

Table S1. Summary of spatial Landsat datasets used in this study.

Year	Sensor	Resolution	Acquisition date	Path/row	ID	Band combinations
1994	Landsat 05 TM C1 Level-1	30m	27 November, 1994	Path:136 Row:43	LT05_L1TP_136 043_19941127_2 0170111_01_T1	4–3–2 (near-infrared red green)
2005	Landsat 05 TM C1 Level-1	30m	25 November, 2005	Path:136 Row:43	LT05_L1TP_136 043_20051125_2 0161123_01_T1	4–3–2 (near-infrared red green)
2013	Landsat8 OLI/TIRS C1 Level-1	30m	15 November, 2013	Path:136 Row:43	LC08_L1TP_136 043_20131115_2 0170428_01_T1	5–4–3 (near-infrared red green)
2018	Landsat8 OLI/TIRS C1 Level-1	30m	29 November, 2018	Path:136 Row:43	LC08_L1TP_136 043_20181129_2 0181211_01_T1	5–4–3 (near-infrared red green)

(Source: <http://earthexplorer.usgs.gov/>).

Table S2. Classification of land use and land cover (LULC).

LULC type	Descriptions
Water	Permanent lakes and freshwater (rivers, ponds, ditches, and streams), as well as wetlands that dry up during the dry season, intermittent ponds and water points, perennial marshy areas, and man-made dams for irrigation purposes.
Built-up	Urban built-up areas, as well as temporary or permanent settlements.
Non-commercial agricultural area	Area of land prepared for crop production, including areas currently covered by crops, areas prepared for cultivation, deforested fallow plots, and degraded forest land.
Commercial agricultural area	Orchards, groves, vineyards, nurseries, and ornamental horticultural areas, as well as confined feeding operations and other agricultural land.
Forest cover	Land covered with trees reaching 5 m in height, 0.5 ha in area, and a canopy cover of > 10% without other land use.


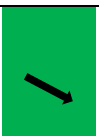


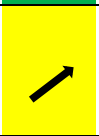

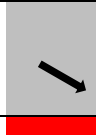
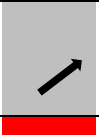

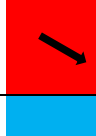
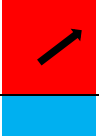




Table S3. Accuracy assessment.

Class of LULC	1994		2005		2013		2018	
	Producer accuracy	User accuracy	Producer accuracy	User accuracy	Producer accuracy	User accuracy	Producer accuracy	User accuracy
Forest area	100.00	96.42	100.00	96.42	92.30	95.00	100.00	96.42
Non-commercial agricultural area	96.30	83.33	96.30	88.89	90.47	91.30	96.30	93.60

Commercial agricultural area	96.30	92.59	96.30	45.16	42.85	83.33	88.30	80.00
Built-up area	100.00	90.90	100.00	90.90	91.30	92.31	100.00	90.90
Waterbody	100.00	57.14	100.00	57.14	55.55	42.86	100.00	57.14
Overall accuracy (%)	91.66		94.67		91.68		92.76	
Kappa co-efficient	0.87		0.89		0.90		0.84	

Note: 0.01–0.20 slight; 0.21–0.40 fair; 0.41–0.60 moderate; 0.61–0.80 substantial; 0.81–1.00 almost perfect.

Table S4. Transition matrix of LULC in Rema-Kalenga Wildlife Sanctuary (RKWS) between 1994 and 2018 (unit: hectare).

Trends and Magnitude of LULC change in RKWS														
LULC class	1994	Area in ha %	2005	Area in ha %	2013	Area in ha %	2018	Area in ha %	Change in(ha) 1994-2005		Change in(ha) 2005-2013		Change in(ha) 2013-2018	
FA	5587.90	89.65	5885.13	94.42	5402.64	86.68	4995.78	80.15	+297.23		-482.49		-406.86	
NCAA	508.81	8.16	235.98	3.79	619.27	9.94	915.21	14.68	-272.83		+383.29		+295.94	
CAA	75.80	1.22	56.98	0.91	117.28	1.88	189.86	3.05	-18.82		+60.30		+72.58	
BA	47.85	0.77	42.19	0.68	73.40	1.18	103.29	1.66	-5.66		+31.21		+29.89	
WA	12.98	0.21	12.88	0.21	20.90	0.34	28.82	0.46	-0.10		+8.02		+7.92	

Note: FA= forest and semi-natural areas; NCAA= non-commercial agricultural area; CAA= commercial agricultural area; BA= built-up area; WA= waterbody area. (+, increase; -, decrease).

Table S5. Annual rates of change.

LULC class	Percentage change			Annual rate of change		
	Change in % 1994–2005	Change in % 2005–2013	Change in % 2013–2018	Change in % 1994–2005 (11years)	Change in % 2005–2013 (8years)	Change in % 2013–2018 (5years)
FA	+4.77	-7.74	-6.53	+0.43	-0.97	-1.31
NCAA	-4.38	+6.15	+4.75	-0.40	+0.77	+0.95
CAA	-0.30	+0.97	+1.16	-0.03	+0.12	+0.23
BA	-0.09	+0.48	+0.48	-0.01	+0.06	+0.10
WA	+0.00	+0.13	+0.13	0.00	+0.02	+0.03

Note: FA= forest and semi-natural areas; NCAA= non-commercial agricultural area; CAA= commercial agricultural area; BA= built-up area; WA= waterbody area. (+, increase; -, decrease). ($df = 9 \times 2 = 21$, and $p < 0.013$)



Figure S1. Examples of primary data sources in RKWS. Clockwise: (a) participatory mapping, (b) GPS data, (c) informal discussion with local residents, (d) settlement in the protected area (PA), (e) commercial land use, and (f) non-commercial agricultural land use.

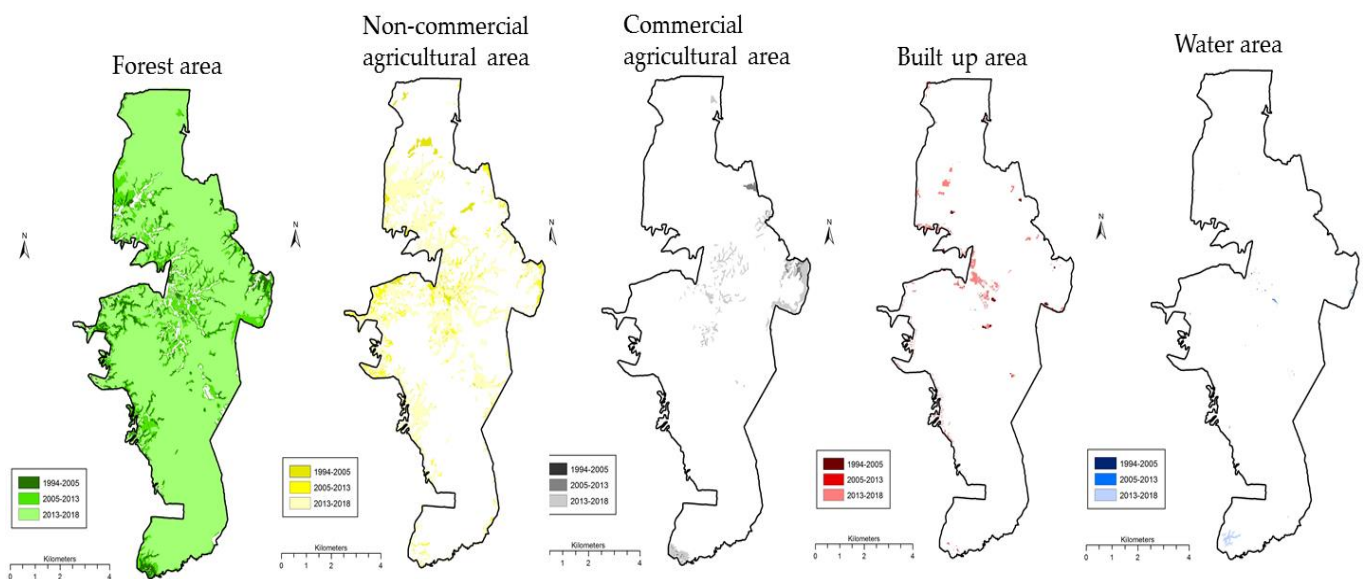


Figure S2. Major LULC conversions from 1994 to 2018.