ARE THE WALLS GIVING WAY TO FENCES? IS RACIAL INTEGRATION WITHIN KWADUKUZA MUNICIPALITY LEADING TO INCOME BASED CLASS SEGREGATION?

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AUTHOR'S DECLARATION:

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Abstract:

The racial and development imbalances created by apartheid have left a profound impact on the urban and social landscape in South Africa. Despite it being 20 years into the dawn of a new South Africa, many parts of society are still bearing the brunt of the harsh impacts of apartheid. The first democratic elections in 1994 heralded a new era of hope and optimism for a better life in a racially integrated country. However 20 years into democracy, just how much has society integrated? Literature suggests that, in the absence of legally enforced segregation as with apartheid, society will segregate itself on class or other factors. This study measures if changes in racial integration within KwaDukuza Municipality is leading to class based segregation. The study makes use of the Neighbourhood Diversity Index, to measure changes in racial integration within the study area. A Geographic Weighted Regression model was then used to determine if there is a relationship between racial integration and income that could explain the transference from racial to classed based segregation. The study found that although low levels of racial integration have taken place within KDM, the coastal areas of the municipality have become increasingly segregated over the last 20 years. The GWR model found that there is positive relationship between income and racial segregation in these coastal areas. This study highlights that politicians, decision makers, town and social planners still face a long and socially demanding challenge in redressing past imbalances and promoting integration by breaking down the current trend of class based segregation.

Key words: Racial integration, racial segregation, class based segregation, income group classification, Neighbourhood Diversity Index, Geographic Weighted Regression, KwaDukuza, South Africa.

Opsomming:

Die ongelykhede teweeggebring deur apartheid ten opsigte van ras en ontwikkeling het 'n diepgaande impak op die stedelike en sosiale uitleg van Suid-Afrika gehad. Ten spyte daarvan dat Suid-Afrika reeds vir 20 jaar 'n nuwe bedeling het, verdra groot dele van die gemeenskap nog die wrede gevolge van apartheid. Met die eerste demokratiese verkiesing in 1994 is 'n nuwe era van hoop en optimisme vir 'n beter lewe in 'n ras-geïntegreerde land ingelui. Maar na 20 jaar van demokrasie, word die vraag gevra tot in watter mate integrasie onder die gemeenskap plaasgevind het? Die literatuur gee te kenne dat 'n gemeenskap, in die afwesigheid van 'n regtens afdwingbare segregasiebeleid soos apartheid, hulself op grond van klas of ander faktore segregeer. Hierdie studie stel vas of die verandering in rasse-integrasie in die KwaDukuza Munisipaliteit besig is om tot klas-gebaseerde segregasie te lei. Die studie maak van die Woonbuurt-diversiteitsindeks gebruik om veranderinge in rasse-integrasie binne die studiegebied te meet. 'n Geografiese-gewigsregressiemodel is daarna gebruik om vas te stel of daar 'n verhouding tussen rasse-integrasie en inkomste is wat die oorgang van segregasie op grond van ras na klas kan verduidelik. Daar is gevind dat alhoewel 'n lae vlak van rasse-integrasie binne die KDM plaasgevind het, daar in die kusgebiede 'n toename in segregasie gedurende die laaste 20 jaar was. Volgens die Geografiese-gewigsregressiemodel is vasgestel dat daar 'n positiewe verwantskap tussen inkomste en rasse-segregasie in hierdie kusgebiede is. Die studie beklemtoon dat politici, besluitnemers, sosiale en stadsbeplanners nog 'n lang en veeleisende taak ophande het om nie net die ongelykhede van die verlede te herstel nie maar ook om die huidige integrasie te bevorder deur die tendens van klasse-segregasie af te breek.

Trefwoorde: Rasse-integrasie, rasse-segregasie, klas-gebaseerde segregasie, inkomstegroep klassifikasie, Woonbuurt-diversiteitsindeks, Geografiese-gewigsregressiemodel, KwaDukuza, Suid-Afrika.

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ABBREVIATIONS AND ACRONYMS

Central Business District (CBD)

Enumerator Area (EA)

Geographic Information Systems (GIS)

Geographic Weighted Regression (GWR)

KwaDukuza Municipalitiy (KDM)

National Development Plan (NDP)

Neighbourhood Diversity (ND)

Small Area Layer (SAL)

Transitional Local Council (TLC)

1   Introduction

The concept of racial segregation which perceives certain groups of people as being superior or inferior to others is not new to social and academic research. From the Negro, Latino and White based segregation in the United States, to caste based class segregation in India and apartheid's racial segregation in South Africa, the concepts of segregation and integration have been the subject of many studies over the years.

South Africa is a historically divided country. Harrison et al (2008) indicates that when South Africa emerged from a past history of colonialism and apartheid in 1994, its society was characterised by spaces of inequality and division. The South African urban landscape was largely influenced by the introduction of British town planning practices and policies and regulations that aimed to control, prevent and restrict the movement of the Black population into urban areas (Harrison et al, 2008). Although policies such as the Housing Act of 1920 and the Slums Act of 1934 were racially neutral, they supplemented the racially specific Native Urban Areas Act of 1923 and the Group Areas Act of 1950 (Maharaj and Mpungose 1994 and Harrison et al. 2008). The latter two pieces of legislation were the primary driving forces that enforced racial segregation and racial zoning in South Africa. By controlling the movement and living spaces of the Black, Coloured and Indian race groups, apartheid policies placed particular burdens, separate levels of development and growing inequality between the Black, Coloured and Indian zoned areas whilst the White racially zoned areas benefited from modern planning methods, better services and facilities.

The National Development Plan (NDP) 2030 that was adopted in September 2012 is the primary strategic planning document that drives South African policies, strategies and work programmes at all levels of government. The plan identified nine key challenges and introduced strategic interventions in order to address these. Amongst those included the challenge that South Africa remains a divided society and that interventions are needed in order to reverse the spatial effects of apartheid, to transform society and unite the nation.

This year, 2014 marks a significant phase in the history of South Africa, it marks twenty years into democracy; twenty years of transformation in a post apartheid society. The previous apartheid policies have left a unique, but prominent spatial impact on the South African landscape. Hence this year presents a unique opportunity to investigate how society has evolved over the last twenty years in terms of racial integration. Racial studies are important in a country such as South Africa, where race was historically used as the basis for discrimination, oppression and segregation.

Since the demise of apartheid and the scraping of legislation that enforced segregation, wide spread racial integration did not happen as was expected. Instead, various studies by Horn (2005), Christopher (2001), Durrheim and Dixon (2010) and Parry and van Eeden (2012) have suggested that there has been low levels of racial integration that has taken place. Instead of integration, a new form of segregation can be seen as emerging, one that is dividing society on class and income. The development of gated communities can be seen to promote such segregation (Santiago and Wilder 1991, Morrill 1995, Durrheim and Dixon 2010, Ballard and Jones 2011, Breetzke et al 2014).

Against this background, the purpose of this paper is twofold, firstly to test how much racial integration took place at a local geographic scale over the last twenty years within the KwaDukuza Municipality (KDM), and secondly to determine if there is a correlation between racial integration and income levels that could suggest a transference from race based segregation to class based segregation.

The paper has four sections and starts out by firstly providing a brief literature review of the history and measurement of racial segregation. Secondly, it investigates how racial patterns for KDM have changed over the last twenty years by using the neighbourhood diversity index with data from Census 1996, 2001 and 2011. Thirdly, a Geographic Weighted Regression model is used to determine if there is a correlation between racial integration and levels of income. The paper concludes with a summary of the research contributions and directions for future research.

2   Literature Review

Some of the earliest work on segregation goes as far back as the Chicago school of human ecology which investigated change due to competition between different social groups in the 1920s (Johnston et al 2003, Pacione 2009, Reibel and Regelson 2011). In his Concentric Zone Model, Burgess proposed a series of concentric circles around a central CBD with changing residential patterns from inferior to superior as one moves outwards from the CBD (Farley 1977 and Pacione 2009). Those who were poor lived close to the CBD in the zone of transition which is characterised by run down properties whilst houses and residential areas got better as you moved further from the CBD into areas where the middle and upper class resided (Pacione, 2009). This was a form of social based class segregation (Reibel and Regelson, 2011).

Reibel and Regelson (2011) indicate that all major theories of racial segregation are linked to the mobility of individuals and particular groups. Massey and Denton (1998:282) define racial segregation as "the degree to which two or more groups live separately from one another, in different parts of the urban environment." Friedman (2008) indicates that segregation studies are important as it allows one to determine the amount of previously disadvantaged people that move to better areas in order to benefit from access to better amenities, schools, jobs and other opportunities.

The movement of people from one place of residence to another can be either voluntary or forced (Pacione 2009). Voluntary movement can be due to one of many reasons, including choosing to live in a better quality neighbourhood further away from the central district and travel further to reach work. This implies a certain level of income in order to afford the higher transport and other related costs of living away from the central districts. Reibel and Regelson (2011) support this notion by highlighting that as people become more economically and socially successful, they become more mobile and this influences how segregated or integrated they become. In addition to mobility, Schwirian (1983) indicates that culture and race pose further problems to integration. People of similar ethnicity may choose to live closer to together regardless of their income situation, implying a type of voluntary ethnic segregation or preference (Morrill 1995, Iceland and Wilkes 2006). Forced relocation on the other hand, often results from a series of legislation and regulations aimed at keeping one group away from another.

The history of segregation around the world and in South Africa in particular, have been well documented by the likes of Franklin (1956), Christopher (2001), Crankshaw (2008), Durrheim and Dixon (2010) and Parry and van Eeden (2012) and no doubt many others.

Instances of segregation in the United States started in the early nineteenth century with slavery of the Negroes (Franklin 1956). Negroes were seen as inferior and were denied basic rights and privileges as citizens (Franklin 1956). This segregation saw the development of violent protests around the United States as a means of expressing opposition to the plight of the Negroes (Franklin 1956). The Civil Rights Act of 1964 and Fair Housing Act of 1968 effectively ended racial segregation in America. Blacks, however, remain the most segregated racial group in the USA with Detroit and Atlanta being the most segregated cities.

Racial segregation in South Africa was also enforced by a series of restrictive laws such as the Native Urban Areas Act of 1923, the Group Areas Act of 1950, the Population Registration Act of 1950 and the Black Authorities Act of 1951 (Christopher 2001). These apartheid policies created and governed separate development of employment, education and housing of Blacks in homelands, black townships and informal settlements on the periphery of towns and cities; whilst wealthier white neighbourhoods were found close to the central city area (Crankshaw 2008, Durrheim and Dixon 2010). The apartheid system began to die gradually in the late 1980s with it being officially scrapped in the early 1990s.

Despite the scraping of apartheid, racial segregation remains a reality in South Africa (Durrheim and Dixon 2010). People of the same race still tend to cluster together in space. In their study, Durreheim and Dixon indicated that Whites principally agree to integration, however they acted opposite in practice. Less than 20% of Whites interviewed in the study by Durreheim and Dixon (2010) approved of their close friends or family marrying someone from another race. Another startling example was that although 80% of Whites interviewed agreed that all races should be allowed to attend the same school and share classroom, less than 60% were happy with a child of colour sitting next to their child (Durreheim and Dixon 2010). This difference between the principle support of integration and the opposition to it in practice is known as the "paradox of contemporary racial attitudes or the principle implementation gap" (Durrheim and Dixon 2010:281). Due to this difference between principle and practice, people find new ways to segregate themselves. Johnston et al (2003) suggests that old methods of segregation are replaced by new methods of segregation. Class based segregation is one such measure.

Schwirian (1983) indicates that a change in the current social structure of cities is eminent. Urbanisation and globalisation are eroding traditional family lifestyles. Modern lifestyles are giving rise to a new social form; one that is emerging in terms of social rank and economic status; a society segregated in terms of levels of work, income and social prestige. Pacione

(2009) indicates that although the caste system in India has traditionally been used to determine social positions in Eastern societies; Western societies are influenced by people's social economic status which is largely a measure of their economic spending power. South Africa is no different. Crankshaw (2008) lends support to this argument by indicating that since the scrapping of apartheid, Blacks in South Africa are free to move to or live wherever they want, provided they can afford to. Segregation by class, therefore separates the haves from the have nots, those that can pay from those that can't pay (Santiago and Wilder 1991, Johnston et al 2003, Horn 2005, Freeman 2009).

The South African situation is affected by the development of gated communities which is another source of class based segregation and could be seen as an attempt to resist integration (Christopher 2001). Ballard and Jones (2011) indicate that Eco security estates and gated communities is a major source of class based segregation in the South African context. Since 1994, South Africa has seen a steady increase in the number of gated communities that are being developed in previously white exclusive areas. These are the choice of residence for the new middle and upper class that are moving to these areas with the control of crime being punted as the major reason for change of residence (Ballard and Jones 2011 and Breetzke et al 2014). However another function of these eco security estates and gated communities is to create social exclusion by preventing certain people from gaining access (Roitman et al 2010, Ballard and Jones 2011 and Breetzke et al 2014). With their superior purchasing power, elite Whites and elite members of other racial groups are able to invest in these areas, ensuring a solely upper class social grouping of like individuals in the area. Hence, although there is a mixing of races in these areas, there is social exclusion in that only those that can afford to live in these areas will locate in these areas.

It is only through empirical measurement of racial segregation and integration that we can determine the impact democracy has had in a non racial South Africa, 20 years after apartheid. Racial integration is important in determining how the fabric of society is changing and how racial barriers and stereotypes are broken down. Integration can be defined as "the pool of people of different racial groups in an area" (Maly, 2000: 39). It is through interaction with other racial groups that neighbourhoods and society enjoy a cross pollination from different cultures and ethnicities that ultimately defines the identity and nature of the neighbourhood (Maly 2000).

Massey and Denton (1998) and Horn (2005) indicate that racial segregation can be attributed and measured according to five key dimensions. The first and most important is

evenness, which is the difference in distribution of two or more population groups within census tracts in a city. Integration is at the highest when all areas have equal numbers of each race group. The second dimension, exposure, refers to the extent to which members of two population groups physically confront or interact with each other within common residential areas within a city. The third dimension, concentration, is the amount of physical space occupied by a particular population group. The fourth dimension, centralisation, is the degree to which members of a particular group are spatially located near to the city centre. Clustering is the fifth dimension and is the extent to which census tracts occupied by a specific population group adjoin one another. High clustering means that there is a racial or ethnic enclave of that particular racial group whilst low clustering implies that the group is spatially scattered.

Many indices have been developed over the years that have been used to measure racial segregation and integration. Table 1 provides a summary of the different indices that have been proposed in previous literature according to the various dimensions mentioned above (adapted from Massey and Denton 1988).

Table 1: Summary of Indices used in racial studies

Dimension of segregation	Measures/indicators used
Evenness	Index of dissimilarity
	Gini Index
	Entropy Index
	Atkinson Index
	Neighbourhood Diversity Index[*]
*Measures racial integration	
Exposure	Interaction index
	Isolation index
	Correlation ratio
Concentration	Delta Index
	Absolute concentration index
	Relative concentration index
Centralisation	Proportion in central city
	Absolute centralisation index
	Relative centralisation index
Clustering	Absolute clustering index
	Spatial proximity index
	Relative clustering index
	Distance decay isolation index
	Distance decay interaction index

According to Cortese et al. (1976), Massey and Denton (1988), Christopher (2001), Forest (2005), and Horn (2005), the index of dissimilarity has served as a standard measure of racial segregation over time and across racial integration studies. The index of dissimilarity is a measure of evenness and was proposed by Duncan and Duncan in 1955. The index compares the residential patterns between two racial groups, for example blacks and whites. It gives a measure of how much a percentage of one racial group will need to relocate in order for there to be an equal and even distribution.

The index of dissimilarity became the most common measure of segregation due to the advantages of being simple enough to understand, and easy to calculate and interpret the results (Massey and Denton 1998, Forest 2005). However the index has been criticised since 1976 with the major disadvantages being that it is a global statistic and only measures segregation between two racial groups at a time (Massey and Denton 1988, Horn 2005, Freeman 2009). Another disadvantage of the dissimilarity index and other measures of evenness is that they ignore the geographical distribution and clustering of people in order to arrive a simple overall even distribution index (Cortese et al 1976).

Given the multiracial composition of South Africa, the index of dissimilarity may not be the best index to use for measuring racial integration across all groups. Massey and Denton (1988), Iceland (2004), Forest (2005), and Freeman (2009) suggest the use of the entropy index for studies involving multiple groups. The entropy index, also known as Theil's H or the Information Theory Index, was introduced by Henri Theil in 1972 and is also a measure of evenness that assesses how evenly different groups are distributed across a certain spatial area (Iceland 2004).

The basic premise of the entropy index is to compare the distribution of the racial groups within census tracts with the distribution of population within the city as a bigger entity. In order to measure residential patterns according to the entropy index, one needs to first define the larger area and its smaller parts (Iceland 2004). The entropy index can also be interpreted as the difference between the diversity of the system and the average weighted diversity of the individual unit expressed as a fraction of the total diversity of the system.

The advantage of the entropy index is that it allows for the calculation of segregation across multiple race groups. However the disadvantage is that it assumes an equal distribution of all racial groups across the geographical area (Maly 2000). This is problematic in a country like South Africa were the Black race group dominates with 79% of the population, and the

remaining three racial groups make up the balance of the population. This makes it extremely difficult to get an even measure of distribution in all places (25% all around) as the available population of the other three racial groups that can be distributed is just not big enough to ensure even distribution (Maly 2000).

As a result of the above, Maly (2000) proposed the Neighbourhood Diversity index as an alternative to the entropy index. The Neighbourhood Diversity index assumes that integration at lower levels is influenced by the context and history of the larger area. Hence the index is based on the population of different groups found at a low geographic level compared to those found at the higher geographic level.

The advantage of this index is that it considers integration in the local context. It is extremely useful when comparing integration within individual city levels, however, as it depends on the population of low level spatial units in relation to the population of the bigger city unit, it will not be comparable across cities as each cities population proportions are different (Maly 2000).

Maly (2000) indicates that in addition to overcoming the shortcoming of earlier indices such as the index of similarity and the entropy index, the neighbourhood diversity index also makes it possible to identify differences in class composition and is most useful in comparing racial change within suburbs in one particular city. However, the disadvantage is that it is a relatively new index and academics have been slow to adopt it and prefer to use the earlier indices as it allows for the comparisons with earlier studies. The neighbourhood diversity index is also not comparable between cities as it is calculated relative to a particular city (Maly 2000).

3 Study methodology

This study will focus on the KwaDukuza Municipality, the dominant district node and commercial hub of the Ilembe District Municipality (Figure 1). KDM is one of the fastest growing areas in the country, prompting the Premier of KwaZulu Natal (KZN) to state that the area is developing into the new metro pole in KZN (KDM, 2007). KDM is strategically located on the north coast of KwaZulu Natal, bordering on the eThekwini municipality and forms part of the N2 corridor that links Durban with Richard's Bay (KDM, 2007). The strategic location is enhanced by the municipality's location between the harbour ports of Durban and Richard's Bay, as well as its very close proximately to the King Shaka International Airport and the Dube Trade port.

The municipality contains the towns of Ballito, Shakaskraal, Groutville, KwaDukuza (formerly Stanger) and Darnall and has places of strong historical, cultural and tourism links.

KDM contains a number of eco security estates and gated communities referred to by Christopher (2001) and Ballard and Jones (2011). These include the likes of Princess Grant, Royal Palm Estates, Simbithi Eco Estate and the Zimbali Coastal Resort.
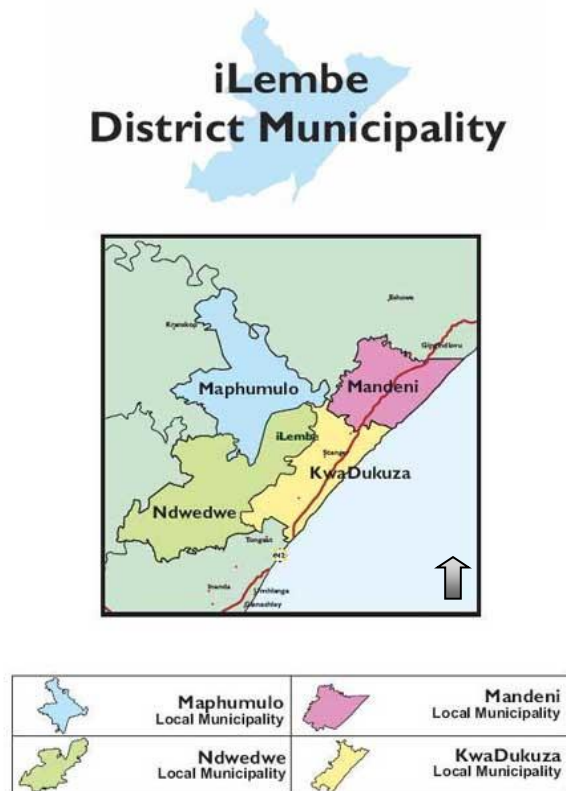

Figure 1: Locality map of Ilembe District Municipality showing local municipalities

3.1.   KDM demarcation and boundary changes

Friedman (2008) pointed to the difficulty that changing boundaries pose to studies of racial integration over time.   KDM is no exception.   In work on racial segregation and neighbourhood racial integration in metropolitan American, Friedman (2008) highlighted the importance of using standardised geographical boundaries in order to make comparisons over time.

This study standardised on the 2011 KDM boundary. Census tracts that fit the 2011 KDM boundary were selected. Enumerator Areas (EAs) form the lowest census geographical unit. Using GIS, these EA's were superimposed over the 2011 KDM boundary. An intersect query was run and those 1996 EA's that fell completely within the 2011 KDM boundary were selected for the study. Those EA's that intersected two or more municipal boundaries were then subject to an area calculation. From the area calculation, those EA's that had 85% of their area within the KDM were added to the selection of EA's suitable for the study. Those EA's that had between 50% and 85% of their area falling within the KDM boundary was then inspected visually using aerial photography and the Eskom Spot Building Count. Those EA's which had 75% or more structures being found within the KDM boundary was selected and added to those EA's that were suitable for the study. All EA's with less than 50% area and less than 75% structures present within the KDM boundary were excluded. As a result of this process spatial boundaries and data were aggregated in such a manner that it is suitable to allow for a comparison of census information over time.

For Census 1996, EA's were the lowest geographical unit at which results were disseminated. However, due to the confidentiality clause in the Statistics Act of 1999, it was no longer possible to disseminate results are an EA level for subsequent censuses. In order to disseminate results at a low geographical unit, a Small Area Layer (SAL) was created. The SAL was a combination of one or more EA that were aggregated in such a way to ensure respondent confidentiality. The same methodology described above was used to aggregate the Census 2001 SAL's and the placenames for Census 1996 and 2001 to the 2011 KDM boundary.

3.2.   Data sources and analytical methods

The main data sources used for the study will be population race group and individual monthly income data extracted at EA level for Census 1996, and at SAL level for Census 2001 and Census 2011. Two different data analysis methods were used in this study. Firstly the

Neighbourhood Diversity Index made use of the population data as an input to calculating racial integration. Secondly, a Geographic Weighted Regression (GWR) used income data to determine the relationship between racial integration and different income classes.

3.3. Neighbourhood Diversity Index

Because this study is concerned with geographic units within one municipality only, the neighbourhood diversity index was an appropriate index to apply in measuring racial integration. The formula is stated as follows:

$$ND = \frac{1}{2}(|C_w - T_w| + |C_b - T_b| + |C_c - T_c| + |C_a - T_a|)$$ Equation: 1

Where: C is the racial percentage of the city;

T is the racial percentage of the census unit;

w represents White population

b represents Black population

c represents Coloured population

a represents Asian population

| | imply an absolute value notation (all minus signs are dropped and the absolute positive value is retained, e.g. |3-7| = 4).

The results of the ND index will be mapped thematically in order to show patterns and trends in racial integration within KDM over the three time periods.

3.4. Geographic Weighted Regression

When aiming to distinguish between different social classes, scholars have used a variety of combinations of indicators such as income, education, occupation and employment (Farley 1977, Schwirian 1983, Santiago and Wilder 1991, Morrill 1995, Iceland and Wilkes 2006, Freeman 2009). As income is the common indicator across most class based studies, this study will make use of individual monthly income as a way to measure class.

To determine the relationship between racial integration and individual monthly income, a GWR model was used. GWR was chosen as it is a local model and performs a regression for each feature in the dataset. The results from the ND index was used as the dependent variable whilst the percentage individuals per income category was used as the independent variable in the GWR model. The output of the GWR model is a R^2 value that ranges from 0 – 1. R^2 values that are close to 1 imply a positive relationship between the two variables and that that an increase in the independent variable will result in an increase in the dependent variable.

3.5.   Data interpretation and results classification

Maly (2000) identified three categories of integration, namely; integrated, moderately integrated and segregated. These categories were based on the median as base as it was seen to reflect a good unit of central tendency and reflects the overall environment without being influenced by outliers or anomalies (Maly 2000). If the results of the ND Index are sorted in ascending order, those areas that had 0-25% less than the median were considered integrated, those between 26% - 50% of the median was considered moderately integrated whilst those areas above the median was considered as segregated (Maly 2000). Due to the last category, segregated being very large, the category was expanded in this study to include two categories of segregated; this being moderately segregated (51% - 75% of the median) and segregated (76% - 100% of median). Although this classification presents similar results as the three category classification, there is a distinct split between the segregated and moderately segregated areas.

With regards to income, Freeman (2009) used four categories of income (poor, working class, middle class and affluent) as determined in relation to the poverty line. The poverty line is a measuring point to separate the poor from the non poor (World Bank 2011). In the study by Freeman (2009), poor was defined as all households earning below the poverty line, whilst working class was people with an income above the poverty line but less than two times the poverty line amount. Those people earning between two times the poverty line and three times the poverty line amount were regarded as middle class, whilst all those earning more than three times the poverty line was regarded as affluent (Freeman 2009).

The upper poverty line for 2011 in South Africa was R620 (Statistics South Africa 2014). In terms of the income classification suggested by Freeman (2009), all those earning below R620 can be regarded as poor. Those earning between R620 and R1240 are the working class whilst those earning between R1240 and R1860 can be regarded as the middle class. The affluent can then be regarded as those earning over R1860 per month. However, given

the huge income disparities that exist, income distribution in South Africa does not follow a linear pattern but rather an exponential one. Therefore, using such a liner based classification as suggested by Freeman will not be a true reflection of income based classes in South Africa.

Although there is a lack of consensus on how to split up income categories into different classes, economic literature suggests that those individuals earning a per capita income of between R1400 and R10 000 per month (based on 2008 prices) can be regarded as middle class (Visagie 2013). Assuming a 15% year on year increase from 2008 to 2011 the above can be adjusted and rounded off to define the South African middle class as those individuals with per capita incomes between R2500 to R17000 (assumed adjustment to 2011 prices).

Using Freeman's classification terms with the adapted definition of middle class according to Visagie, the closest Census 2011 income categories were aggregated as follows into; Poor (R1 – R800), Working class (R801 – R3200), Middle class (3201 – R25600), and Affluent (R25601 and more).

4   Results

4.1.   KDM Population Changes between 1996, 2001 and 2011

The population of KDM has increased steadily from 1996 – 2011. Table 1 provides a breakdown of the population growth trends as per the three Census periods.

Table 2: KDM Population 1996, 2001, 2011

KDM Pop	Black	White	Indian	Coloured	Unspecified	Total
1996	98732	6759	36410	1315	1744	144960
2001	124443	7820	33001	1835	N/A	167099
2011	182282	12876	32528	2207	1273	231166
KDM Pop	% Black	% White	% Indian	% Coloured	% Unspecified	Total
1996	68.1	4.7	25.1	0.9	1.2	100
2001	74.5	4.7	19.7	1.1	N/A	100
2011	78.8	5.6	14.1	1.0	0.5	100

The population of KDM has grown 37% from 1996 to 2011 with the majority of growth occurring within the Black race group. The Black population grew approximately 20% from 1996 to 2001 and then by a further 31% over the ten years from 2001 to 2011. However, the biggest percentage growth occurred amongst the White and Coloured population, which has grown by a significantly larger 47.5% and 40% from 1996 to 2011 respectively. The removal of apartheid legislation and the dawn of democracy have seen an increase in interracial relationships and marriages. This could be a possible reason for the 40% increase in the Coloured or mixed race population from 1996 to 2011. As racial tolerance increases, the Coloured population could be expected to increase in significant proportions compared to the other racial groups.

Another notable trend is the drop in the Indian population over the years. KDM has historically been associated with indentured Indians who worked in the sugar cane fields. Over time and partly due to the restrictive legislation that curtailed movement of people of colour, a large number of their descendants have also settled in the area. However post 1994, a large number of young Indians have been moving out of KDM to the bigger cities such as eThekwini, Johannesburg, Tshwane and Cape Town in order to further their education or seek better employment and income opportunities.

4.2.   Calculating the Neighbourhood Diversity Index 1996 - 2011

The year 1996 marked 2 years into the dawn of democracy in the new South Africa. Racial integration within KDM as depicted using the neighbourhood diversity (ND) index for 1996

at EA level is shown in Figure 2. The majority of the segregated areas in 1996 remained in the former TLC areas. These areas contained suburbs that were directly impacted by the apartheid planning policies of separate development and separate living areas. Being two years into the dawn of democracy, society may still have been adapting to the idea of a multiracial society and hence this could explain the existence of highly segregated areas within the TLC boundaries. In 1996, 215 or 76% of all EA's contained one dominant population group that contributed 70% or more to the total population of that particular EA tract.

Those EA's that do show signs of integration are found immediately outside the TLC boundary and borders on the segregated areas. These integrated areas are the agricultural farming areas of the municipality. Farm owners at the time had farm compounds where accommodation for the farm labours was provided. Most of the farms are owned by White or Indian families and employ a mixture of Indian and Black labour, hence these show higher integration levels.
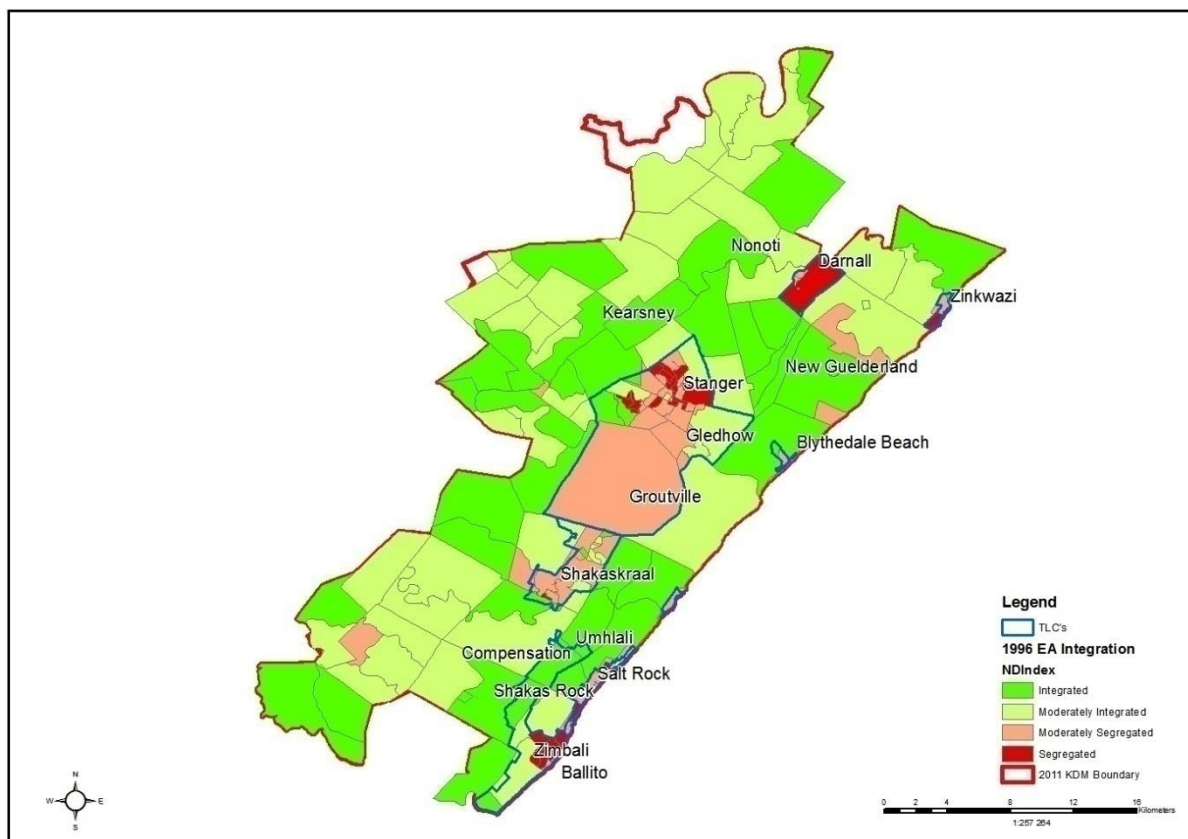

Figure 2: 1996 KDM EA Racial Integration Status using ND Index

For Census 2001 and 2011, information was disseminated at a small area layer level. Figure 3 represents the ND index calculated from the 2001 Census for the SAL.

The map presents slight but significant changes compared to 1996. Signs of integration are present around the Shakaskraal, Groutville areas as well as the northern parts of Stanger. Darnall is now represented as integrated, whereas it was segregated in 1996. Zinkwazi is slightly less segregated as it was in 1996, however Princess Grant (immediately northeast of Blythedale Beach has become more segregated. This is one of the many golf security estates that have arisen in KDM over the last 20 years. Areas occupied by other estates most notably are around the Ballito, Zimbali, and Salt Rock areas and they also show signs of increased segregation, confirming the notion by Ballard and Jones (2011) that security estates and gated communities contribute to social exclusion and class based segregation.

There is the emergence of a cluster of integrated areas that surround the segregated areas near Ballito, places such as Sheffield Beach, Umhali, and Shakas Rock. Due to these areas being slightly inland and thereby not having access to sea views, property prices are cheaper which makes them affordable and accessible to a bigger market of people, whilst the properties along the coast demand high prices due to the sea views and remain within the affordability of the elite only. The farms surrounding the former TLC areas still retain much of their integrated status from 1996, whilst the deep rural areas of Dabeka, Ohlange and Sokesimborne found towards the northern boundary of KDM consists of SAL's that contain 100% black population hence is considered segregated.
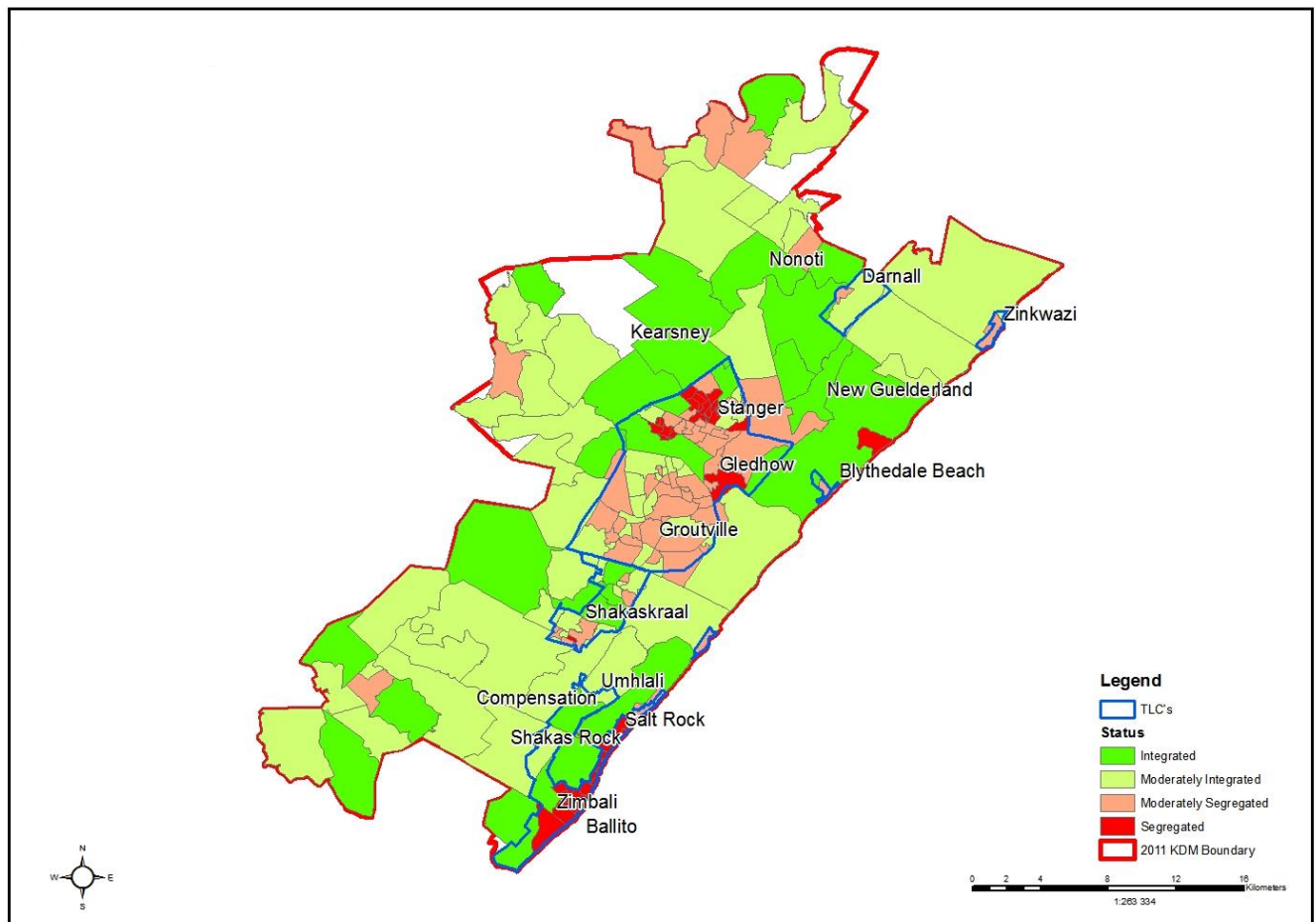
Figure 3: 2001 KDM SAL Racial Integration using ND Index

The ND index for 2011 as shown in Figure 4 paints a sad picture for democracy and the ideals of a racially integrated society. As is evident, KDM is much more segregated in 2011 than in 1996 and 2011, implying that 17 years after democracy areas at a SAL scale within KDM have become increasingly segregated as opposed to integrated.

The Ballito, Zimbali and Salt Rock areas remains amongst the most highly segregated area whilst the previously integrated neighbouring area near Shakas Rock and Umhlali have also become segregated. This could be due to the rapid increase in the number of security and eco estates in that part of the municipality that could have pushed up the property prices. Figure 4 validates the above by displaying the spatial locations of these gated communities. Other coastal areas such as Tinely Manor Beach, Blythedale Beach and Zinkwazi have also become highly segregated. As with the other coastal areas, the property values in these areas have also made these areas accessible only to a certain elite.
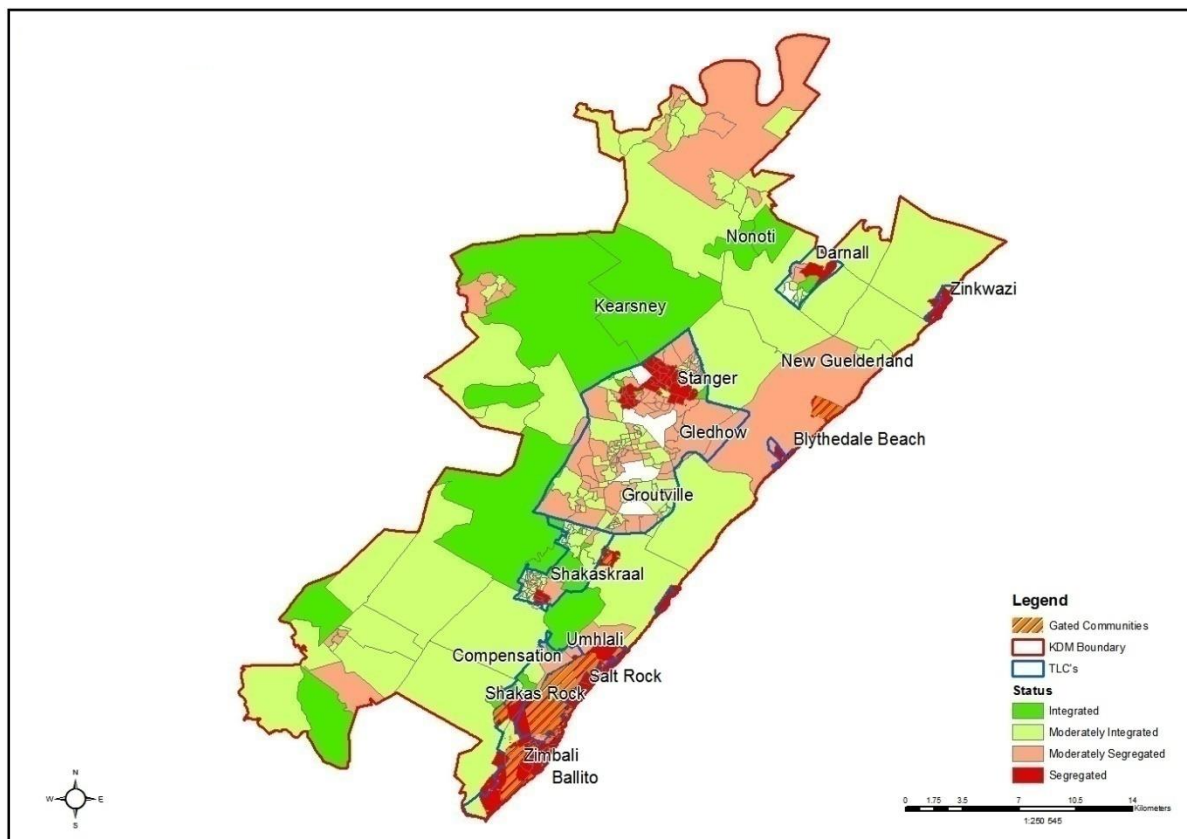
Figure 4: 2011 KDM SAL Racial Integration using ND index

Other major changes are noted within the former Stanger TLC where SALs have become more segregated and those that were integrated have moved into moderately integrated. The SALs around Groutville remain mostly segregated interspersed with patches of integrated SALs. Although the agricultural areas adjacent to the TLC are still integrated, most have moved from integrated to moderately integrated. The deep rural areas towards the northern boundary are showing increasing signs of segregation with the Indian population in the area dropping from 6% to just over 1% whilst the White population was a mere 1% in 2001 and 0.6% in 2011. This implies that minority race groups are moving out of the area to other areas.   The SAL between New Guelderland, Blythedale Beach and bordering the former Stanger TLC has seen a drop in the Black population from 75% in 2001 to 44% in 2011. In a similar fashion it has seen an increase in the Indian population from 25% in 2001 to 55% in 2011. This change in racial percentages contrasts from the racial average, hence the SAL has now changed from integrated in 2001 to moderately segregated in 2011.

4.3.   The relationship between racial integration and income

The income related questions however have traditionally been amongst the worst responded to questions across censuses. Most respondents are reluctant to accurately answer these questions and either under state their income or indicate no income on the census questionnaire. Within KDM, 38% of the population indicated that they had no income. However, in the absence of other low level income datasets, the census dataset still remains the best to use for low level income calculations.

As evident in Figure 5, the highest percentage of affluent individuals within KDM are found along the coastal areas, particularly around the Ballito, Zimbali, Shaka's Rock, Salt Rock area. Other correlations are found in the Royal Palm Estates near Shakaskraal and Princes Grant just north of Blythedale Beach. Blythedale Beach and Zinkwazi also have fairly high percentages of affluent individuals. This corresponds to the segregated coastal areas in Figure 5.   However the noteworthy exclusions occur in the inland areas which are segregated as a result of them being occupied by extremely high percentages of either Black or Indian populations.   The segregated coastal and affluent areas are predominately occupied by a high percentage of the White population.

In order to understand and determine the relationship between income and racial integration a Geographic Weighted Regression (GWR) model was run. When a GWR was run using the ND index as the dependant variable and percentage affluent individuals as the independent variable the resultant R2 value was 0.60. This means that there is a fairly positive relationship between the two variables. The percentage of affluent individuals, therefore predicts 60% of the ND index, and when the percentage of affluent individuals increase, the ND Index can be expected increase as well which implies increased segregation. Figure 6 shows the GWR intercept between the ND index and percentage affluent individuals for KDM. The map indicates that in the yellow to red areas, the percentage of affluent individuals is a good predictor and plays a greater role in influencing segregation in these areas. This follows a similar pattern of segregation as depicted by Figure 4. In the blue areas, the percentage of affluent individuals does not play a significant role in segregation.
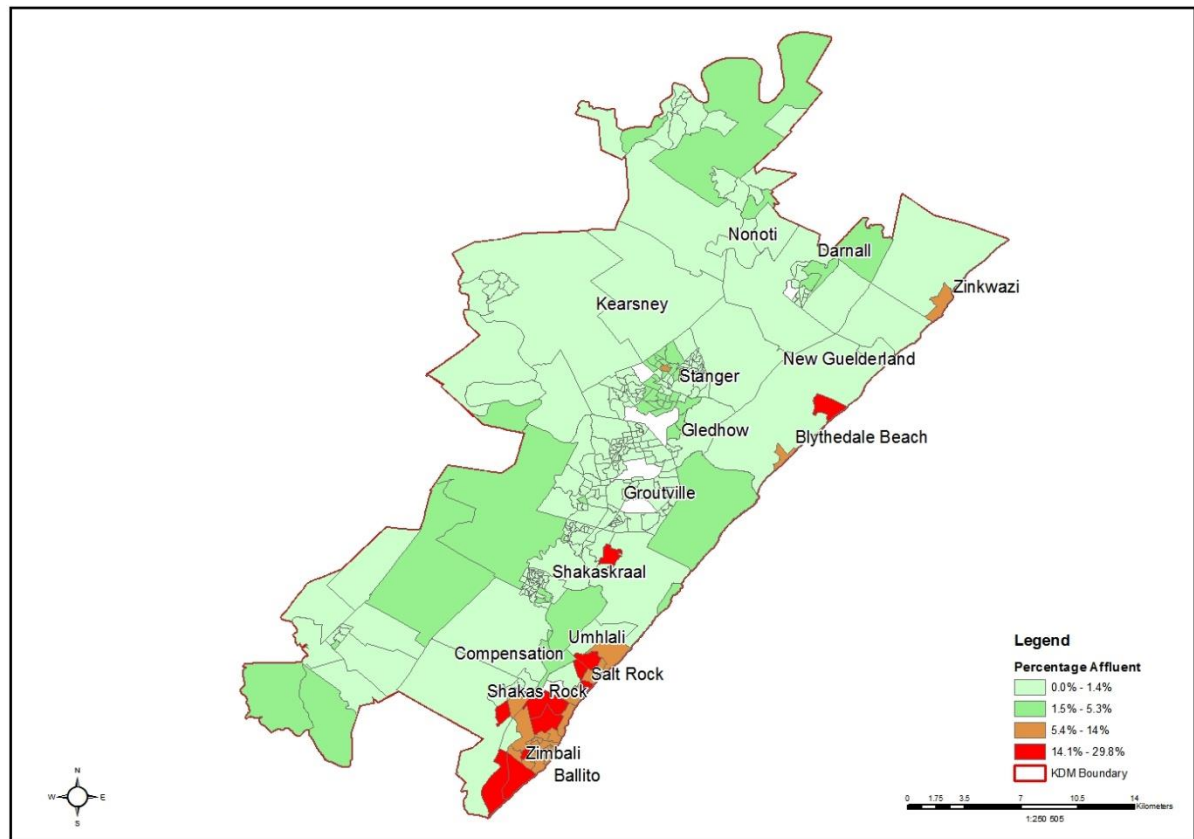
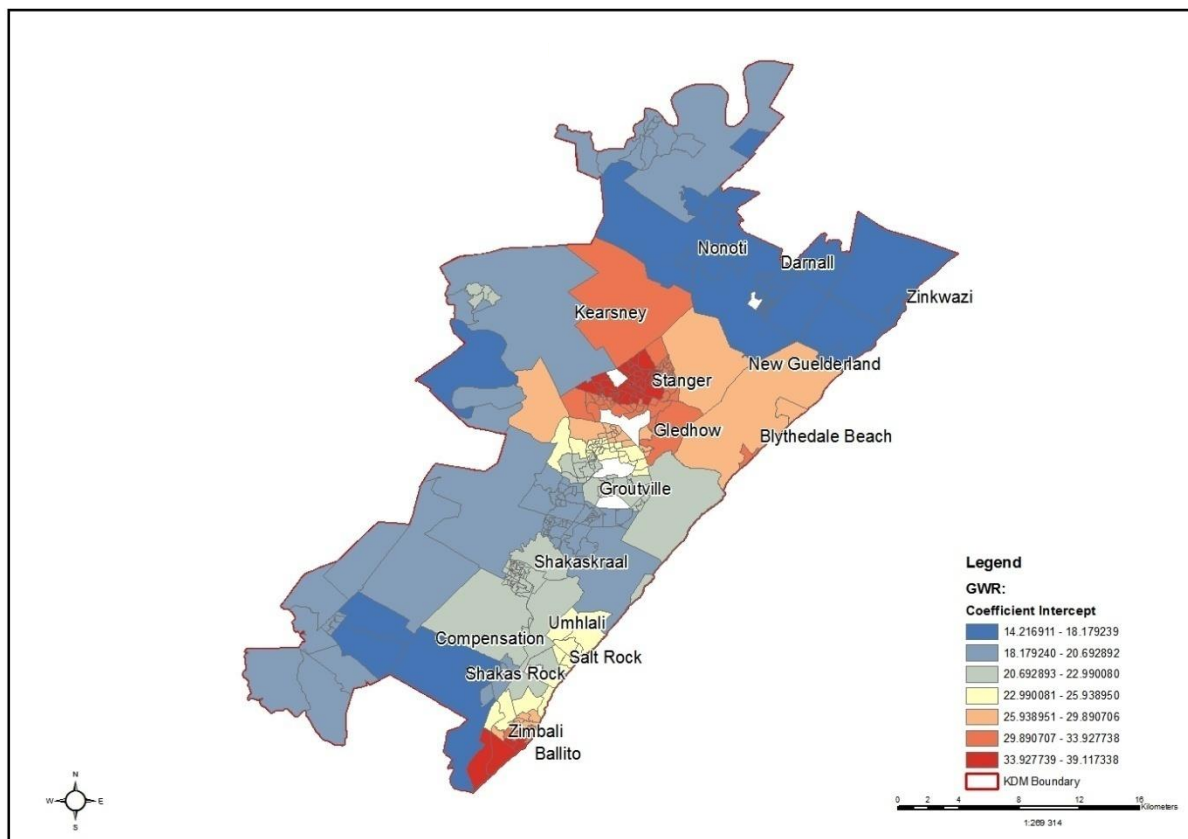**Figure 5: Percentage Affluent Individuals in KDM per SAL – 2011**

Figure 6: GWR Coefficient of ND Index and Percentage Affluent Individuals for KDM at SAL Level, 2011

As mentioned, earlier the income question is generally not well answered in the census questionnaire and people are reluctant to state their correct income, often understating the income earned. This could explain why the model under predicts in the areas surround Ballito. An evaluation of the GWR between the ND Index and the percentage of middle class individuals saw an increase in the R2 value to 0.66. This presents a stronger positive correlation than the earlier GWR with a percentage of affluent individuals.   Figure 7 presents the GWR intercept between the ND index and the percentage of middle class individuals. As per earlier explanation, the red areas are where the percentage of middle class individuals explain more of the ND index (level of segregation) whilst the blue areas is where the percentage of middle class individuals explain less of the ND index in those areas.
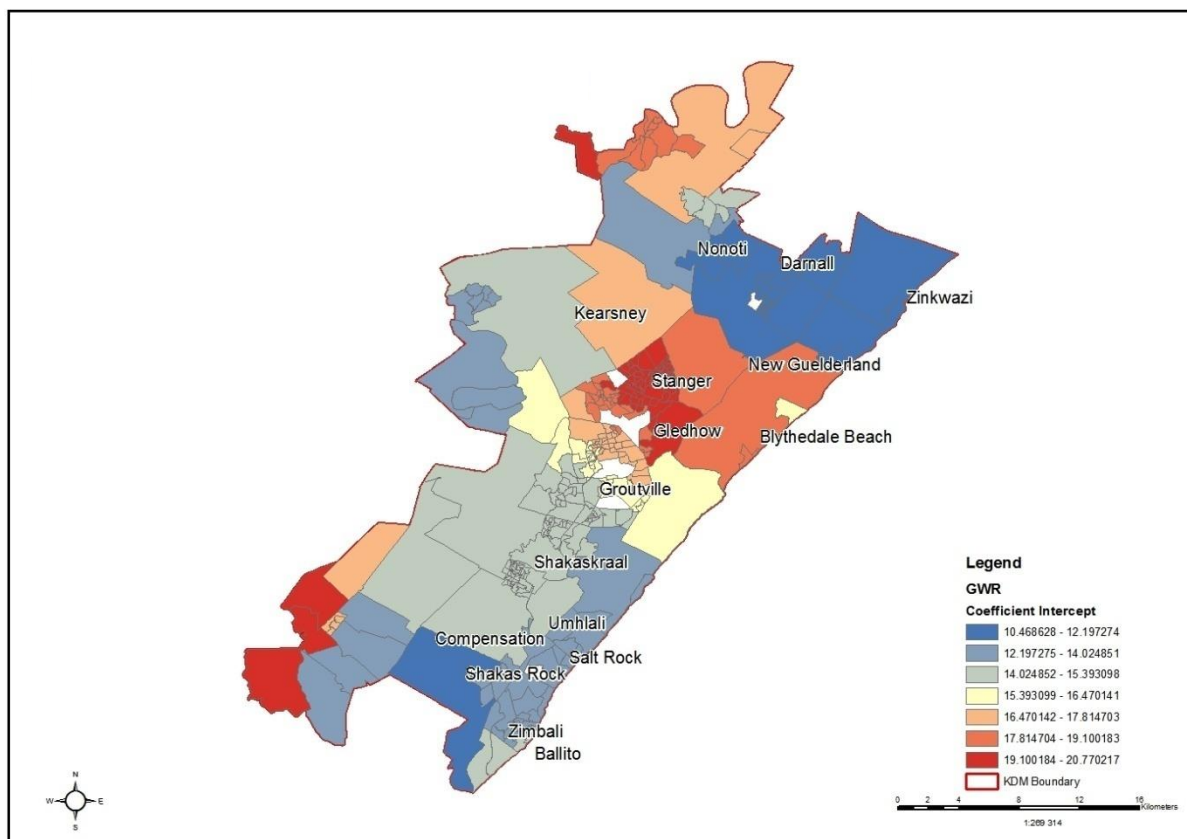

Figure 7: GWR Coefficient of ND Index and Percentage Middle Class Individuals for KDM at SAL level, 2011

The GWR with the percentage poor was mapped in Figure 8, since the results for the R2 was 0.69 which means that there is positive relationship between the ND Index and percentage poor individuals[1]. However, due to the sensitivity of the income question, it is likely that a

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[1] GWR's were also done for the percentage working class, percentage poor and percentage of those earning no income. For the percentage working class, the R2 value was 0.53, for the percentage classified as poor, the R2 was 0.69 and for the percentage of those earning no income it was 0.45. This means that individual monthly income is ineffective in explaining racial segregation and integration amongst the working class and those earning no income. For this reason it was not mapped further.

large number of individuals would have underestimated their income and recorded it as poor. This could be reason for the percentage of people having such a huge significance on the ND index in the areas near Ballito, Princes Grant, and Stanger. In the outlying areas along the northern and southwestern boundaries of the municipality the percentage of poor people provides little explanation for segregation in these areas. These areas have a high percentage of black population who remain locked into pockets of segregation.
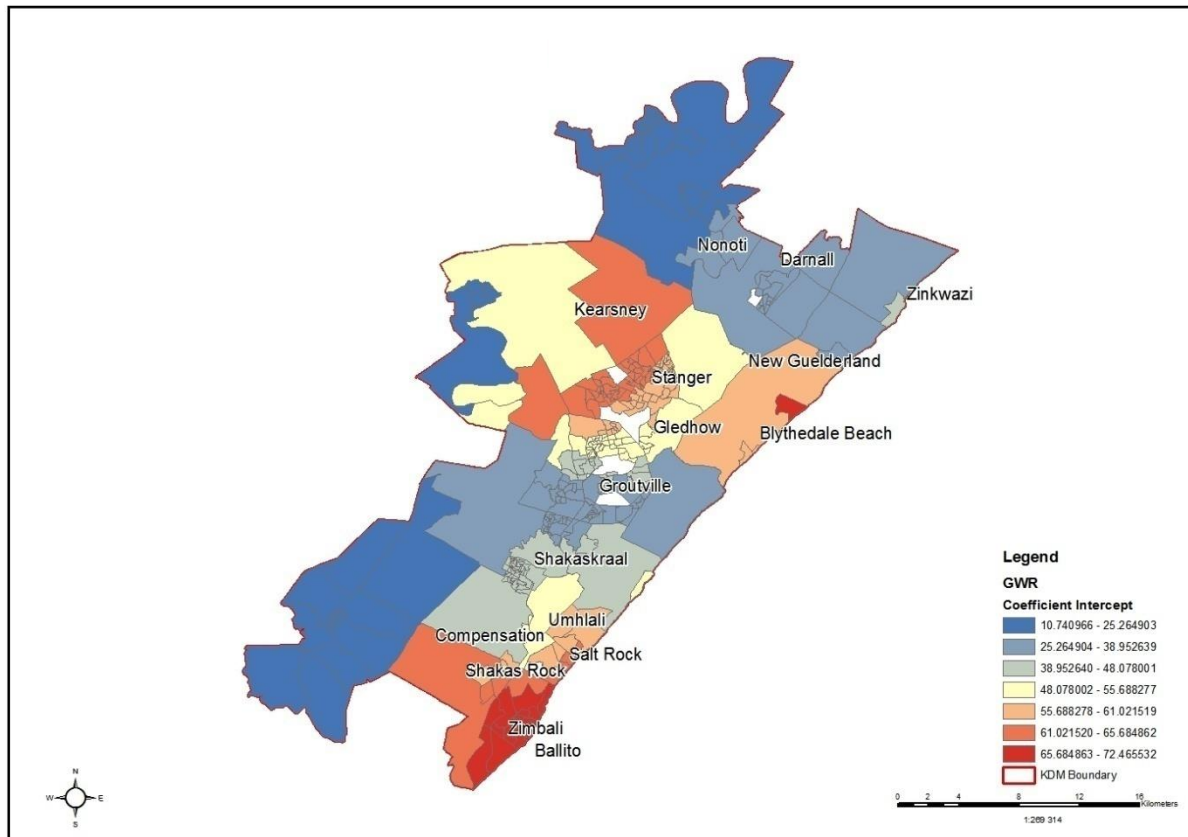

Figure 8: GWR coefficient of Percentage Poor Individuals and ND Index within KDM at SAL level, 2011.

The GWR models do prove that there is indeed a significant relationship between racial integration and lower and upper income levels at a small area level.

5   Conclusion

The dawn of democracy in South Africa in 1994 ushered in a new era of change with the promise of a non racial, non discriminatory society. This study had two main aims. The first was to determine how much racial integration took place over the last twenty years, with the KwaDukuza Municipality (KDM) being used as the case study. The second was to determine if there is a relationship between racial integration and income levels. In accomplishing these aims, this study makes some important contributions to existing literature on the subjects of racial integration, racial segregation and class based segregation.

The study found that in a country where one population group dominates the total population with over 70%, an expectation of evenness amongst all racial groups per census tract become unrealistic. As a result of this, the neighbourhood diversity index can be considered a viable alternative to the historic indices of dissimilarity and entropy, as it considers the racial composition of each census tract in relation to the municipal racial composition.

The literature also suggests that society will be segregated along various different forms as people with similar characteristics will tend to stick together. The removal of apartheid legislation therefore means that people can no longer be legally segregated along racial lines, however, there may be a possible transference from racially based segregation to a class based segregation in terms of affordability and income that is becoming the new defining feature that is segregating South African society. Hence, although the big walls of apartheid have fallen down, new barriers or fences of segregation along income or class lines have risen.

The findings of this study confirm to suggestions in existing literature that low levels of racial integration have taken place at a small area level within KDM, particularly in the agricultural and small holding areas which are also the areas immediately bordering the former TLC areas. However the coastal areas of the municipality which are also home to numerous eco and security estates have become increasingly segregated over the last 20 years. As a result KDM as a whole remains largely segregated despite 20 years of democracy.

This study is perhaps the first study that specially tries to correlate racial integration as measured with the ND index with income levels. Although this is done within the context of KDM, the fact that this it is perhaps the first of its kind makes it quite significant. The GWR

models that were run showed a moderate positive relation between the ND index and affluent, middle and poor individuals at a SAL.

This study highlights that the politicians, decision makers, town and social planners still face a long and socially demanding challenge in implementing policies and programmes that aim to target the integration challenges as posed by the NDP. Class based segregation has created major sociocultural and economic implications at a local level. Those within the upper income residential areas will attract economic and developments due to their higher spending power. There is therefore still a long way to go in redressing past imbalances and promoting integration by breaking down the current fences of class based segregation.

5.1.   Limitations of the study

As this study uses the ND index in measuring racial integration, it is not possible to compare the results of this study with other places in different cities or municipalities. This is because the ND index is calculated relative to a particular municipality and population profiles vary across municipalities. The historical background of KDM that has influenced by apartheid and later by the different TLC has given rise to unique racial spatial patterns. These patterns may also influence the results and hence make them different from patterns found in other municipalities.

Another limitation of this study is that it is totally dependant on census information. There is always some measure of under reporting for censuses as people refuse to answer the questionnaire. Those that do fill the questionnaire may also choose either not to answer certain questions or to answer them incorrectly. The income question is one example, were underreporting is common. These lead to data inaccuracies. However, in the absence of any other official datasets, the census still remains the best source of data low level population and income data.

The income categories from the 2011 census were also too broad to provide accurate calculations of class categories. As a result the closest available income sub category was chosen. Similarly, this study was also totally dependent on the census boundary demarcation. The study may have resulted in different results, had demarcation been done differently.

5.2. Recommendations for future research

As income is generally one of the worst answered questions in the Census questionnaire, it is recommended that future studies use other variables to compliment income as measures of class. These could include highest education level, housing prices, occupation, etc. This may result in higher R2 values implying a stronger relationship with racial integration and class segregation.

In addition to studying other variables, consideration should also be given to conducting qualitative research in order to determine why people could be reluctant to move or integrate with others. This would provide personal input such a family home, sense of belonging and community involvement, which cannot be gained by quantitative research.

As this study focused on KDM only, it will be worthwhile to repeat this study in other municipalities in order to determine if results found in this study can be generalised and applied to other areas. It would also be useful to repeat this study using the entropy index to see how the results of this study will compare to the results of entropy index.

Low level migration data has not yet been released for Census 2011. Once available, migration data for KDM should be interrogated at a SAL level to see if migration patterns of those people that are moving into segregated coastal areas. This can provide further evidence that supports finding that racial segregation is now leading to class based segregation.

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