

Time-Series Satellite Imagery Demonstrates the Progressive Failure of a City Master Plan to Control Urbanization in Abuja, Nigeria

Supplementary Information

Table S1

Land cover class training and testing data for the 1975-2014 Landsat images of Abuja.

Image date	No. class training samples (pixels)					
	Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water
1975	35	-	21	94	163	-
1986	192	172	218	205	188	106
1990	92	268	202	314	546	182
1999	97	164	257	213	559	264
2002	153	137	196	147	210	112
2008	138	184	237	232	325	145
2014	99	171	225	144	553	358

Table S2

Error matrix for Abuja land cover classification using 1975 Landsat Multispectral Scanner image.

		Reference class				Users accuracy (%)
		Bare exposed rock	Built-up land	Forest	Grassland	
Predicted class	Bare exposed rock	10	0	5	5	50.0
	Built-up land	0	8	0	0	100.0
	Forest	0	0	18	1	90.0
	Grassland	0	12	2	18	56.3
Producers accuracy (%)		100.0	40.0	72.0	75.0	
Overall classification accuracy = 67.5%						

Table S3

Error matrix for Abuja land cover classification using 1986 Landsat Thematic Mapper image.

		Reference class						Users accuracy (%)
		Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water	
Predicted class	Bare exposed rock	40	0	0	0	0	40	100.0
	Bare ground	3	27	8	0	2	0	67.5
	Built-up land	0	0	32	1	4	0	80.0
	Forest	0	0	0	40	0	0	100.0
	Grassland	0	0	0	0	39	0	97.5
	Water	0	0	0	0	0	0	100.0
Producers accuracy (%)		87.0	100.0	80.0	95.2	86.7	100.0	
Overall classification accuracy = 90.8%								

Table S4

Error matrix for Abuja land cover classification using 1990 Landsat Thematic Mapper image.

		Reference class						Users accuracy (%)
		Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water	
Predicted class	Bare exposed rock	37	0	0	2	1	0	92.5
	Bare ground	0	36	2	0	2	0	90.0
	Built-up land	1	2	23	0	14	0	57.5
	Forest	0	0	0	33	7	0	82.5
	Grassland	2	0	0	3	35	0	87.5
	Water	0	0	1	0	0	39	97.5
Producers accuracy (%)		92.5	94.7	88.5	86.8	59.3	100.0	
Overall classification accuracy = 84.6%								

Table S5

Error matrix for Abuja land cover classification using 1999 Landsat Thematic Mapper image.

		Reference class						Users accuracy (%)
		Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water	
Predicted class	Bare exposed rock	38	0	0	1	1	0	95.0
	Bare ground	2	24	10	0	4	0	60.0
	Built-up land	0	2	36	1	1	0	90.0
	Forest	0	0	0	40	0	0	100.0
	Grassland	2	0	0	5	33	0	82.5
	Water	1	0	1	1	0	37	92.5
Producers accuracy (%)		88.4	92.3	76.6	83.3	84.6	100.0	
Overall classification accuracy = 86.7%								

Table S6

Error matrix for Abuja land cover classification using 2002 Landsat Enhanced Thematic Mapper Plus image.

		Reference class						Users accuracy (%)
		Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water	
Predicted class	Bare exposed rock	37	0	0	0	2	1	92.5
	Bare ground	0	21	14	0	5	0	52.5
	Built-up land	0	0	37	0	3	0	92.5
	Forest	0	0	0	38	2	0	95.0
	Grassland	2	0	1	3	36	0	90.0
	Water	1	0	0	0	1	38	95.0
Producers accuracy (%)		93.4	100.0	71.2	91.7	73.5	97.4	
Overall classification accuracy = 86.0%								

Table S7

Error matrix for Abuja land cover classification using 2009 Landsat Enhanced Thematic Mapper Plus image.

		Reference class						Users accuracy (%)
		Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water	
Predicted class	Bare exposed rock	33	1	0	0	6	0	82.5
	Bare ground	2	17	14	0	7	0	42.5
	Built-up land	1	1	29	3	6	0	72.5
	Forest	0	0	0	39	1	0	97.5
	Grassland	0	0	1	4	35	0	87.5
	Water	0	0	0	4	0	36	90.0
Producers accuracy (%)		91.7	89.5	65.9	78.0	63.6	100.0	
Overall classification accuracy = 78.8%								

Table S8

Error matrix for Abuja land cover classification using 2014 Landsat Operational Land Imager image.

		Reference class						Users accuracy (%)
		Bare exposed rock	Bare ground	Built-up land	Forest	Grassland	Water	
Predicted class	Bare exposed rock	27	0	0	0	0	0	100.0
	Bare ground	0	21	4	0	0	1	80.8
	Built-up land	0	1	36	0	1	2	90.0
	Forest	0	0	0	26	2	0	92.9
	Grassland	10	6	3	9	53	0	65.4
	Water	0	0	0	0	0	38	100.0
Producers accuracy (%)		92.7	75.0	83.7	74.3	94.6	92.7	
Overall classification accuracy = 83.8%								