

# Urban and rural trends in South Africa

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Both urban and rural development is important in South Africa. Both require effective policies to ensure its sustainable economic and social development. However, the differentiation between the two is complex. This paper makes use of non-spatial and spatial statistical techniques to give insights on these complexities, and it shows the trends across the three census periods (1996, 2001 and 2011).

**Key Words:** urban, rural, South Africa, spatial, non-spatial

## 1. Introduction

Defining urban and rural areas for South Africa has a long history. It still remains relevant today, forming an integral part of the country's growth and development strategies. The definition of the dichotomy is the first step towards understanding the dynamics in these areas and for effective policy implementation. No standard definition exists for the country. Several definitions are used based on the type of application, for example, the provision of water and sanitation services in the former homelands in South Africa, where the former homelands were referred to as rural. In the case of Statistics South Africa (Stats SA), enumeration areas (EAs) demarcated for the censuses were assigned geographical characteristics that describes the type of geographical area it resided in mainly based on administrative boundaries and aerial photograph interpretation (called EA-types and Geography-types). EAs were classified according to these to give some indication of urban (and non-urban). The other evolving trend in the country is to move away from defining urban and rural areas; to rather base policy on settlement typologies that classify cities and towns in the country based on size, function and institutional legacy.

This paper explores yet another way of defining urban and rural, that of using census enumeration areas, census data and selected statistical methods to classify urban and rural for South Africa. It begins by summarising the results obtained from a study conducted by Laldaparsad (2006) using the 2001 census data; the methods are applied to the 2011 census data, followed by discussion on the usefulness of the methods and results.

## 2. Results

### 2.1 Classifying areas as urban and rural, 2001 census

The study conducted by Laldaparsad (2006) made use of supervised classification methodology. It was based on sample datasets of areas that are known with certainty to be urban or rural in the country. The rationale was to identify characteristics from these known areas and apply it to the unknown areas in the country. Two different sample datasets of known areas were created using the 2001 census EA-type characteristics. The first sample dataset comprised all areas in the country where the EA-type was *urban settlement*<sup>1</sup> (labelled as known urban areas), and all areas in the country where the EA-type was purely *farm*<sup>2</sup> (labelled as known rural areas). The second sample dataset was similar to the first, but in addition, rural areas included those within the country falling under the jurisdiction of the traditional authorities (or traditional chiefs). The first sample was a strict sample which is indicative of most international definitions. The second sample reflects South Africa more realistically where traditional areas are considered rural, mainly due to their lack of infrastructure due to past legacy exclusions.

The study made use of both non-spatial and spatial statistical techniques. The non-spatial statistical techniques were *linear logistic regression*, *classification trees*, and *discriminant analysis*. The spatial statistical methods were *straight-majority rule* and *Markov Random Fields* i.e. Iterated Conditional Modes (ICM). The statistical methods were applied for each of the nine provinces in South Africa and the country as a whole, for both samples. Results were spatially analysed using maps. Population data was aggregated to determine the overall urbanisation for the country. The 2001 population census data was used. Comparisons were also done using the 1996 census data.

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<sup>1</sup> Urban settlements – an EA-type assigned to an EA that was located within the official proclaimed urban area of the municipality.

<sup>2</sup> Farm – an EA-type assigned to an EA that was located in the proclaimed commercial farming area of the municipality.

Generally the non-spatial statistical methods identified significant variables that separate and describe urban and rural (see Table 2.1.3). The non-spatial statistical methods showed similar trends within each sample, but differences between the two samples (See Table 2.1.1 & 2.1.2). The spatial statistical methods due to its nature of making use of adjacencies further refined the classifications (See Table 2.1.4 & 2.1.5). The study concluded that sample 2 (urban-farm-traditional) more realistically represents South Africa. There is need to include a third category i.e. traditional, with the urban rural dichotomy, in addition further sub-divisions within each due to variations in settlements types, population sizes and economic function.

Table 2.1.1 Population classified by urban and rural for South Africa for the non-spatial statistical techniques for Sample 1 (urban-farm)

		<i>Linear Logistic Regression</i>	%	<i>Classification Trees</i>	%	<i>Discriminant Analysis</i>	%	<i>Census 2001</i>	%	<i>Census 1996</i>	%
South Africa	Rural	15 165 764	34	4 534 509	10	12 625 836	28	19 050 159	43	18 220 668	45
	Urban	29 653 909	66	40 285 164	90	32 193 837	72	25 769 619	58	22 362 906	55
	Total	44 819 673	100	44 819 673	100	44 819 673	100	44 819 778	100	40 583 574	100

Source: 2001 population census, Statistics South Africa

Table 2.1.2 Population classified by urban and rural for South Africa for the non-spatial statistical techniques for Sample 2 (urban-farm-traditional)

		<i>Linear Logistic Regression</i>	%	<i>Classification Trees</i>	%	<i>Discriminant Analysis</i>	%	<i>Census 2001</i>	%	<i>Census 1996</i>	%
South Africa	Rural	19 816 920	44	20 200 678	45	20 678 423	46	19 050 159	43	18 220 668	45
	Urban	25 002 753	56	24 618 995	55	24 141 250	54	25 769 619	58	22 362 906	55
	Total	44 819 673	100	44 819 673	100	44 819 673	100	44 819 778	100	40 583 574	100

Source: 2001 population census, Statistics South Africa

Table 2.1.3 Summary of Census 2001 variables that separate (or describe) urban and rural based on the non-spatial statistical methods

Urban	Rural (farm)	Rural (traditional)
Sex of head of household (female)	Persons with no or some primary schooling	Race group of head of household (African)
Race group of head of household (White)	Households accessing water from rain water tanks or rivers	Larger number of children ever born i.e. 10 or more
Smaller number of children ever born i.e. 0-5	Households using wood or paraffin as the main source of energy for cooking	Persons living in traditional/ hut structures
Unemployed persons	Head of household occupation is skilled agriculture/ fishery or elementary work	Households with chemical toilets or pit latrines
Population density		Person with no annual income
Persons who have completed primary schooling		Persons whose employment status is house maker or housewife
Households with flush toilets connected to sewer		
Persons living in informal/ squatter areas		
Households using bucket latrines		

Source: Laldaparsad (2006)

Table 2.1.4 Straight-majority-rule applied to the classification obtained from linear logistic regression (population changes)

		Iterations					
		0	1	2	3	4	5
<b>RSA (Sample 1 - Urban-Farm)</b>							
Rural		15165704	16883147	17006880	17094838	17128266	17145887
Urban		29653710	27936267	27812534	27724576	27691148	27673527
TOTAL		44819414	44819414	44819414	44819414	44819414	44819414
Rural	%	34	38	38	38	38	38
Urban	%	66	62	62	62	62	62
TOTAL	%	100	100	100	100	100	100
<b>RSA (Sample 2 - Urban-Farm-Traditional)</b>							
Rural		19816833	19993842	19986709	19989986	19995653	19998151
Urban		25002581	24825572	24832705	24829428	24823761	24821263
TOTAL		44819414	44819414	44819414	44819414	44819414	44819414
Rural	%	44	45	45	45	45	45
Urban	%	56	55	55	55	55	55
TOTAL	%	100	100	100	100	100	100

Table 2.1.5 ICM applied to the classification obtained from discriminant analysis (population changes)

		Iterations				
		0	1	2	3	4
<b>RSA (Sample 1 – Urban-Farm)</b>						
Rural		12656536	12701563	12823510	12863972	12879666
Urban		32162878	32117851	31995904	31955442	31939748
TOTAL		44819414	44819414	44819414	44819414	44819414
Rural	%	28	28	29	29	29
Urban	%	72	72	71	71	71
TOTAL	%	100	100	100	100	100
<b>RSA (Sample 2 – Urban-Farm-Traditional)</b>						
Rural		20678304	20464948	20426137	20416000	20414364
Urban		24141111	24354466	24393277	24403414	24405050
TOTAL		44819414	44819414	44819414	44819414	44819414
Rural	%	46	46	46	46	46
Urban	%	54	54	54	54	54
TOTAL	%	100	100	100	100	100

## 2.2 Classifying areas as urban and rural, census 2011

The 2006 study gave insight on the census variables that separate or define urban and rural. Most variables are available for census 2011, with the exception of *occupation*. It was not available at the time of writing this paper; as a result it was left out of the analysis. Borrowing from the 2006 study, census 2011 data such as gender of household head, population group of household head, children ever born, level of education, employment status, type of dwelling, energy, water, toilet facilities, and population density, were used in the analysis.

The EA-type and Geography-type classification for Census 2011 differs from census 2001 (see Table 2.2.1). However similar samples of known urban, farm and traditional settlements were created using the 2011 census EA-types that is using the EA-types formal residential, farm and traditional residential settlements. Non-spatial statistical methods namely linear logistic regression and discriminant analysis were used for both samples for South Africa. The 2011 census Geography-types (namely urban, farm, traditional) are based on administrative boundaries

(namely built-up areas, farm parcels, traditional authority boundaries). These can be used as a proxy of urban and rural based on administrative areas only, similar to previous censuses. It is included in the tables below for comparative purposes only.

Table 2.2.1 Census 2011 and 2001 EA and Geography type classification

<i>EA-Types</i> Census 2011	<i>EA-Types</i> Census 2001	<i>Geography-Types</i> Census 2011	<i>Geography-Types</i> Census 2001
Vacant	Vacant	Urban	Urban formal
Traditional settlement	Traditional settlement	Farm	Urban informal
Farm	Farm	Traditional	Rural formal
Small-holding	Small-holding		Traditional
Formal residential	Urban settlement		
Informal residential	Urban informal settlement		
Park	Recreational		
Industrial	Industrial area		
Collective living quarter	Institution		
Commercial	Hostel		

Table 2.2.2 Population classified by urban and rural for South Africa for the non-spatial statistical techniques for Sample 1 (urban-farm)

		<i>Linear Logistic Regression</i>	%	<i>Discriminant Analysis</i>	%	<i>Census 2011</i>	%	<i>Census 2001</i>	%	<i>Census 1996</i>	%
South Africa	Rural	3 504 909	7	15 570 160	30	18 929 073	37	19 050 159	43	18 220 668	45
	Urban	48 265 738	93	36 200 487	70	32 841 487	63	25 769 619	58	22 362 906	55
	Total	51 770 647	100	51 770 647	100	51 770 647	100	44 819 778	100	40 583 574	100

Source: 2011 population census, Statistics South Africa

Table 2.2.3 Population classified by urban and rural for South Africa for the non-spatial statistical techniques for Sample 2 (urban-farm-traditional)

		<i>Linear Logistic Regression</i>	%	<i>Discriminant Analysis</i>	%	<i>Census 2011</i>	%	<i>Census 2001</i>	%	<i>Census 1996</i>	%
South Africa	Rural	18 246 029	37	20 066 248	39	18 929 073	37	19 050 159	43	18 220 668	45
	Urban	33 524 618	63	31 704 399	61	32 841 487	63	25 769 619	58	22 362 906	55
	Total	51 770 647	100	51 770 647	100	51 770 647	100	44 819 778	100	40 583 574	100

Source: 2011 population census, Statistics South Africa

Table 2.2.4 Summary of census 2011 variables that separate (or describe) urban and rural based on the non-spatial statistical methods

Urban	Rural (farm)	Rural (traditional)
Sex of head of household (female)	Race group of head of household (Coloured)	Race group of head of household (African)
Persons with complete primary and secondary schooling; and higher education	Persons with some primary schooling	Households using animal dung or solar as the main source of energy for cooking
Households with water from regional/local water schemes (operated by the municipality or other private providers)	Households with water from a borehole	Households using river or spring water as the main supply water.
Population density	Low income persons	Persons living in a hut or traditional dwelling
Smaller number of children ever born	Households using gas, paraffin, wood and coal as the main source of	

	energy for cooking	
Households with flush toilets connected to a sewer, septic tank, pit with ventilation or bucket toilets		
Higher income persons		
Persons living in a formal house, shack in squatter or backyard		

### 3. Conclusions

Generally, comparing the two censuses, the statistical methods applied shows that more people reside in urban areas in South Africa. Urbanisation has increased over the two censuses. With the exception of linear logistic regression for sample 1, the urban rural ratio is on average 65:35. Linear logistic regression applied to sample 1, classified about 90% of the traditional EAs as urban, whilst for the same sample discriminant analysis classified about 70% of the traditional EAs as rural. Further exploration is required to understand the different underlying classes within both urban and traditional. Since urban and rural is a spatial phenomenon spatial statistical methods must also be explored.

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