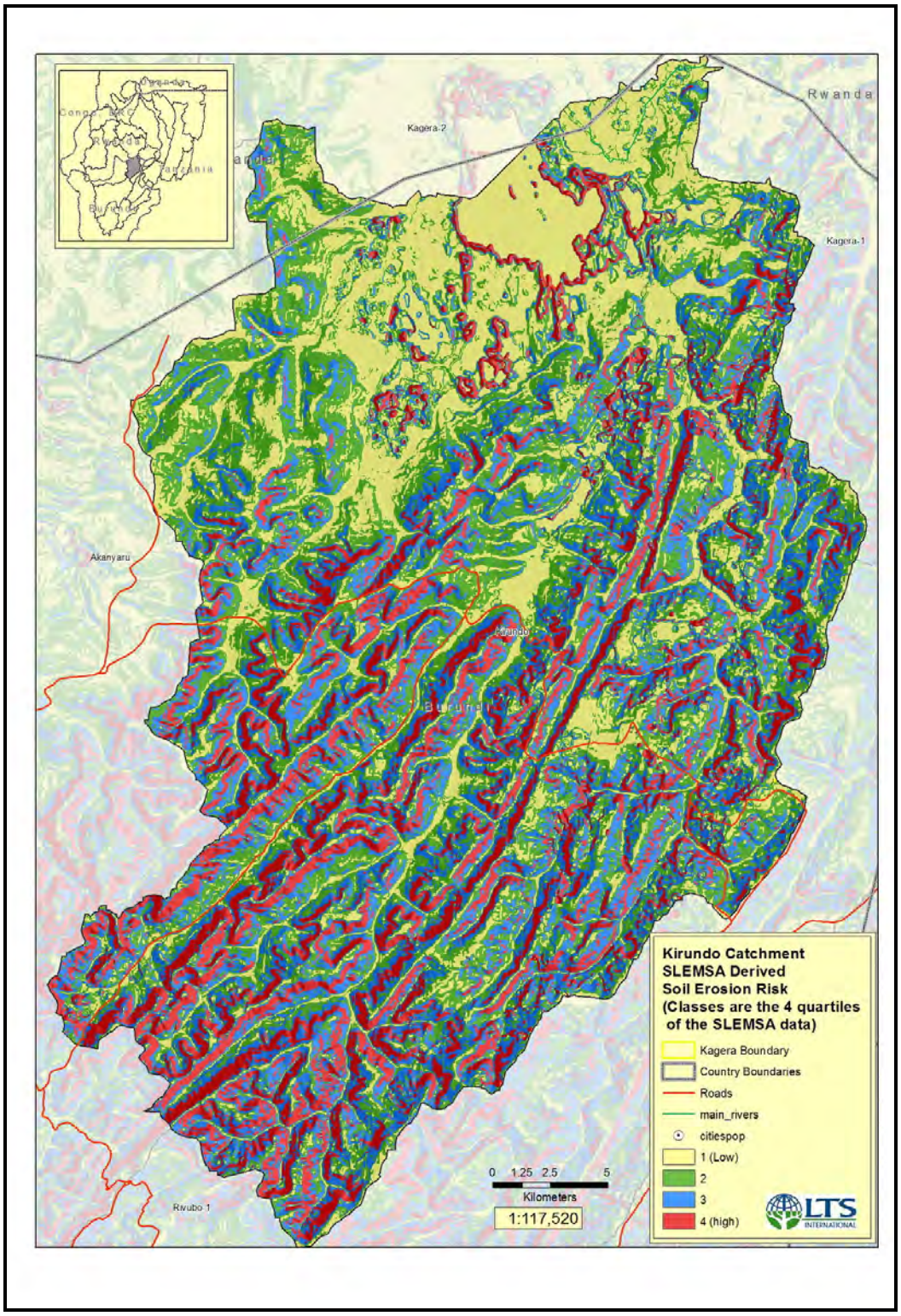
Mean annual rainfall is less than 800mm in the lower parts to 1,200mm in the highest parts. PET exceeds rainfall by 700 to 300mm/yr. Green (soil) water is 250 to 350mm/yr.

Population densities are 250 to 500ppk2. Intensive agriculture and garden cover some 77 percent of the area. Lakes and wetlands cover some 11 and 4 percent respectively. The Kagera Piedmont Farming System is found in the lower parts of the Sub-watershed and the High Plateau farming System in the upper parts. Coffee is an important cash crop in both Farming Systems.

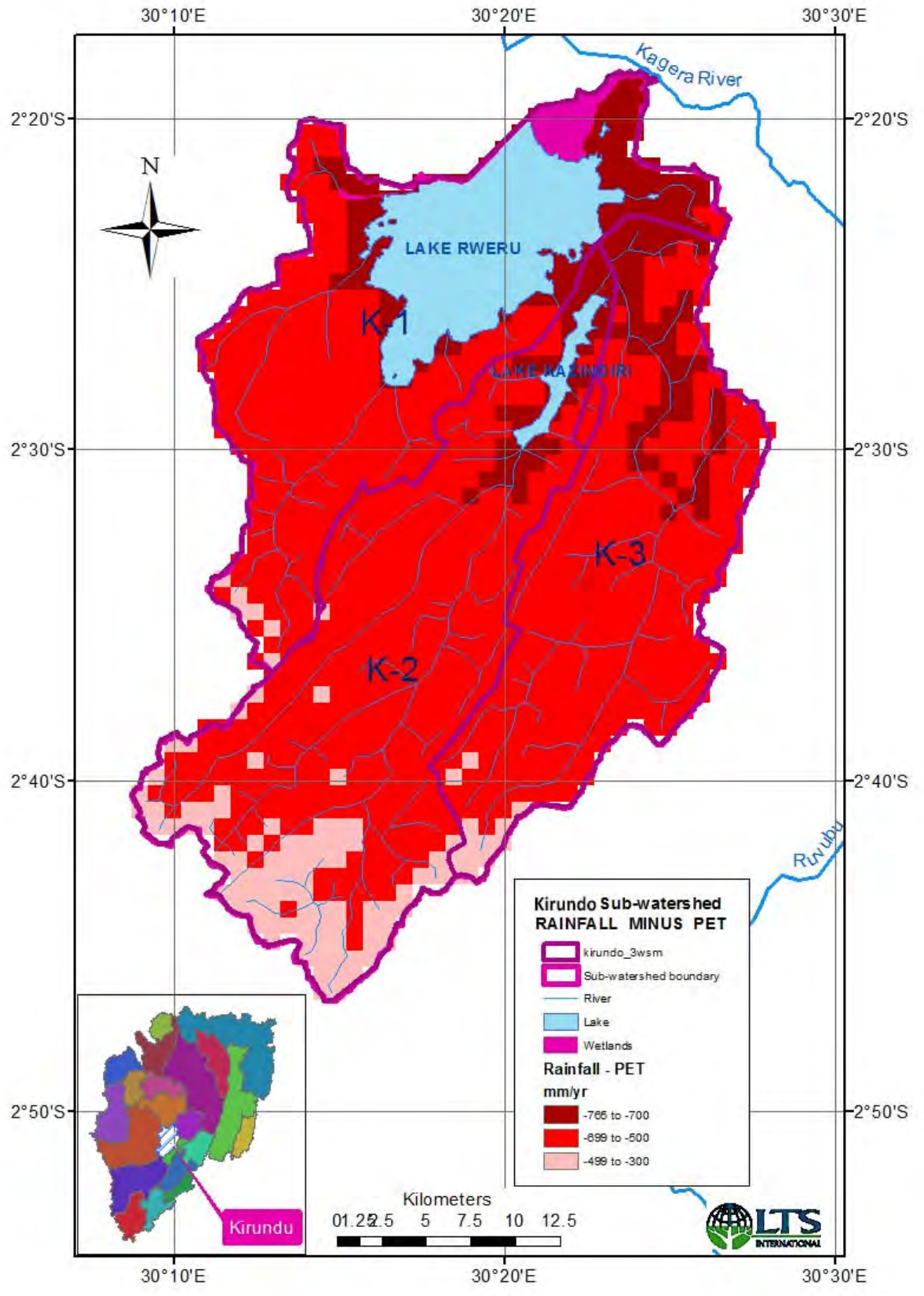
Map 63. Kirundo Sub-Watershed Relief



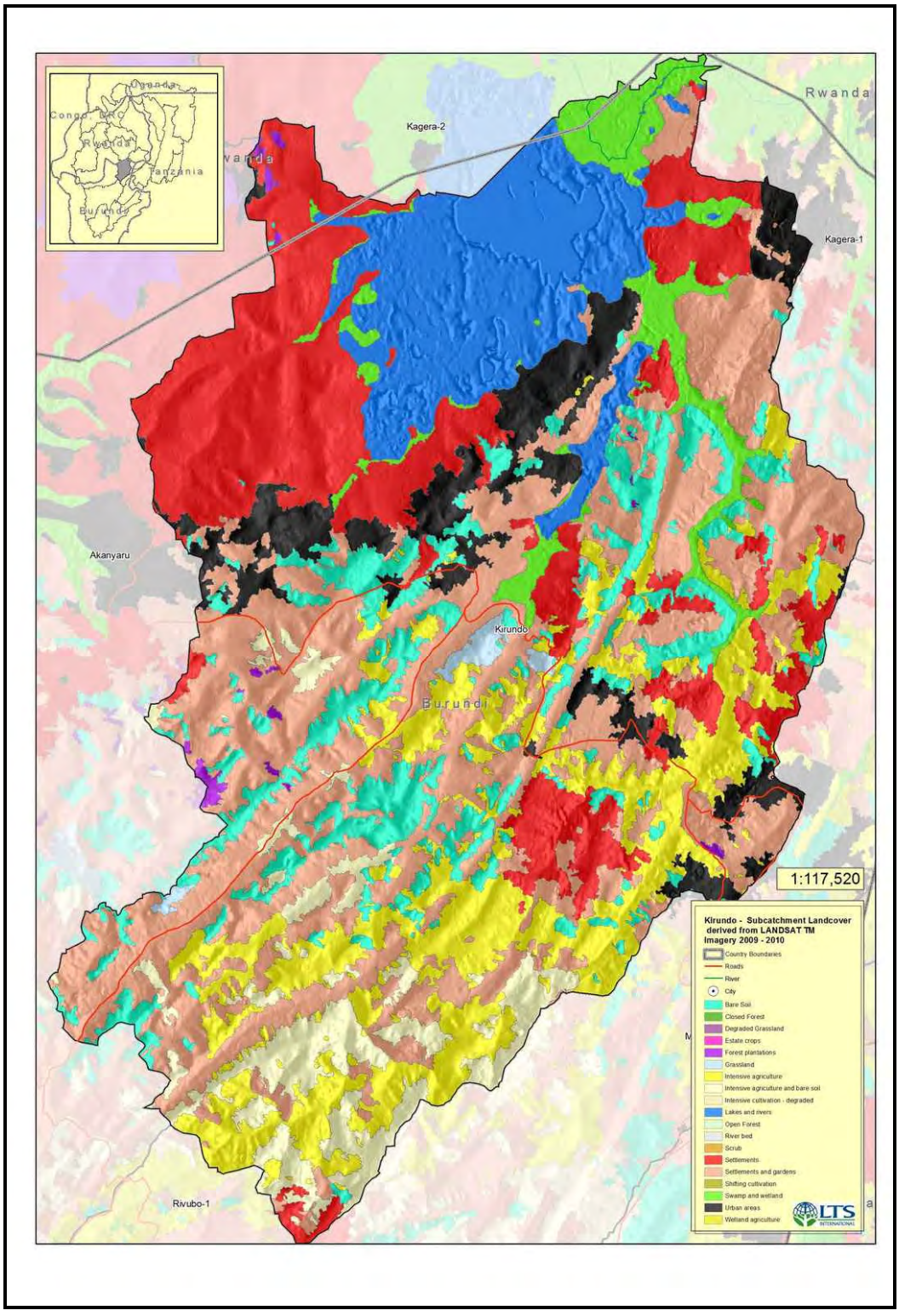
Map 64. Kirundo Catchment Soil Erosion Risk



Map 65. Kirundo Sub-Watershed Rainfall minus PET



Map 66. Kirundo Sub-Catchment Landcover



13. Mukungwa Sub-watershed

13.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
764.7	338.6	379.9	1048.1	566.9	692.6
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
380.2	81.8	182.7	527.4	219.0	305.2
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
2.53	5	6.33	1.87	4	3.96
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
23.1	14.7	16.5	31.2	20.3	22.0
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
84.1	228.4	158.6	95.9	231.2	169.4

(b) Land Use/Landcover

Mukungwa - Landcover	Hectares	% of Total
Intensive agriculture	114,712	60.5
Settlements and gardens	36,464	19.2
Closed Forest	11,920	6.3
Lakes and rivers	8,459	4.5
Swamp and wetland	6,010	3.2
Shifting cultivation	4,374	2.3
Forest plantations	3,036	1.6
Settlements	1,965	1.0
Grassland	1,064	0.6
Urban areas	639	0.3
Scrub	401	0.2
Open Forest	393	0.2
Bare Soil	191	0.1
TOTAL	**189,627**	**100.0**

13.2 Description of the Sub-watershed

13.2.1 Specific nature of Sub-watershed

The Sub-watershed is located on the Nile Divide and Mukungwa River meets the Nyabarongo River at its outlet. The head-waters are located in the Volcanoes National Park in the Virunga Mountains - highest parts of the Kagera sub-basin.

13.2.2 Key Issues

- Acidic and infertile soils, steep slopes with high erosion risk;
- Loss of soil fertility and instability of radical terraces
- High sediment loads in rivers and sedimentation in wetlands
- Livestock feed deficits
- Agricultural encroachment of wetlands
- Limited and irregular rainfall in lower Sub-watershed

13.2.3 Characterization of Sub-watershed

The Sub-watershed is some 189,633ha in extent and is located in the northwestern part of the Sub-basin.

Altitude ranges from 1,400masl upto 4,410masl at the top of the watershed. Mean annual rainfall is between 1,200 and 1,600mm/yr being the highest of the Sub-watersheds. Rainfall exceeds PET from 100mm/yr in the lowest part of the Sub-watershed to 800mm/yr along the top of the Nile-Congo Divide. Green (soil) water exhibits a similar wide range of values: from 350 mm/yr in the lowlands to 750mm/yr on the watershed.

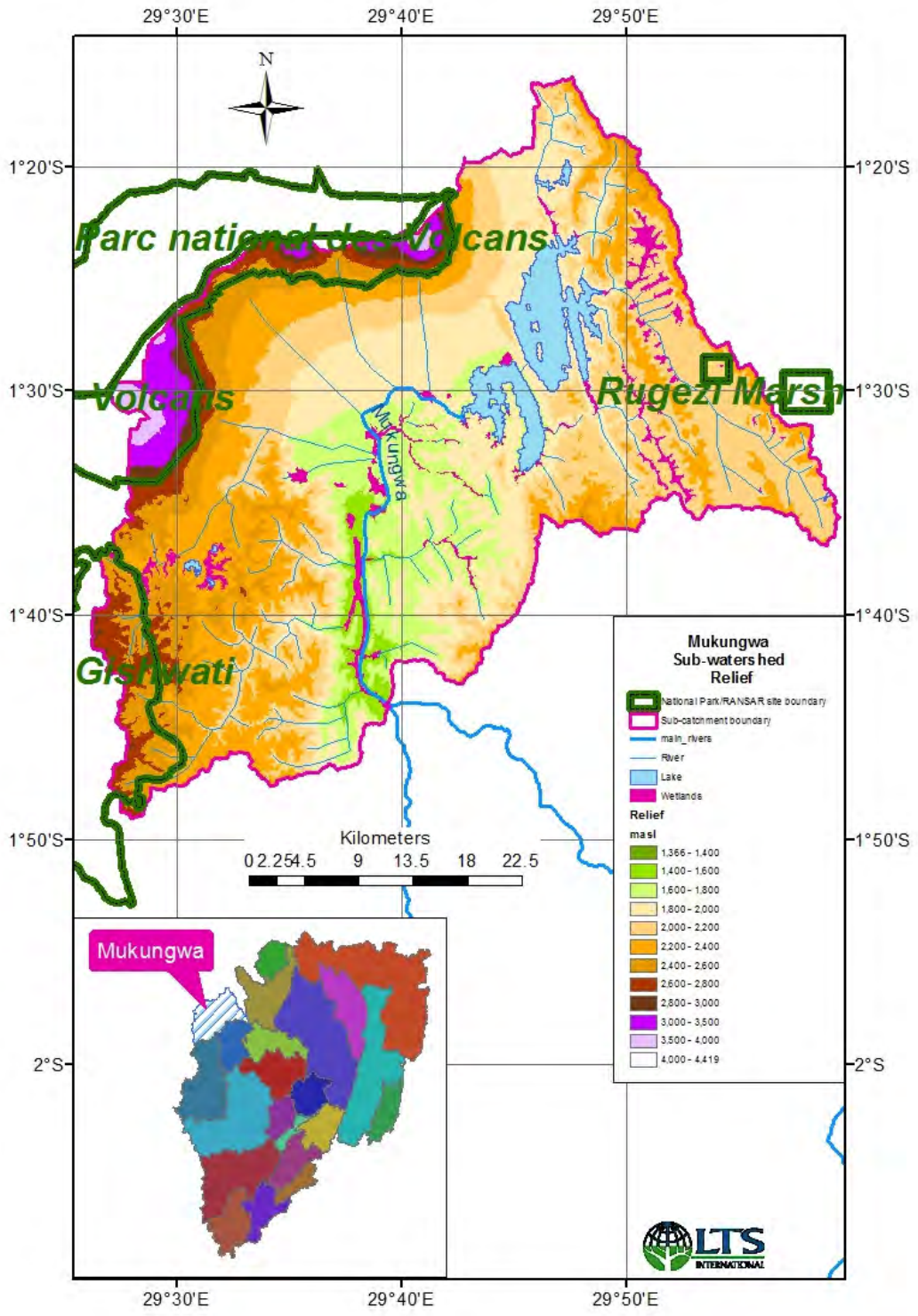
Apart from the steep slopes of the volcanoes on the watershed, the highest soil erosion risks occur in the lower half of the sub-watershed, where the steepest slopes occur. Overall some 65 percent of the Sub-watershed has a severe to very severe soil erosion risk.

Some 80 percent is covered by intensive agriculture and gardens. High forest covers some 6.5 percent and is located on the highest parts of the Divide. In the foothills lakes and wetlands cover nearly 8 percent of the area. Population densities are between 500 and 1,250ppkm2.

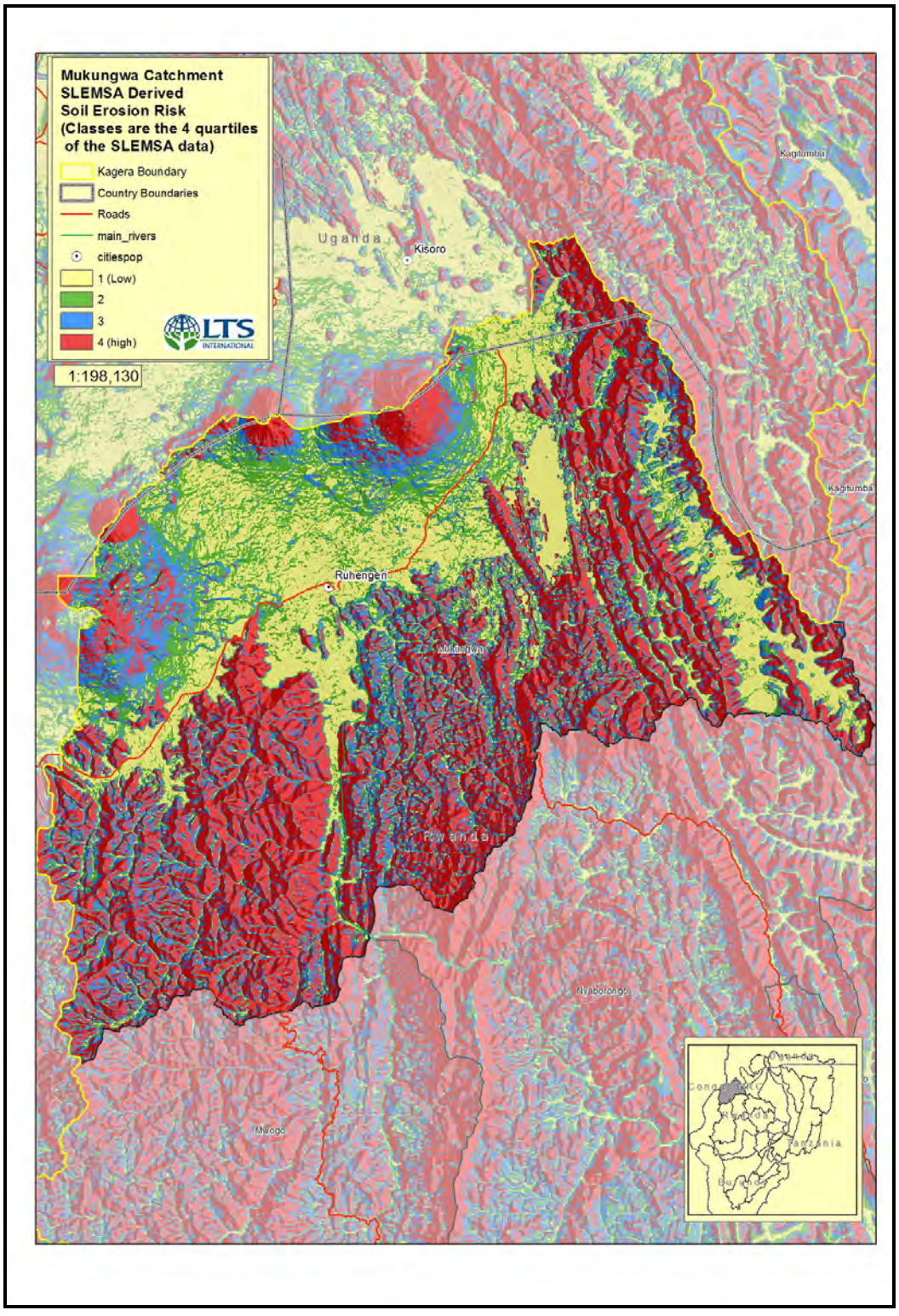
In the lowest part of the Sub-watershed is the Kagera Piedmont Farming System, which is succeeded by the High Plateau Framing system upto 1,800masl. Above 1,800masl to about

2,800masl is the Nile Divide farming System. Coffee is the main cash crop of the two lower Farming Systems. The Volcanoes National Park is a premier tourist attraction because of the Mountain gorilla. The Rugezi Marshes are designated RAMSAR wetlands.

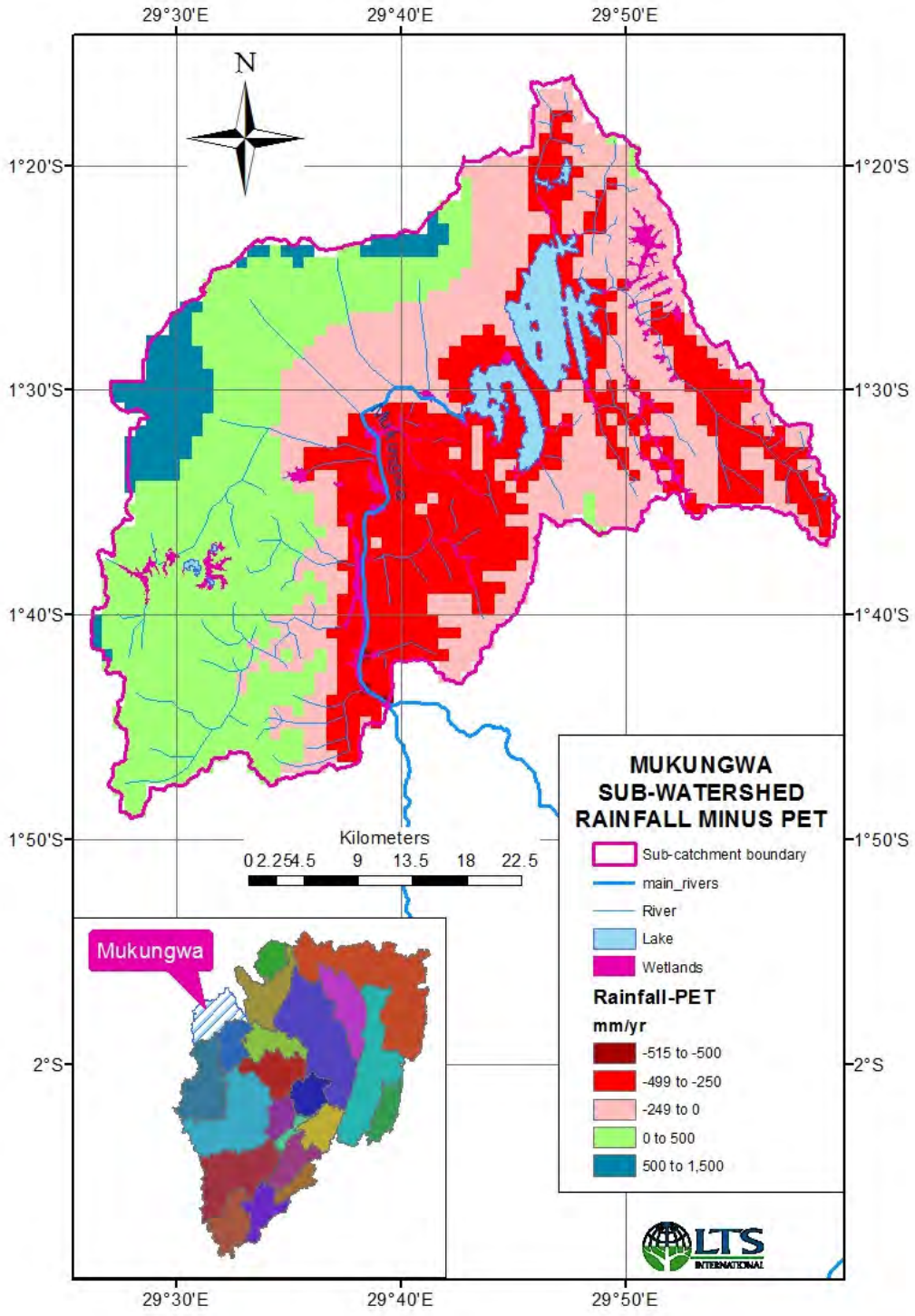
Map 67. Mukungwa Sub-Watershed Relief



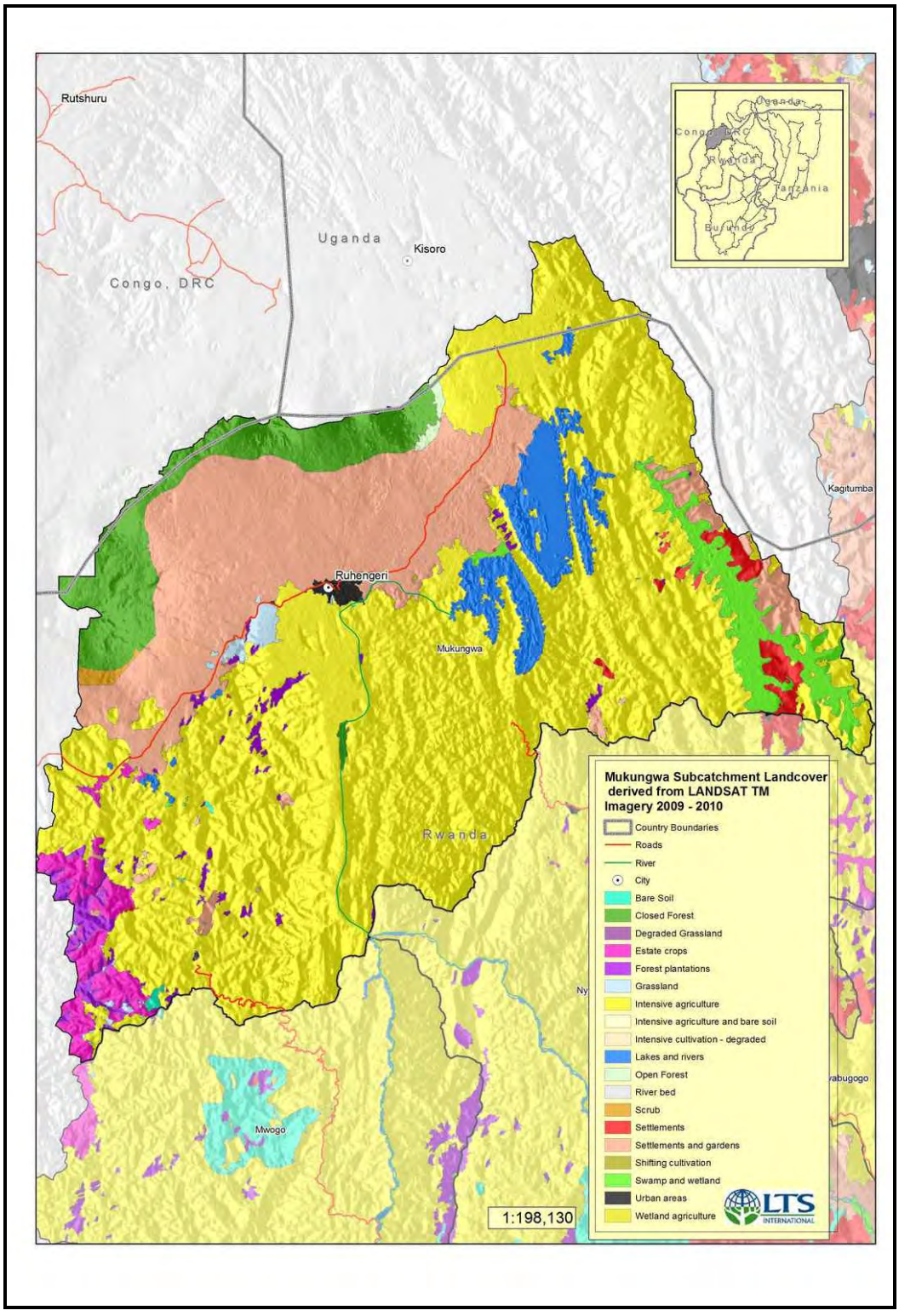
Map 68. Mukungwa Catchment Soil Erosion Risk



Map 68. Mukungwa Sub-Watershed Rainfall minus PET



Map 69. Mukungwa Sub-Catchment Land Cover



14. Muyinga Sub-watershed

14.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
441.1	247	273.4	358	121.6	187.1
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
212.8	80.1	97.5	169.6	8.4	40.5
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
4.93	7	7.86	3.9	6	7.2
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
3.6	2.5	2.7	3.	1.8	2
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
436.7	519.2	484.8	692.1	807.5	741.7

(b) Land Use/Landcover

Muyinga - Landcover	Hectares	% of Total
Settlements and gardens	19,155	40.8
Intensive agriculture	9,302	19.8
Intensive agriculture and bare soil	7,350	15.7
Bare Soil	5,887	12.5
Urban areas	3,631	7.7
Settlements	1,468	3.1
Swamp and wetland	119	0.3
Forest plantations	17	0.0
Lakes and rivers	4	0.0
TOTAL	**46,933**	**100.0**

14.2 Description of the Sub-watershed

14.2.1 Specific nature of Sub-watershed

Located partly in Burundi and partly in Tanzania the Sub-watershed is a tributary watershed of the main Ruvubu Sub–basin. It is the smallest of all the Sub-watersheds.

14.2.2 Key Issues

- Acidic and infertile soils, steep slopes with high erosion risk;
- Loss of soil fertility and increasing acidification and aluminium toxicity;
- High sediment loads in rivers and streams;
- Livestock feed deficits
- Agricultural encroachment of wetlands;
- Limited and irregular rainfall and PET exceeds rainfall;
- Lack of water supplies for humans and livestock.

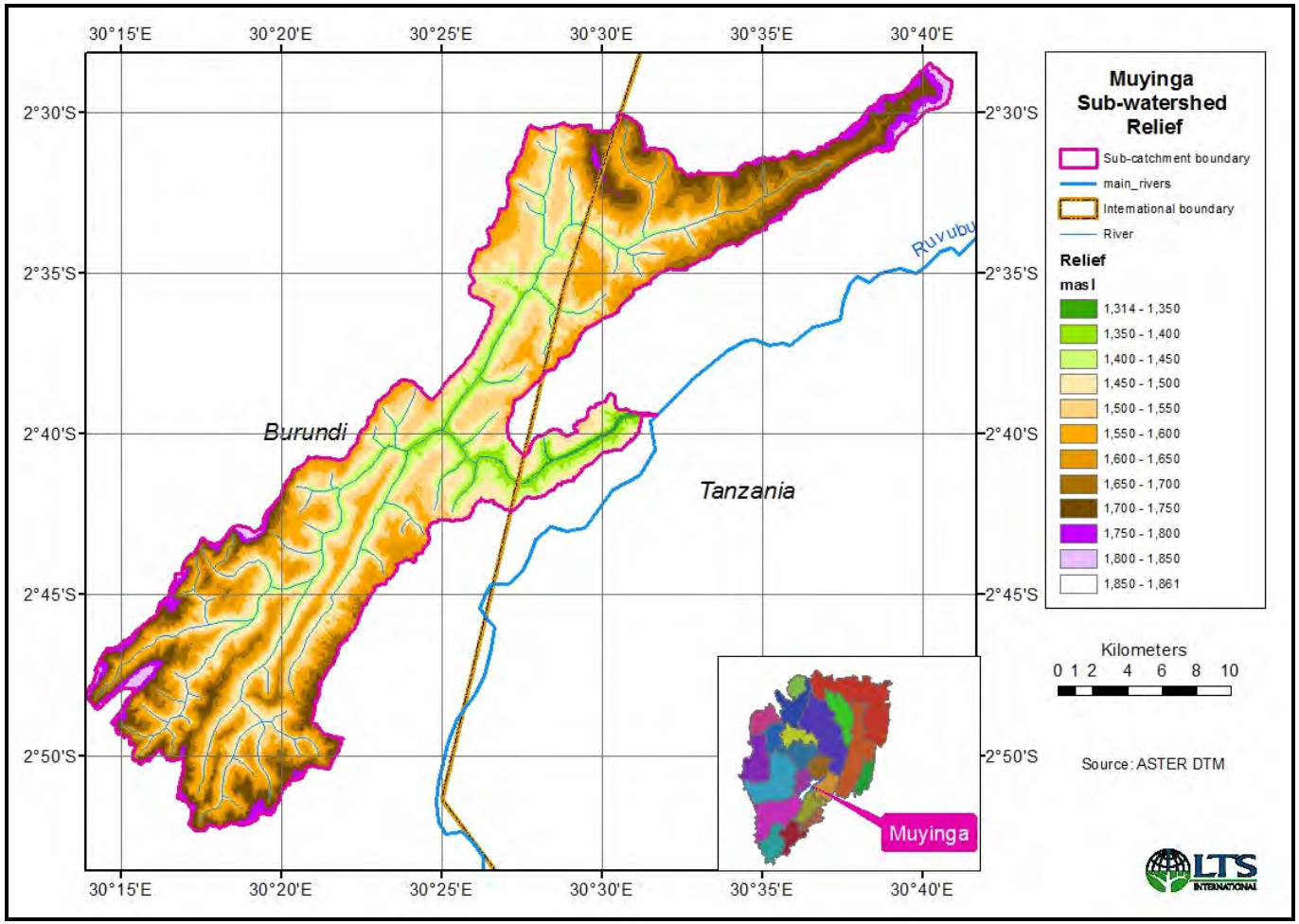
14.2.3 Characterization of Sub-watershed

The area of the Sub-watershed is only 46,933ha. It lies between 1,300 and 1,800masl. The dominant soil is very acid Ferralsols of low fertility. Mean annual rainfall is between 800 to 1,100mm/yr. PET exceeds rainfall by 300 to 400mm/yr. Green (soil) water is only 50 to 150mm/yr. Thus, with soils of very low fertility and soil moisture deficits crop production is at a very high risk. This is exacerbated by high soil erosion rates: some 52 percent of the Sub-watershed has a severe to very severe soil erosion risk under its present land cover.

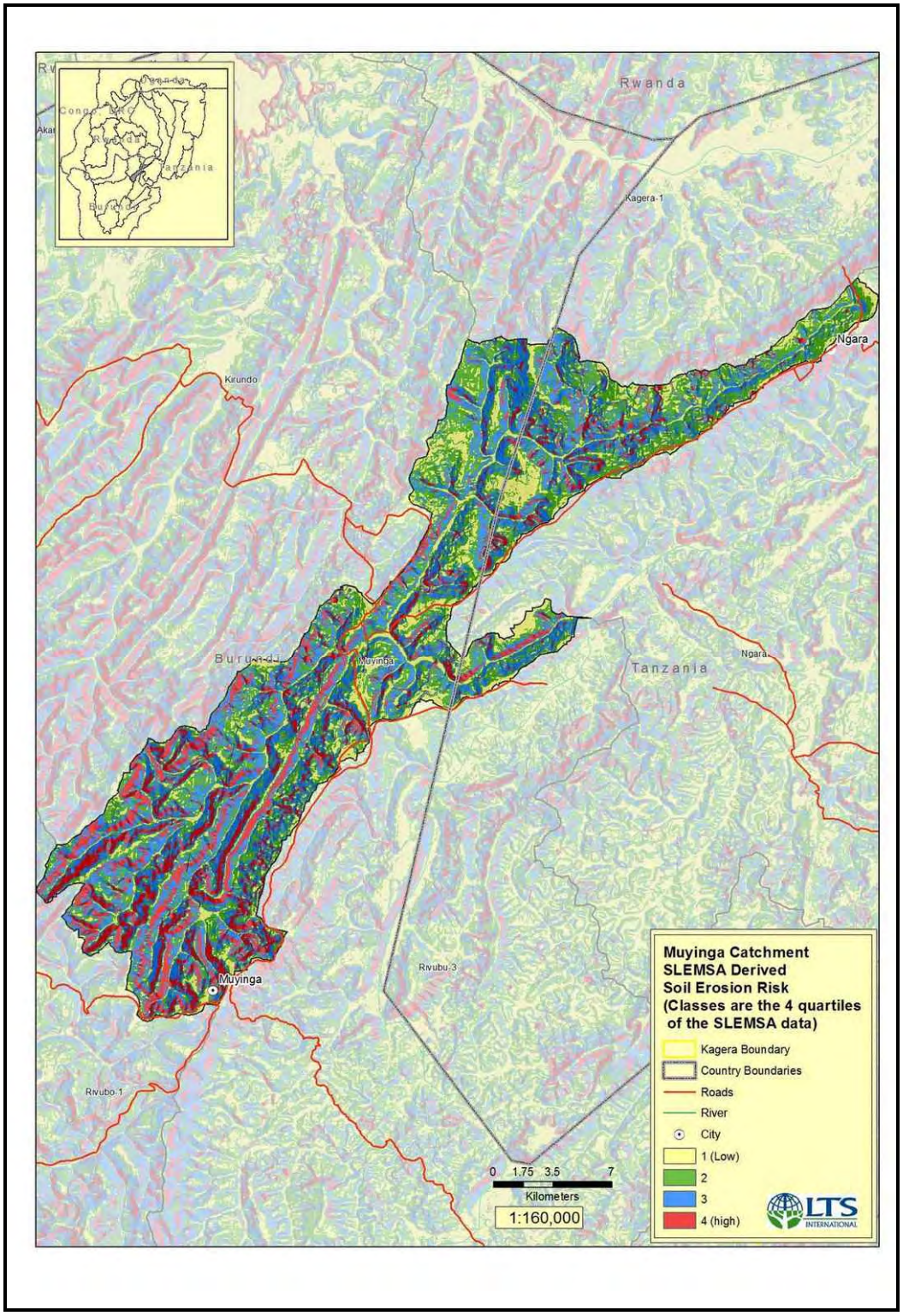
Intensive agriculture and gardens cover some 88 percent of the area, with areas of bare soil covering 28 percent of the total area. Wetlands cover only a very small area along the Muyinga River and its tributaries, which have been fully converted to agriculture and thus provide no opportunity for agricultural expansion. Population densities are 500 to 750ppkm2.

Given the low and erratic rainfall the Farming Systems are similar to the Savanna Lowlands Systems except at the highest altitudes where the High Plateau Farming System dominates. Cassava and sorghum are major crops.

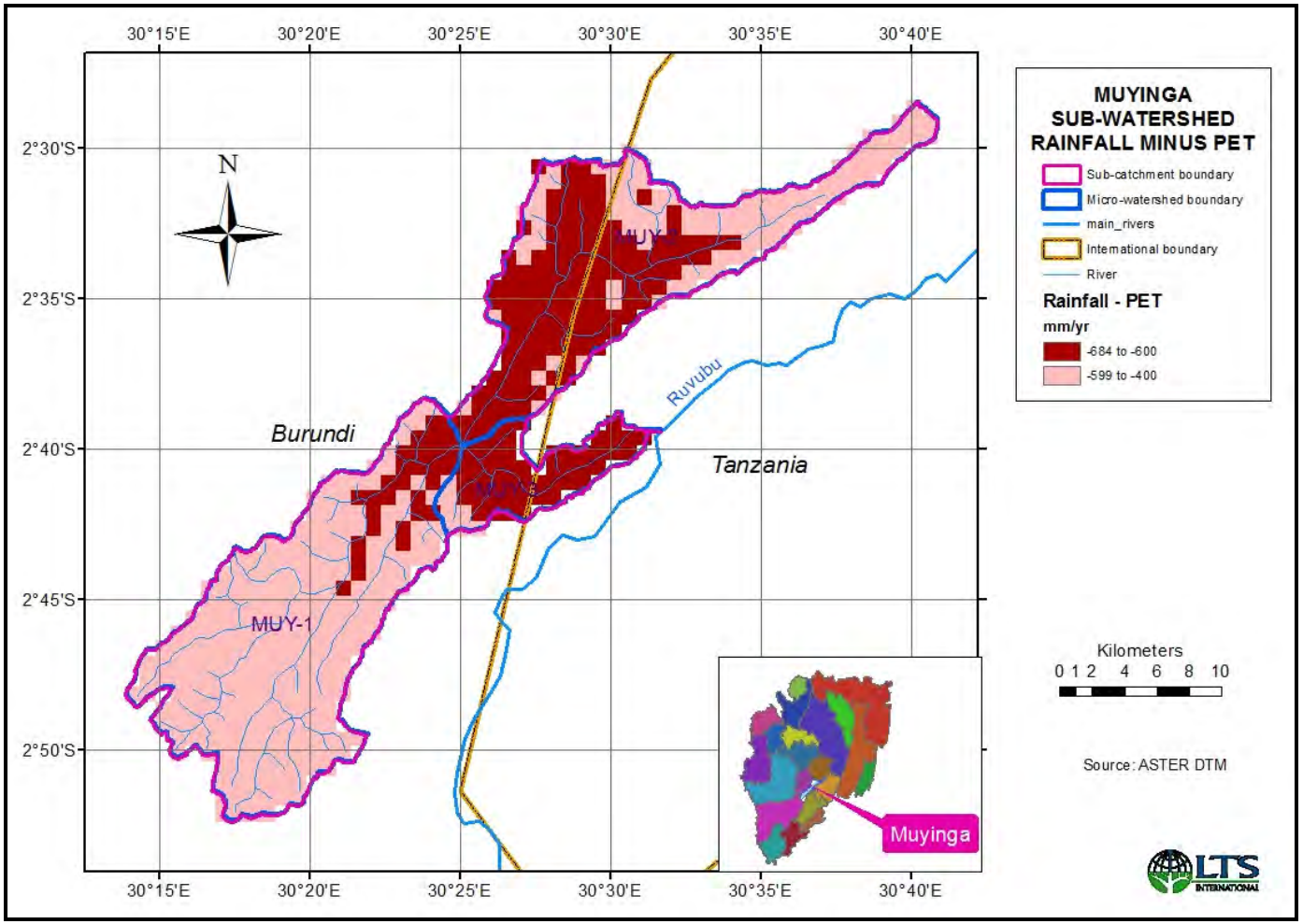
Map 70. Muyinga Sub-watershed Relief



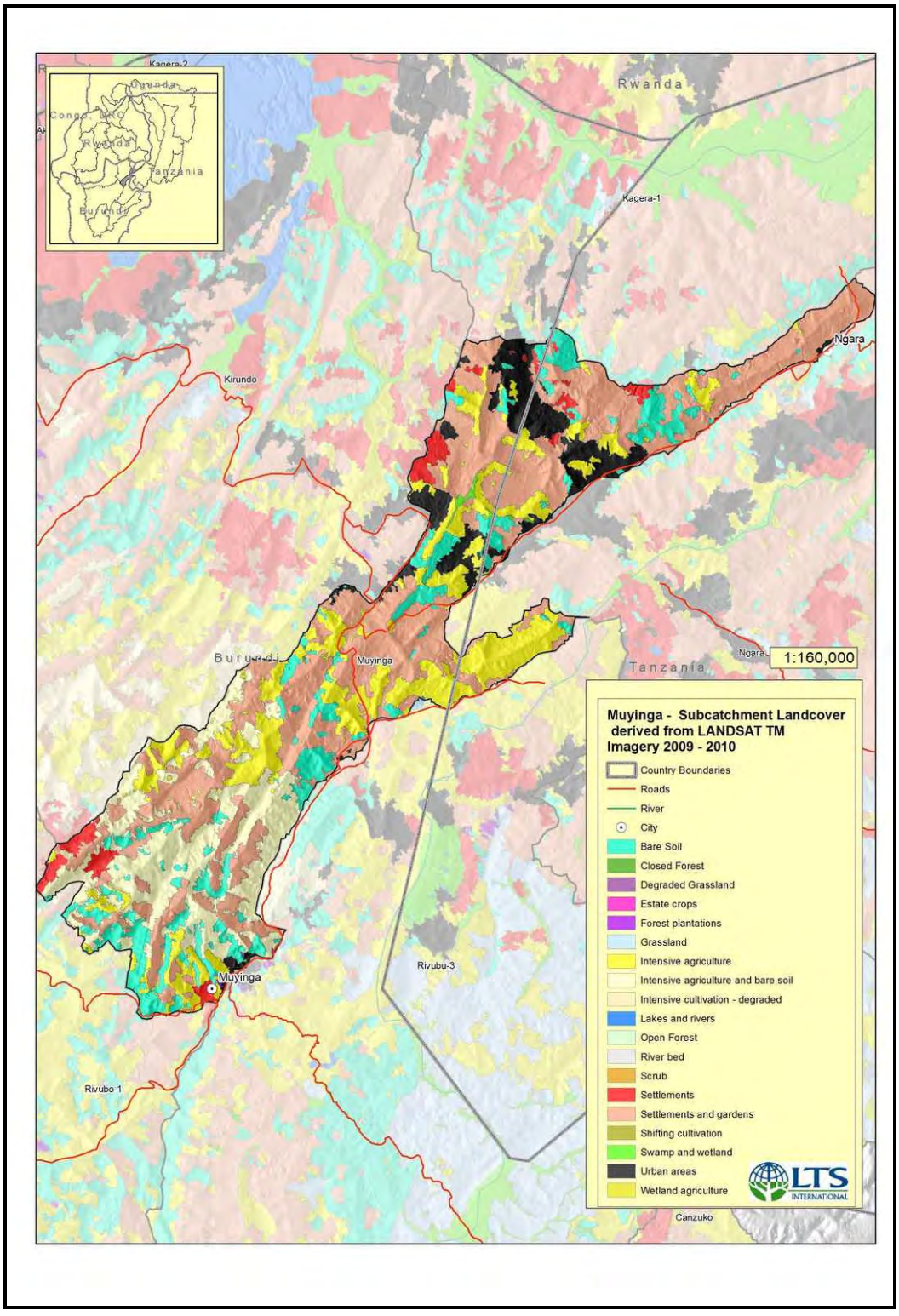
Map 71. Muyinga Sub-watershed Relief



Map 72. Muyinga Sub-watershed minus PET



Map 73. Muyinga Sub-Catchment Land Cover



15. Mwisa 1 Sub-watershed

15.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
739.1	133.8	227.9	939.1	299.6	361.9
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
371.5	3.3	38.9	476.0	105.0	124.2
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
5.83	9	9.68	4.63	8	7.84
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
15.9	5.6	6.7	20	8.4	9.3
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
479.8	616	539	543.2	664.1	609.1

(b) Land Use/Landcover

Mwisa 1 - Landcover	Hectares	% of Total
Grassland	66,455	48.8
Scrub	16,269	11.9
Settlements	11,136	8.2
Swamp and wetland	7,099	5.2
Settlements and gardens	6,809	5.0
Estate crops	5,816	4.3
Bare Soil	5,632	4.1
Urban areas	3,664	2.7
Lakes and rivers	3,400	2.5
Open Forest	3,090	2.3
Intensive agriculture	2,903	2.1
Closed Forest	2,462	1.8
Degraded Grassland	1,402	1.0
Forest plantations	21	0.0
TOTAL	**136,157**	**100.0**

15.2 Description of the Sub-watershed

15.2.1 Specific nature of Sub-watershed

This is the most sparsely populated of all the Sub-watersheds in the Sub-basin. It is one of the two headwater tributaries of the Mwisa River. The northern part of the Sub-watershed encompasses part of the Biharamulo Game reserve.

15.2.2 Key Issues

- Acidic and infertile soils, steep slopes with high erosion risk;
- Loss of soil fertility and increasing acidification and aluminium toxicity;
- High sediment loads in rivers and streams;
- Overgrazing and Livestock feed deficits
- Agricultural encroachment of wetlands;
- Grazing encroachment into Biharamulo Game reserve.
- Lack of tourist facilities for Biharamulo Game reserve
- Limited and irregular rainfall and PET exceeds rainfall;
- Lack of water supplies for humans and livestock.

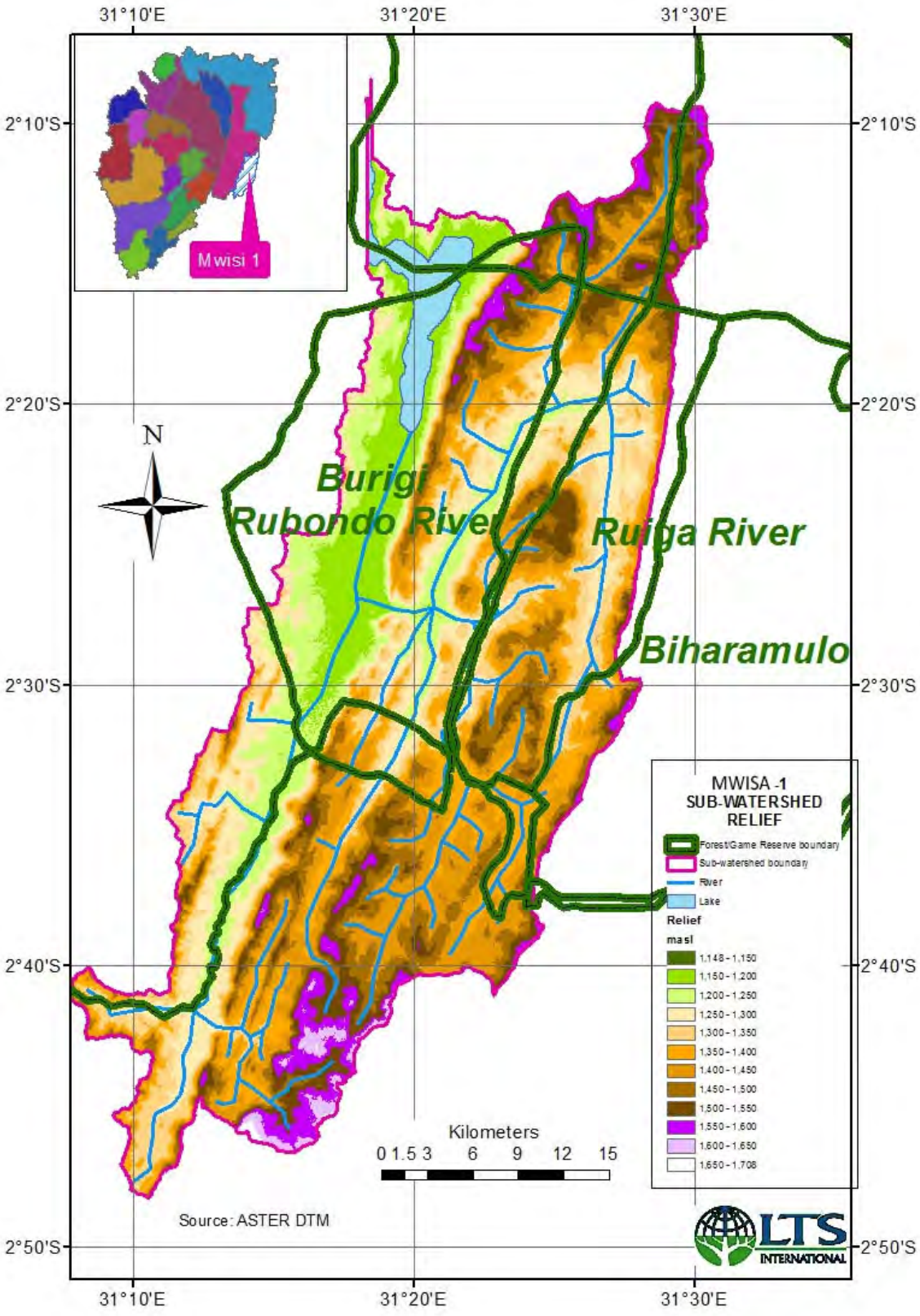
15.2.3 Characterization of Sub-watershed

The Sub-watershed is some 136,157ha and is located west central part of the Sub-basin.

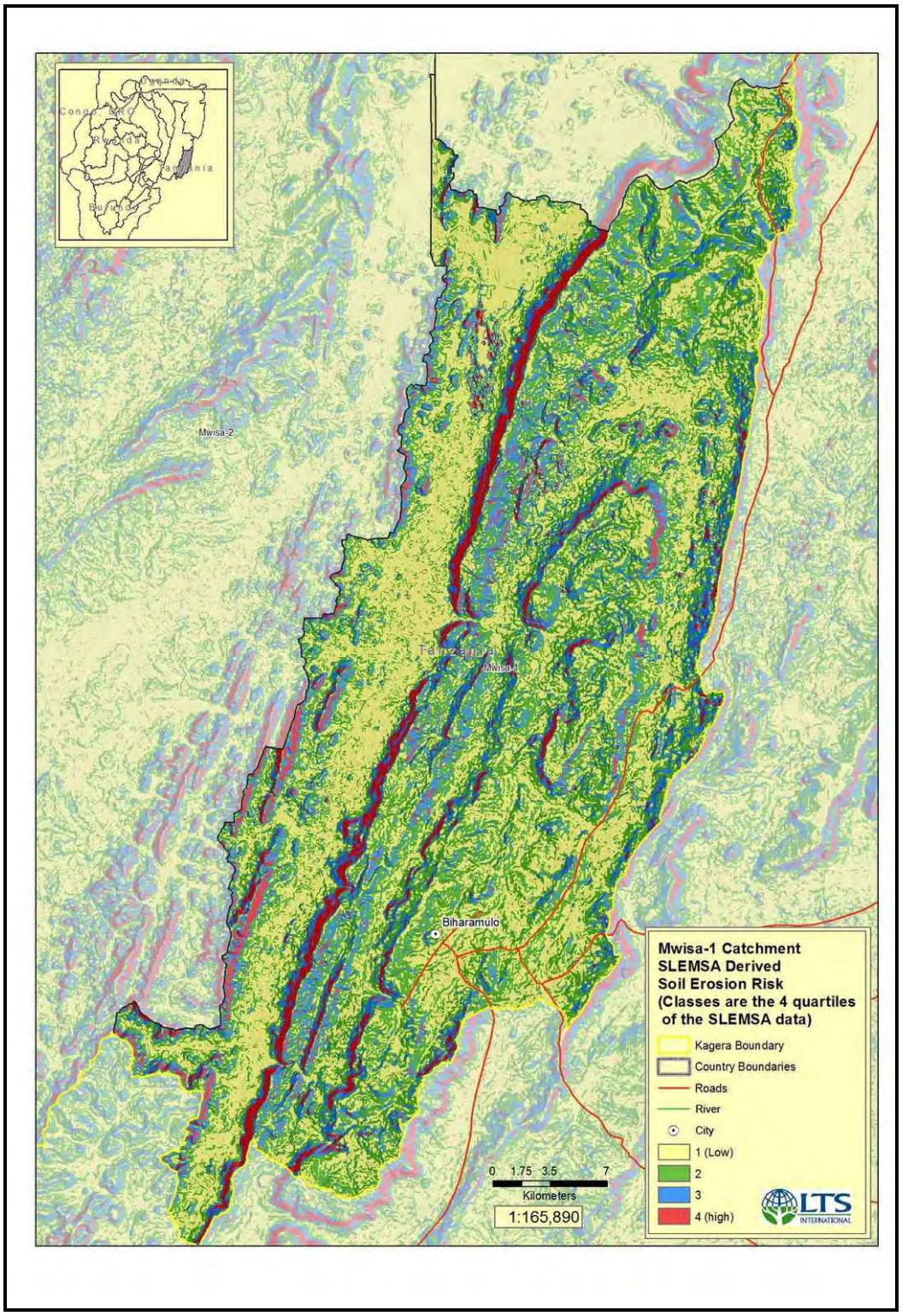
The Sub-watershed lies between 1,150 and 1,750 masl. Linear scarps present steep slopes with back-slopes which are much less steep. Only 23 percent of the sub-watershed has a severe and very severe erosion risk. Mean annual rainfall is 800 to 1,000mm/yr. PET exceeds rainfall by 400 to 500mm/yr, whilst green (soil) water is only 150mm/yr.

Some 62 percent of the area is cover with grassland and scrub. Only 7 percent is intensive agriculture or gardens. Many of the wetlands have been converted into agriculture. Some 7 percent is open and close forests. The population density is less than 125ppkm2 and most of the northern half of the area is not populated. The Kagera Piedmont Farming System predominates. However most of the sub-watershed is given over to the Biharamulo Game reserve.

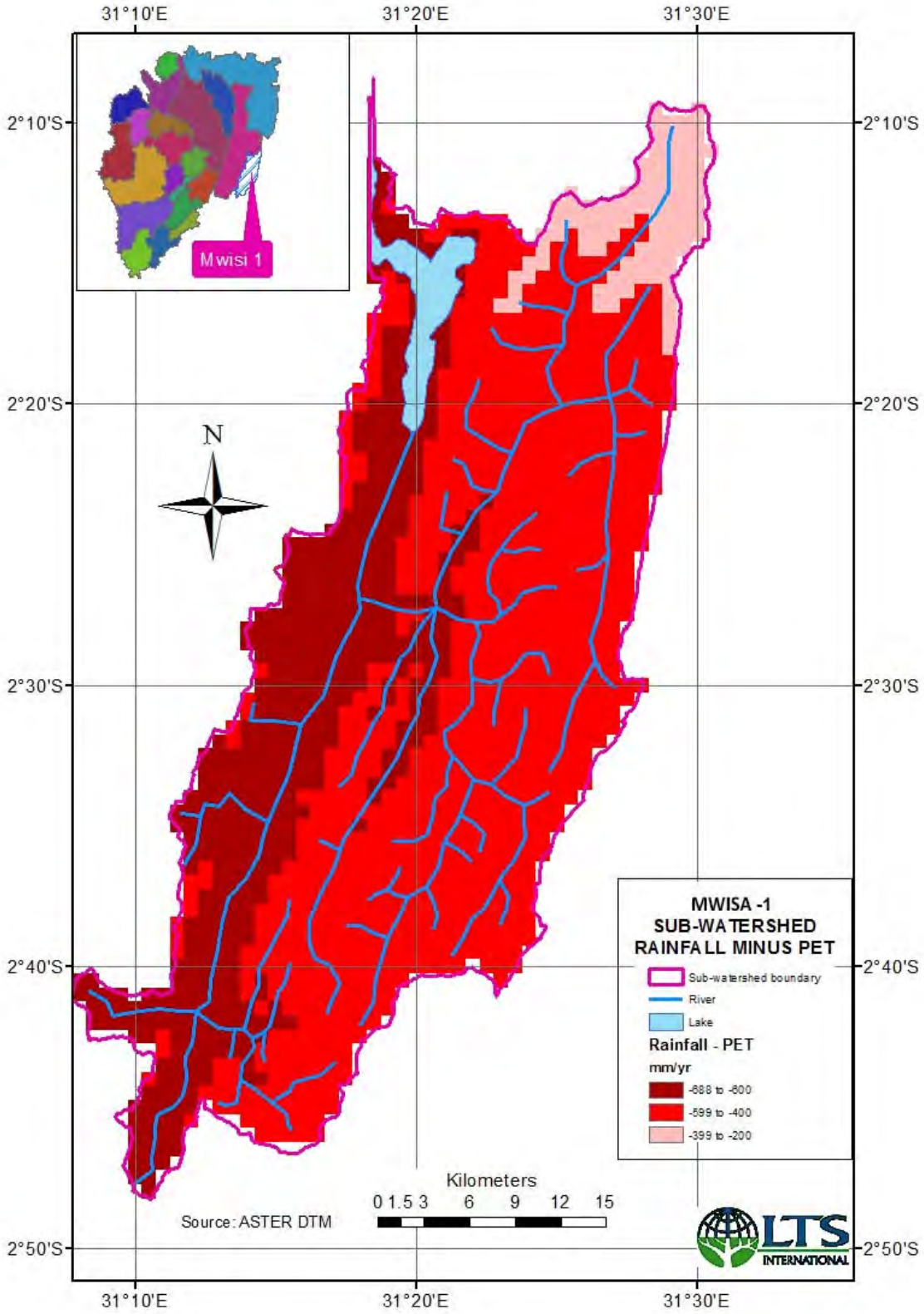
Map 74. Mwisa 1 Sub-Watershed Relief



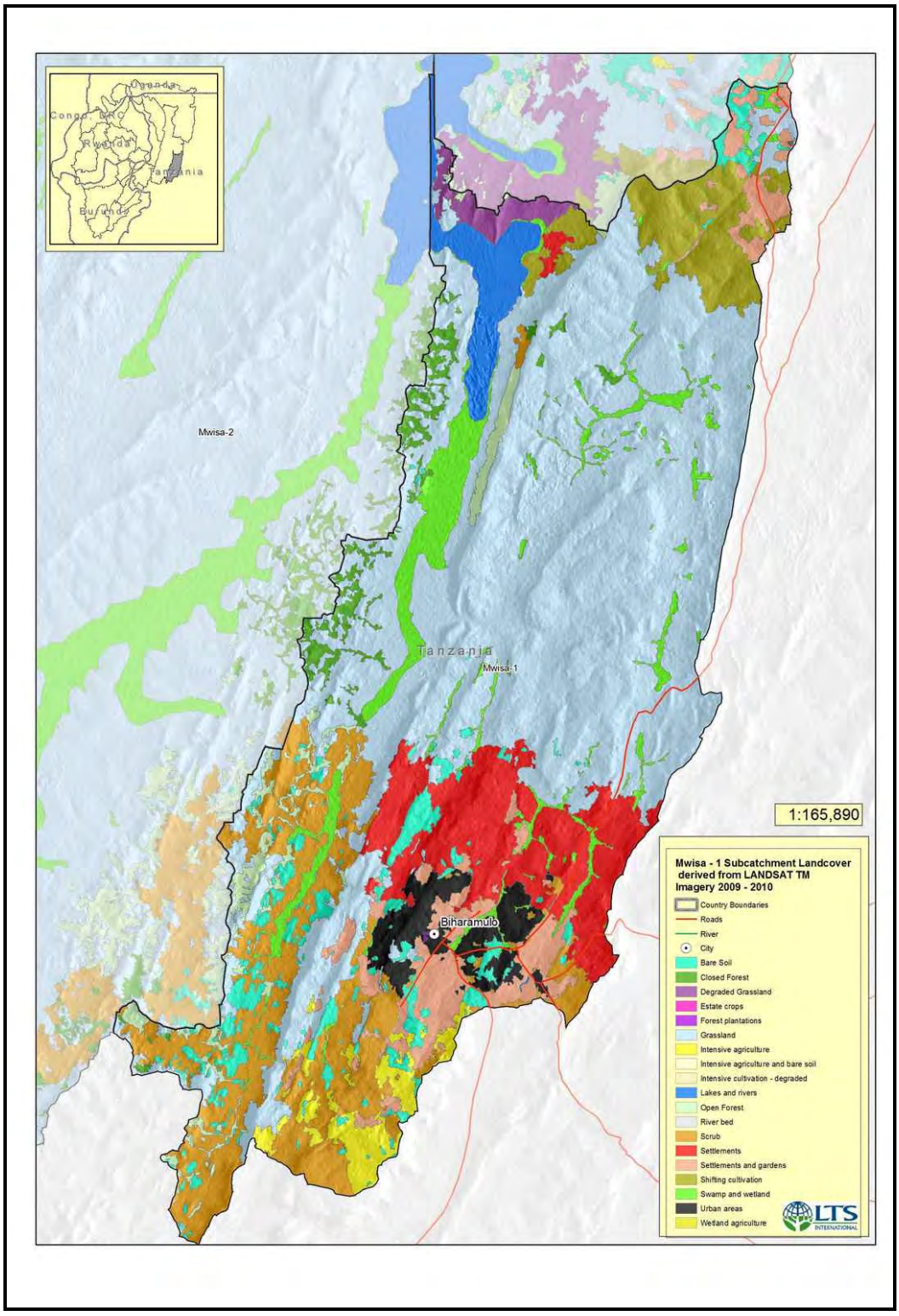
Map 75. Mwisa 1 Catchment Soil Erosion Risk



Map 76. Mwisa 1 Sub-Watershed Rainfall minus PET



Map 77. Mwisa 1 Sub-Watershed Rainfall minus PET



16. Mwisa 2 Sub-watershed

16.1 Key Parameters

(a) **Hydrology**

Runoff – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
342.7	110.2	128.4	634.1	312.8	331.2
Ground-water re-charge – mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
164.6	14.4	30.3	316.4	96.2	123.5
Months of soil moisture stress					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
6.97	10	11.04	4.77	7	7.82
Monthly river flows m3/s					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
27.1	11.7	12.7	40.1	20.2	21.9
Irrigation demand mm/yr					
Observed – 1970 to 1999			**Projected – 2070 to 2099**		
Mean	Minimum	1-in-20	Mean	Minimum	1-in-20
445.9	590.3	495.4	4129.9	558.8	464.1

(b) Land Use/Landcover

Mwisa 2 - Landcover	Hectares	% of Total
Grassland	383,899	71.3
Swamp and wetland	27,997	5.2
Scrub	26,414	4.9
Settlements and gardens	22,521	4.2
Bare Soil	17,059	3.2
Open Forest	16,075	3.0
Lakes and rivers	14,583	2.7
Intensive agriculture	14,015	2.6
Degraded Grassland	7,548	1.4
Closed Forest	7,501	1.4
Estate crops	1,053	0.2
Urban areas	35	0.0
Shifting cultivation	32	0.0
TOTAL	**538,731**	**100.0**

16.2 Description of the Sub-watershed

16.2.1 Specific nature of Sub-watershed

This is the other headwater Sub-watershed of the Mwisa River located just to the west of Mwisa 1 and is as sparsely populated as Mwisa 1. The Brigit Game Reserve and located within the .Sub-watershed.

16.2.2 Key Issues

- Acidic and infertile soils, steep slopes with high erosion risk;
- Loss of soil fertility and increasing acidification and aluminium toxicity;
- High sediment loads in rivers and streams;
- Overgrazing and Livestock feed deficits
- Agricultural encroachment of wetlands;
- Grazing encroachment into Biharamulo Game reserve.
- Lack of tourist facilities for Biharamulo Game reserve
- Limited and irregular rainfall and PET exceeds rainfall;
- Lack of water supplies for humans and livestock.

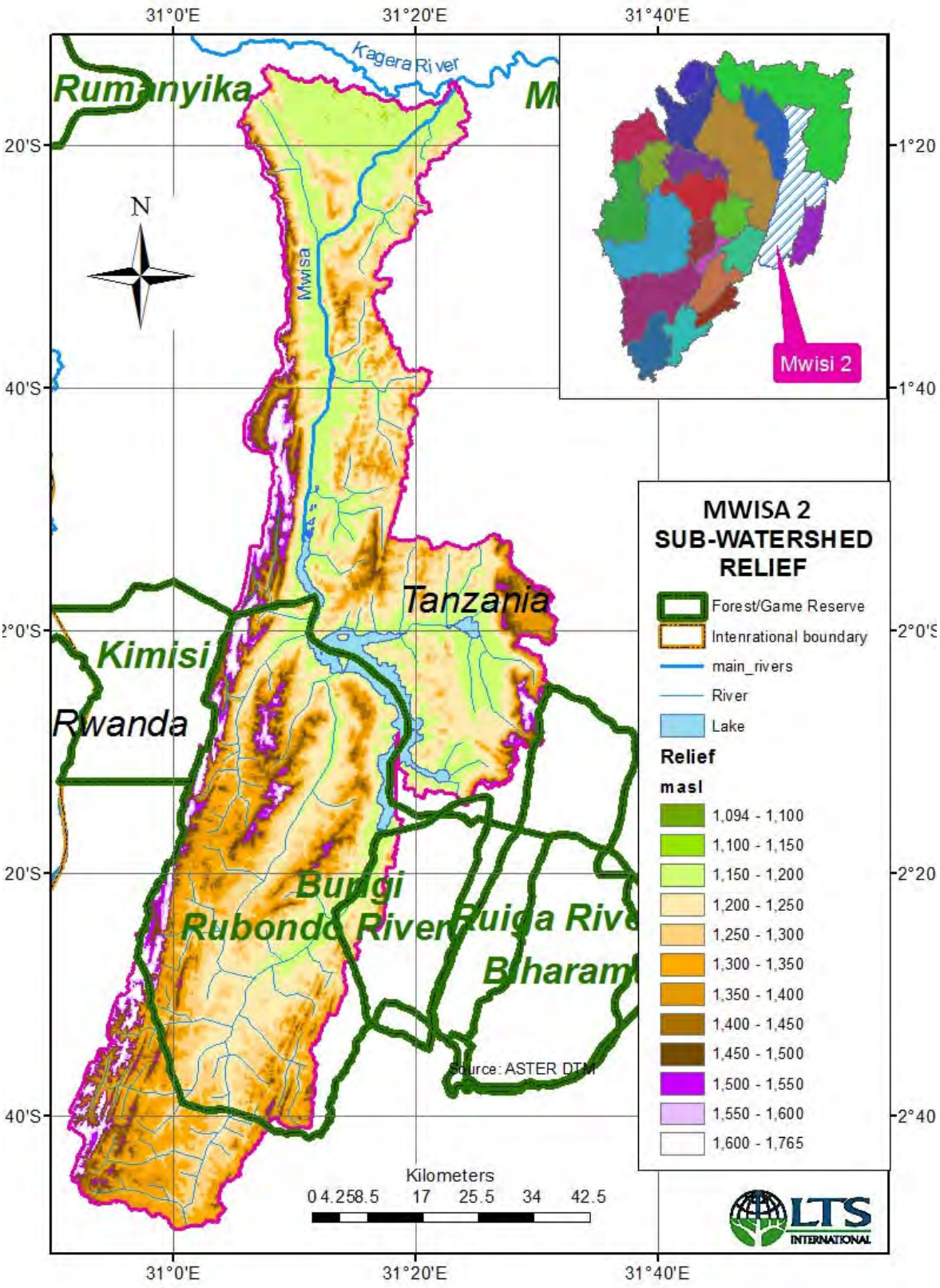
16.2.3 Characterization of Sub-watershed

The Sub-watershed is some 538,727ha and is located west central part of the Sub-basin.

The Sub-watershed lies between 1,100 and 1,750 masl. Linear scarps present steep slopes with back-slopes which are much less steep. Only 23 percent of the sub-watershed has a severe and very severe erosion risk. Mean annual rainfall is 800 to 1,000mm/yr. PET exceeds rainfall by 400 to 500mm/yr, whilst green (soil) water is only 150mm/yr.

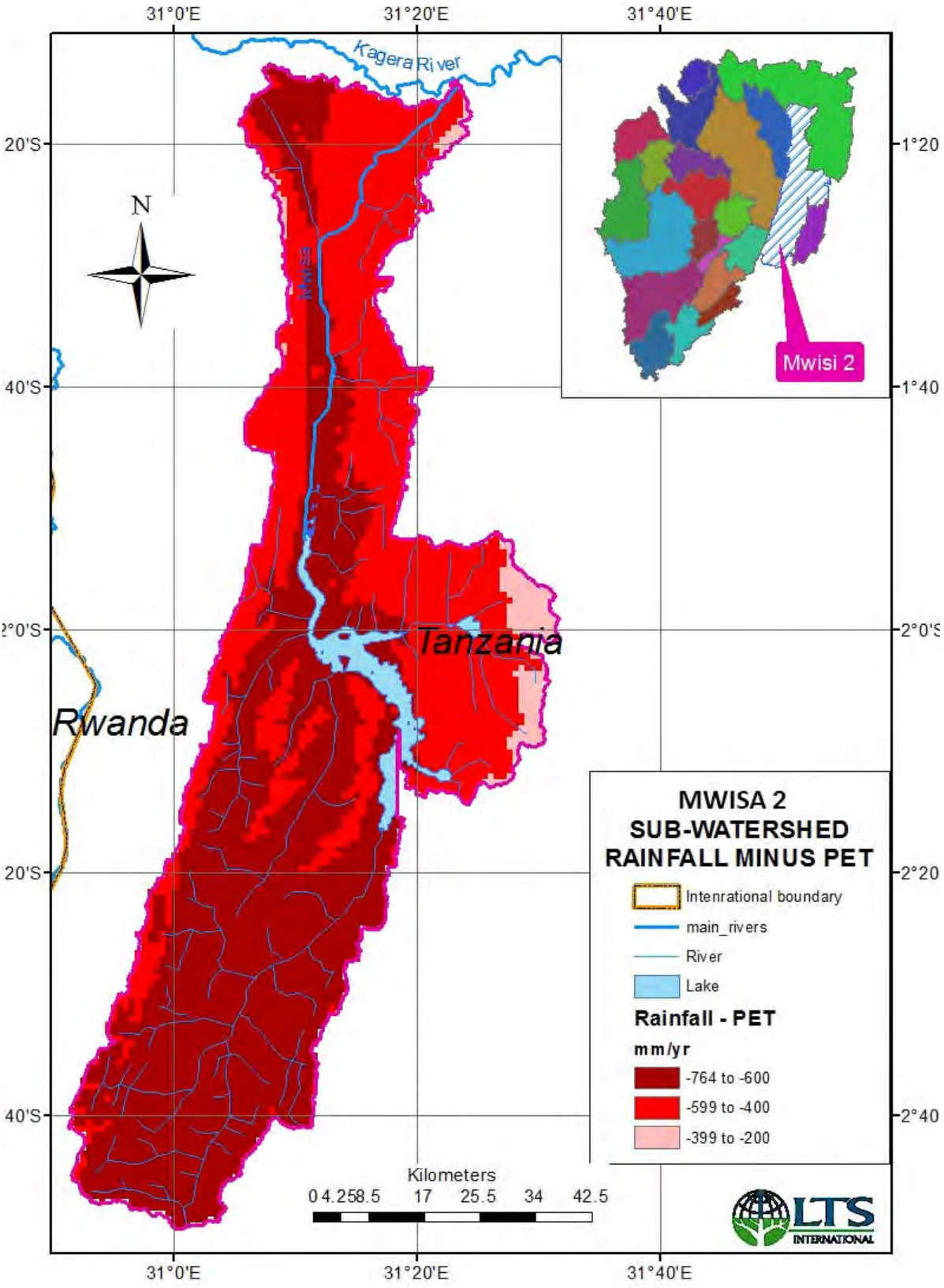
Some 79 percent of the area is cover with grassland and scrub. Only 7 percent is intensive agriculture or gardens. Many of the wetlands have been converted into agriculture. Some 4 percent is open and close forests. The population density is less than 125ppkm2 and most of the area is not populated. The Kagera Piedmont Farming System predominates, however most of the sub-watershed is given over to the Burigi Game reserve.

Map 78. Mwisa 2 Sub-Watershed Relief



Map 79. Mwisa 2 Catchment Soil Erosion Risk

Map 80. Mwisa 2 Sub-Watershed Rainfall minus PET



Map 81. Mwisa 2 Sub-Catchment Landcover