

Celsius 1.5 – IAIA International Symposium  
27 September 2022 CTICC Cape Town



The Green Book online tool:  
Towards climate resilient settlements

Melanie Lück-Vogel, Amy Pieterse, Willemien van Niekerk,  
Gerbrand Mans

Council for Scientific and Industrial Research CSIR

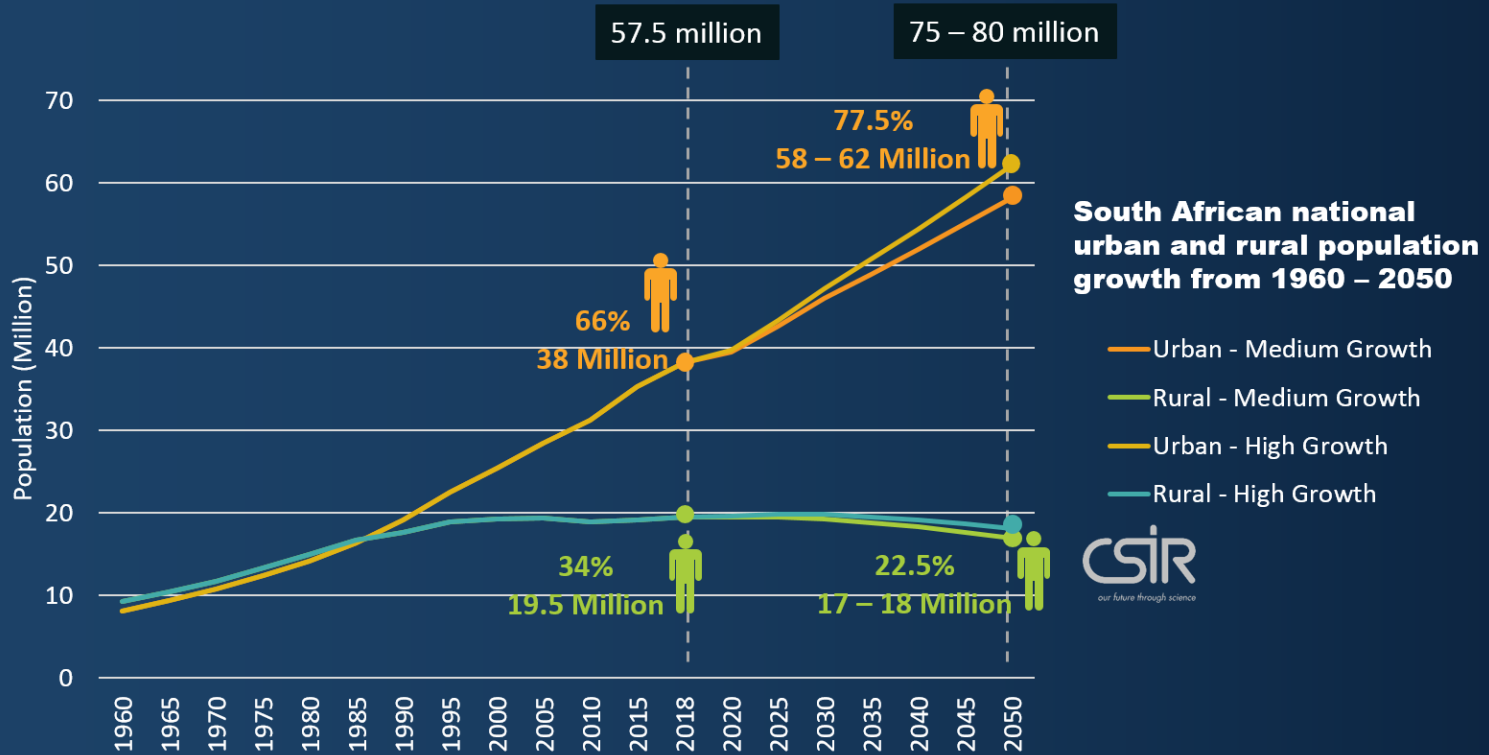
Project partners since 2016



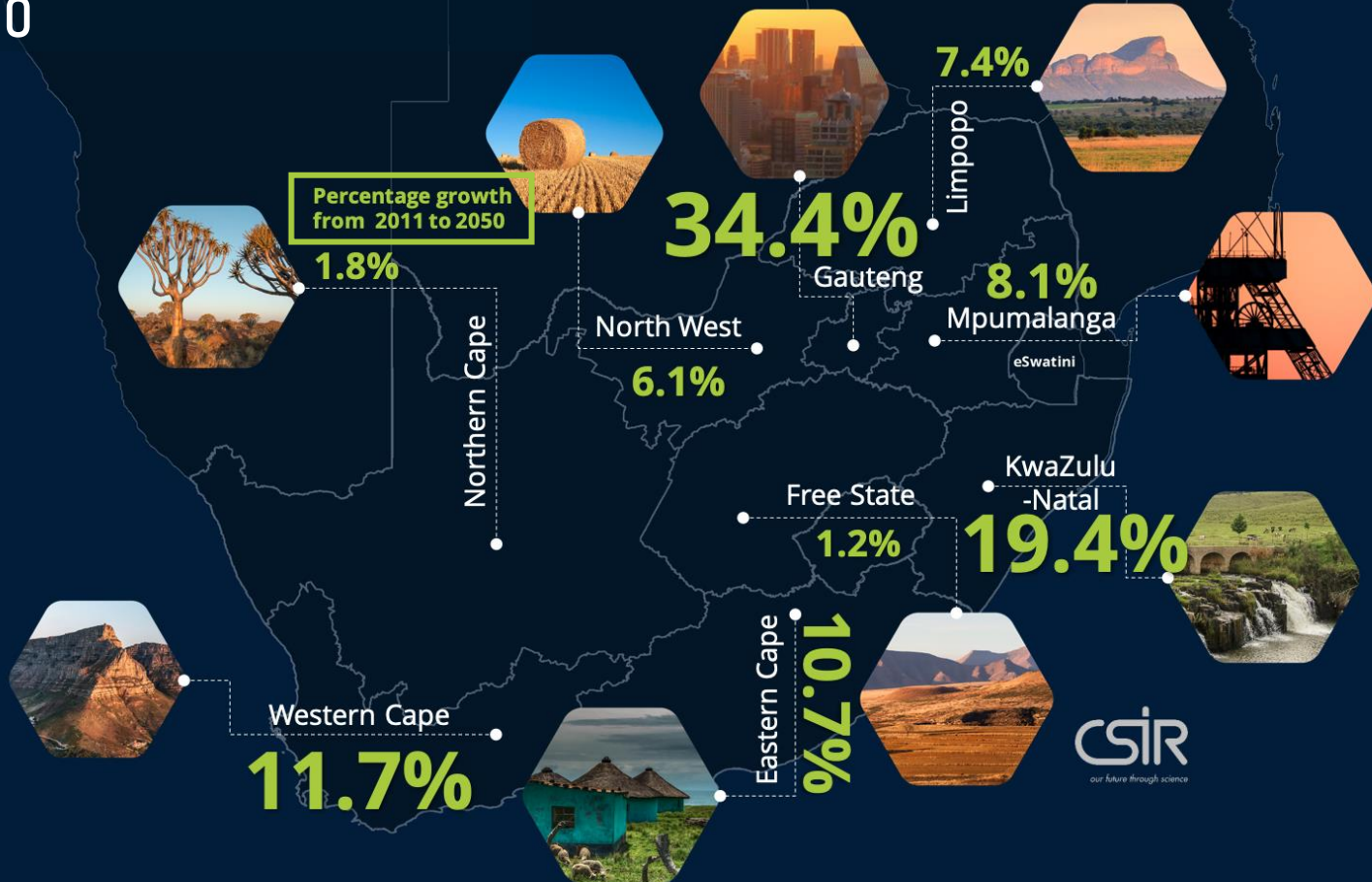
International Development Research Centre  
Centre de recherches pour le développement international



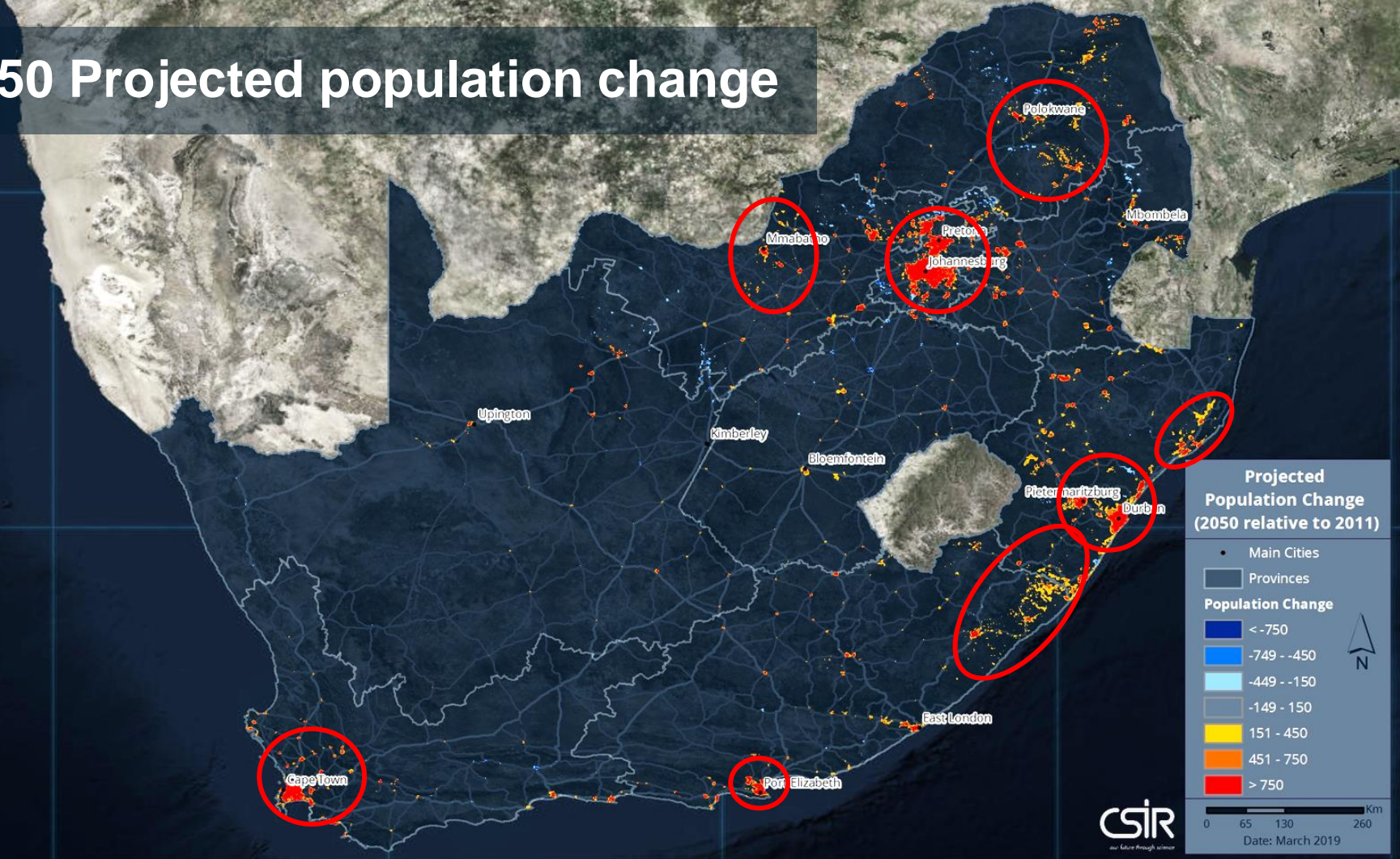
# Population growth 1960-2050



# Projected population growth 2011-2050



# 2050 Projected population change



**Projected Population Change (2050 relative to 2011)**

- Main Cities
- Provinces

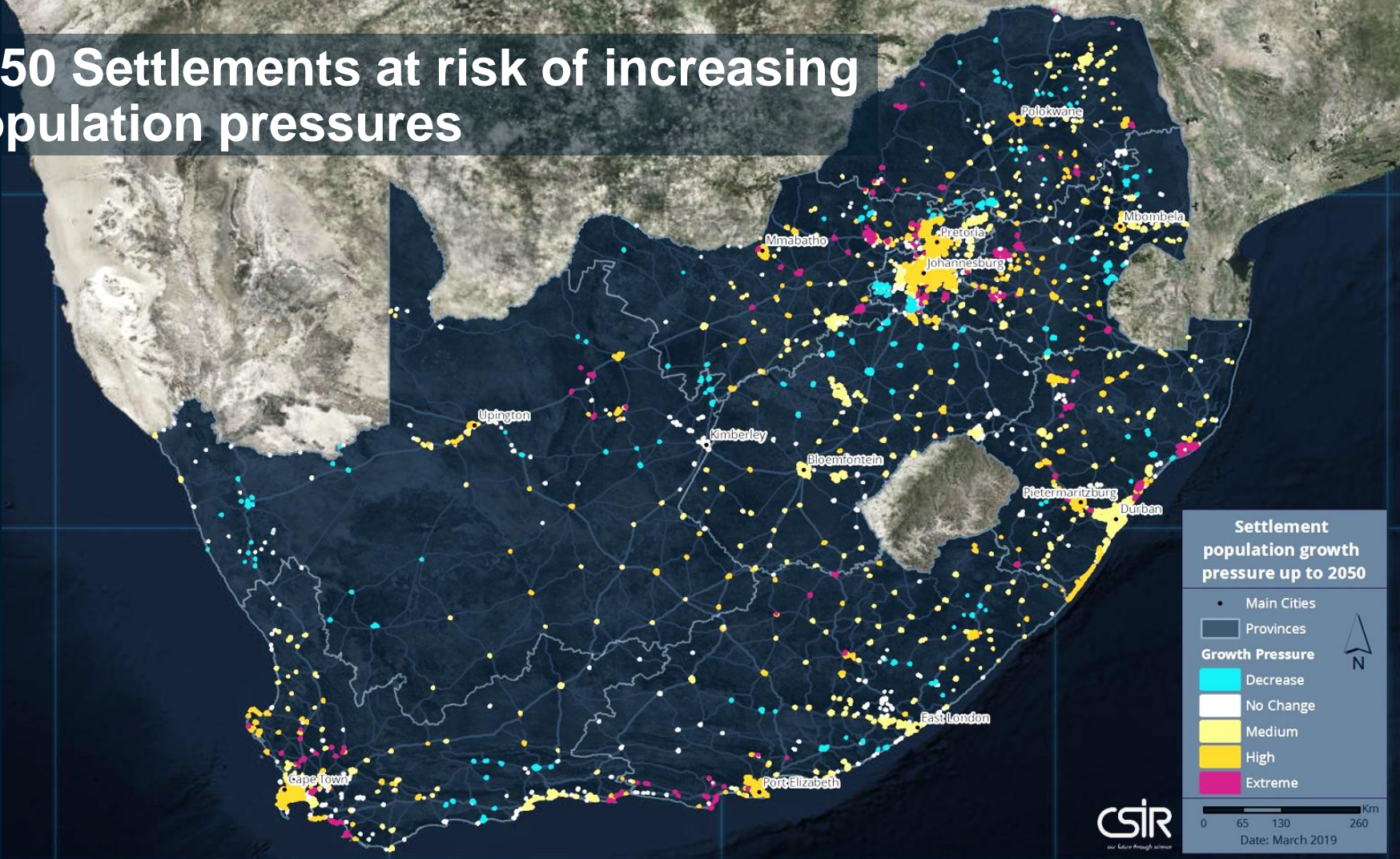
**Population Change**

- < -750
- 749 - -450
- 449 - -150
- 149 - 150
- 151 - 450
- 451 - 750
- > 750

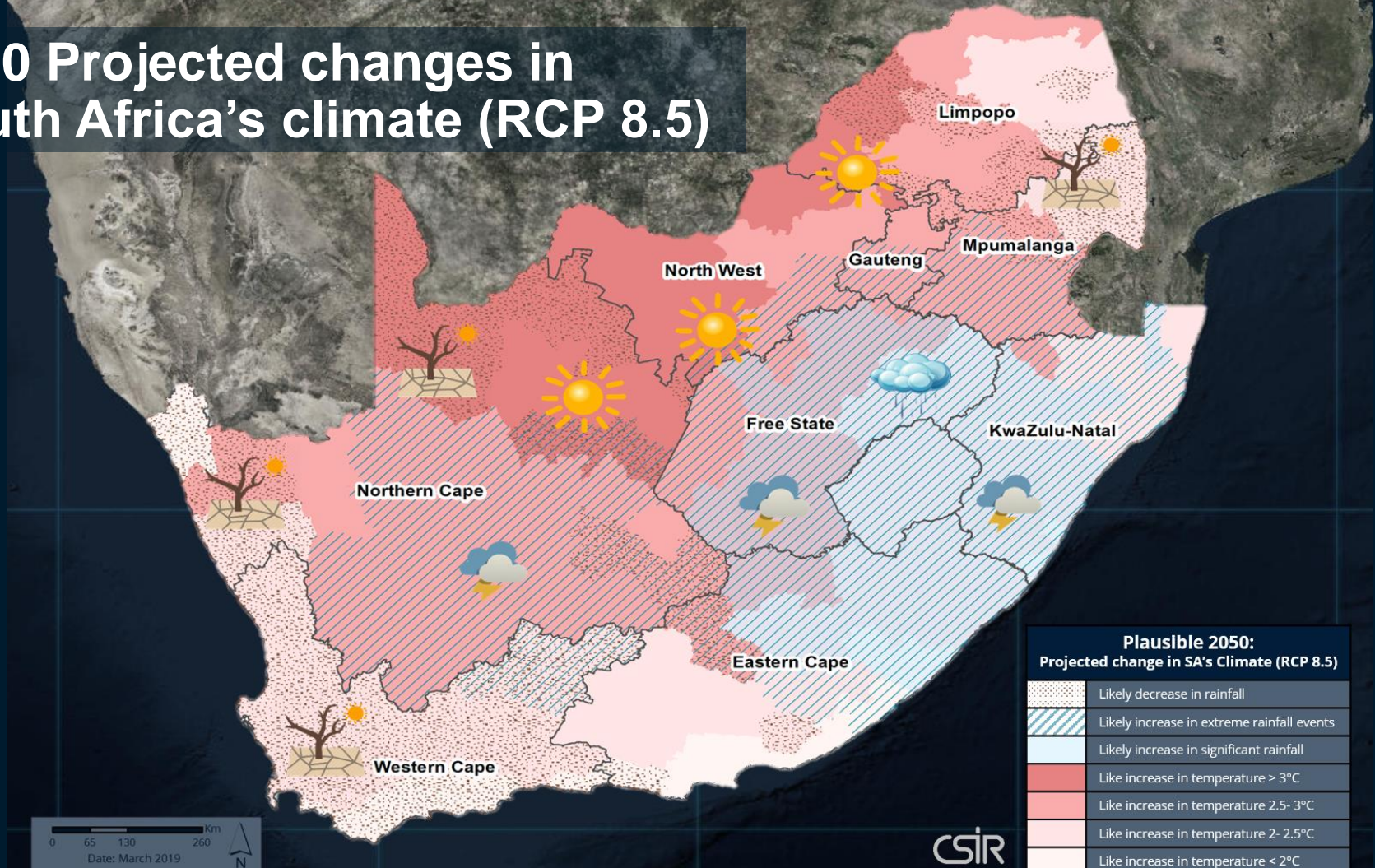
0 65 130 260 Km

Date: March 2019

# 2050 Settlements at risk of increasing population pressures



# 2050 Projected changes in South Africa's climate (RCP 8.5)





# THE URBAN CONTEXT



**Extreme weather events  
are becoming more  
frequent and intense with  
climate change**

+



**Growing & urbanising  
population will continue to place  
pressure on cities and local  
government**

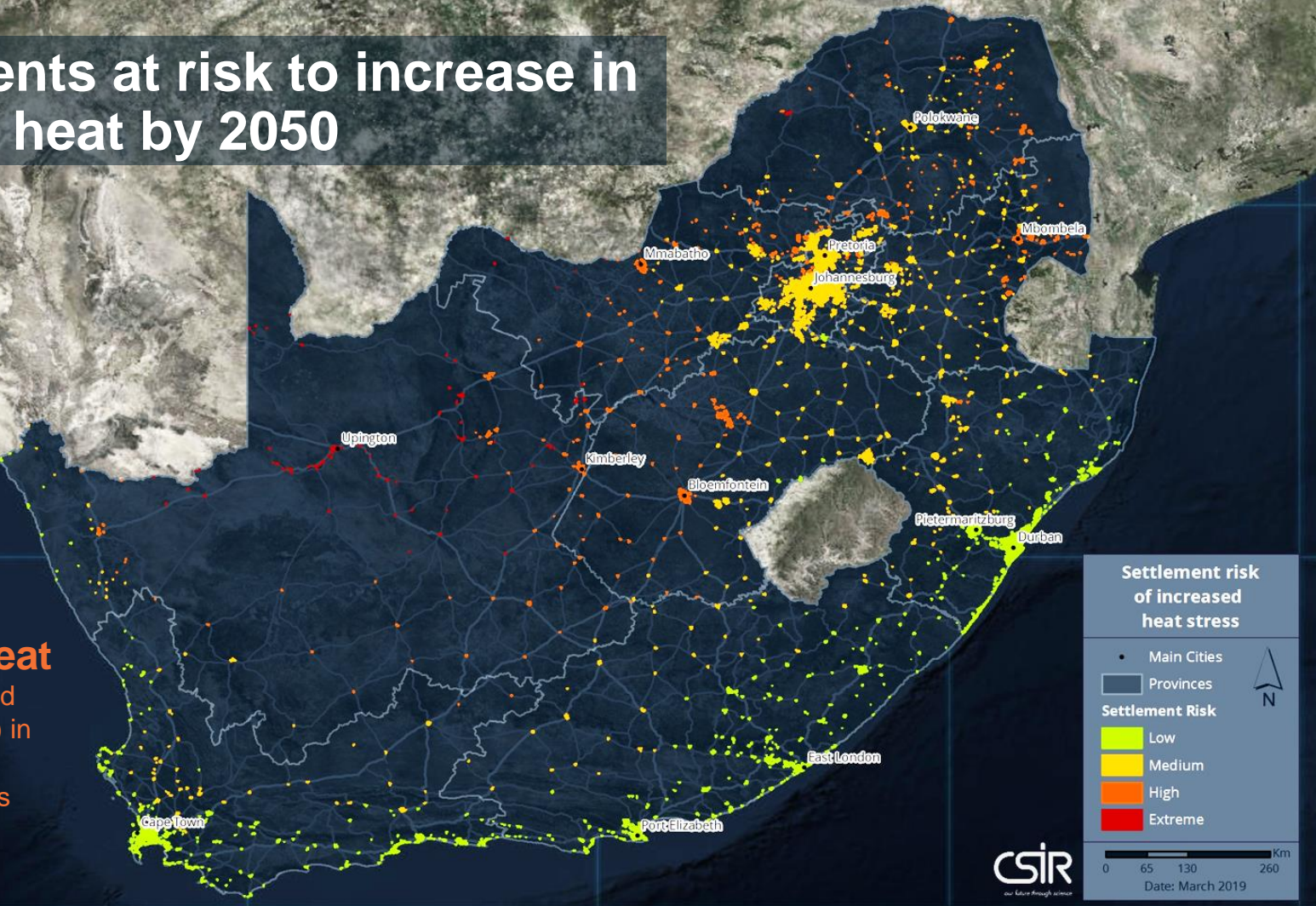
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**Exacerbate vulnerabilities and  
place more people,  
infrastructure and ecosystems  
at risk**

# Settlements at risk to increase in extreme heat by 2050

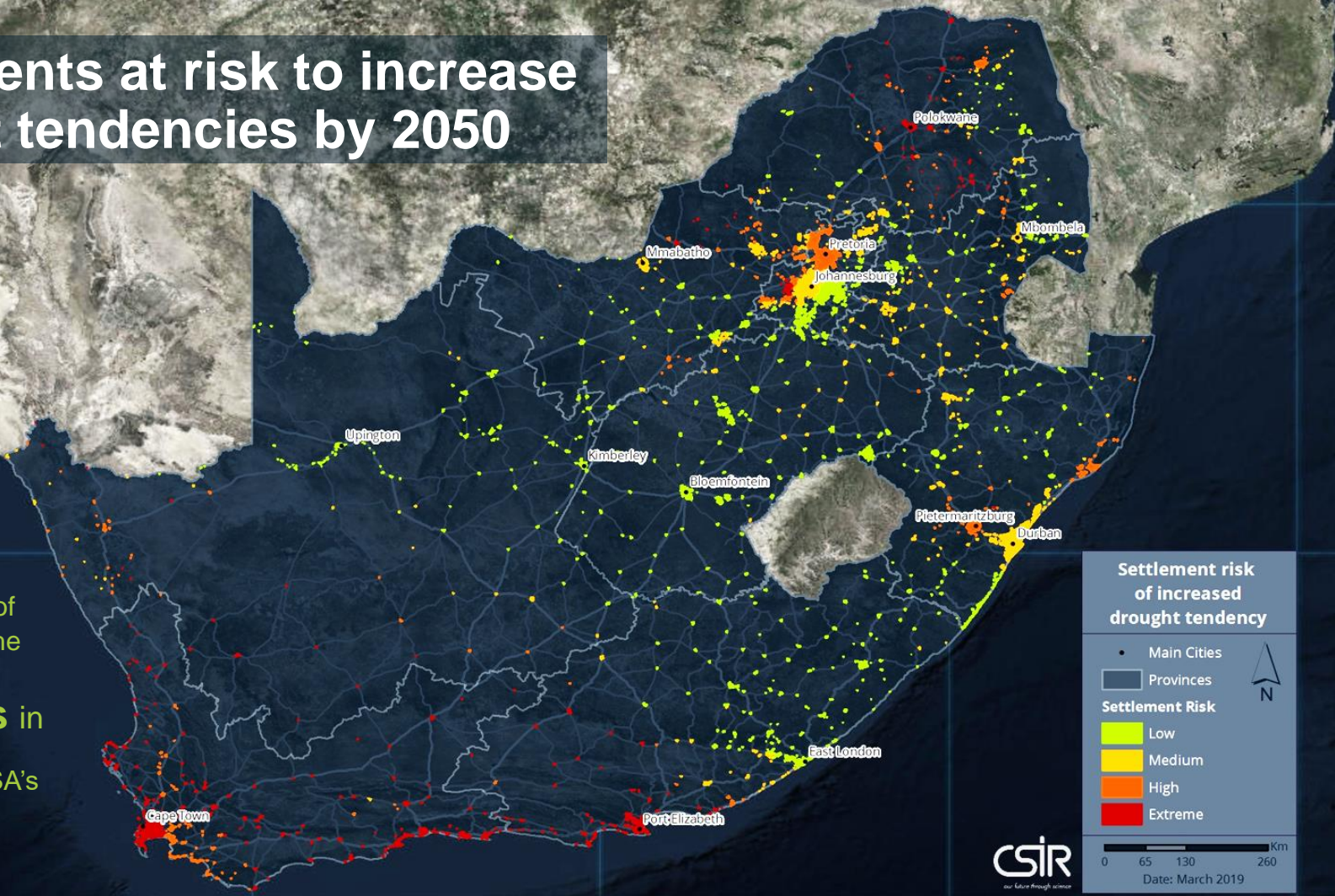
High & very high risk of increases in their exposure to Extreme Heat (very hot days and heat waves days) in 28% of SA's settlements





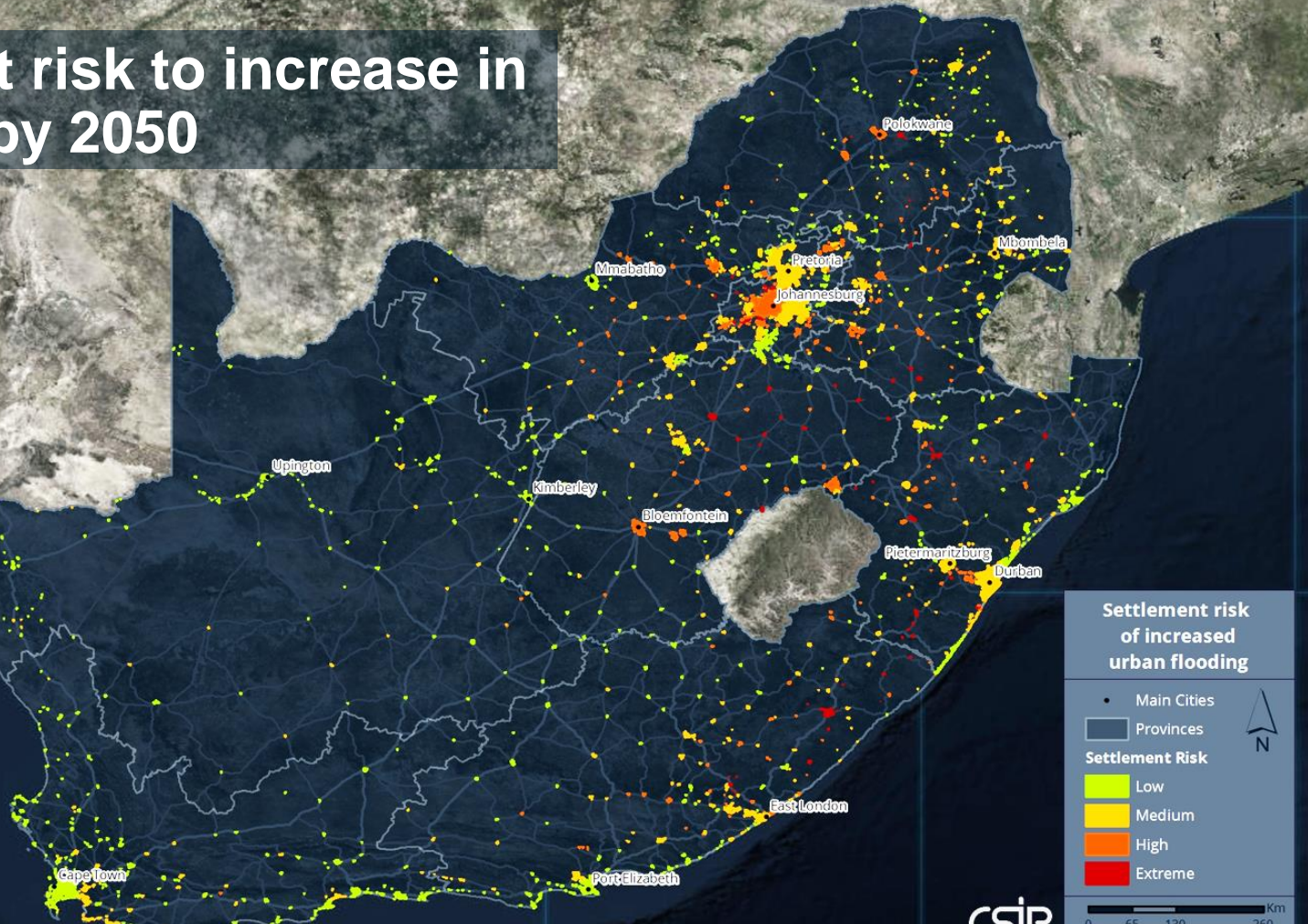
# Settlements at risk to increase drought tendencies by 2050

High & extremely high risk of increases in the frequency of droughts in **30%** of SA's settlements



# Settlements at risk to increase in urban floods by 2050

High & extremely high risk of increases in the frequency of urban flooding in **21%** of SA's settlements

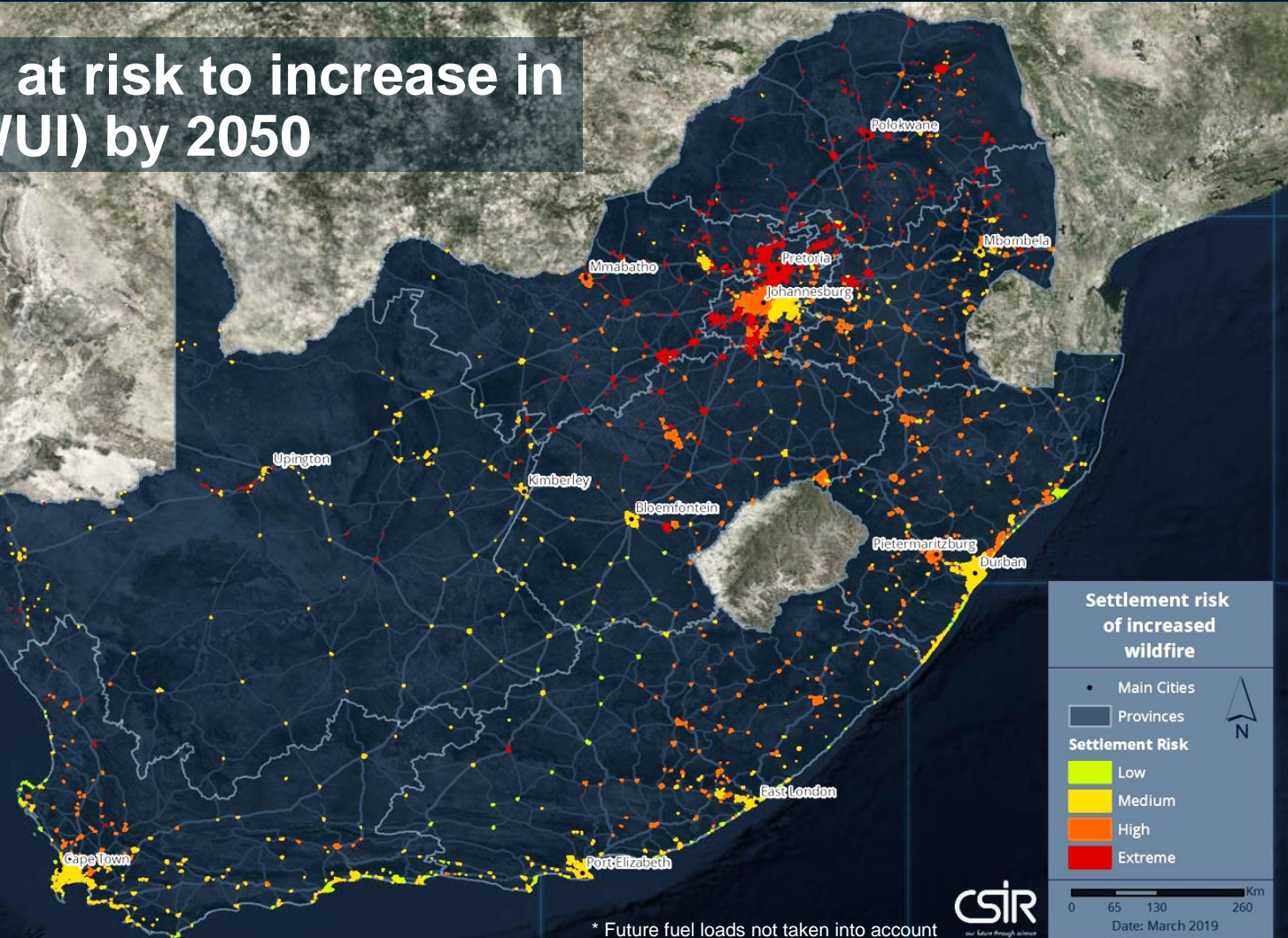


\* Downstream effects not taken into account



# Settlements at risk to increase in wild fires (WUI) by 2050

High & extremely high risk of increased exposures to wild fires in 60% of SA's settlements

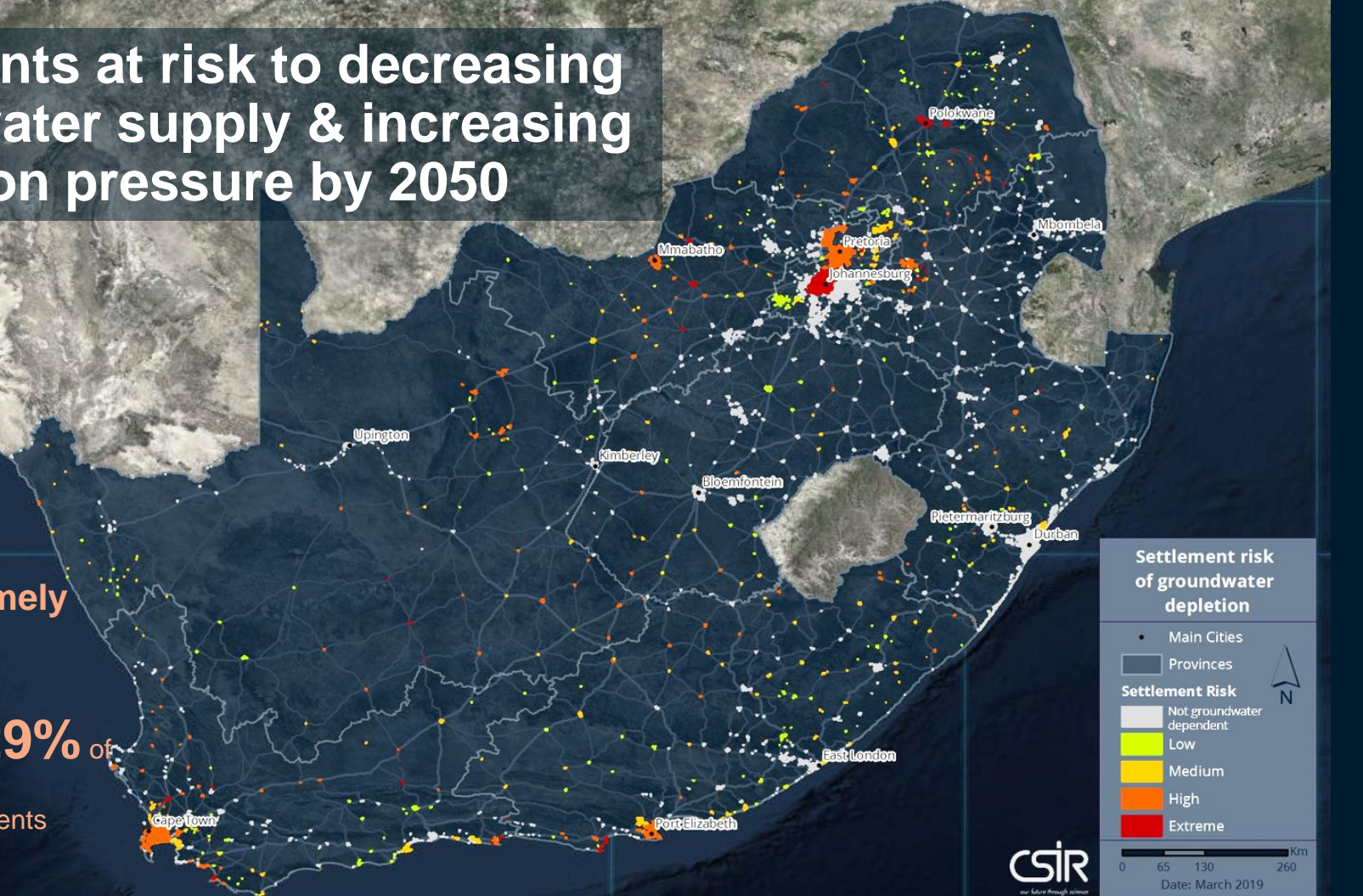


\* Future fuel loads not taken into account

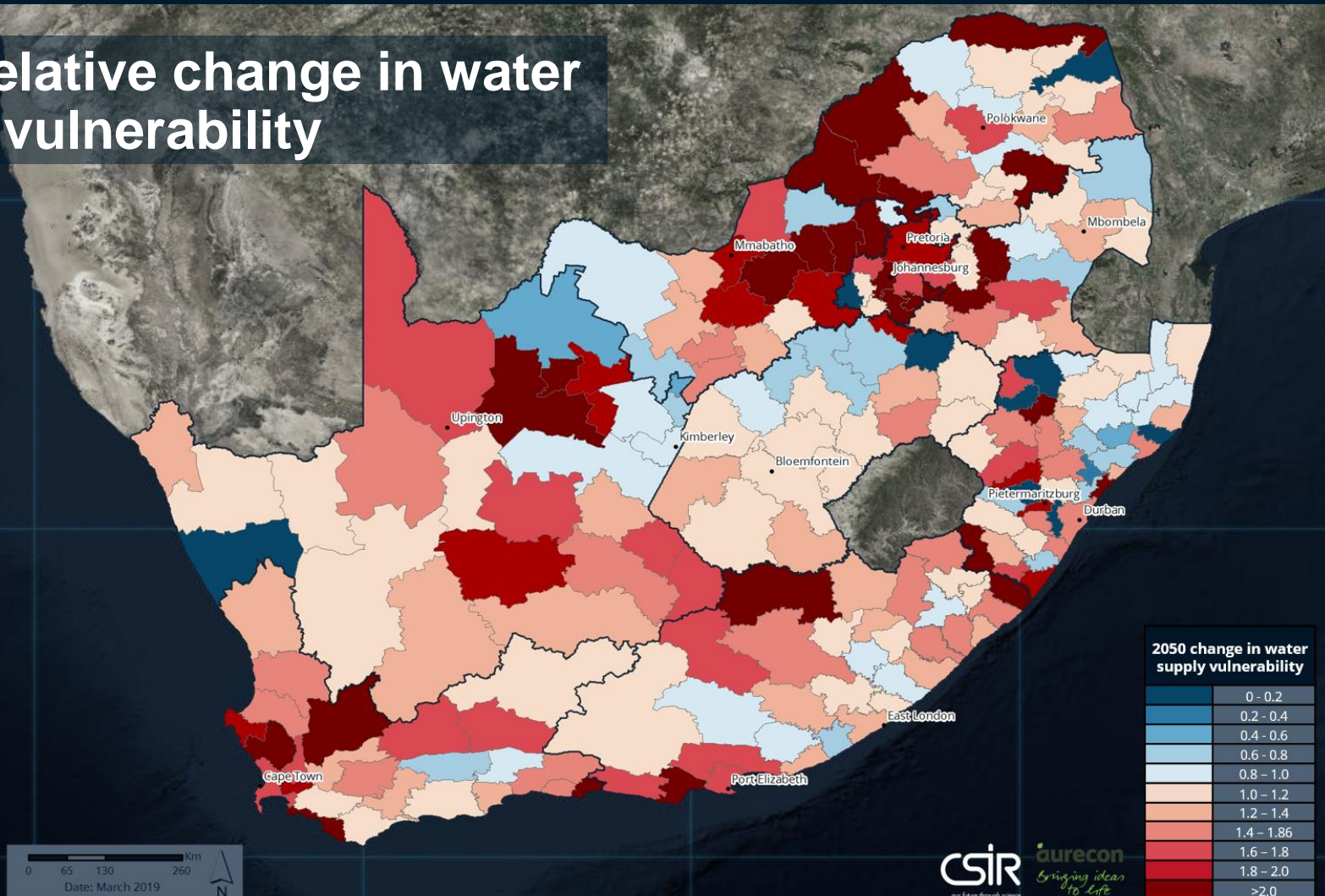
CSIR  
Our future through science

# Settlements at risk to decreasing groundwater supply & increasing population pressure by 2050

High & extremely high risk of groundwater depletion in **29%** of SA's groundwater dependent settlements



# 2050 Relative change in water supply vulnerability





<https://greenbook.co.za/>

# GREEN BOOK ONLINE PLANNING SUPPORT SYSTEM

## GREENBOOK

*adapting settlements for the future*

The Green Book online tool supports municipal planning with the development of climate resilient settlements. It ultimately facilitates the mainstreaming of climate change adaptation into local government planning instruments and processes.

[YOUR GUIDE TO THE GREEN BOOK](#)

[A CALL TO ACTION](#)



[ABOUT](#)

[STORY MAPS](#)

[RISK TOOL](#)

[ADAPTATION TOOL](#)

[TRAINING](#)

[CONTACT](#)

# BACKGROUND TO THE GREENBOOK

- The GreenBook is a multi-disciplinary, open-access **planning support system** that provides **evidence** to South African municipalities to adapt their **cities and towns** to current and future climate change impacts based on their risk assessment.
- Initially co-funded by the IDRC and the CSIR (2016-2019), and in partnership with the NDMC. With more partners coming on board since 2019.

213

In-depth, current, and future (2050) climate risk and vulnerability profile for every municipality in the country

81

Planning-related climate change adaptation actions

11

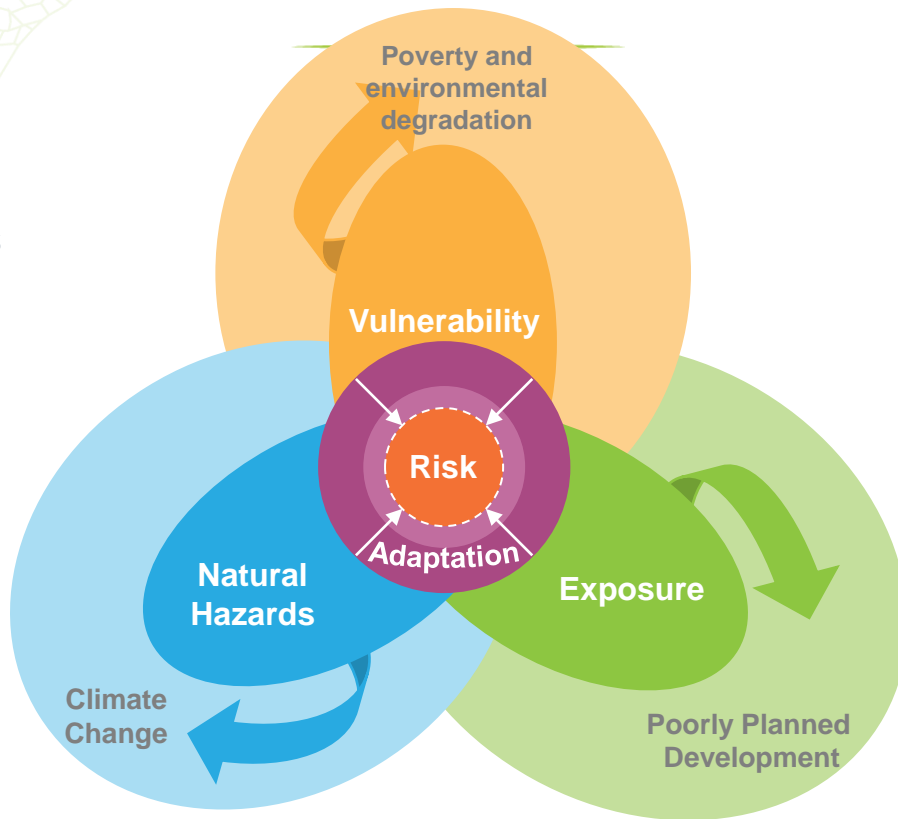
National climate change impacts contextualised in narrated story maps





# INTERDISCIPLINARY RESEARCH DESIGN

More than 50 scientists  
of difference disciplines  
involved.

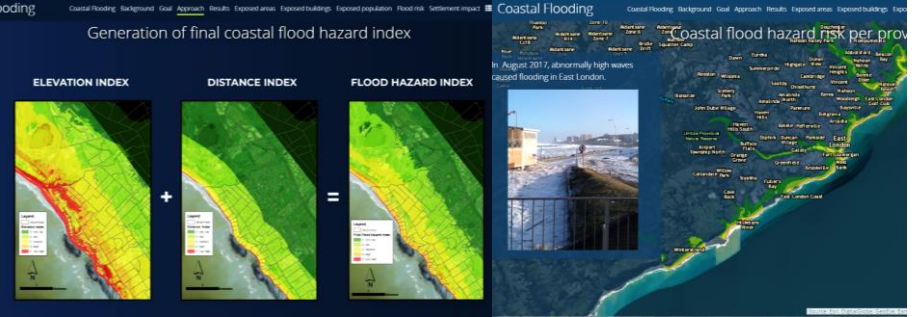
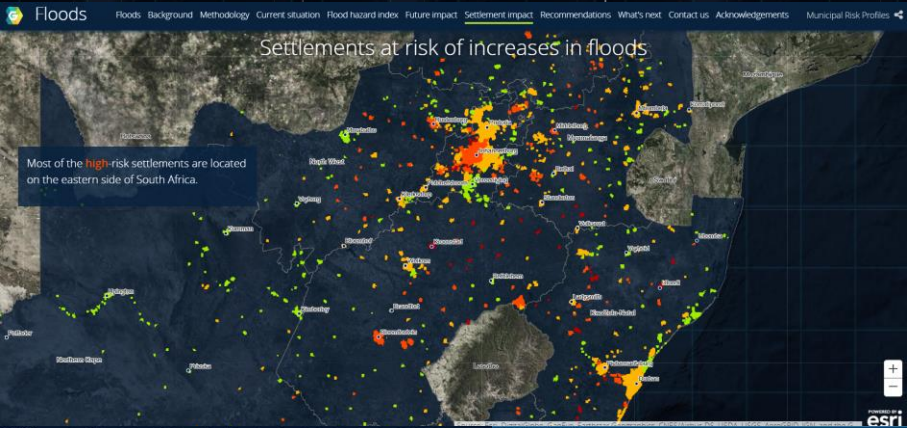
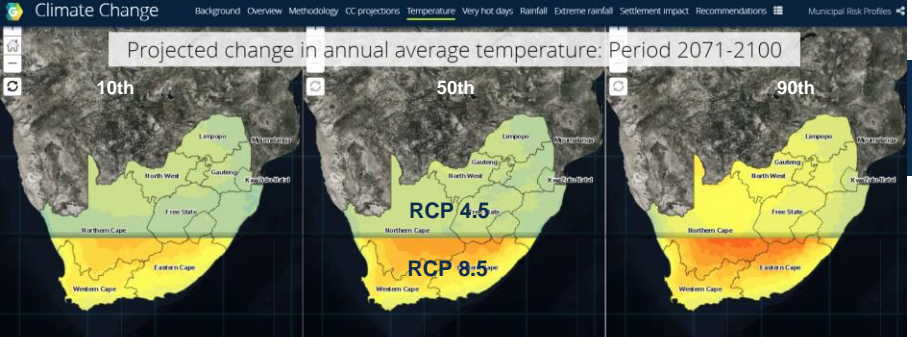




# Elements of the GREENBOOK



**CSIR**  
Touching lives through innovation

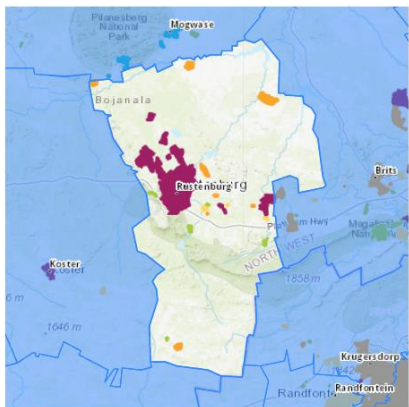


# STORY MAPS

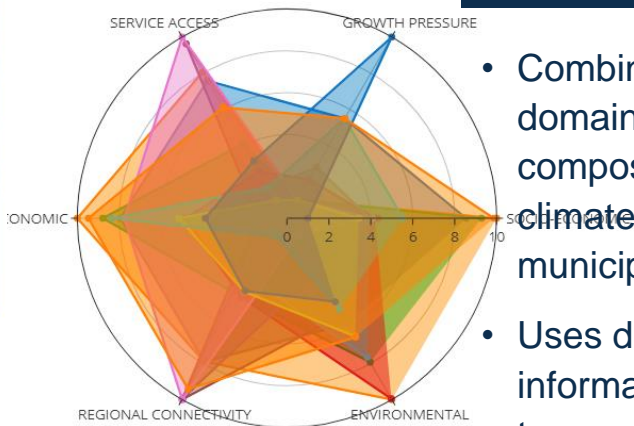
- 11 Interactive story maps to communicate the research methodologies and main findings from the research streams.
- Developed using the ESRI Story Map application which allowed a narrative around scientific findings to be supported by custom maps, images and statistics.
- Story maps for climate change, flooding, wildfire, coastal flooding, urban growth, settlement vulnerability, surface water, groundwater, drought, the economy, and agriculture.

# RISK PROFILE TOOL

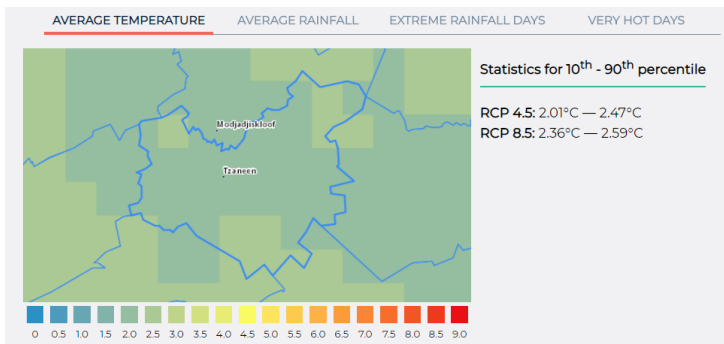
## POPULATION GROWTH PRESSURE



## SETTLEMENT VULNERABILITY



- Combines scientific evidence produced from multiple domain-specific research streams into interactive, composite profiles covering current and future (2050) climate risks, impacts and vulnerabilities for all municipalities in South Africa and their settlements.
- Uses different data communication methods to distil information to be relevant to local municipal actors, and to support evidence-based planning and decision-making.



# ADAPTATION ACTIONS TOOL

- Provides 81 different planning and design actions for municipalities to adapt their settlements and environments.

**GREENBOOK**

**FILTERS** Search for an adaptation action

**HAZARDS & CLIMATE IMPACTS**

- Coastal Flooding
- Inland Flooding
- Heat Stress
- Wildfire
- Increased Wind Speed
- Drought
- Groundwater Depletion
- Surface Water Depletion
- Biodiversity Loss

**PLANNING FUNCTION**

**STRATEGY**

**ADAPTATION ACTIONS**

HAZARDS & CLIMATE IMPACTS	MUNICIPAL PLANNING FUNCTION
Determine urban edge	Identify all open spaces
Connect open spaces	Identify areas where vegetation coverage can be increased
	Identify areas for vegetated windbreaks

## HAZARDS & CLIMATE IMPACTS



COASTAL FLOODING



INLAND FLOODING



HEAT STRESS



SURFACE WATER DEPLETION



INCREASED WIND SPEED



DROUGHT



GROUNDWATER DEPLETION

## MUNICIPAL PLANNING FUNCTION



SPATIAL PLANNING



LAND USE MANAGEMENT



LANDSCAPE DESIGN



ENVIRONMENTAL PLANNING



ENGINEERING SERVICES

This includes water, energy and ICT, stormwater, sanitation, solid waste, and mobility and transport).

# ADAPTATION ACTIONS TOOL

- Provides 81 different planning and design actions for municipalities to adapt their settlements and environments.
- Users can filter through the list of adaptation actions by climate risk, impact, adaptation strategy, or planning function.

# ADAPTATION ACTIONS TOOL

Implement water conservation measures

Design a water pressure management system



DESCRIPTION GOALS BENEFITS COSTS EXAMPLE CREDITS LINKS

Water conservation interventions reduce the demand on water resources. Interventions include pressure management; replacing non-functional water meters; re-using treated effluent; installing flow-limiting devices; and increased water storage. Other water conservation measures (such as clearing alien invasive vegetation from infested catchments) can increase the amount of surface water run-off and also the recharge to groundwater sources, whilst rainwater harvesting in agriculture and homes (especially those in rural areas) could reduce reliance on municipal/formal water supplies by optimising rainfall. There is significant potential in the domestic and agricultural sectors for minimising inefficient water use by reducing leakages from piped and open channel distribution systems.

GREENBOOK

- Provides access to 81 different planning and design actions for municipalities to adapt their settlements and environments.

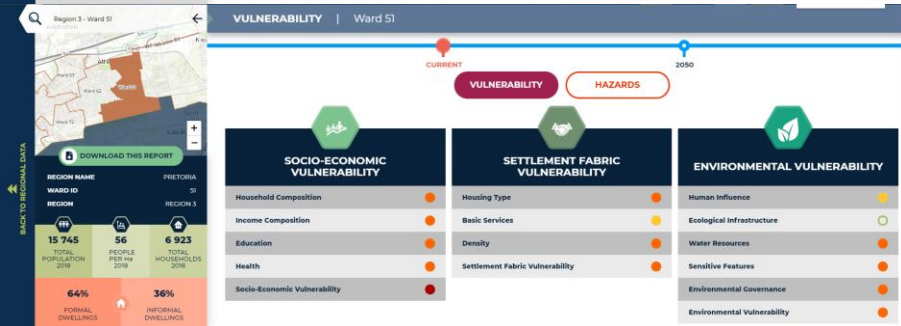
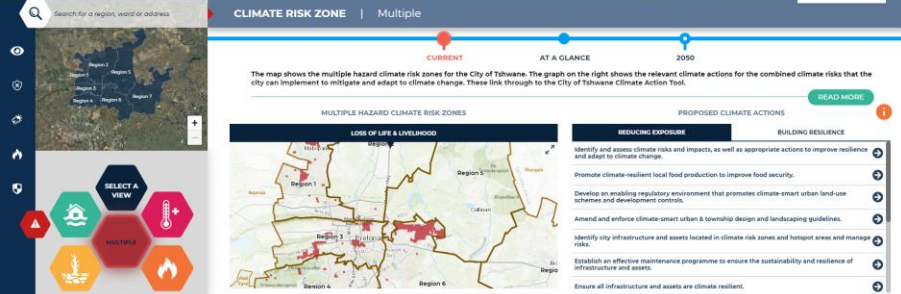
- Users can filter through the list of adaptation actions by climate risk, impact, adaptation strategy, or planning function.

- Descriptive information on what the adaptation action entails, its benefits and co-benefits, possible costs and implications, and an image is provided for each adaptation action.

SUPPORTING ACTIONS

- Interlinkages between adaptation actions are highlighted and users are able to identify multiple actions that are able to support each other when implemented.

<https://adaptationactions.greenbook.co.za/>



# METROVIEW

- GreenBook MetroView provides spatialised and quantified climate risk, vulnerability, and demographic evidence, linked to place-based climate response measures.
  - Climate Risk & Vulnerability Profile
  - Climate Actions Tool
- Supports communication and analysis of evidence to assist practitioners, policymakers, and decision-makers to effectively inform and add value to climate change adaptation.
- Openly accessible through an online planning support system.
- City of Tshwane pilot.

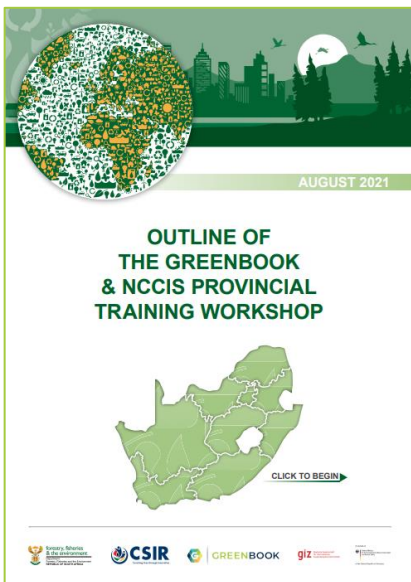
Risk & Vulnerability Profile: <https://tshwane-riskprofile.greenbook.co.za>

Climate Actions Tool: <https://tshwane-climateactions.greenbook.co.za/>

# GREENBOOK TRAINING

Green Book training events aim to build enduring capacity in all spheres of government (and beyond) to proactively adapt South African settlements to the impacts of hydro-meteorological hazards. Mainstreaming climate change adaptation into sector plans and policies are critical to build resilience, and reduce the exposure of people, infrastructure, buildings, and the environment to the long-term impacts of climate change and severe weather events.

[GO TO EVENTS & RESOURCES](#)



## TRAINING

- Duration: 2 days, is paid for by clients and partners.
- Focusses on awareness raising about the climate risks associated with a changing climate, and the need for adaptation.
- The GreenBook planning support tools are demonstrated in detail.
- The concept of mainstreaming is explained, and obstacles and guidelines toward mainstreaming are provided.

Alfred Nzo  
District Municipality

Amathole  
District  
Municipality

Buffalo City  
Metropolitan  
Municipality

Sarah Baartman  
District Municipality

Chris Hani  
District Municipality

Joe Qqabi  
District Municipality

Nelson Mandela Bay  
Metropolitan  
Municipality

O.R. Tambo  
District Municipality

<https://greenbook.co.za/green-book-training.html>



# GREENBOOK 3.0: THE FUTURE STORY

- Several gaps have been identified and will be addresses in the future:
  - changes in the underpinning science of climate models (i.e., IPCC AR6);
  - probabilities of extreme event occurrences under different scenarios;
  - coastal flood risk and erosion modelling;
  - the impact of climate change on health, food security and the energy sector;
  - green infrastructure as adaptation strategy;
  - and a decision-model around adaptation efforts based on evidence.





**GREENBOOK**  
*adapting settlements for the future*

**Thank you**

Melanie Lück-Vogel  
[mluckvogel@csir.co.za](mailto:mluckvogel@csir.co.za)

on behalf of the Green Book Team

