

## **Economic Development, Technological Change and Growth**

### **Application of the Multi- Dimensional Regional Economic Development Index (MREDI) in the Metropolitan Regions of South Africa**

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**Abstract:** Over the last few decades, global growth and development have been driven by highly urbanised regions. This has made the research field of regional economic development of major importance within the research field of development economics. The quantification of the progress in regional economic development has been attempted by many researchers. Previous attempts to measure regional economic development have made use of single and limited composite indices, such as the Human Development Index (HDI). These indices are limited in extent, failing to capture important aspects of development, and therefore a gap for the formulation of a comprehensive regional economic development index exists. The primary objective of this study was therefore to apply the multi-dimensional regional development index (MREDI) in South Africa from 1997 to 2017. The research design methodology included a comprehensive literature review and the use of secondary data obtained from Global Insight. The index was applied to all eight metropolitan regions in South Africa. The findings indicate that metropolitan regions are at different stages of development, while development also occurs at a different pace across regions. The results provide economic development practitioners with detailed insight of the socio-economic strengths and weaknesses of the metros in South Africa and where interventions are required. The implications of this alternative index are that it could be utilised as a tool for the analysis and measurement of global regional efforts, as well as to compare different economic regions vis-à-vis their level of economic development.

**Keywords:** Metropolitan region; multi-dimensional index; regional development; South Africa

**JEL Classification:** O10; O21; R58

### **1. Introduction**

Over the past decade, the importance that policymakers, academics and key stakeholders have ascribed to regional development has increased profoundly

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(Jovovic, 2017, p. 259). An increasing awareness has emerged that regional development is a leading driver of national and international progress (Feldman & Lowe, 2017, p. 37). This has been primarily ascribed to an increasing globalised world where countries and their state organs have continuously struggled to maintain national and local identities. Increasing international cooperation, trade and the dismantling of various geographic boundaries, although thought to bring with it various benefits such as increased competitiveness and an influx of information, have nonetheless imposed a myriad of implications for countries and their development endeavours (Rodrik, 2018, p. 9). No more so has this been true than for countries in the earliest and middle stages of their own economic and social progress (Siddiqui, 2017, p. 521). The forces of globalisation in this regard have led to many challenges, including extensive technological production practices, widespread inequalities, continuously changing economic structures and the concentration of resources to specific regions that all have seen many societies become increasingly vulnerable to economic marginalisation (Bogović & Čegar, 2015, p. 63).

While it is naïve to assert that globalisation has only impeded these countries' developmental progress, the rise of the geographic significance in economic activity across the globe has nonetheless been in stark contrast to the notion that globalisation has brought with it a borderless and more integrated world (Ascani et al., 2012, p. 5). From this perspective, globalised international integration has ironically acted as a driver that has reasserted the modern significance of local and regional prosperity towards the achievement of national and global developmental objectives (Kahika , Karyeija, 2017, p. 13). Evidence ascribing to this feat can be seen worldwide where dense regional agglomerations of economic activity have acted as major sources of both economic and social wellbeing (Mohanty & Mishra, 2014, p. 237). The UN-Habitat (2016, p. 1) particularly points to the emergence of major city-regions in the last two decades with development comprising a complex set of internal structures, including the creation of multiple urban cores, innovation-driven processes, and a range of interconnected economic activity associated with highly efficient practices and satisfactory standards of living.

The reinforced recognition regarding the significance of regional and local development and its associated multidimensionality has, however, meant that the measurement of these processes and the subsequent analyses thereof have become intrinsically complex (Paradowska, 2017, p. 19). Nevertheless, assessing the progress that countries and regions have made in this regard remains imperative towards improving the socio-economic environment in any society (Meyer , de Jongh, 2018, p. 97). Given the holistic nature of these processes, attempts at providing an accurate quantifiable picture on regional and local development have seen the emergence of the use of a range of composite and multi-dimensional indices and movement away from historically applied single denominators. Composite indicators such as the Human Development Index (HDI) and Weighted Index of

Social Indicators (WISP) all resemble attempts to provide a comprehensive picture of the nature of development, but none have fully encompassed the necessary holistic framework that truly depicts the development process (Greyling & Tregenna, 2017, p. 890). Based on these limitations, this study seeks to add the underlining knowledge on the quantification of regional development.

In doing so, the study applies and further tests the composite multi-dimensional regional development index known as MREDI, developed by Meyer et al. (2016) and Meyer and de Jongh (2018) with the purpose of measuring and assessing the regional development progress made within the eight metropolitan regions in South Africa since the country's transition to democracy. These specific regions were selected based largely on their noteworthy contribution to the country's unique path of urbanisation and development. While metropolitan areas in developing countries generally play an enormous role towards social transformation, the development of South Africa's metropolises have had a somewhat intricate history owing to a complex political, institutional and geographical background (Turok & Borel-Saladin, 2014, p. 676). This all provides a unique and multifaceted framework that allows for a comprehensive test regarding the index's viability as meaningful measure in the regional development sphere.

## 2. Literature Review

Achieving sustainable economic growth and the subsequent provision of adequate and empowering living standards have undoubtedly become the most prominent policy objectives for most countries around the globe (UN, 2018, p. 3). Growing populations, the incidences of widespread poverty, inequality and the relentless occurrence of unemployment have all contributed to an endless pursuit of effectively utilising resources and increasing output as a means of improving the lives of global societies. While it may seem a simple process, the comprehension of what truly constitutes economic advancement has, however, attracted numerous debates and diverse ideological thought (Haller, 2012, p. 66). Initial protagonists such as Rostow (1959, p. 2) and Myrdal (1957) viewed the advancement and improvement of societies on the basis of improving predominantly quantitative aspects. From these beliefs, the achievement of economic growth based purely on the use of capital and labour would suffice in allowing societies and regions to prosper (Krugman, 1994, p. 417). As time passed and with the onset of numerous industrial revolutions, the introduction of technological advancements and forward innovative thinking has somewhat altered these initial considerations (Piva & Vivarelli, 2017, p. 3). Nonetheless, the idea surrounding economic advancement as purely quantitative still remains among supporters of the ideology, even within a contemporary global context.

While these beliefs have provided a framework for understanding various economic processes throughout the evolution of economic discourse, their applicability in truly capturing and illustrating the economic progress societies have made has faded (Ivković, 2016, p. 257). The notion that the increase in output would be shared by all members of society has been surpassed by increasingly complex economic landscapes and geographies across the globe (Gala, 2018, p. 224). Instances of substantial economic activity that have been associated with a vast number of people residing in impoverished conditions and a severe unequal distribution of resources have worryingly been noticeable, especially in developing countries. This has explicitly rejected the underlining belief that economic progress is purely quantitative and based on single measures of output (Coyle, 2017, p. 17). Modern conceptualisations regarding the economic improvement of nations, regions and societies have rather increasingly been associated with more holistic ideological doctrines (Milne, 2017, p. 553). From these perspectives, economic progress has rather been associated with a range of factors that are not only limited to output, but also the improvement in standards of living, provision of quality education, structural transformation, provision of adequate employment opportunities and an overarching focus on the implementation of sustainable production practices (Todaro & Smith, 2015, p. 6).

Ascribing to the multi-dimensionality of these perspectives, economic development has gained profound significance over the last decade especially (Liu, 2016, p. 4). Meyer (2017, p. 1377) describe the process in stark contrast to economic growth, as it includes a range of social, cultural and economic factors that all contribute towards the provision of the quality of life of communities and their specific locations. Regional development in particular has drawn a tremendous amount from this framework, where improving the associated processes within specific areas was originally believed to originate from the improvement of various exogenous factors (Tiebout, 1956, p. 416). Earliest of theorists such as Perroux (1955, p. 42) and later Krugman (1979, p. 471) encouraged and advocated the idea that concentrated economic activity, a sectoral focus on production and export performances all contribute to the underlining advancement of the endogenous conditions of communities. Nevertheless, these ideas, much like the conceptualisation of economic growth, have been significantly augmented. With the onset of globalisation and more complex economic occurrences, modern considerations regarding regional development have emphasised the idea of a bottom-up approach in the effort of improving local conditions and competitiveness (Ascani et al., 2012, p. 11). From these perspectives, regional development is driven by the enhancement of endogenous factors that emanate from a range of social, environmental and human domains that, in turn, power the performance of exogenous production processes (Antonescu, 2015, p. 2).

While the recognition regarding the importance of the endogenous nature of development has become clearer over the last decade, its associated multidimensionality has brought with it a range of implications in the measurement thereof (Feldman & Lowe, 2017, p. 44). As modern understandings have progressed, so too have the means of measuring the concept. Initial attempts in this process applied a number of indicators with the purpose of portraying the progress that societies have made, largely focusing on the quantitative aspects. Indicators such as the gross national product (GNP) as well as gross domestic product (GDP) per capita have widely been used as denominators for regional improvement (Ivković, 2016, p. 258). Notwithstanding the importance of these measures, concerns surrounding their ability to accurately portray the holistic nature of development have continuously been raised by academics (Giannetti et al., 2015, p. 11). These criticisms have largely revolved around the inability of the quantitative measures to reflect the qualitative aspects such as the quality of life and ability to meet one's own basic needs now deeply entrenched in the idea of regional prosperity (Stiglitz et al., 2010, p. 7).

As such, contemporary attempts at measuring the process have involved the use of composite indices. The OECD (2008, p. 12) describes these measures as a combination of indicators based on specific models and more generally used in the measurement of complex concepts. Within development discourse, these have come in various forms with more well-known examples including the Human Development Index (HDI) (UNDP, 1990) and the Index of Sustainable Economic Welfare (Cobb et al., 1989). These indices have widely been used and to some extent have provided considerable scope in understanding the intricacies of social and human functioning. The HDI, in particular, has extensively added to the view that the aim of development is encompassed in primarily enlarging individuals' choices (Seth & Villar, 2017, p. 4). In this sense, it considers a region's prosperity based on the underlining knowledge, health and life expectancy of people. Nevertheless, despite its widespread use, many have come to highlight the vast differences in the subjective selection of indicators when compared to other measures as a serious limitation. Schrott et al. (2015, p. 3), in fact, suggest that the extent of these dissimilarities just reflects how difficult it is to accurately capture the regional development process. Other shortcomings that have been raised include the inability of these indices to measure all domains of development, especially those surrounding pure economic as well as social processes (Majerová, 2012, p. 1).

Not disregarding these shortcomings, composite indices have still proved the most effective in measuring the development of regions and the intricate processes that are associated with it (Perišić & Wagner, 2015, p. 207). Greyling and Tregenna (2017, p. 894) explain that their ability to encompass large amounts of information through combining various indicators yet not losing any of their individual significance is at the centre of these measures' ability to depict a more accurate reflections of progress. Nevertheless, subsequent risks in their use, if not constructed

correctly, can include a number of aspects such as inducing simplistic and inaccurate conclusions, contributing to misleading policy agenda and a use of subjective weighting procedures that can adversely distort analyses (Greco, 2018, p. 2). Given the aforementioned, international bodies including the OECD (2008) and IMF (2006) have provided extensive guidelines and frameworks on which these measures should be built and included indicators should be selected. These criteria predominantly revolve around a careful consideration of the relevance, reliability, and availability of the chosen indicators (OECD, 2008, p. 45). Furthermore, these should be readily accessible, easy to interpret and finally provide a sense of cohesion with one another with the purpose of providing a synergetic and viable measure.

Keeping in line with the guidelines, various measures and indices have been constructed within the South African context with the aim of assessing a range of socio-economic processes. The assessment of the country's developmental progress has nonetheless proven difficult given the intricate nature of its social, economic and cultural background (Zoch, 2016, p. 2). This has particularly been evident in the construction of indices that have differed considerably yet aiming to measure interconnected relationships. Examples of these indices include the Quality of Metropolitan Life (Naudé, 2009, p. 319), the Development Index constructed by the South African Audience Research Foundation (SAARF, 2016) and Everyday Quality of Life Index (Higgs, 2007, p. 331). All of the aforementioned aim to measure specific micro-economic living conditions of individuals and their ability to effectively function in these environments. Albeit their significant contribution to lending insight into the intricate nature of development within the country, none have fully captured the complexity of the process, especially when regional perspectives are considered (Greyling & Tregenna, 2017, p. 891). Shortcomings that have been raised surrounding these indices include the lack of the inclusion of quantitative as well as qualitative indicators and the application of weighting procedures that are based on the assumption that all domains are equally significant.

When considering regional development as the specific focus in the assessment procedure, the measurement tools have been limited within the South African context. Greyling (2013), in this regard, has thus far made the most significant contribution in the development of the Gauteng City Region Quality of Life Index. The measuring instrument aims to assess households' standard of living focusing on the progress made within five specific dimensions. These are housing infrastructure levels, socio-economic wellbeing, social interactions, health and effectiveness and quality of governance. While it has given noteworthy insight into the progress made in the Gauteng area, the design, which is based on the use of ordinal survey data, has restricted its applicability towards measuring levels of development over a range of diverse economic geographies (Meyer, de Jongh, 2018, p. 102).



Irrespective of these limitations, the South African context in general has proven difficult in the assessment of regional prosperity (Zoch, 2016, p. 2). The country, unlike similar developing countries, has had its own unique processes characterised by historical inequities, complex geo-political transformations, vast social migration and a significant reliance on natural resources that up until now has driven the majority of urbanisation and development within the country (Turok, 2012, p. 4). These intricacies have had a range of implications in the formation of the country's metropolitan areas. Van Huyssteen et al. (2010, p. 27), in this regard, assert that the metropolises within the country have had to face a range of challenges. Among these the most telling have been a dramatic increase in population growth, worryingly high concentrations of economic and social activity all of which have brought with it extreme inequalities between the central and peripheral locations (Sinclair-Smith & Turok, 2012, p. 392). In addition to these challenges, the lack of adequate working opportunities and continuously increasing poverty levels have brought with it an influx of internal migrants, which has imposed a tremendous amount of pressure on local government officials in their service delivery obligations (Eigelaar-Meets, 2018, p. 37). Despite these challenges, these areas have remained pivotal in driving economic growth and development contributing approximately 80 percent of national output, housing majority of excellent educational institutions, providing quality infrastructure while also ensuring comparatively high living standards (Mlambo, 2018, p. 63).

The viable, holistic and accurate measure of regional prosperity has become imperative. Truly assessing and understanding regional growth and development from this perspective can possibly assist towards a more insightful picture regarding the complexities underlining these processes. Furthermore, it brings with it the probability of instilling more directive effective policy measures that can assist towards achieving national objectives. Henceforth, the study aims to further test the viability of the composite regional development index (MREDI) developed by Meyer et al. (2016) and Meyer and de Jongh (2018) to measure the progress the country has made regarding regional prosperity within the eight demarcated metropolitan areas. Applying the index to these unique and intricate urban environments provide a comprehensive framework to assess its viability as regional development tool that allows for in-depth and comparative analyses within developing regions.

### 3. Methodology

This section presents the methodology that was applied in the research process. The research design and objectives are firstly discussed. This is followed by an in-depth explanation of the design of the composite multi-dimensional index and its various sub-dimensions that were used in the measurement of regional economic

development levels within the eight metropolitan regions in South Africa. Finally, the section describes the weighting procedure that was applied to the selected indicators as well as the system that was utilised in classifying the lagging and leading metropolitan areas within the country.

### **3.1. Research Purpose and Design**

The main purpose of the study was to analyse and measure the various regional economic development levels within the eight metropolitan regions within South Africa. In doing so, the study made use of both qualitative and quantitative methods. This included an extensive literature review pertaining to the multidimensional nature of regional development and the noteworthy role metropolitan regions play in these processes. While this alluded to the qualitative aspects of the inquiry, the quantitative aspects pertained to the use of the MREDI developed by Meyer et al. (2016) and Meyer and de Jongh (2018). The index was used to measure and analyse the underlining regional development levels within South Africa's eight metropolitan areas. Secondary annual data obtained from the IHS Global Insight (2018) database was used with the period under observation ranging from 1997 to 2017. This timeframe was selected with the purpose of firstly ascertaining the developmental progress these regions have undergone since the democratic transition in the country. Secondly, utilising this specific interval provides context to better comprehend how each metropolis' unique socio-economic environment over the last two decades has contributed to its contemporary role in the current economic and social climate of the country.

### **3.2. Design of the Composite Regional Development Index**

The index as utilised comprises four sub-dimensions carefully selected to illicit a comprehensive picture on the multidimensional nature of regional development. These four sub-dimensions include a total of 18 economic and social indicators pertaining to a region's performance surrounding their demographic characteristics, social developmental progress, labour market processes as well as the region's underlining economic activity. In order to calculate the index measurement, each indicator within the sub-dimensions is subsequently assigned a score ranging from 0 to 5, where higher scores are assigned to better performances pertaining to the various social and economic aspects. The four sub-dimensions together with their scoring criteria are discussed in the following sub-sections.

#### **3.2.1. Demographics Sub-Dimension**

Any country, region or area is profoundly affected by the demographic change of its population (Matuschewski et al., 2016, p. 225). Characteristics such as population growth, density measures and urbanisation levels withhold a range of implications for the wellbeing of societies. As such, the first sub-dimension of the composite index pertains to an overview of the demographic characteristics of the region. The



sub-dimension includes four indicators including population growth (% annual growth), household size (number of people in the household), population density (number of people per square km) and the level of urbanisation present within an area. The scoring criteria pertaining to the level of urbanisation and density attribute positive associations with these respective indicators as higher levels of both are associated with better developmental characteristics (Bairoch & Braider, 1991, p. 19). The scoring criteria, however, for population growth as well as household size attribute more complex associations. As such, both were assigned maximum and minimum thresholds (shown in Table 1) that affect index scores.

**Table 1. Scoring Criteria for the Demographic Sub-Dimension**

Index score	0	1	2	3	4	5
Population growth rate	< 0% and > 4%	0.0% - 1.0%	1.1% - 2.0%	2.1% - 3.0%	3.1% - 3.5%	3.6% - 4.0%
Household size	> 6.0 and < 2.5	5.0 - 6.0	4.5 - 4.9	4.0 - 4.4	3.5 - 3.9	2.5 - 3.4
Population density	0-20	21-50	51-100	101-150	151-200	200+
Level of urbanisation	0 - 30%	31-40%	41-50%	51-60%	61-70%	70%+

### 3.2.2. Social Development Sub-Dimension

Closely associated with the first-sub-dimension, the social wellbeing and dynamics that are associated with a region's population play a vital role in providing adequate living standards and inclusive societal cohesion. Nevertheless, these processes encompass a range of aspects that impact the possibility of social development, ranging from levels of education and equality to low levels of poverty and a safe and satisfactory living environment (Peach & Petach, 2016, p. 32). Given the myriad of facets, the sub-dimension includes seven indicators that are shown in Table 2 below. Among these, HDI, literacy levels as well as infrastructure index (ranging from 0% - 100%) scores were positively associated with scoring criteria. Contrastingly, lower scores pertaining to the Gini coefficient, poverty levels, informal housing (% of the housing stock) and the crime index contributed positively to the aggregate scoring of the sub-dimension.

**Table 2. Scoring Criteria for the Social Development Sub-Dimension**

Index score	0	1	2	3	4	5
HDI	< 0.40	0.40 - 0.54	0.55 - 0.64	0.65 - 0.69	0.70 - 0.79	0.80 - 1.00
Gini coefficient	1.00 - 0.80	0.79 - 0.70	0.69 - 0.60	0.59 - 0.40	0.39 - 0.30	< 0.30
Poverty levels	60%+	51 - 60%	41 - 50%	31 - 40%	21 - 30%	0 - 20%
Literacy	< 60%	60 - 74%	75 - 84%	85 - 89%	90 - 94%	95-100%

Infrastructure index	< 60%	60- 69%	70 - 79%	80 - 89%	90 - 94%	95-100%
% household in informal housing	> 30%	21 - 30%	16 - 20%	11 - 15%	6 - 10%	0 - 5%
Crime index	> 101	81 - 100	61 - 80	41 - 60	21 - 40	0 - 20

### 3.2.3. Labour Sub-Dimension

Debatably one of the most important resources driving economic prosperity, labour and the effective employment thereof make a significant contribution to regional development (de Jongh, 2017, p. 12). Underlining this notion is that the prevalence of a healthy absorption of human resources into economic processes brings with it enhanced spending, safer environments together with an improved utilisation of resources towards productive investment and away from needed social security provisions (Goodman, 2015, p. 3). By means of measuring the effective use of these resources, the index includes two indicators. The first of these, as shown in Table 3, pertain to the percentage of the population who are economically active (EAP) and this is positively correlated with index scoring. The second includes the strict unemployment rate (% of the EAP who are unemployed), where higher unemployment levels are negatively associated with the scoring criteria.

**Table 3. Scoring Mechanism for the Labour Sub-Dimension**

Index score	0	1	2	3	4	5
Economic active population	0-10%	11-20%	21-30%	31-40%	41-50%	50%
Unemployment	> 30%	26-30%	16-25%	11-15%	6-10%	0-5%

### 3.2.4. Economics Sub-Dimension

The fourth and final sub-dimension attempts to measure regional economic progress. While economic activity and development are arguably not synonymous, the wellbeing of any economic system is a fundamental pillar for development (Haller, 2012). This transcends not only from the associated monetary gains made from these processes, but also from the various linkages that economic activity has with a range of social factors (Gnade, 2017). As such, the sub-dimension consists of five individual indicators, including the GDP growth rate (% annual growth), trade surplus (export less import per capita), household annual income (average income), GDP per capita and stress index scores (levels of economic diversification). Among these, all but the latter have a positive correlation with the scoring criteria, given that higher levels of economic diversification are shown in accordance with lower stress index scores. Therefore, lower scores (or higher diversification) bring with it enhanced regional wellbeing (Kaulich, 2012).

**Table 4. Scoring Mechanism for the Economics Sub-Dimension**

Index score	0	1	2	3	4	5
GDP growth rate	< 0.0%	0.1-1.0%	1.1-2.0%	2.1-3.0%	3.1-4.0%	4.0%
Trade surplus (R per capita)	< 0.00	0.00-500.00	501-1000	1001-1500	1501-2000	2000+
Household annual income (R)	0-50 000	50 001-100 000	100 001-150 000	150 001-200 000	200 001-250 000	250 000+
GDP per capita (R)	0-20 000	21 000-40 000	41 000-60 000	61 000-80 000	81 000-100 000	100 000+
Tress Index	70+	61-70	51-60	41-50	21-40	0-20

### 3.3. Applied Weighting and Classification System

As prescribed by the OECD's (2008) principles and guidelines pertaining to the construction of composite indices, all included indicators were weighted. This procedure entailed the use of a participative methodology, where a total of 30 national and international regional economic development specialists ranked indicators in accordance with their perceived importance of each included measure. In doing so, a four-point weighting scale was utilised ranging from 1 limited importance to 4 very high importance. Subsequent to obtaining each of the expert's scoring sheets, scores were then aggregated and an average weighted score (out of a maximum of 4) for each of the 18 indicators was calculated. Results from this process showed that household size obtained the lowest score of 2.13, while literacy levels obtained the highest score at 3.78. Thereafter, scores were normalised through the use of the highest obtained average to provide a final score with a ratio between 0 and 1. After applying each of the individual weighted ratios to the scoring criteria, an index score with a possible maximum value of 73.86 was eventually obtained. Finally, these scores were then converted to a percentage, while a classification system was also added, as shown in Table 5 below.

**Table 5. Index Classification System**

Index score	Classification
0-10	Very low index
11-20	Low index
21-30	Medium low index
31-40	Upper low index
41-50	Low medium index
51-60	Medium index
61-70	Upper medium index
71-80	Low high index
81-90	Medium high index
91-100	High index

*Source: Amended from Meyer and de Jongh (2018)*

#### 4. Results and Discussion

Annexure A provides a summary of the most important socio-economic data for South Africa (SA) and the eight metropolitan regions in the country. The applicable and relevant data was sourced from Global Insight. The data, as presented, was utilised to allocate the ‘scores’ in the index as contained in Annexure B. All the scores, as allocated, were aggregated to provide a total development index for each of the metropolitan regions. The following section provides highlights of the main results from Annexure A. The data for South Africa was used as the baseline to compare the various regions. Table 6 provides a summary of the metropolitan regions in South Africa with the abbreviations used in the analysis in the two annexures.

**Table 6. Metropolitan Regions in South Africa**

Metro region	Abbreviation	2017 Index classification from annexure B
City of Cape Town Metropolitan Municipality	CPT	Medium index – 58.1
eThekweni Metropolitan Municipality	ETH	Medium index – 54.6
City of Ekurhuleni Metropolitan Municipality	EKU	Medium index – 57.9
City of Johannesburg Metropolitan Municipality	JHB	Upper medium index – 65.8
Nelson Mandela Bay Metropolitan Municipality	NMA	Medium index – 53.4
City of Tshwane Metropolitan Municipality	TSH	Upper medium index – 65.9
Mangaung Metropolitan Municipality	MAN	Low medium index – 49.3
Buffalo City Metropolitan Municipality	BUF	Low medium index – 47.4

In terms of population growth, a general decline in the growth rate has been experienced from 1997 to 2017. South Africa (SA) had a constant growth rate of between 1.6 and 1.7% from 1997 to 2017, while City of Cape Town Metropolitan Municipality (CPT) had the highest population growth in 2017 of 2.9%, and Buffalo City Metropolitan Municipality (BUF) had the lowest at 1.4%. All metro regions had higher population growth rates if compared to the country’s growth rates, except for BUF and Mangaung Metropolitan Municipality (MAN). Household sizes have also declined in general and for SA from 1997 to 2017; this decline is significant from 4.7 to 3.5 people per household. Nelson Mandela Bay Metropolitan Municipality (NMA) had the largest households in 2017, with 3.6 people, while the City of Johannesburg Metropolitan Municipality (JHB) and City of Ekurhuleni Metropolitan Municipality (EKU) had the smallest households with average of 3.1 persons per household. In general, the metro regions have smaller household than the country on

average. All the metro regions have much higher population densities than the country as a whole. JHB had by far the highest population density of the metros, followed by ECU, while MAN had the lowest population density. Population densities have increased significantly in most metros. All the metro regions also have much higher levels of urbanisation than the country as a whole. CPT, JHB and ECU had the highest level of urbanisation, while BUF had the lowest level of urbanisation.

In terms of HDI, all the metros had higher HDI than the country on average with CPT the highest at 0.74 (SA=0.66), while the metros of MAN and BUF had the lowest HDI 0.67. All metros have experienced improved HDI since 1997. Regarding income inequality (GINI coefficient), SA had an index of 0.63, while the metros had similar indexes of between 0.62 and 0.64, indicating high levels of inequality. The GINI coefficient has increased for all metros and SA. Poverty is a huge problem in SA, with a poverty level of 58%. Poverty is also a problem in the metro regions, where poverty levels range between 44.5% (City of Tshwane Metropolitan Municipality TSH) and 58.4% (BUF). Poverty levels have significantly declined since 1997, but are still very high. Literacy levels are high for all metro regions and have also increased over the last 20 years. Basic infrastructure provision has also improved significantly over the last 20 years, with NMA having the highest index of 0.92, and BUF having the lowest index of 0.74. Housing provision in SA has been focused in the metro regions and the backlogs for housing have declined significantly for all regions as well as for SA. Crime is also still a major issue in SA, but the data shows that SA and all metro regions have slightly declining crime levels. CPT has the highest crime levels, followed by MAN. The crime rates in the metro regions are generally higher than for SA in general.

The economically active population (EAP) has also increased over time for SA and all the metros, while all the metros have higher EAPs if compared to SA. Unemployment is a structural problem in SA with high levels of unemployment. SA had an unemployment rate of 27.2% in 2017, while ECU, NMA and BUF had even higher levels of unemployment than the national average. In recent times, economic growth has been low in SA and the metros also have been affected. In 2017, SA had a growth rate of only 1.3%, while the metros had growth rates ranging between 0.6% and 1.3%. BUF even had a negative growth rate. GDP per capita has been steadily increasing over time for all metros, with TSH and JHB with the highest per capita output. BUF again was worst off of all the metros regarding GDP per capita. In terms of trade surplus, most metros had negative results, indicating a higher level of imports as compared to exports, having a negative impact on economic growth. TSH had the most positive trade surplus, while ECU and CPT had the highest negative trade surpluses. Household income has been increasing steadily and most households in the metros have higher levels of income than for SA on average. Only BUF and MAN have lower income levels than the national average. CPT has the highest income levels, followed by TSH. Lastly, the tress index indicates the level of

diversification of the economy with a lower score indicating higher levels of diversification. ETH had the most diversified economy of all the metros, while TSH had the lowest level of diversified economy.

## 5. Application of Index Including Results and Discussion

Annexure B provides detail regarding the application of the index to all the metro regions in SA, and Tables 5 and 6 provide index classification results. Firstly, in terms of the overall ranking, it was found that TSH has the highest composite index of 65.9, indicating an upper medium development index, followed by JHB with an index of 65.8 (upper medium index). Interestingly, CPT had only the third highest index of 58.1 (medium index). The metro with the lowest index is BUF, with 47.4 (low medium index), followed by MAN (low medium index) and NMA (medium index). All of the metros achieved higher development index scores if compared to SA, which had a score of 45.64 (low medium index). Different regions grow and develop at different paces and tempos. The question of convergence between leading and lagging metro regions is evident in that the index of the metro with the lowest index also had the highest overall annual growth rate of 1.6%, followed by MAN with 1.4% and NMA with 1.1%. The leading metros of TSH and JHB have for example only improved by 0.8% and 0.9% respectively per annum over the last 20 years.

In terms of the **sub-index: Demographic development** (maximum score of 13.31), the metros with the highest overall indexes, namely CPT, ECU, JHB and TSH had the highest scores of 12.1, while the metro with the lowest score was MAN with a sub-index of 9.4. CPT and BUF were improving the fastest in terms of this sub-index at 1.7% and 1.3% per annum since 1997, while the metros with the lowest growth were JHB and ECU at -0.3%. Regarding the **sub-index: Social development** (maximum score of 31.73), ECU has the highest score of 17.5, followed by TSH with 17.4, while the metros with the lowest scores were BUF and MAN with sub-indexes of 13.5 and 14.4, respectively. BUF and MAN were improving the fastest in terms of this sub-index at 4.3% and 3.9% per annum since 1997, while CPT and TSH were growing the slowest at 1.0% and 1.8%.

The **labour sub-index** (maximum score of 9.3) has in most of the metros and also SA moved backwards. For SA, the index declined from 3.72 in 1997 to 3.6 in 2017, while CPT, ECU, JHB, NMA, TSH and MAN also had negative growth rates for this sub-index. The only metro that had an improvement in this index was BUF. CPT had the highest index of 5.45, followed by JHB at 5.33, while the other metros had indexes ranging between 4.46 and 4.59. BUF had the highest growth rate followed by TSH in growth of the index per annum. Lastly, the fourth **sub-index: Economics** (maximum score of 19.52) indicates that JHB had the highest index of 14.6, followed



by TSH with 13.8, while BUF is again the lowest at 5.6. JHB had the highest annual improvement growth rate of 1.8%, while ETH and BUF had the lowest improvement rates of -0.68% and -0.65%, respectively. The comparative index indicates that it is possible to facilitate economic development over a period of time; in this case, over 20 years. For South Africa, the overall index improved by an average of 1.33% per annum. BUF, which has the lowest total index of 47.4, also has the highest annual improvement growth rate of 1.6%, compared to a growth rate of 0.8% for TSH, which had the highest overall index. This indicates some convergence over time where lagging regions can catch up with leading regions. Overall, for all the metros combined, the average annual improvement rate of the total index from 1997 to 2017 was 0.94%. The sub-index that improved the most is social development with 2.47% growth, followed by the demographic sub-index at 0.35% and the economic sub-index at 0.24%. The labour sub-index had the lowest improvement rate of 0.13%. Developmental processes are slow and long-term processes. The results of the index could be used to identify weaknesses and strengths for a specific region, comparison of regions, determine the speed and tempo of development and be utilised to compile strategic development policy for regions.

## 6. Conclusion and Recommendations

Globally, regions and especially highly urbanised regions are driving development and growth. The main aim of this study was to apply and further test the multi-dimensional regional development index (MREDI) developed by Meyer et al. (2016) and Meyer and de Jongh (2018) with the purpose of measuring and assessing the regional development progress made within the eight metropolitan regions in South Africa since the country's transition to democracy. The index was developed with the aim to comply with accepted guidelines, such as multi-dimensionality of indicators, quantitatively measurable indicators, grouping of indicators and allocation of weights to indicators. The analysis of the metropolitan regions in South Africa produced interesting and realistic results. South Africa has a dominant focus on social development and this shows in the results when the four sub-indexes are analysed. The social development sub-index had by far the highest annual growth rate over the study period. Most of the metros significantly improved regarding this sub-index. On the other hand, however, most of the metro regions lost ground concerning the economic and labour sub-indexes.

It was surprising to find that TSA had the highest development index with a high development classification, followed by JHB with a medium development classification. It was surprising to find CPT, with its high average income only with the third highest index, also with a medium development classification. Convergence between metros is taking place with the lowest developed metros growing at significantly high growth rates when compared to the top three metros. Each metro

is at a different level of development and is developing at a different pace. One of the limitations of the formulation of a comprehensive index is the use of subjective indicators that require surveys, making the index slow and costly to update even on an annual basis. Future studies will include the development of a more comprehensive regional classification system, the application of econometric models and further testing and refinement of the index in other regions on a global scale. The implications of the research are that regions could be rapidly assessed and compared. The index has been successful in its original purpose, which was to compare the level of development of a region. However, the index also makes it possible to compare regions, allow in-depth analysis of regions for strategy development, and to determine the pace and the stage of development of a region.

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### Annex A. Regional profile

Indicator	South Africa		CPT		ETH		EKU		JHB		NMA		TSH		MAN		BUF	
	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017
Population Growth Rate in %	1.6	1.7	6.8	2.9	2.7	1.9	4.3	2.3	4.1	2.7	1.7	1.8	3.8	2.7	1.8	1.5	0.9	1.4
Household Size	4.7	3.5	4.0	3.4	4.5	3.5	3.9	3.1	3.7	3.1	4.4	3.6	4.0	3.1	4.0	3.2	4.6	3.4
Population Density*	35	46	1036	1707	1135	1513	1066	1786	1652	3065	502	650	299	525	66	86	266	312
Level of Urbanization in %	56	64	99	99	84	82	99	99	99	99	98	97	86	91	92	91	74	79
HDI (0-100)	0.56	0.66	0.69	0.74	0.60	0.67	0.66	0.71	0.69	0.73	0.62	0.68	0.69	0.73	0.58	0.67	0.58	0.67
Gini Coefficient (0-100)	0.61	0.63	0.55	0.62	0.58	0.63	0.58	0.63	0.61	0.63	0.57	0.63	0.57	0.62	0.58	0.62	0.58	0.64
Poverty Levels** in %	73.7	58.2	51.4	44.9	57.8	54.0	53.2	49.4	51.2	46.9	65.7	57.4	47.9	44.5	68.1	54.8	74.4	58.4
Literacy *** in %	68.0	84.1	85.2	92.2	78.1	88.2	81.2	91.0	84.1	92.2	80.9	89.8	83.0	91.3	72.6	85.2	74.1	86.9
Infrastructure Basic Index (0-100)	0.63	0.75	0.87	0.89	0.76	0.83	0.80	0.83	0.84	0.87	0.79	0.92	0.78	0.86	0.68	0.82	0.64	0.74
% of Households in Informal Housing	14.4	10.2	18.1	11.7	19.1	4.9	25.9	12.3	18.8	11.8	22.8	2.5	17.6	10.8	20.5	8.9	21.4	5.4
Crime Index****	146	98	194	159	144	99	193	98	235	123	246	119	171	105	202	127	185	115
Economically Active Population in %	28	39	39	48	36	40	40	49	42	51	32	43	38	49	33	44	30	43
Unemployment in %	20.6	27.2	12.4	24.3	18.0	16.7	22.2	32.5	19.9	26.5	19.1	29.8	16.1	23.9	18.6	26.7	23.3	28.7
GDP Growth Rate %	11.7	1.3	8.2	0.6	11.5	0.5	8.3	1.0	9.6	0.9	16.1	0.6	8.6	1.2	14.9	1.1	15.0	-0.2
GDP per capita in R (X000)(Constant)	43.2	55.3	65.2	73.4	53.8	78.4	63.1	61.7	85.6	95.0	54.5	66.1	75.6	95.4	48.4	76.3	42.1	53.1
Trade Surplus per Capita (R1 000)	0.3	1.7	-2.2	-16.1	0.1	-8.5	-5.2	-16.4	-4.6	10.7	-2.9	-4.2	14.2	32.2	-0.3	-0.2	-2.2	-3.3
Average Income per Household (Rx1000)	51	202	76	287	62	223	71	221	83	253	57	217	89	273	49	198	48	195
Tress Index (0-100)	40.8	40.2	53.4	52.9	49.1	45.6	53.1	46.9	49.6	54.1	56.8	52.5	54.1	54.5	53.7	54.8	56.2	53.1

\*Number of people per km<sup>2</sup> \*\* Share below upper poverty line \*\*\*Functional literacy: age 15+, completed grade 7 or higher \*\*\*\*Weighted average /100 000

Source: *Global Insight(2018)*

## Annexure B. Scoring and calculation of the development index

Indicator	South Africa		CPT		ETH		EKU		JHB		NMA		TSH		MAN		BUF		
	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	
Population Growth Rate (%)	1.26	1.26	0.00	1.88	1.88	1.26	3.14	1.88	3.14	1.88	1.26	3.14	1.88	1.26	1.26	0.63	1.26		
Household Size	1.12	2.25	1.69	2.81	1.12	2.25	2.25	2.81	2.25	2.81	1.69	2.25	1.69	2.81	1.69	2.81	1.12	2.81	
Population Density*	0.68	0.68	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	1.36	1.36	3.39	3.39	
Level of Urbanisation (%)	2.38	3.17	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	3.97	
Sub-index: Demographic Development	5.44	7.36	9.04	12.05	10.36	10.86	12.75	12.05	12.75	12.05	10.30	10.86	12.18	12.05	8.27	9.39	9.11	11.42	
HDI (0-100)	1.98	2.98	2.98	3.97	1.98	2.98	2.98	3.97	2.98	3.97	1.98	2.98	2.98	3.97	1.98	2.98	1.98	2.98	
Gini Coefficient (0-100)	1.74	1.74	2.60	1.74	2.60	1.74	2.60	1.74	1.74	1.74	2.60	1.74	2.60	1.74	2.60	1.74	2.60	1.74	
Poverty Levels** (%)	0.00	0.95	0.95	1.90	0.95	0.95	0.95	1.90	0.95	1.90	0.00	0.95	1.90	1.90	0.00	0.95	0.00	0.95	
Literacy *** (%)	1.00	2.00	3.00	4.00	2.00	3.00	2.00	4.00	2.00	4.00	2.00	3.00	2.00	4.00	1.00	3.00	1.00	3.00	
Infrastructure Basic Index (0-100)	0.90	1.80	2.70	2.70	1.80	2.70	2.70	2.70	2.70	2.70	1.80	3.60	1.80	2.70	0.90	2.70	0.90	1.80	
% of Households in Informal Housing	2.28	3.04	1.52	2.28	1.52	3.80	0.76	2.28	1.52	2.28	0.76	3.80	1.52	3.04	1.52	3.04	0.76	3.04	
Crime Index****	0.00	0.88	0.00	0.00	0.00	0.88	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sub-index: Social Development	7.90	13.38	13.75	16.59	10.86	16.04	11.99	17.46	11.88	16.59	9.15	16.07	12.80	17.35	8.01	14.41	7.25	13.50	
Economic Active Population (%)	1.74	2.60	2.60	3.47	2.60	2.60	2.60	3.47	3.47	4.34	2.60	3.47	2.60	3.47	2.60	3.47	1.74	3.47	
Unemployment (%)	1.98	0.99	2.98	1.98	1.98	1.98	1.98	0.99	1.98	0.99	1.98	0.99	1.98	1.98	1.98	0.99	1.98	0.99	
Sub-index: Labour	3.72	3.60	5.58	5.45	4.59	4.59	4.59	4.46	5.45	5.33	4.59	4.46	4.59	5.45	4.59	4.46	3.72	4.46	
GDP Growth Rate (%)	3.97	1.59	3.97	0.79	3.97	0.79	3.97	0.79	3.97	0.79	3.97	0.79	3.97	1.59	3.97	1.59	3.97	0.00	
GDP per capita	1.85	1.85	2.78	2.78	1.85	2.78	2.78	2.78	3.70	3.70	1.85	2.78	2.78	3.70	1.85	2.78	0.93	1.85	
Trade Surplus per Capita (R1 000)	0.67	0.67	0.00	0.00	1.34	0.00	0.00	0.00	0.00	3.35	0.00	0.00	3.35	3.35	0.00	0.00	0.00	0.00	
Average Income per Household	0.74	2.94	0.74	3.68	0.74	2.94	0.74	2.94	0.74	3.68	0.74	2.94	0.74	3.68	0.00	2.21	0.00	2.21	
Tress Index (0-100)	2.33	2.33	1.55	1.55	2.33	2.33	1.55	2.33	2.33	3.11	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	
Sub-index: Economics	9.55	9.38	9.03	8.80	10.22	8.84	9.03	8.84	10.74	14.63	8.11	8.07	12.38	13.87	7.37	8.12	6.45	5.61	
Total index score, max 73.86	26.61	33.71	37.41	42.90	36.04	40.33	38.36	42.82	40.82	48.60	32.14	39.46	41.95	48.72	28.23	36.38	26.52	35.00	
Index out of 100 score	36.03	45.64	50.65	58.08	48.79	54.61	51.93	57.98	55.27	65.80	43.52	53.42	56.80	65.97	38.23	49.26	35.91	47.39	
Overall ranking			4	3	5	5	3	4	2	2	6	6	1	1	7	Active Windows	8		

\*Number of people per km<sup>2</sup> \*\* Share below upper poverty line \*\*\*Functional literacy: age 15+, completed grade 7 or higher \*\*\*\*Weighted average /100 000 people.



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