UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

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Getting to the Heart of climate change - The role of science engagement

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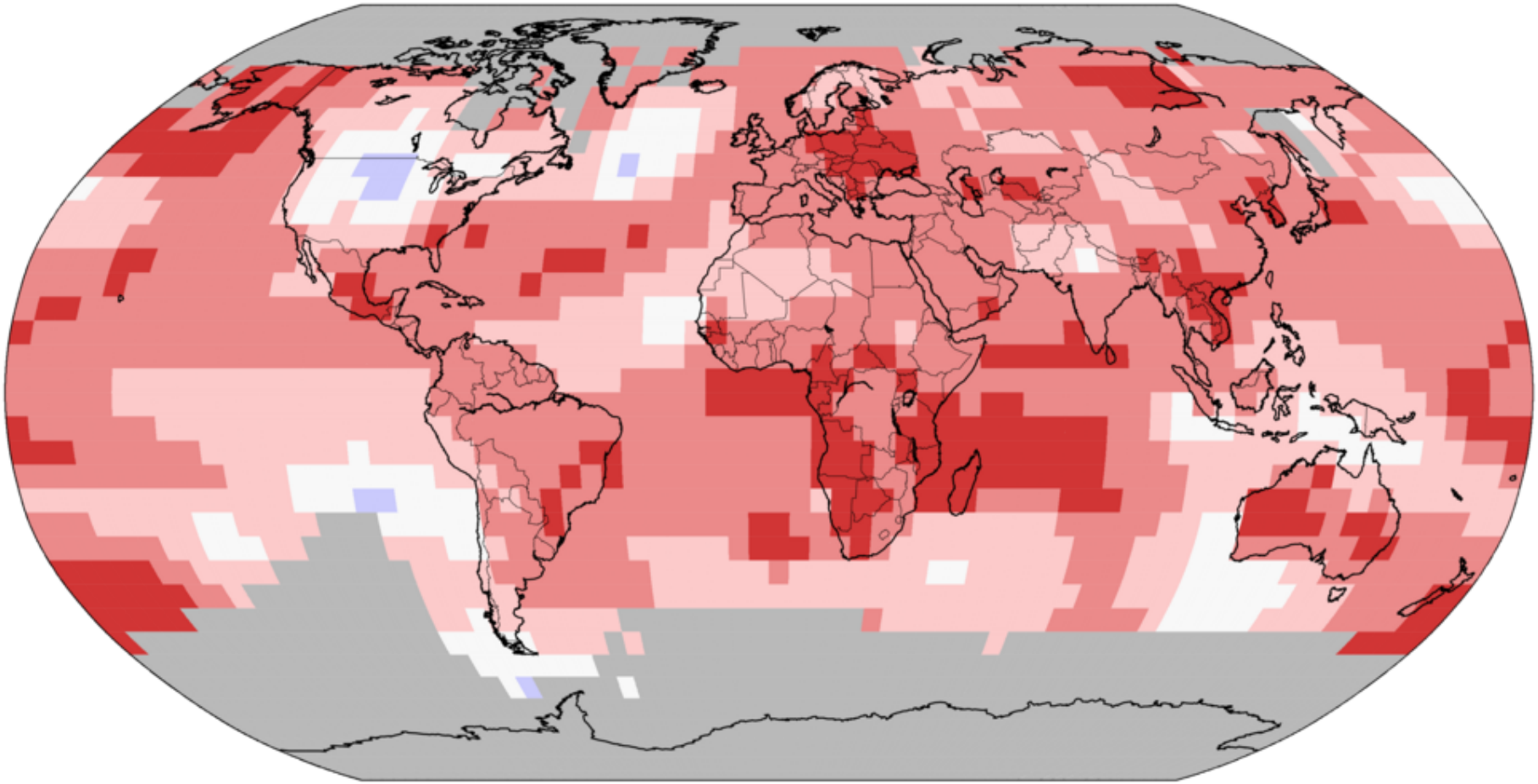
University of the Witwatersrand

Land & Ocean Temperature Percentiles Jan–Dec 2019

NOAA's National Centers for Environmental Information

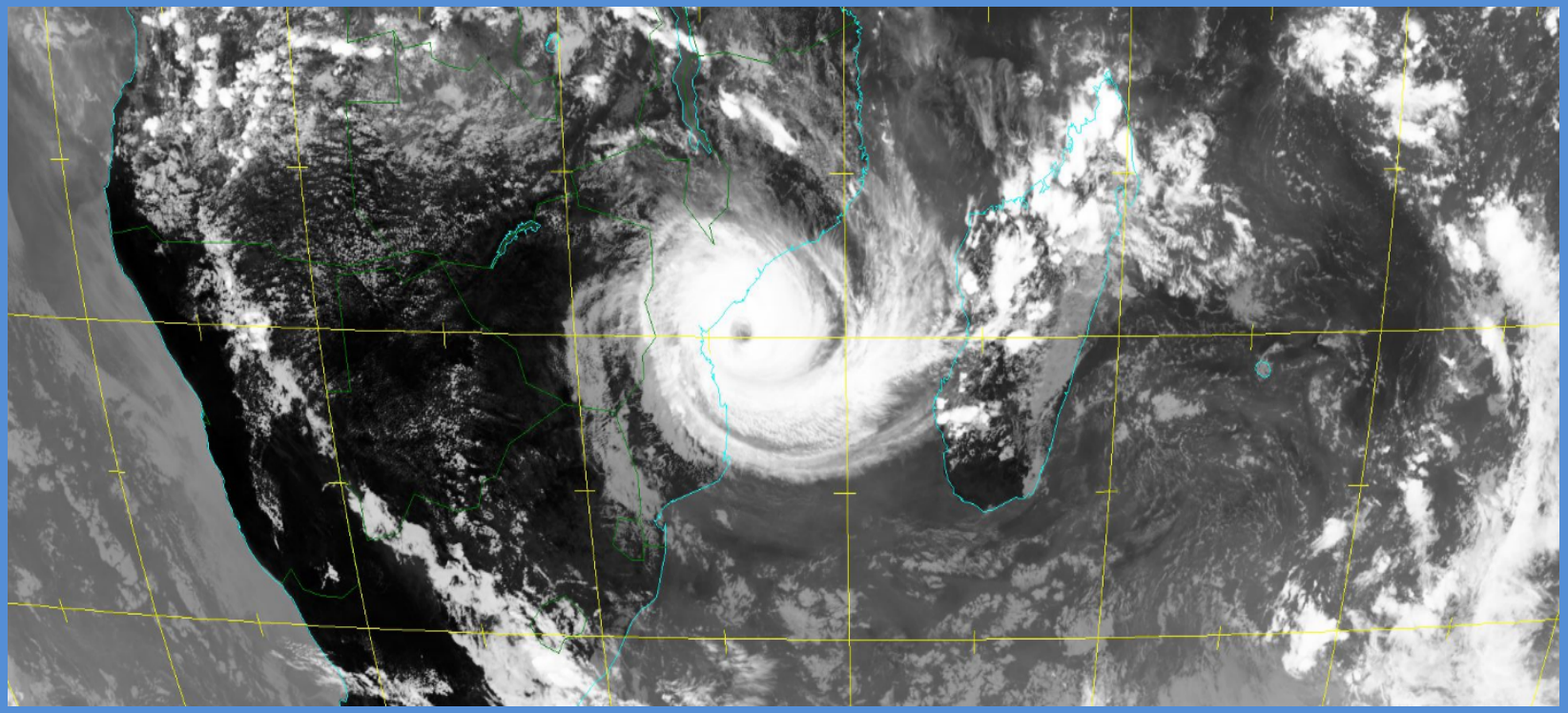
Data Source: NOAAGlobalTemp v5.0.0–20200108



Record Coldest	Much Cooler than Average	Cooler than Average	Near Average	Warmer than Average	Much Warmer than Average	Record Warmest

GHCNM v4.0.1.20200106.qfe

Tropical Cyclone Idai just before making landfall over Beira on 14 March 2018.



http://www.sat.dundee.ac.uk/geobrowse/geobrowse.php. Meteosat Second Generation (MSG) infra-red satellite image.

Drought in southern Africa

A dust storm rolls over the plains of the Free State in December 2015.

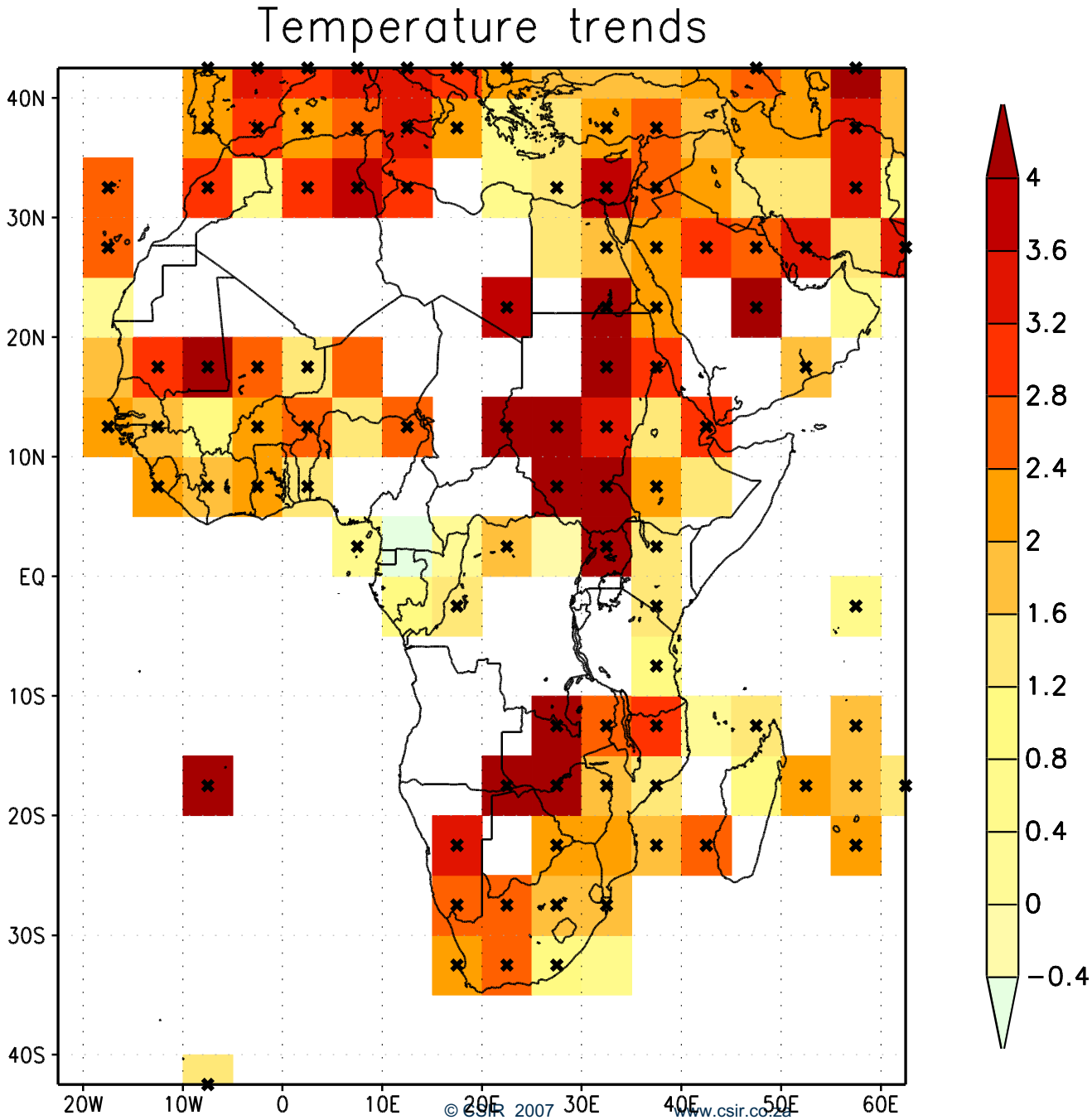
The 2015/16 El Niño brought the worst drought on record to the Free State and Northwest Province

Vaal Dam level dropped to below 25% in September 2016

Cape Town drought of 2015-2017

October 2020: Extreme drought in Eastern Cape, Northern Cape, western Limpopo

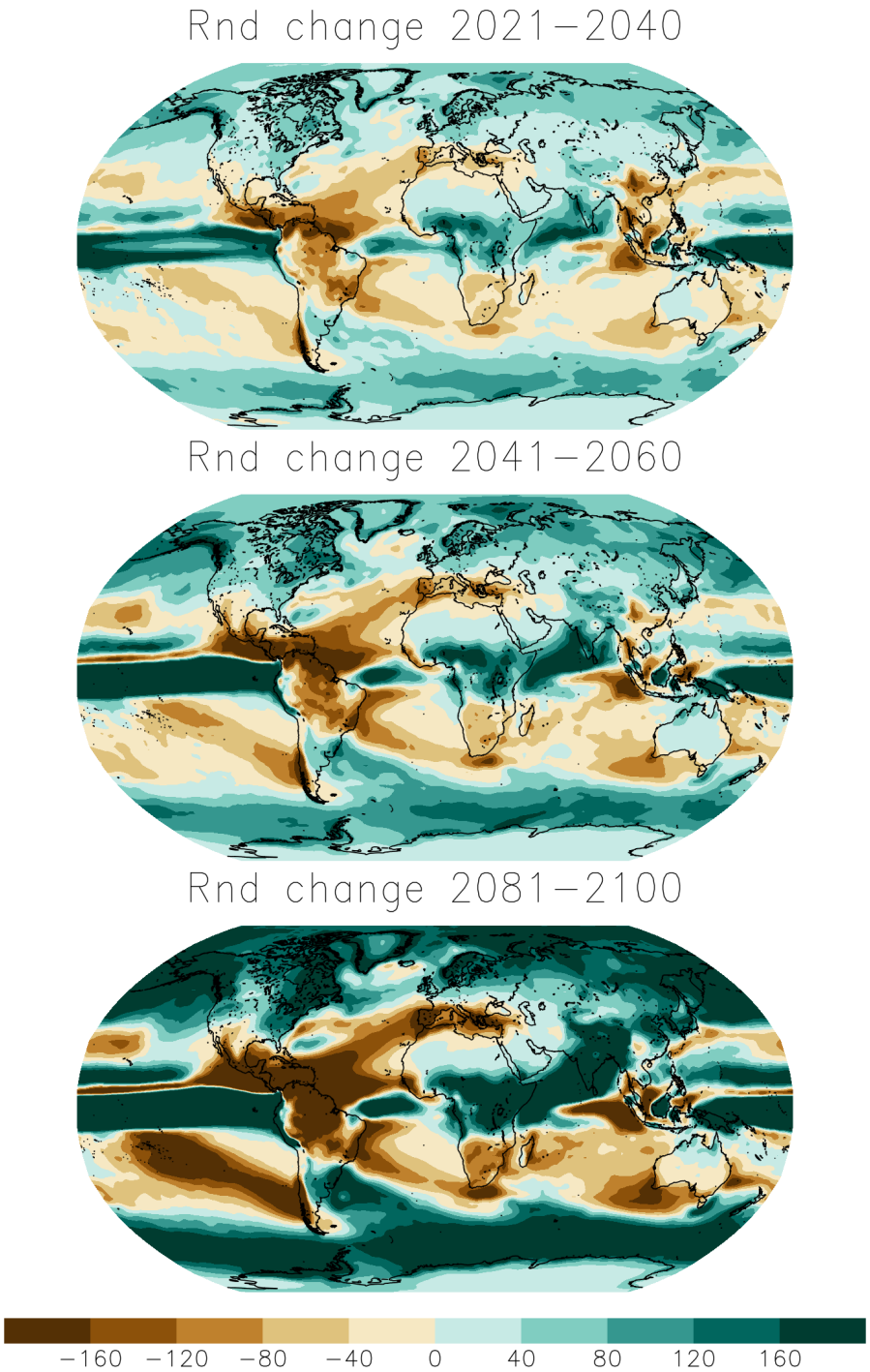
Future climate change likely to bring more frequent multi-year droughts



Observed trends in annual-average temperatures over Africa 1961-2010

Southern African temperatures rising at ~ twice the global rate of temperature increase

(Engelbrecht et al., 2015; *ERL 10: 085004*)



Southern Africa is projected to become systematically drier and drastically warmer: implications for water and food security.

More frequent multi-year droughts: winter and summer rainfall regions

Options of adaptation are limited

Figure shows the projected changes in rainfall (mm) from the ensemble average of 15 CMIP6 GCMs for 2021-2040, 2041-2060 and 2081-2100 relative to 1850-1900.

Key messages - southern Africa as a climate change hotspot

Temperature increases are projected to range between 4 and 7 ˚C over the interior by the end of the century under low mitigation. Temperature increases may plausibly reach 3-4 ˚C by the 2040s.

Drastic increases in the number of high fire-danger days, very hot days and heat-wave days.

The southern African region is likely to become generally drier. Multi-year El Niño type droughts may plausibly occur from the mid-century (2030-2060) onwards – with implications for a potential “day zero” in Gauteng.

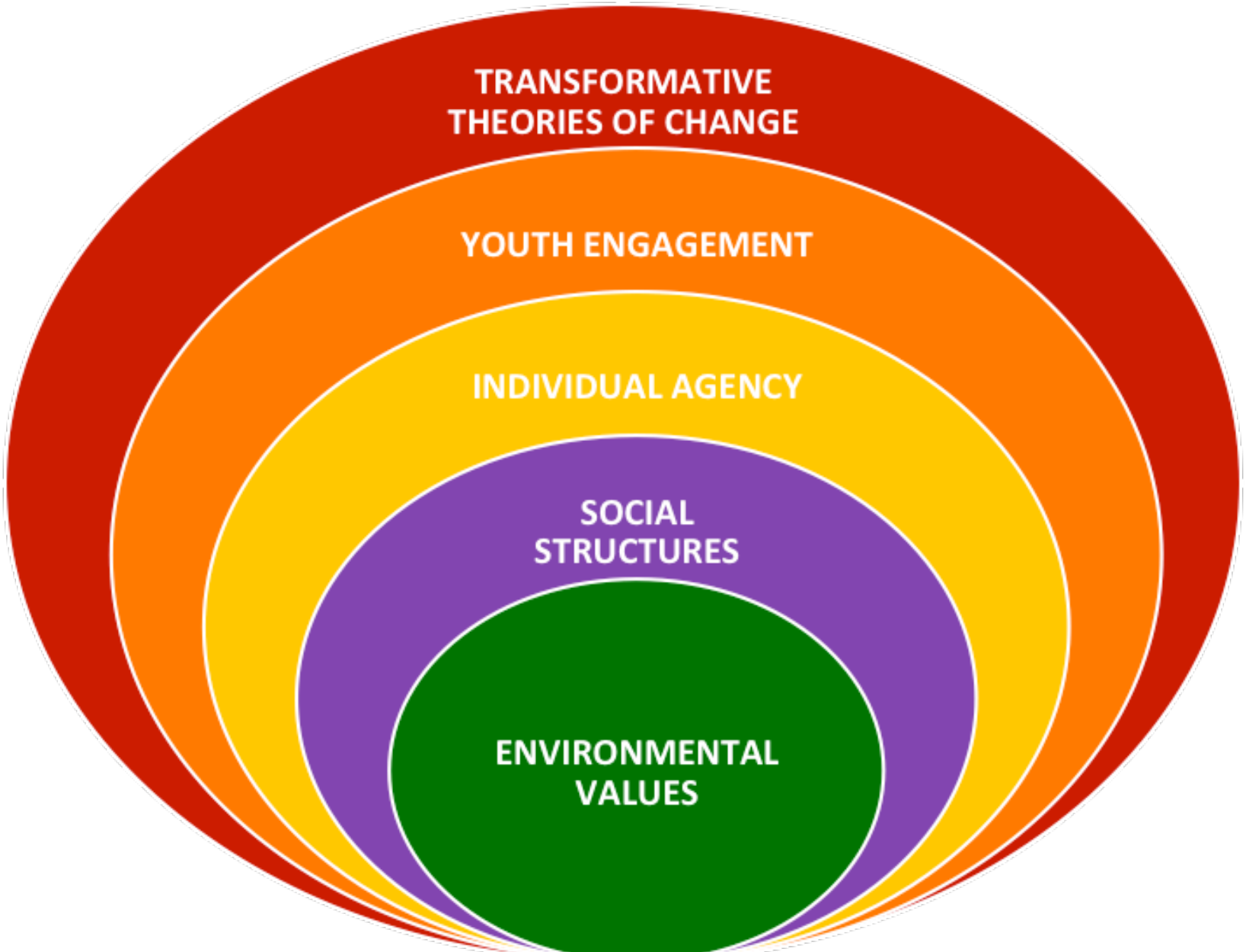
Probability of day zero events in Cape Town to further increase over the next three decades (and beyond, under low mitigation).

Over northeastern South Africa, Mozambique and Zimbabwe an increase in extreme rainfall events is plausible. Changing probabilities of category 3-5 hurricane (intense tropical cyclone) making landfall over Maputo or even Richards Bay remains to be quantified.

An increase in the frequency of intense thunderstorms is likely over eastern South Africa – changes in tornadic thunderstorms remain to be quantified

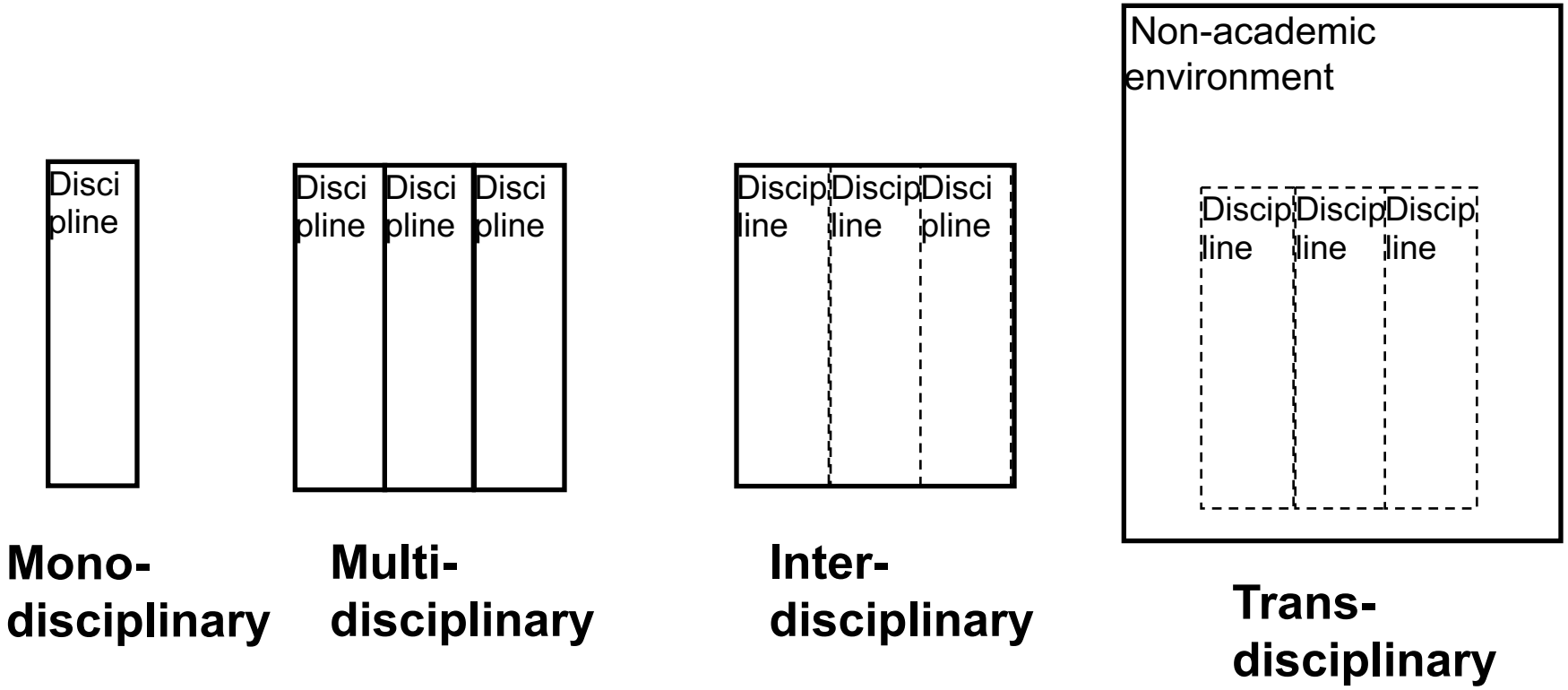
So what? – How do we engage citizens?

Transformative changes



Transdisciplinarity:

"a new form of **learning** and **problem solving** involving cooperation among **different parts of society and academia** in order to meet **complex challenges of society**" (Julie Klein et al., 2001)



Heartware

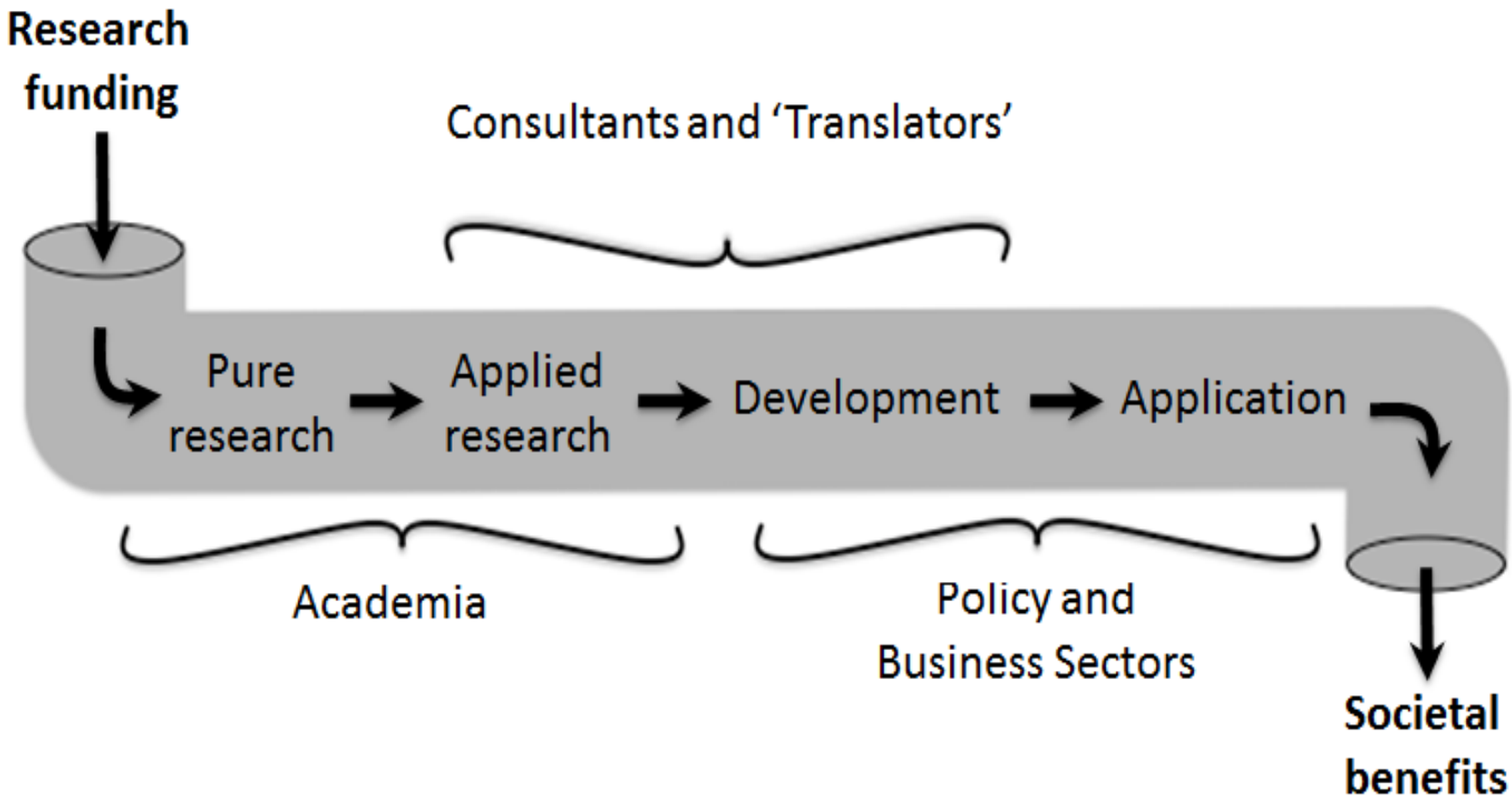
Internal motivation for long-term collective action

Hardware

Technological solutions

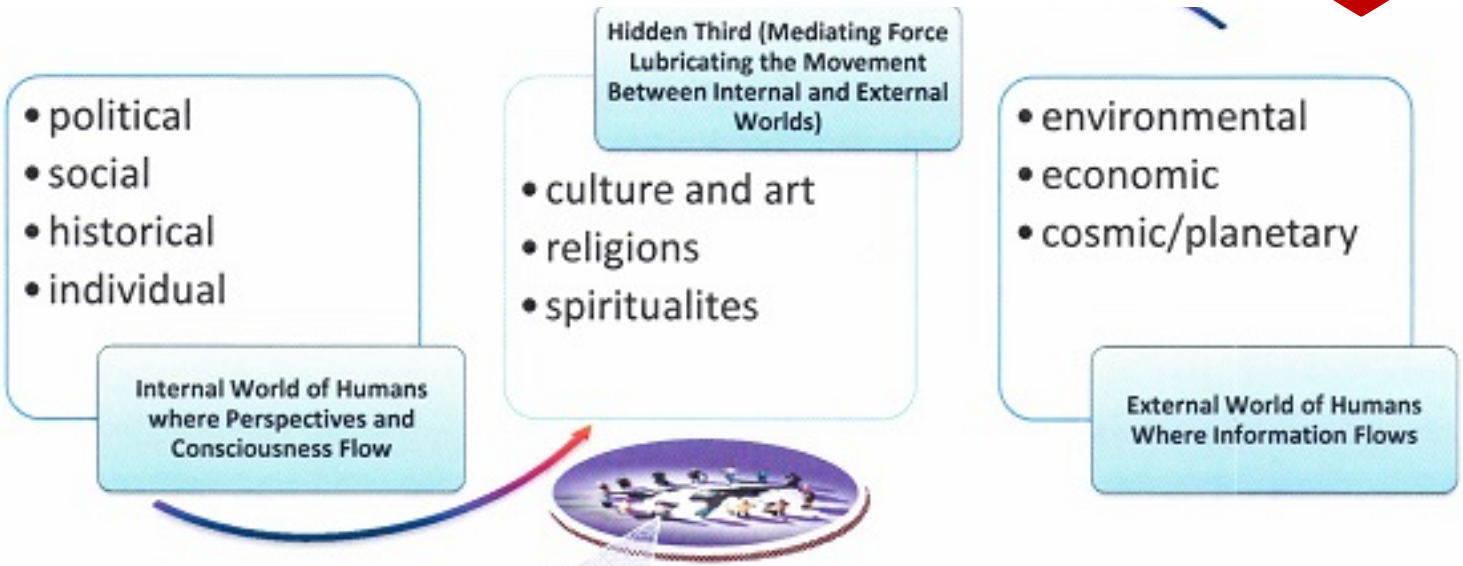
Software

Policy & Institutions
Arts, social media


Research funding
Consultants and 'Translators'
Pure research
Applied research
Development
Application
Academia
Policy and Business Sectors
Societal benefits

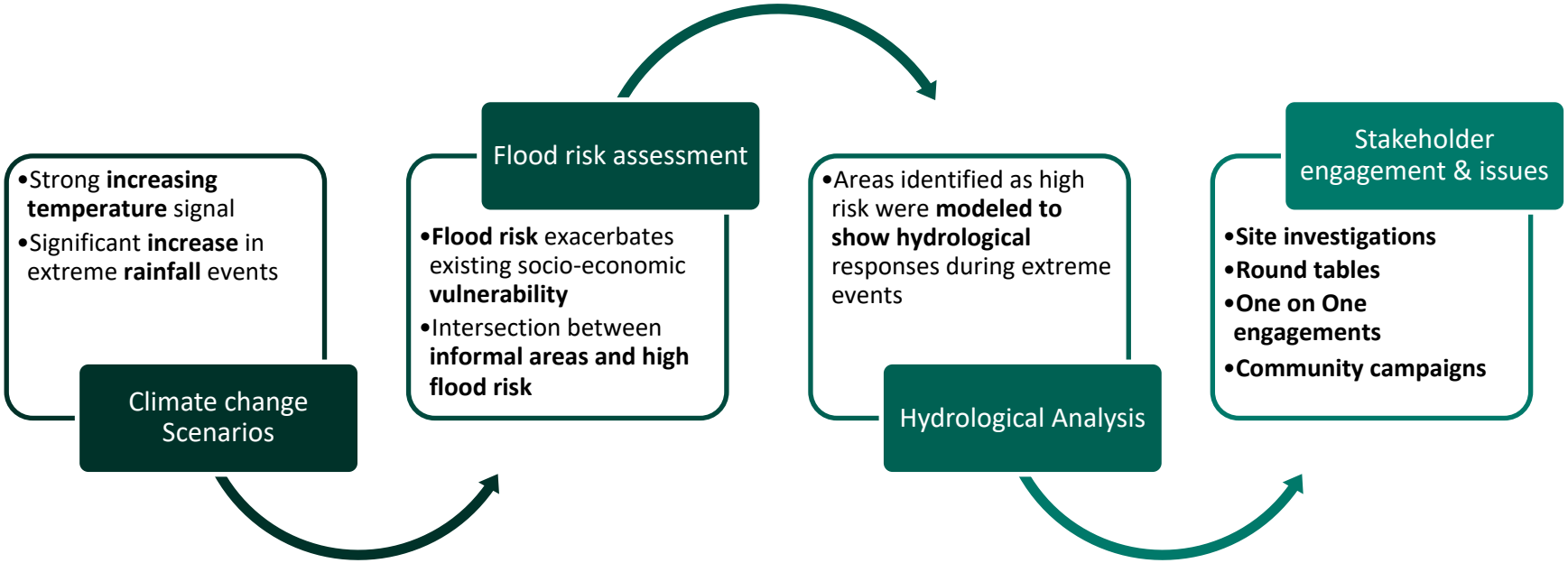
Platforms and practice engagements

(source McGregor)



People from all walks of life (Multiple Realities) enter this fecund "middle ground" (zone of non-resistance, ripe with potential and possibilities) prepared to remain open to others' viewpoints so they can use inclusive logic, temporarily reconcile contradictions, while respecting emergence, synergy and fusion, and integrate ideas to form new complex, embodied, and cross-fertilized knowledge that can be used to address the complex problem

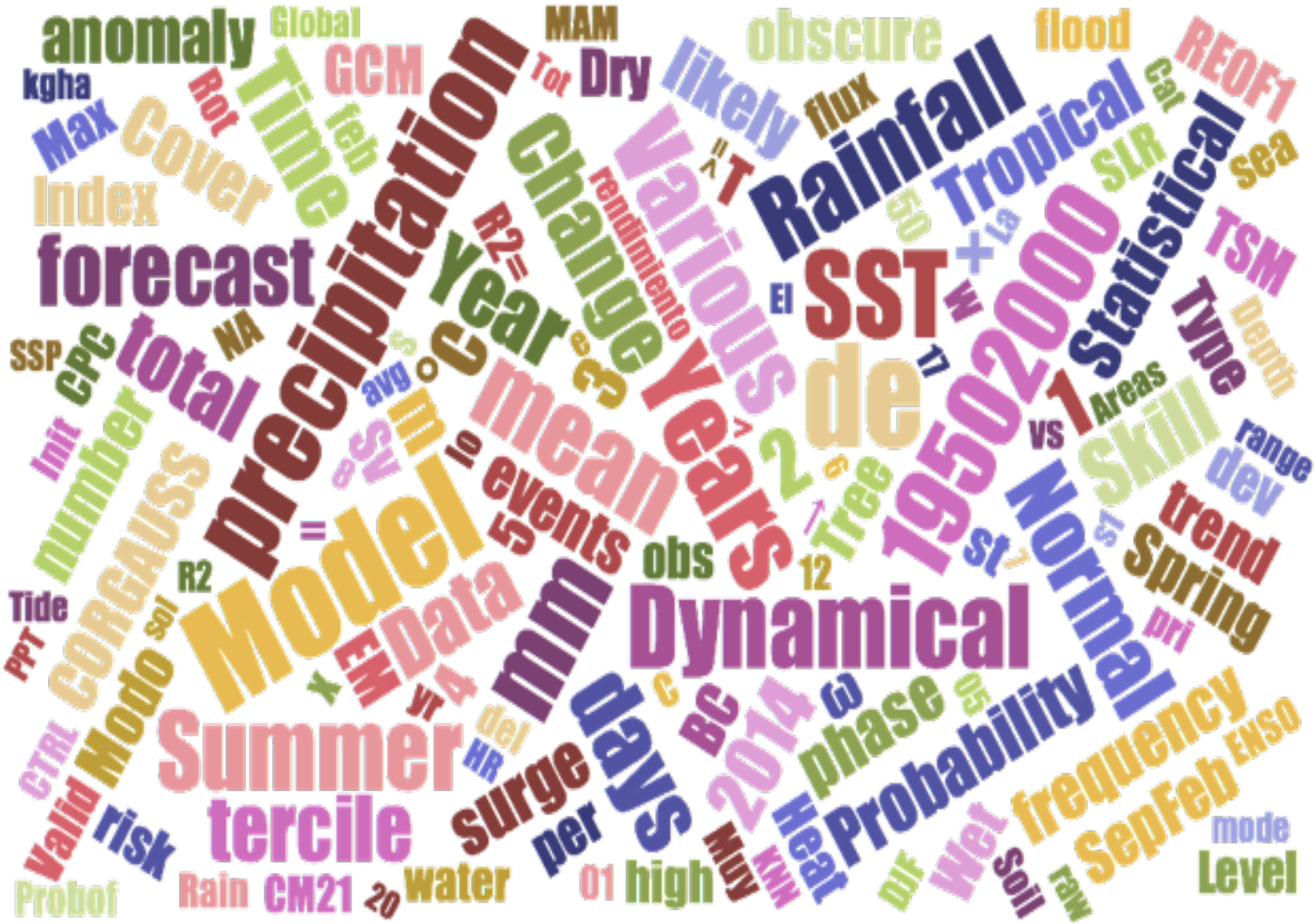
One way of doing things – missing the heart of the matter!



How reflexive are we: climate services ?

Word Cloud Analysis of 37 power point presentations at the 2014 World Climate Research Program conference for Latin America and the Caribbean. Conference theme was the development and application of climate knowledge (Tall et al).

Majority of papers dedicated to biophysical drivers of the climate system (Source Tall et al.)


anomaly
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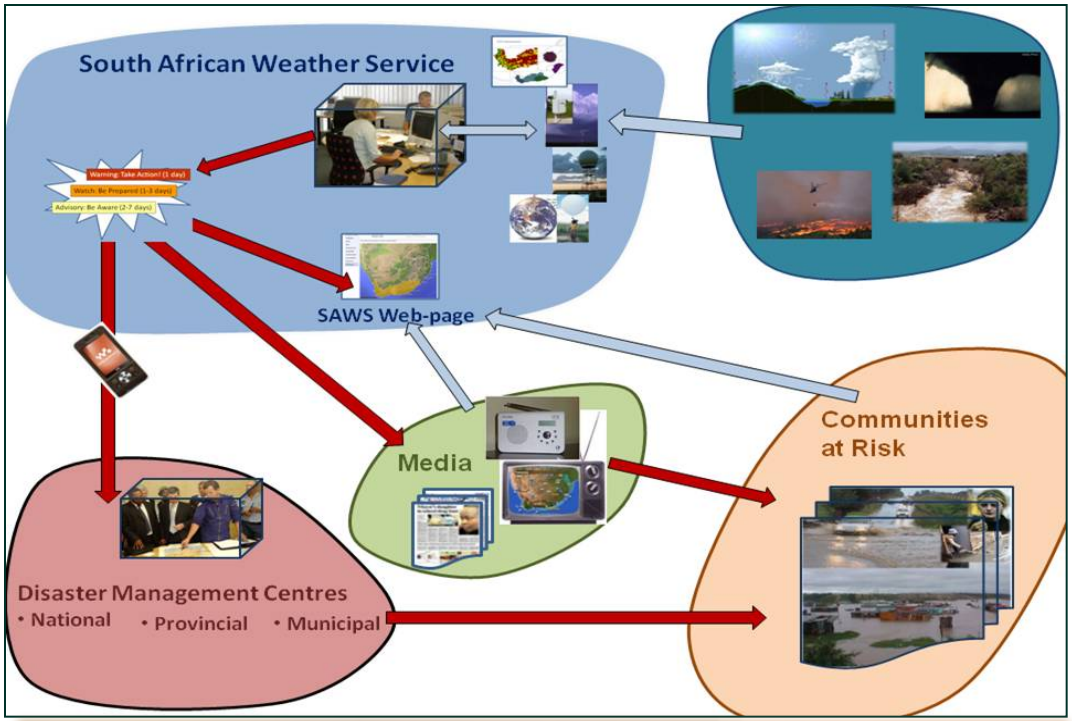
Enhanced National Early Warning Systems (SWFDP – Severe Weather Forecast Demonstration Project)

- Cascading of modern forecast products from Global to Regional to Nat'nal Met Centres (NMSs)
- Collaborate with Disaster Management prior and during events
- Adapted warning information products supporting user decision-making systems



Source : Poolman, SAWS

C40 CITIES

Joburg

LOCALLY DETERMINED CONTRIBUTIONS

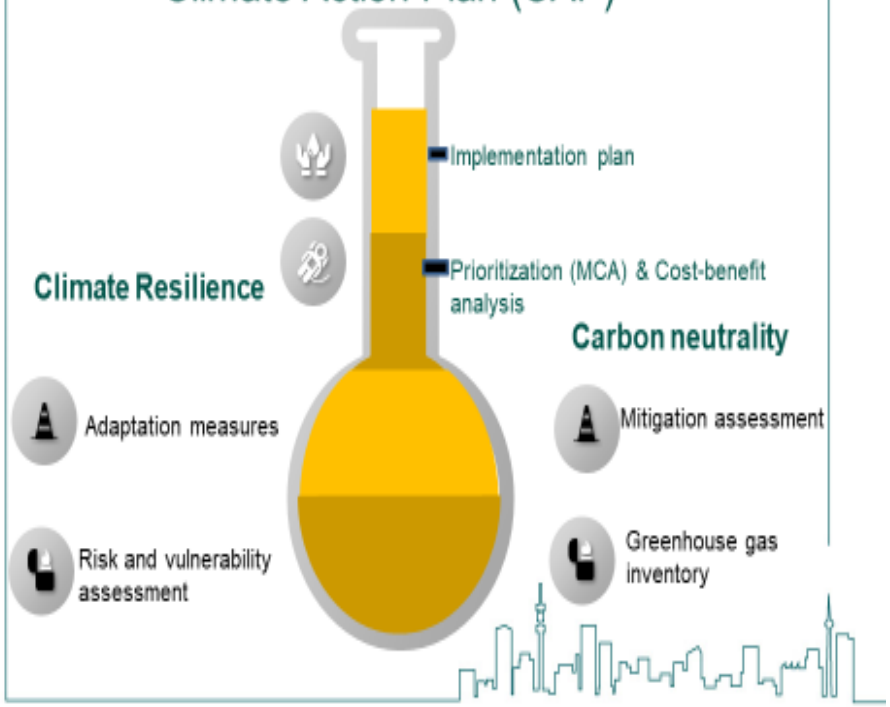
CAP Africa Programme

Outcome: 11 Cities in sub-Saharan Africa adopt and publish long-term climate action plans and implement actions to deliver on their targets

- Technical capacity within cities to develop Climate Action Plans
- Inclusive and evidence based to low carbon city development
- Contributing to national level climate objectives
- Identification of vertical integration mechanisms

City of Johannesburg's long-term objective of carbon neutrality and climate resilience by 2050, through a development of a Climate Action Plan.

Climate Action Plan (CAP)



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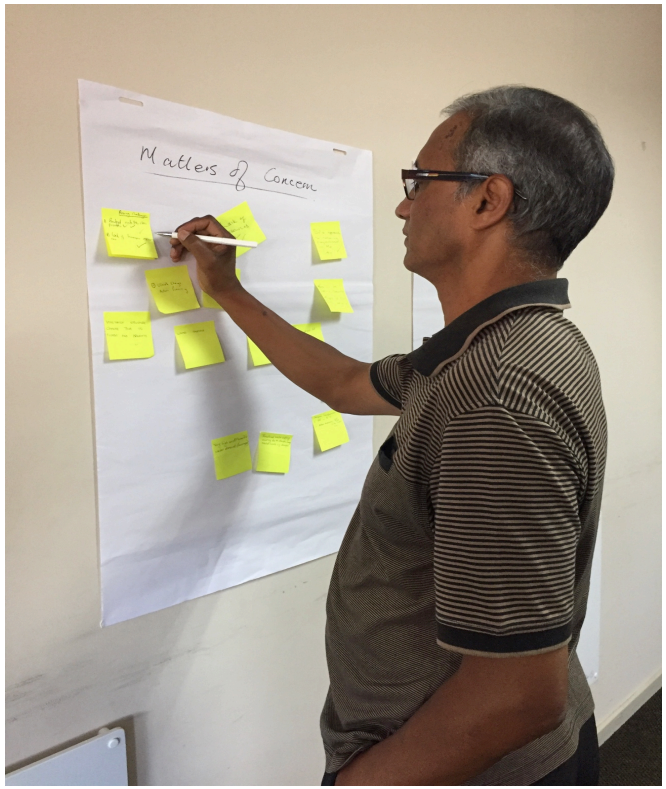
University – bringing the ‘outside in’ and the taking the ‘inside out’



City of Johannesburg
CLIMATE ACTION PLAN

The City of Johannesburg recognizes its responsibility as a global leader to take ambitious action against climate change. This Climate Action Plan lays out our path towards city-wide carbon neutrality by 2050, in line with the Paris Agreement. The CAP was developed with an aspiration to achieve carbon neutrality and climate resilience by 2050, with 2025, 2030, 2040 time horizons.

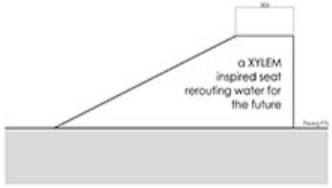
The City aims to:

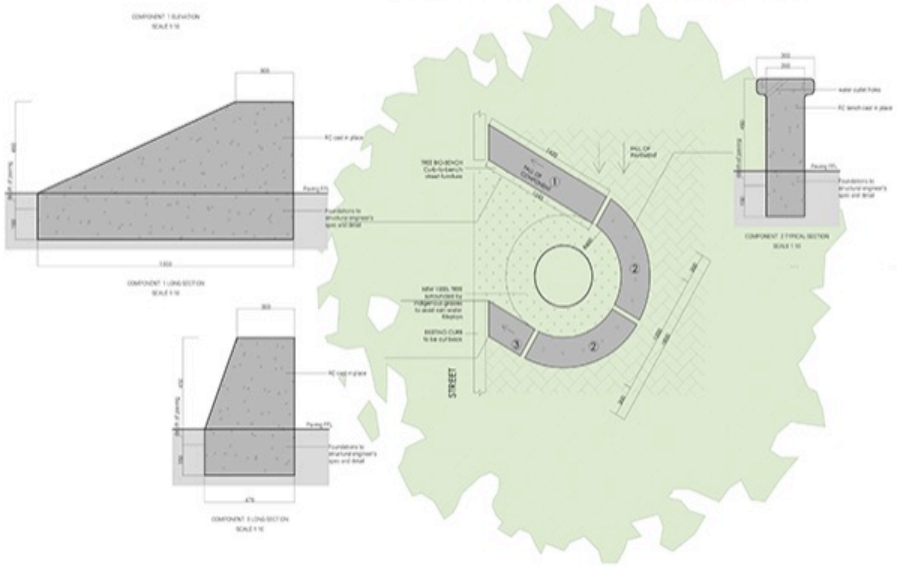
- Enable a safe and just, climate-responsive City for all citizens,
- Promote climate change leadership and accountability,
- Reduce risks and vulnerabilities to current and future climate stresses,
- And promote sustainable development transitions moving forward.

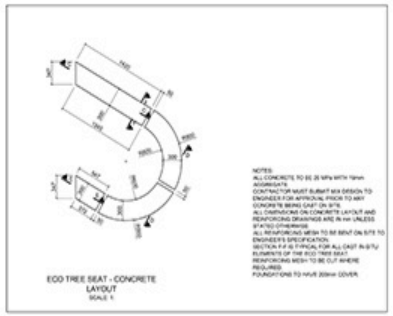
water for the future

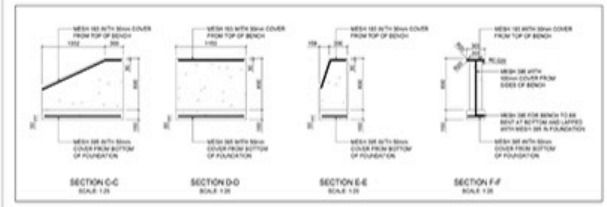
Eco Tree Seat

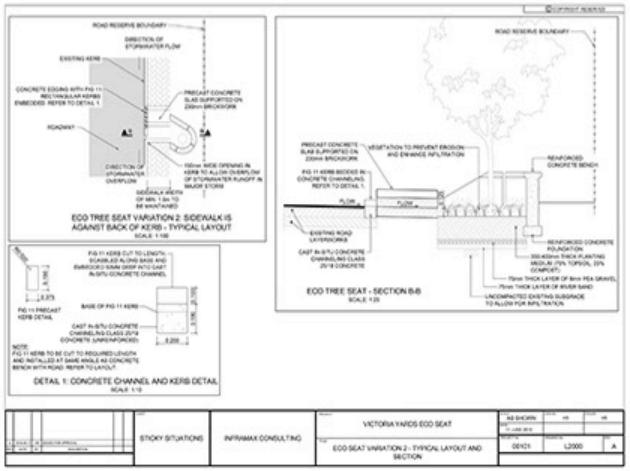
rerouting rainwater to grow indigenous trees/fruit trees











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Malaysian 'heart ware' research (Jour. Hydrology, 530, 2015)

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Simone Smit.

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