

#### environmental affairs

Department: Environmental Affairs REPUBLIC OF SOUTH AFRICA



#### EXTENSION OF A STRATEGIC ENVIRONMENTAL ASSESSMENT TO FACILITATE THE EFFICIENT AND EFFECTIVE IMPLEMENTATION OF WIND AND SOLAR PHOTOVOLTAIC ENERGY DEVELOPMENT IN SOUTH AFRICA

**Socio-economic considerations** 



### Content

- Background
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# Background

- The proposal was to develop a broad categorisation of intensity of socio-economic activity, based on a comparison of areas in terms of both existing levels of socioeconomic activity, as well as growth/decline in socio-economic activity using population and GVA (as proxy for economic output) at LM and Town level
- To provide a broad replicable indication of the likelihood of municipal areas and towns (given existing spatial patterns and trends) for energy demand.
- Given the differentiated nature of the South African settlement and spaceeconomy landscapes the challenge in such indexes are usually to ensure that national and regional comparisons do also enable size and growth differentiation within, i.e.:
  - Areas with low levels of activity (both in terms of population size and economic output, typically in large and sparsely populated areas); and
  - Areas where the population growth is more than economic output growth (such as often found in high density rural areas and especially in former Homeland towns due to the Apartheid spatial legacies).
  - The index makes use of both size and weighted comparative growth in order to provide a comparative view







### Data inputs

- Local municipal Level (2011 boundaries)
  - Population data: Statistics South Africa (StatsSA) population for the 2011 census and the 2016 community survey data.
  - The economic output data used is Gross Value Added (GVA) from Quantec Easy-data for 2011 and 2016. This was Real GVA at basic prices, (in R millions) constant at 2010 prices. Having the prices constant, allows for temporal comparability
- Town Level:
  - CSIR's Meso-frame
  - The Functional City, Town and Settlement Typology for SA
  - Dissagregated Population Data





## Municipal level Analysis

- Calculate 2016 population and GVA output Per LM
- National Growth:
  - Used basic growth formula  $(PG = \frac{Pa Pb}{PB})$  to benchmark national population and GVA growth where *Pb* represents the latest population / GVA figures (2016) and *Pa* representing previous population / GVA total figures (2011)
- Weighted growth
  - To calculate which areas have been most significantly affected by growth trends an analysis of population and GVA growth of municipalities from 2011 to 2016 was conducted using a method by Geyer jr and Geyer (2016) that they undertook to indicate relative agglomeration and diffusion patterns over and above natural growth of migration subpopulations at municipal level.
  - Weighted Growth between 2011 and 2016 population; and 2011 and 2016 GVA was calculated.
  - The weighted growth (for purposes of this analysis) will be used to analyse the population and economic growth in relation to other municipalities; controlling for the total population and economic growth





### Municipal level Analysis Cont.

$$-NMj = \sum_{j=1}^{n} \frac{Pe_j (Pb_n/Pe_n)}{Pb_j - 1}$$

Where NMj is the net population [or GVA] growth/decline for municipality, j. Pb and Peare population [or GVA] sizes for municipality, j, or nationally, n, for the base- and end-years, respectively. The controlling weight, Pb<sub>n</sub>/Pe<sub>n</sub>, ,minimizes natural growth in the population in the municipality between the base year and the end year





### Municipal level Analysis Cont..

#### Using the inputs the data was classified....

Population Total 2016	Population Category	Name
>1 000 000	А	Extremely Large
500 000 - 1 000 000	В	Very Large
100 000 - 500 000	С	Large
50 000 - 100 000	D	Moderate
10 000 - 50 000	E	Low
<10 000	F	Very Low
GVA Total (R' 000 000) 2016	GVA Category	Name
> 1 00 000	А	Extremely Large
50 000 -100 000	В	Very Large
10 000 - 50 000	С	Large
1 000 - 10 000	D	Moderate
500 - 1000	E	Low
100 - 500	F	Very Low

<u>Population WG</u> : National Absolute Growth is 7.5% which would be Between -0.5%05% WG			
Growth %	Population WG % Category	Name	
>10%	A	High growth above national	
5% - 10%	В	Moderate growth above national	
0.6% - 5%	С	growth slightly above national	
-0.5% - 0.5%	D	on par with national growth	
-0.6%7%	Ш	Growing but at a rate lower than national Growth	
< -7%	F	Decline	
Gross Value Added (GVA) WG : National Absolute Growth is 7.8% which would be Between -0.5%05% WG			
Growth %	GVA WG % Category	Name	
>10%	A	High growth above national	
5.1% - 10%	В	Moderate growth above national	
0.6% - 5%	С	growth slightly above national	
-0.5% - 0.5%	D	on par with national growth	
-0.6%7%		Growing but at a rate lower than national Growth	
<-7%	F	Decline	

#### <u>Size Classification</u>

E.g.

AA = Extremely large population and economic production (comparatively)DF = Moderate population and very low Economic production (comparatively)

Growth Classification

E.g.

AA = High population and economic growth (comparatively) DF = population growth on par with national and a negative economic growth

### Municipal level Analysis Cont.

#### **Re-classifying Size and Growth**

Size Classes	Combined Classed	
Very Big	AA; AB BB; BB; BC and (Very Large areas in population and Economy)	
Big	CC; CA: (With Large and Above Populations.)	
	CD;CE ((Large populations with moderate economies (1 or 2 low economies	
Large	but with still large populations))	
	DD; ED; DE (Moderate populations and Moderate economies or Low	
Moderate	population and Moderate economy)	
Small	EE;FF;EF;FE (Low populations and low economies)	
Growth Classes	Combined Classed	
Growing	on Par or above National Growth	
	EB; EC;ED; (Low population with growing economies) OR	
ok Area	FB;FC:FD(declining population but growing economies)	
	EE (Low population growth and low economic Growth) OR DE; (Population	
Lagging	growth on par with national growth but lagging economic growth)	
	FE (Declining population and lagging Economy) OR (BF; CF) High Growth	
	population with declining Economy; OR EF (Low growth population and	
At Risk	declining Economy)	





### Municipal level Analysis Cont.

Re-classifying Size and Growth and Defining Final Classes

Class Number	Classes Combined	Class Name	
1	Very big and growing	Very High Intensity and	
		Growing	
2	Very Big, Big Growing; Big OK; Large growing;	High Intensity and	
	Large ok; Moderate Growing;	Growing	
3	Very Big Big Lagging, Large Lagging; Moderate	High Intensity and	
	Lagging	Lagging	
4	Very Big and Big At Risk; Large At Risk;	High intensity and	
	Moderate At Risk;	Declining	
5	Moderate OK; Small OK	Moderate intensity	
6	Small Growing	Low intensity and	
		Growing	
7	Small At Risk, Small Lagging	Low intensity and	
		declining	



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### Final municipal level Classes and examples

	Category	Description	Assumption
1	Very High	Mainly Metropolitan regions and big cities characterised by very high intensity of socio-economic activity	High levels of existing domestic and other
_	Intensity and	(population exceeding 500 000 and economic output in most municipalities is more than R50 Billion but no	energy demand, most likely to grow due
	Growing	less than 28 billion), and where growth in population and economic output is higher than the national	to natural growth and agglomeration
		growth rates (growth exceeding the national 7.5% population growth rate and 7.8% growth in economic	advantages.
		output)	
2	High Intensity	Municipalities which have large secondary cities, big towns and densely populated areas that are	High levels of existing domestic and other
	and Growing	characterised by high intensity of socio-economic activity (where population numbers exceed 50 000 and	energy demand, with demand most likely
		economic output generally exceeds R10 Billion), and where growth in economic output is higher than growth	to grow due to natural growth and
		in population, and above national growth. Areas also include densely settled areas in Kwa-Zulu Natal and	agglomeration advantages.
		Mpumalanga and border areas in Limpopo that seem to be characterised with higher growth rates.	
3	High Intensity	Municipalities that are characterised by relatively high intensity of socio-economic activity, typically with big	Relatively high levels of existing domestic
	and Lagging	towns in surrounding agricultural and resource economy hinterlands (where population numbers generally	and other energy demand, where existing
_		exceed 50 000 and economic output mostly exceeds R10 Billion), and where population and economic	growth rates might point towards
		growth is low or on par with national growth, and where growth in economic output is lagging behind the	stagnating or lagging future growth
		national growth. A number of municipalities in this category are located in the Free-State, Limpopo, North-	without intervention.
		West and Eastern Cape in-land regions.	
4	High intensity	Municipalities that are characterised by relatively high intensity of socio-economic activity, typically with big	Relatively high levels of existing domestic
	and Declining	towns in surrounding resource economy hinterlands (where population numbers exceed generally 50 000	and other energy demand, where existing
		and economic output exceeds generally R10 Billion). Municipalities in this category are areas where growth	growth rates might point towards
		rates of population and economic output are low and declining, as well as areas where economic output is in	stagnating or declining growth in
		decline but population growth rates relatively high compared to national growth. These areas typically include	economic output, but also to the need for
		municipalities located in resource rich mining areas in Limpopo, Free State and North-west, areas to the north	industrialisation, green economy and
		and west of Gauteng (including Madibeng), as well as the Northern Cape.	other interventions.
5	Moderate	Municipalities in this category are characterised by moderate and smaller population sizes (typically in the	Relatively smaller population and
	intensity	range between 20 000 and 100 000), and moderate levels of economic output (mostly between R1 Billion	economic demand for energy than in
		and R10 Billion), however where growth rates in economic output since 2011 exceeded national growth	other municipalities, but typically with
		rates, as well as local population growth rates. A number of municipalities in this category are located in the	growth in specific locations and/sectors.
		sparsely populated areas of the Western and Northern Cape.	
6	Low intensity	Municipalities in this category are characterised by moderate and smaller population sizes (typically in the	Relatively small population and economic
	and Growing	range between 10 000 to 50 000), and low levels of economic output (Less than R1 Billion), where growth	demand for energy than in other
		rates in economic output since 2011 where on par or exceeded national growth rates.	municipalities, but typically with growth
			in specific locations and/sectors.
7	Low intensity	Municipalities in this category are characterised by small population sizes (less than 10 000 people), and low	Relatively small population and economic
	and declining	levels of economic output (Less than R1Billion), where growth rates in bot economic output and population	demand for energy compared with other
		were lower than the national average, as well as areas where economic output since 2011 where lagging	municipalities, and characterised with
		behind the national growth rate or declining in real terms. In the latter cases population growth varies but	slow growing or declining economic
		from a very small base.	output. Areas with where demand for
			energy seems very low.









### Town Analysis

- Due to the level of detail required for this process, the analysis period for the town growth could only be undertaken for the period between 2001 and 2011 for population.
- Again National Growth and Weighted growth where calculated
- Analysis inputs:
  - CSIR's Meso-frame.
    - The meso-frame is a meso-scale "geoframe" for South Africa; it is a demarcation of South Africa into a "grid" of just less than 25 000 "mesozones", each approximately 50km<sup>2</sup> in size (GAP 2017). (For more information of this methodology please see <u>https://www.gap.csir.co.za/techical-overview</u>)
  - The Functional City, Town and Settlement Typology for SA.
    - This Typology was developed by CSIR in collaboration with the South African Cities Network (SACN), and provides a mechanism to profile (identify, calculate and analyse) a set of development information and trends pertaining to the towns and cities, as well as high density rural settlements across South Africa (StepSA 2017 and Van Huysteen et al 2015) (For more information of this Typology and its development please see <u>http://stepsa.org/settlement\_typology.html</u>)
  - Population Data.
    - Original population data was sourced from StatsSA for the censuses of 2001 and 2011. The data was then disaggregated into the CSIR meso-frame / Functional City, Town and Settlement Typology. (Mans 2012)

### Town Analysis Cont

- Once the population data was packaged into the meso-frame that contained the settlement typology classification for each meso-zone, the data was dissolved and summed based on the:
  - Town Type The classification of each mesozone to what type / category of settlement it is
  - SACN Town The functional extent of each City, town or settlement [Note that the functional extent of each City/town which may cover of several mesozones. Please see above sources on the meso-frame and The Functional City, Town and Settlement Typology for more information]



CSIR/SACN City, Town & Settlement Typology



http://stepsa.org/settlement\_typology.html

### Town Analysis Cont...

• Once the calculations where complete both the real and weighted growth to create a classification of the growth for each town.

Class Name	Description	
Large Decline	More than 15% decline in real population growth OR a decline of more than 26.4% in the weighted Growth	
Moderate Decline	More than 5% but less than 15% decline in real population OR Between a 17.7 - 26.4% decline in weighted Growth	
Low Decline	More than 0.05% but less than 5% decline in real population OR Between a 13.4 - 17.6% decline in weighted Growth	
Lagging	a growth of between 0.01 - 14.32% in population In real growth OR Values between -1%13.4% in weighted Growth	
On Par	On par is an indication of being between -0.99% -0.99% in weighted growth which equates to a real growth of between 14.4 - 16.4% in population. note that national real growth is 15.47, therefore if a town grows at this rate it is considered to be on par with national Growth	
Slight Growth Above	Growth of between 1%-5% in weighted growth; equating to a real growth of between 16.6% - 21.2%	
Moderate Above	Growth of between 5%-15% in weighted growth; equating to a real growth of between 21.3% -32.8%	
Large Above	Growth of between 15%-50% in weighted growth; equating to a real growth of between 32.8% -73%	
High Above	Growth of more than 50% in weighted growth; equating to a real growth of more than 73%	









### Phase 2: The social vulnerability index

- Once REDZ have been identified; In order to highlight critical socioeconomic considerations to take into account in specific locations within a REDZ a Social vulnerability is proposed.
- Social vulnerability is defined as the inability of people, settlements and societies to cope with, withstand or adapt to the impact of multiple stressors such as disruptive natural or manmade events.
- The social vulnerability index can be used to differentiate vulnerable communities from more resilient communities
- The social vulnerability index is a composite indicator, created statistically through principal components analysis based on 14 variables





### Phase 2: The social vulnerability index Cont...

KwaZulu-Natal

KwaMncane

Khokwane

naswazin

Munywini

#### Ethekwini metro



**Buffalo City** 





Richmond

Msunduzi

uMngeni

Ebaleni

KwaDulela

Qanda

eSigodini Esifishane





uMshwathi

Ashburton

Mkhambathini

Northdal

Pietermaritzburg

The Msunduz

Wilgefontein

Wubukazi

Sir

NOTE:

Social vulnerability is defined as the inability of people, settlements and societies to cope with, withstand or adapt to the impact of multiple stressors such as disruptive natural or manmade events. The social vulnerability index is based on 14 indicators highlighting South Africa's most vulnerable communities.

Citation: le Roux, A., Naude, A.2014. CSIR Regional Dynamics and Interactions Analyses Note: Social vuvlnerability -Locating South africa's vulnerable people.

# Thank you for your participation to this second ERG/PSC meeting on 25<sup>th</sup> July 2017

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