

Supplementary Materials

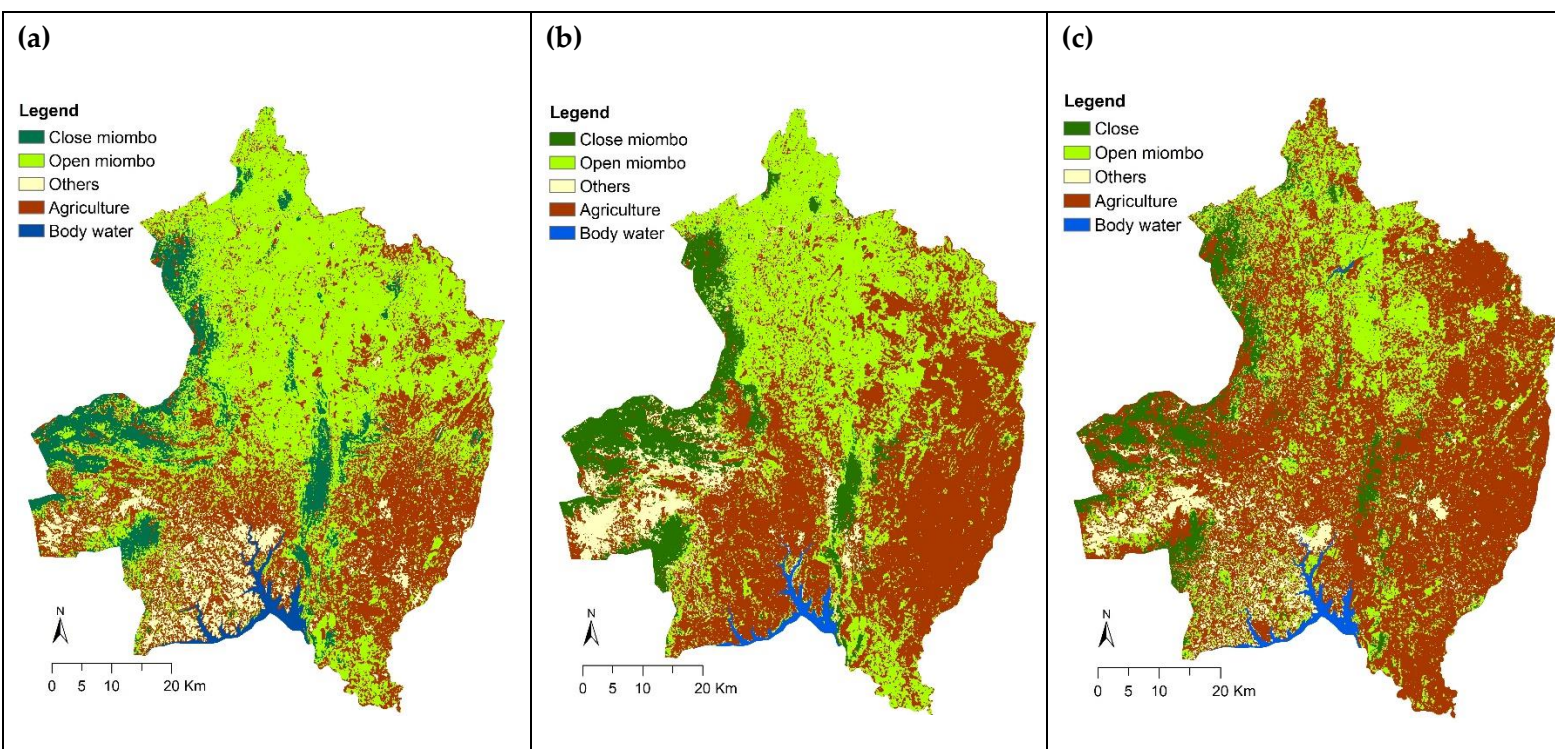


Figure S1. Land cover and land use maps of study area for 2001 (a), 2008 (b), and 2018 (c)

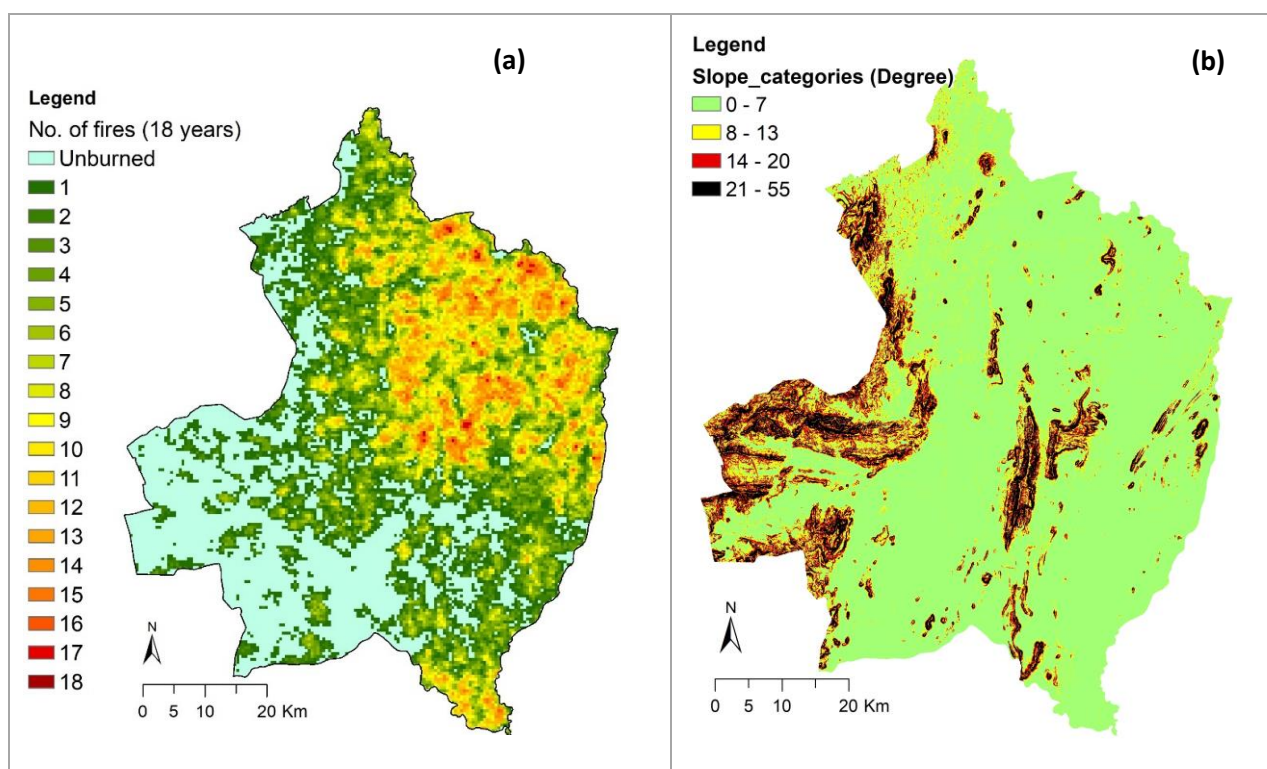


Figure S2. Fire frequency (2001-2018) (a) and slope map category (b) for the study area

Table S1. Accuracy assessment of classification results based on confusion matrix for 2001, 2008 and 2018

	Dense mi- ombo	Opened mi- ombo	Others	Agriculture	Body wa- ters	Total	UA (%)
2001							
Dense miombo	39	1	0	0	0	40	97.50
Opened miombo	2	166	2	19	0	189	87.83
Others	0	0	24	2	0	26	92.31
Agriculture	0	7	12	115	1	135	85.19
Body waters	0	0	0	0	6	6	1.00
total	41	174	38	136	7	396	
PA (%)	95.12	95.40	63.16	84.56	85.71		88.38
OA (%)	88.39						
Kappa	0.82						
2008							
Dense miombo	41	2	0	3	0	46	89.13
Opened miombo	0	106	6	25	0	137	77.37
Others	1	0	20	3	0	24	83.33
Agriculture	0	3	2	179	1	185	96.76
Body waters	0	0	0	0	4	4	1.00
Total	42	111	28	210	5	396	
PA (%)	97.62	95.49	71.43	85.24	80.00		88.38
OA (%)	88.39						
Kappa	0.82						
2018							
Dense miombo	32	0	0	0	0	32	1.00
Opened miombo	1	82	0	9	0	92	89.13
Others	0	3	22	2	0	27	81.48
Agriculture	4	23	13	200	0	240	83.33
Body waters	0	0	0	0	5	5	1.00
Total	37	108	35	211	5	396	
PA (%)	86.49	75.93	62.86	94.79	1.00		86.11
OA (%)	86.10						
Kappa	0.77						

Table S2. Accuracy assessment of the fire frequency map based on confusion matrix

	Unburned	Burned	Total	UA (%)
Unburned	301	4	305	98.69
Burned	17	74	91	81.32
Total	318	78	396	
PA (%)	94.65	94.87		94.69
OA (%)	94.70			

Kappa

0.84

Table S3. OLS and GWR results of the grid size cells tested under the parameters in analysis

Grid size cell (m)	Miombo type	OLS		GWR			
		R ²	AICc	R ²	AICc	Moran	P-value
500	Dense miombo	0.36	11346.14	0.65	9,487.16	0.000776	0.697663
	Opened miombo	0.38	32115.96	0.81	15,046.00	0.000000	0.014347
750	Dense miombo	0.34	6725.70	0.61	5,560.37	0.004480	0.163006
	Opened miombo	0.82	6898.34	0.92	3,208.88	0.045823	0.000000
1000	Dense miombo	0.35	4605.88	0.67	3,739.38	0.001199	0.795935
	Opened miombo	0.84	3742.80	0.93	4,514.36	0.007595	0.118325

Table S4. Summary of OLS Results – model variable_for dense miombo

Variable	Coefficient	StdError	t-Statistic	Probabil- ity	Ro- bust_SE	Robust_t	Ro- bust_Pr	VIF
Intercept	9.601835	0.583714	16.449545	0.000*	0.558458	17.193489	0.000*	-----
Agriculture	0.246033	0.009925	24.790223	0.000*	0.013083	18.805528	0.000*	1.003
Slope	0.713060	0.033013	21.599679	0.000*	0.040154	17.758023	0.000*	1.003
Fire frequency	0.003745	0.014020	0.267135	0.789400	0.016943	0.221054	0.825073	1.006
OLS Diagnostics								
Number of Ob- servations:	1916		Akaike's In- formation Criterion (AICc):	14964.349				
Multiple R- Squared:	0.355		Adjusted R- Squared:	0.354				
Joint F-Statistic:	351.477		Prob(>F), (3,3727) degrees of freedom:	0.000*				
Joint Wald Sta- tistic:	563.626		Prob(>chi- squared), (3) degrees of freedom:	0.000*				
Koenker (BP) Statistic:	75.641		Prob(>chi- squared), (3) degrees of freedom:	0.000*				

Jarque-Bera Statistic:	1171.271	Prob(>chi-squared), (2) degrees of freedom:	0.000*
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Table S5. Summary of OLS Results – model variable_for opened miombo

Variable	Coefficient	StdError	t-Statistic	Probability	Robust_SE	Robust_t	Robust_Pr	VIF
Intercept	-5.668	0.357637	-15.849	0.000*	0.384	-14.771	0.000*	-----
Agriculture	-0.874	0.006319	-138.328	0.000*	0.008	-110.247	0.000*	1.005
Fire frequency	-0.003	0.010159	-0.343	0.732	0.013	-0.272	0.786	1.012
Slope	0.6417	0.027026	23.747	0.000*	0.039	16.475	0.000*	1.008
OLS Diagnostics								
Number of Observations:	3731		Akaike's Information Criterion (AICc):	28626.589				
Multiple R-Squared:	0.841		Adjusted R-Squared:	0.841				
Joint F-Statistic:	6559.729		Prob(>F), (3,3727) degrees of freedom:	0.000*				
Joint Wald Statistic:	14248.968		Prob(>chi-squared), (3) degrees of freedom:	0.000*				
Koenker (BP) Statistic:	202.521		Prob(>chi-squared), (3) degrees of freedom:	0.000*				
Jarque-Bera Statistic:	6325.155		Prob(>chi-squared), (2) degrees of freedom:	0.000*				

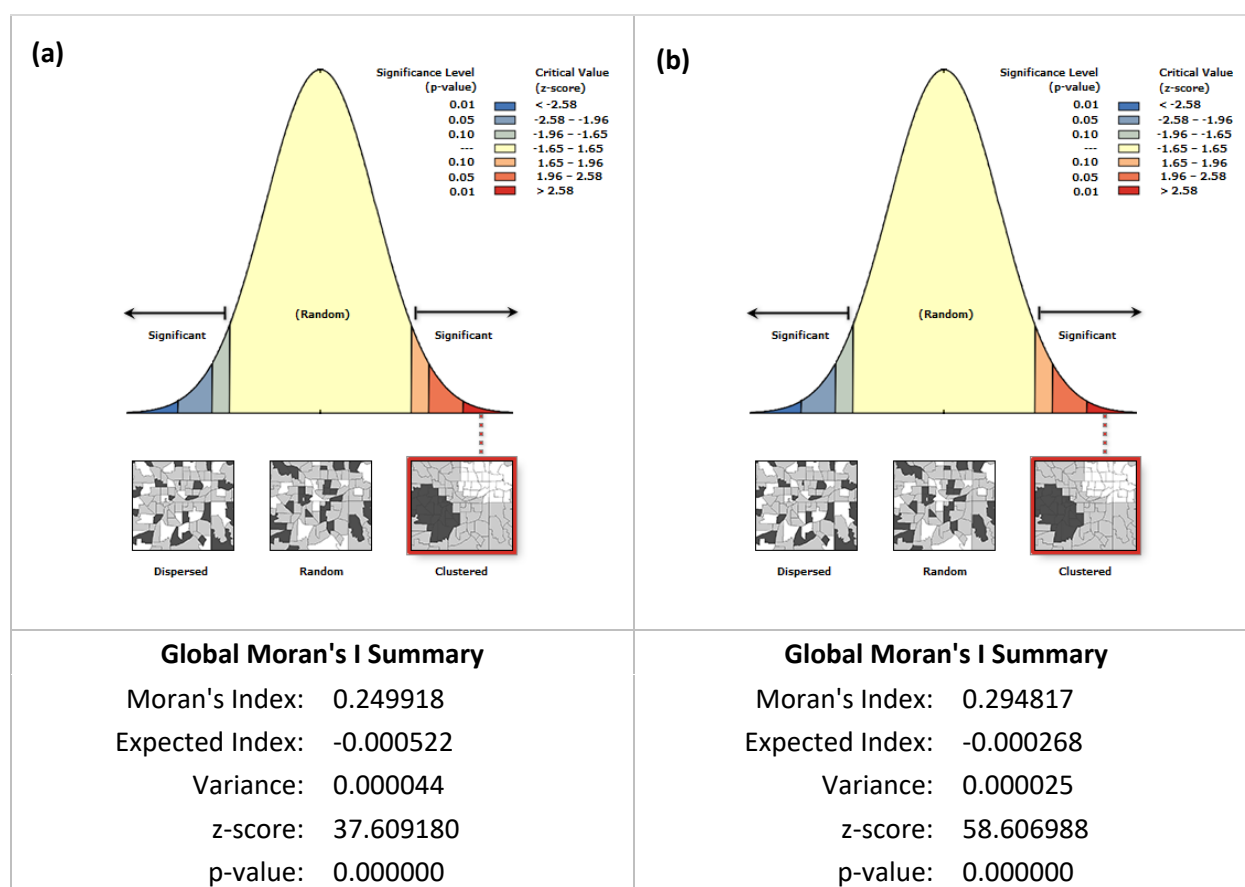


Figure S3. OLS Spatial autocorrelation report for dense miombo **a)** and opened miombo **b)**

Table S6. Geographically weighted regression (GWR) Results for dense miombo

Coordinates type:	Projected
Spatial kernel:	Adaptive bisquare
Criterion for optimal bandwidth:	AICc
Bandwidth used:	58.000
Diagnostic information	
Residual sum of squares:	529.333
Effective number of parameters (trace(S)):	318.273
Degree of freedom (n - trace(S)):	1597.727
Sigma estimate:	0.576
Log-likelihood:	-1486.338
Degree of Dependency (DoD):	0.421

AIC:	3611.221
AICc:	3739.381
BIC:	5385.737
R2:	0.724
Adj. R2:	0.669
Adj. alpha (95%):	0.001
Adj. critical t value (95%):	3.425

Summary statistics for GWR parameter estimates

Variable	Mean	STD	Min	Median	Max
Intercept	-0.052	0.455	-1.431	0.018	0.947
Agriculture	-0.463	0.449	-1.905	-0.319	0.389
Fire frequency	0.035	0.187	-1.691	0.032	0.775
Slope	-0.288	0.280	-1.365	-0.243	0.400

Table A7. Geographically weighted regression (GWR) Results for dense miombo

Coordinates type:	Projected
Spatial kernel:	Adaptive bisquare
Criterion for optimal bandwidth:	AICc
Bandwidth used:	69.000

Diagnostic information

Residual sum of squares:	231.749
Effective number of parameters (trace(S)):	521.085
Degree of freedom (n - trace(S)):	3209.915
Sigma estimate:	0.269
Log-likelihood:	-110.252
Degree of Dependency (DoD):	0.408
AIC:	1264.674
AICc:	1434.938
BIC:	4514.359

R2:	0.938
Adj. R2:	0.928
Adj. alpha (95%):	0.000
Adj. critical t value (95%):	3.554

Summary statistics for GWR parameter estimates

Variable	Mean	STD	Min	Median	Max
Intercept	0.053	0.262	-0.766	-0.000	1.055
Agriculture	-0.822	0.257	-1.476	-0.927	-0.020
Fire frequency	-0.016	0.079	-0.368	-0.013	0.843
Slope	0.100	0.136	-0.136	0.082	0.711

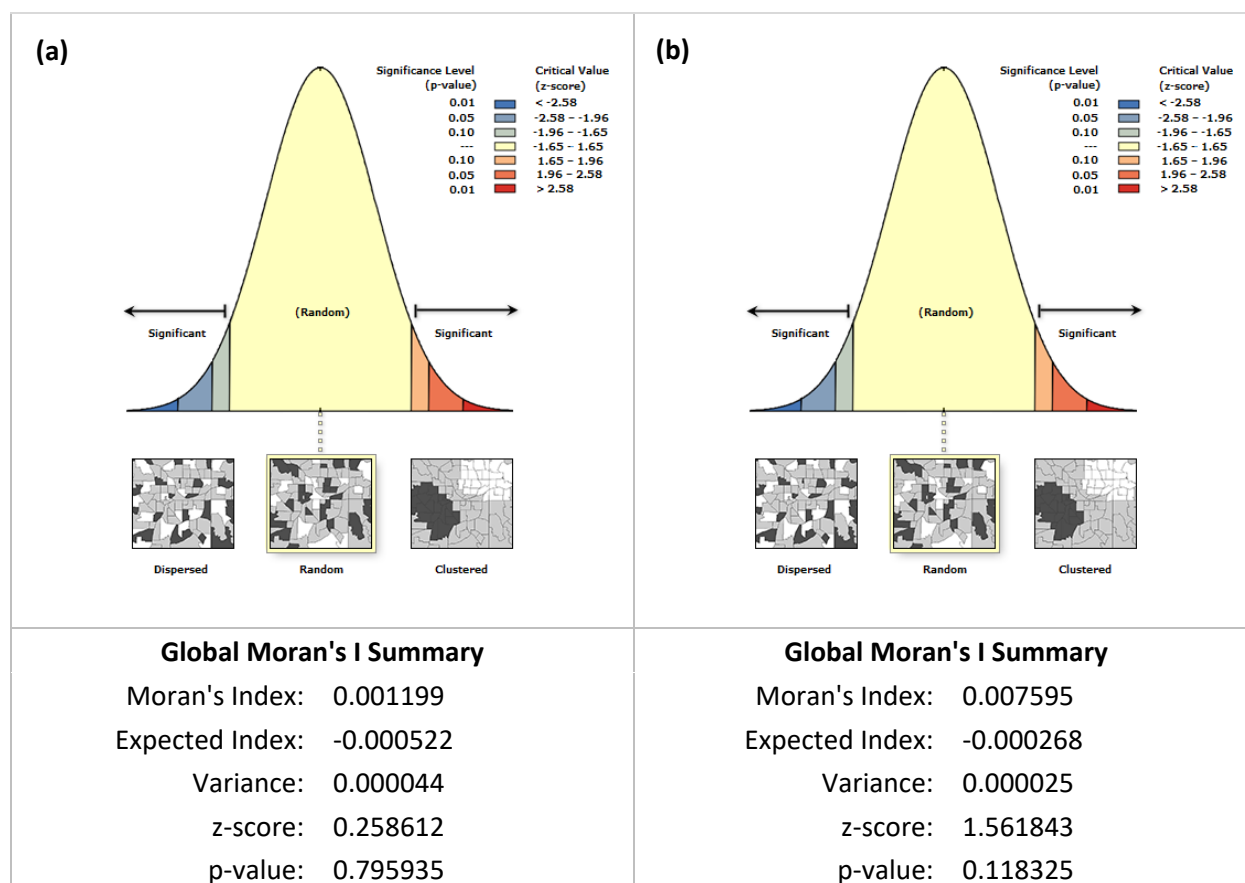


Figure S4. GWR Spatial autocorrelation report for dense miombo **a)** and opened miombo **b)**