Risk trajectories of South African settlements
Gauteng initial findings

4 September 2018

Authors: Alize le Roux, Kathryn Arnold, Chantel Ludick, David le Maitre, Greg Forsyth, Francois Engelbrecht, Daleen Lotter, Willemien van Niekerk, and Asmerom Beraki
Background

• Strong evidence that extreme weather events are becoming more frequent and intense with climate change expected to amplify these trends, particularly heat waves, floods, droughts, wildfires and storm surges
• Strong evidence to support that Urbanisation will continue & that this will place even more pressure on infrastructure and service delivery
• More frequent and intense events combined with a growing and urbanising population, poor land use practices, growing informal sector = likely exacerbate the vulnerabilities of communities and place more people at risk of climate induced disasters
• Growth can be a catalyst for economic growth but effective planning and policy interventions are needed
• Spatial planning will be vital to planning for peoples sustainable livelihoods
Knowing **what** change to adapt for and **how** to adapt for this change is of critical importance to **decision makers** involved in the **planning** and **design** of human settlements.

The Green Book was commissioned with the aim of supporting municipal planning on the development of climate-resilient cities and settlements through research in climate adaptation.
SA is expected to follow the worldwide trend - experiencing high population growth and urbanisation. Current projections indicate and additional 19-24 million people to be added to the country in the next three decades. Vast majority of growth to be confined to cities and towns.
Gauteng’s population is projected to reach 20 – 22 million people by 2050.
The City of Johannesburg will experience the greatest growth in the province, with population increases of 3.6 million people projected.

The City of Tshwane is projected to grow by 2.2 million people.

Population growth of 1.7 million people is projected for Ekurhuleni.
Gauteng’s LM vulnerabilities

- **Socio-economic**: Households vulnerabilities (household composition, income composition, education, health, access to basic services, safety & security)
- **Economic vulnerability**: Economy of the LM (diversification, size of economy, labour force, GDP growth/decline pressure, inequality)
- **Physical vulnerability**: Access & infrastructure (road infrastructure, housing types, density, accessibility within the LM)
- **Environmental vulnerability**: Air quality, environmental governance, competition between ecology & urban encroachment)
Gauteng’s Local Municipalities vulnerabilities

1. High % of population have low literacy level
2. High % of households live under minimum living level

1. High % of households live under minimum living level
2. High child mortality rate

1. High Inequality
2. Low GDP per Capita

1. High Inequality
2. Low GDP per Capita

1. High % of informal housing
2. High % of government subsidised housing

1. High % of informal housing
2. High % of government subsidised housing

1. Water Resources (Groundwater, Surface Water, Wetlands)
2. Environmental Health (Low Air Quality)

1. Water Resources (Groundwater, Surface Water, Wetlands)
2. Environmental Health (Low Air Quality)

1. Environmental Health (Low Air Quality)
2. Human influence (Urban encroachment, Eroded/Degraded area)

<table>
<thead>
<tr>
<th>MUNICIPALITY</th>
<th>Socio-economic vulnerability</th>
<th>Trend</th>
<th>Economic Vulnerability</th>
<th>Trend</th>
<th>Physical vulnerability</th>
<th>Trend</th>
<th>Environmental vulnerability</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ekurhuleni</td>
<td>1.94</td>
<td>➣</td>
<td>4.46</td>
<td>➣</td>
<td>2.62</td>
<td>➣</td>
<td>9.74</td>
<td>No Trend</td>
</tr>
<tr>
<td>Emfuleni</td>
<td>2.82</td>
<td>➣</td>
<td>7.96</td>
<td>➣</td>
<td>4.20</td>
<td>➣</td>
<td>5.95</td>
<td>No Trend</td>
</tr>
<tr>
<td>Midvaal</td>
<td>2.21</td>
<td>➣</td>
<td>5.06</td>
<td>➣</td>
<td>5.11</td>
<td>➣</td>
<td>3.86</td>
<td>No Trend</td>
</tr>
<tr>
<td>Lesedi</td>
<td>3.13</td>
<td>➣</td>
<td>6.72</td>
<td>➣</td>
<td>4.41</td>
<td>➣</td>
<td>4.30</td>
<td>No Trend</td>
</tr>
<tr>
<td>Mogale City</td>
<td>2.28</td>
<td>➣</td>
<td>5.67</td>
<td>➣</td>
<td>5.84</td>
<td>➣</td>
<td>7.03</td>
<td>No Trend</td>
</tr>
<tr>
<td>Merafong City</td>
<td>2.83</td>
<td>➣</td>
<td>6.65</td>
<td>➣</td>
<td>5.60</td>
<td>➣</td>
<td>4.48</td>
<td>No Trend</td>
</tr>
<tr>
<td>Rand West City</td>
<td>3.22</td>
<td>➣</td>
<td>9.32</td>
<td>➣</td>
<td>5.94</td>
<td>➣</td>
<td>6.05</td>
<td>No Trend</td>
</tr>
<tr>
<td>City of Johannesburg</td>
<td>1.26</td>
<td>➣</td>
<td>2.51</td>
<td>➣</td>
<td>1.00</td>
<td>➣</td>
<td>9.32</td>
<td>No Trend</td>
</tr>
<tr>
<td>City of Tshwane</td>
<td>1.07</td>
<td>➣</td>
<td>2.52</td>
<td>➣</td>
<td>4.48</td>
<td>➣</td>
<td>6.13</td>
<td>No Trend</td>
</tr>
</tbody>
</table>
2050 Projected changes in climate

**Low mitigation (RCP 8.5)**
- **Temp:** 2.5°C – 3.5°C increase in both min and max temp
- **Very Hot Days**
  - More vhd projected for the north (up to 40-50 vhd more)
  - South (up to 20 vhd more)
- **Extreme Rainfall Events**
  - Mixed signal for north
  - Clear signal of increases in extreme rainfall events for southern Gauteng (up to 3 more)

**High mitigation (RCP 4.5)**
- **Temp:** 2°C – 3°C increase in both min and max temp
- **Very Hot Days**
  - More vhd projected for the north (up to 30-40 vhd more)
  - South (up to 15 vhd more)
- **Extreme Rainfall Events**
  - Decrease in far North (up to 2 days less)
  - Mixed signal for central Gauteng
  - Clear signal of increases in extreme rainfall events for southern Gauteng (up to 3 more)
Changes in heat stress

Increase no. Very Hot Days
Low Mitigation Scenario
Urban flooding

The mean ratio of the near-future (2021-2050) and current (1961-1990) extreme daily rainfall (95th percentiles) for each quinary catchment.
Changes in drought

Drought Index (SPI)
Implications for Gauteng

- The significant population growth projected, if not managed and planned for effectively, will place an enormous amount of pressure on bulk infrastructure delivery and will have critical implications for national and regional policies and inter-governmental prioritisation efforts.
- This growth however also opens up the possibilities of designing principles of resilience into our cities, principles that can open up pathways to change.
- Increase in severe events will result in flash flooding, hail, damaging winds and lightning impacting infrastructure and housing.
- Heat stress on ecology.
- Heat stress on human comfort—specifically elderly, lower income & youth.
- The population growth & warmer climate projections will have significant relevance for energy demand (increase demand for cooling in summer due to maximum temperature increase, decrease warming demand given increase in minimum temp).
Thank you