Assessing the State of the Water-Energy-Food (WEF) Nexus in South Africa

Authors: Mabhaudhi T., Simpson G., Badenhorst J., Mohammed M., Motongera T., Senzanje A., Jewitt GWP., Naidoo, D and Mpandeli, S.

NSTF Water – Energy – Food Nexus Workshop

23 October 2018

Water Research Commission

University of Venda

UNIVERSITY OF KWAZULU-NATAL

Introduction

- ✓ Since 2011, the Water-Energy-Food (WEF) nexus has been investigated by many actors, each approaching their analyses with their niche or sector in mind, be they political, social, or scientific perspectives,
- ✓ The WEF nexus is broadly defined as an approach that considers the *interactions, synergies and trade-offs* of water, energy and food when undertaking the management of these resources,
- ✓ Each resource sector within this nexus has an equal weighting,

Introduction Cont…

- ✓ The WEF nexus presents an opportunity for policymakers, researchers and development agencies to integrate the sectors to optimise the use of the resource base, maximise synergies and trade-offs and minimise conflicts,
- ✓ The WEF nexus is closely aligned to the SDGs, particularly SDGs 2 (zero hunger), 6 (clean water and sanitation) and 7 (affordable and clean energy).

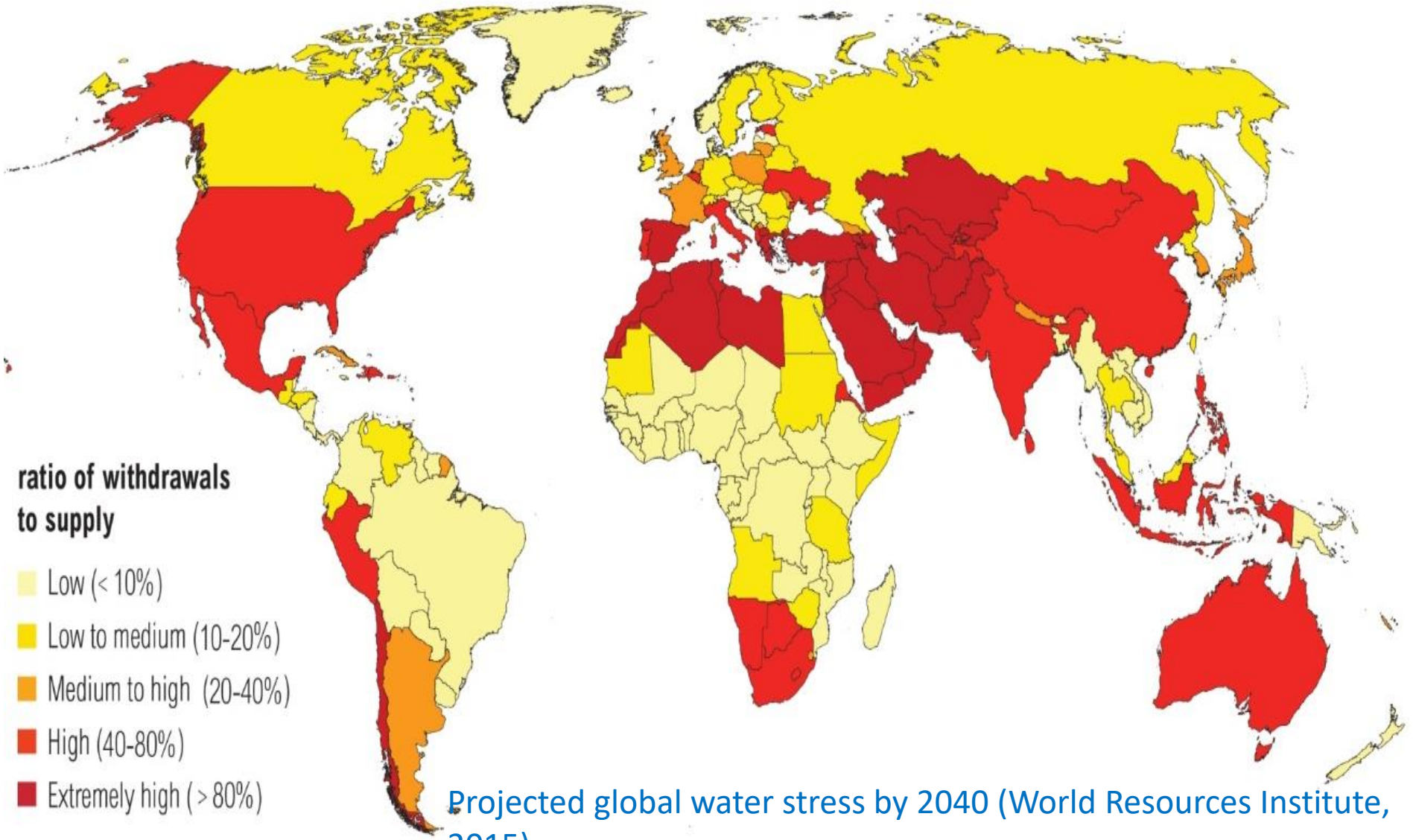




Aim of the study

- ✓ The aim of the study was to conduct a review of available information and knowledge about the Water – Energy – Food nexus in South Africa,
- ❑ Specifically, to conduct a state-of-the-art literature review on past, present and ongoing work on the WEF nexus focusing on current status, potential, challenges and opportunities for intersectoral WEF Nexus planning,
- ❑ In addition, to propose a framework for linking the WEF Nexus to the Sustainable Development Goals (SDGs), paying emphasis on SDG 2, 6 and 7.

A map indicating the levels of projected water stress in the world by 2040

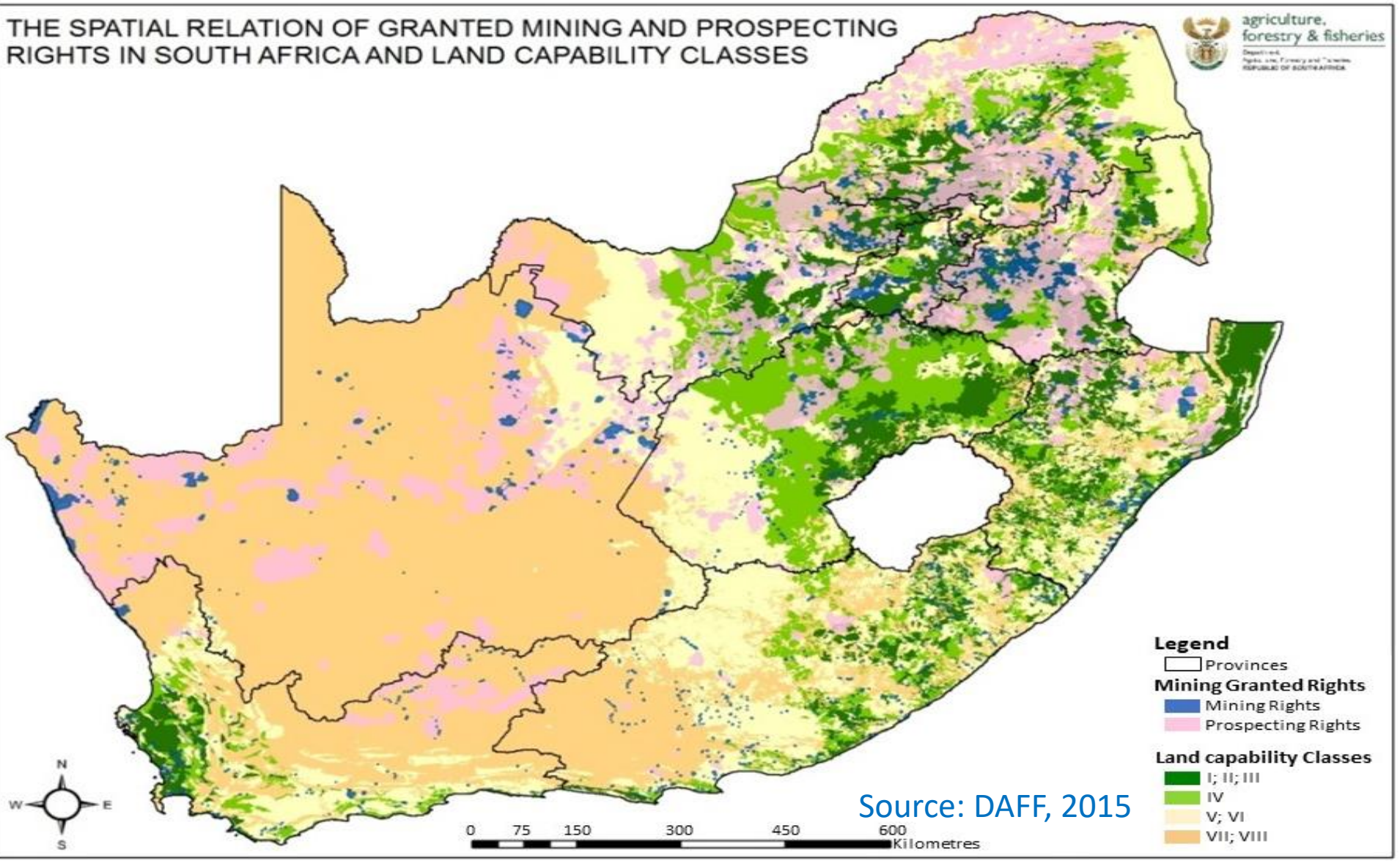


Projected global water stress by 2040 (World Resources Institute, 2015).

South Africa's water situations

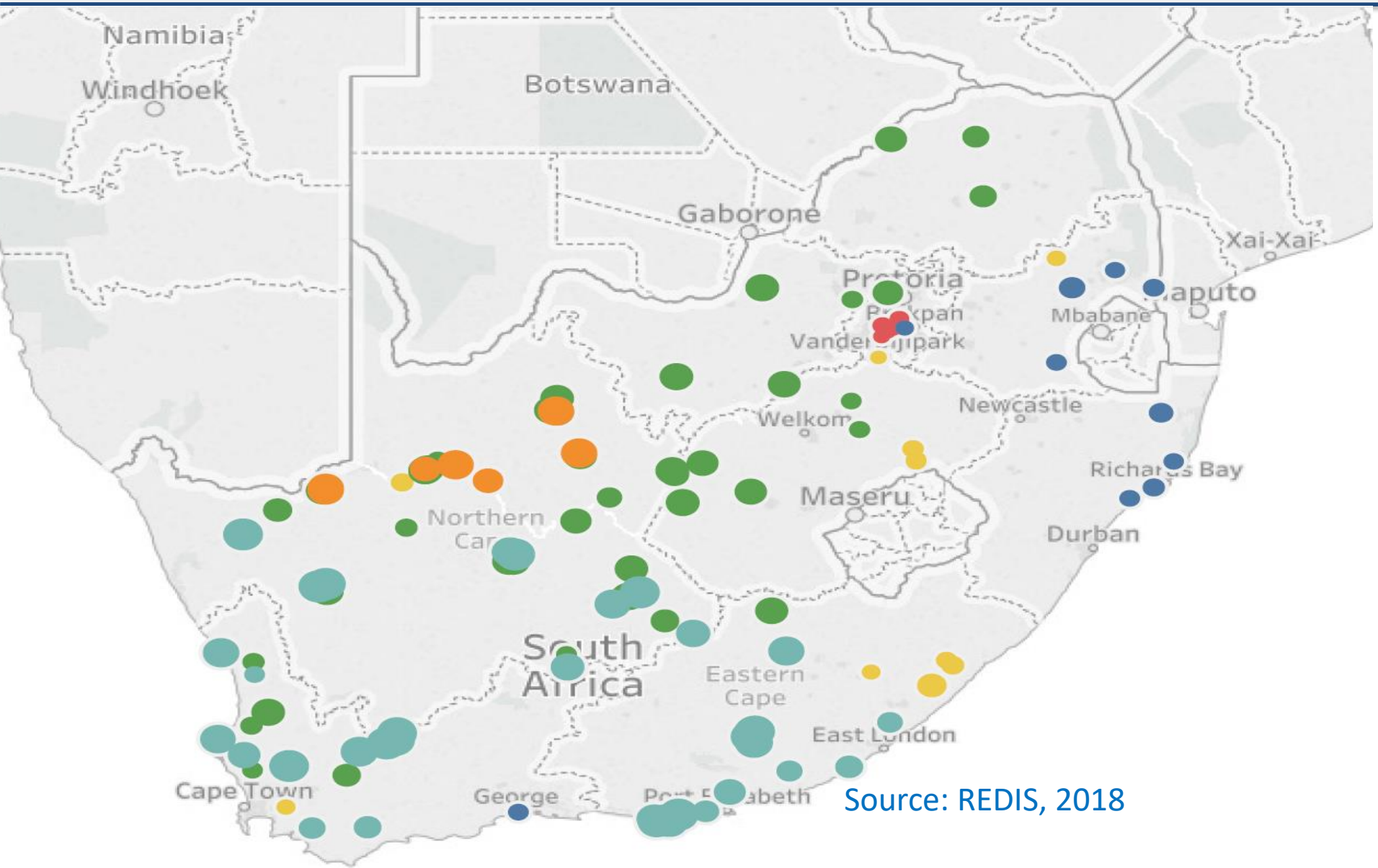
- ✓ Inter-basin water transfers (both national and international) are essential for addressing South Africa's water security, and efforts are regularly made to secure access to water resources beyond its national borders,
- ✓ The water scarcity situation in South Africa emphasises the importance of maintaining the existing infrastructure used to transport, transfer and treat water. Together with these international considerations, South Africa will be building and enlarging numerous dams during the next decade to service its increasing population with water and sanitation needs (DWS, 2015).

Map showing the overlap of arable land capability and mining rights in South Africa (DAFF, 2015).



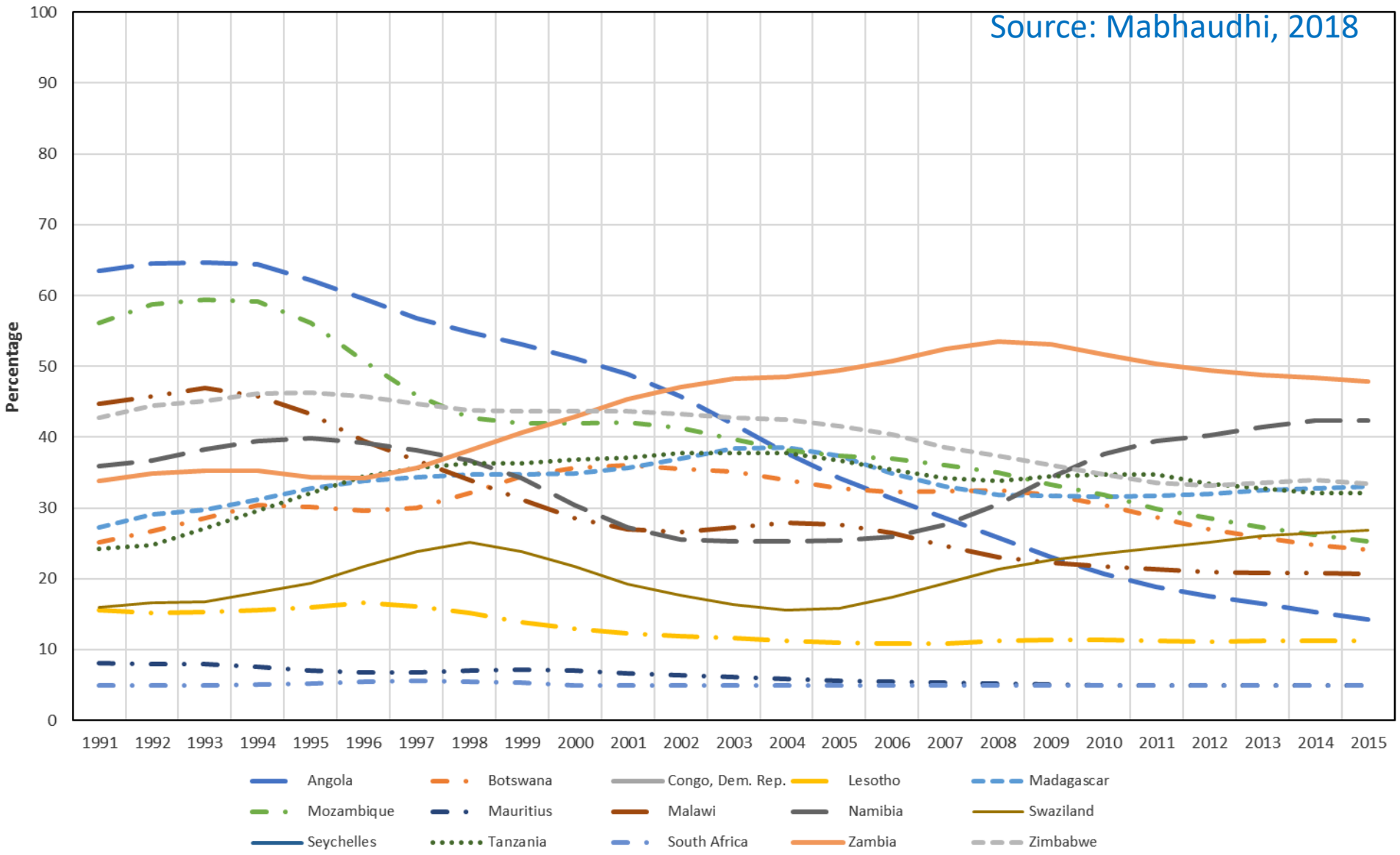
Source: DAFF, 2015

Renewable energy projects in South Africa



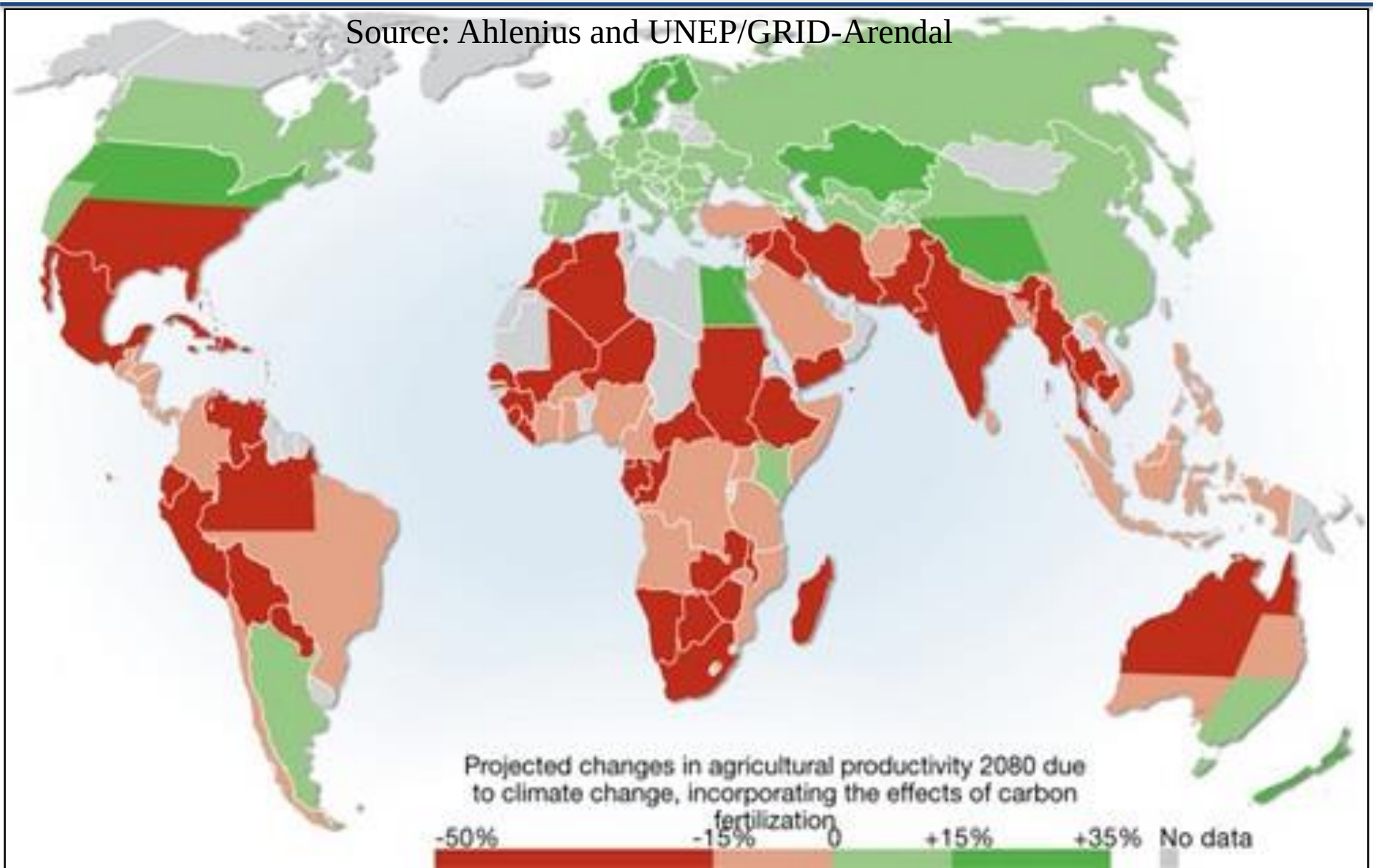
Source: REDIS, 2018

The prevalence of undernourishment in SADC countries in 1991 and 2015



Climate change impacts on agriculture

Source: Ahlenius and UNEP/GRID-Arendal



Legislation, policy and strategies for the water sector in South Africa (Mabhaudhi et al., unpublished, Madhlopa et al., 2014).

Document Name	Document Type
Constitution of South Africa (RSA, 1996)	Legislation
National Water Act 36 of 1998 (RSA, 1998a)	Legislation
National Environmental Management Act 107 of 1998 (RSA, 1998b)	Legislation
National Water Resource Strategy 2 (2012)	Strategy
White Paper on a National Water Policy for South Africa (DWAF, 1997)	Policy
National Climate Change Response Policy	Policy
National Development Plan	Plan
Water for Growth and Development (DWA, 2009)	Plan

Legislation, policy and strategies for the energy sector in South Africa ((Mabhaudhi et al., unpublished, Madhlopa et al., 2014).

Document Name	Document Type
National Energy Act 34 of 2008	Legislation
National Energy Regulation Act 40 of 2004	Legislation
National Environmental Management Act 107 of 1998	Legislation
Energy Efficiency Strategy	Strategy
White Paper on the Energy Policy of South Africa (1998)	Policy
White Paper on Renewable Energy (2003)	Policy
National Climate Change Response Policy	Policy
Integrated Resource Plan (2016)	Plan
Integrated Energy Plan	Plan
National Development Plan	Plan
Department of Energy Strategic Plan 2011/12 – 2015/16	Plan

Legislation, policy and strategies for the energy sector in South Africa ((Mabhaudhi et al., unpublished, Madhlopa et al., 2014).

- The existing policies in the energy sector have been driven by the need to promote industrialisation and economic development,
- The prioritisation of energy generation has often created new conflict, for example the expansion of coal mining in Mpumalanga which threatens food production and the broader environment,
- There is a need for greater alignment; the WEF nexus could be applied to align energy sector policies and improve sustainability.

Legislation, policy and strategies for the Agriculture food sector in South Africa (Mabhaudhi et al., unpublished).

- ✓ The agriculture (food) sector policies have been driven by an incremental agenda, aimed at increasing production and food security.

Document Name	Document Type
Livelihoods Development Support Programme	Strategy
White Paper on Agriculture 1995	Policy
National climate change response policy	Policy
Integrated growth and development plan (IGDP) for agriculture, forestry and fisheries	Plan
Conservation of Agricultural Resources Act 1983	Legislation
Draft Preservation and Development of Agricultural Land Bill 2016	Legislation

Challenges facing the WEF Nexus in South Africa

- ✓ Poor education,
- ✓ Urbanisation and poverty,
- ✓ ‘Silo’ approach,
- ✓ Political dynamics,
- ✓ Lack of proper coordination & harmonisation of activities across sectors,
- ✓ Poor policy implementation across government departments.





WEF Nexus Links to the SDGs

Source: UNDP, 2015

Conclusions

- The application of the WEF nexus is particularly relevant when considering the recent proposed policy shift on land expropriation, which will significantly influence land utilisation depending on the policies associated with it,
- Currently, the various governmental departments — DAFF, DWS, DoE, DEA etc. — generally approach resource management in isolation, without considering the usage of water, energy and land by other sectors,





Conclusions Cont…

- This is a major challenge in South African policymaking, especially when referring to the country's limited water availability, the scarcity of high potential arable land, and its reliance on fossil-fuel based energy generation,
- Furthermore, it is predicted that climate change will have a negative impact on the availability of resources in South Africa, where ecosystem services, rainfall frequency & distribution, and natural disasters will impact the reliability of the ecosystem.





Proposed WEF Nexus Research Projects

The following projects, presented in no particular order, will aid in the future development and adoption of the WEF nexus in South Africa:

- ✓ Catchment-based assessments of selected Water Management Areas (WMA) utilising the Water-Energy-Food (WEF) nexus as a framework to identify resilient upstream policy recommendations,
- ✓ An assessment of the potential impact of climate change on water availability, energy generation capacity and food production in South Africa during the 21st Century,
- ✓ The development of a roadmap to achieve SDGs 2, 6 and 7 by 2030 in South Africa utilising the WEF nexus approach

Proposed WEF Nexus Research Projects Cont...

- ✓ Water usage per energy generation technology type,
- ✓ Fossil-fuel based energy security and food security in South Africa: When will the tipping point occur?
- ✓ A WEF nexus city-based metabolism study for Cape Town,
- ✓ Potential sector-specific policy harmonisation to promote a WEF nexus approach to sustainable development in South Africa,

Proposed WEF Nexus Research Projects Cont...

- ✓ A study into practical household level application of the WEF nexus approach in South Africa, with a focus on rural, peri-urban and urban areas,
- ✓ Water and land requirements for bioenergy implementation in South Africa,
- ✓ A review of the availability of WEF nexus data at different spatial and temporal scales within South Africa,
- ✓ *The development of a WEF nexus index, and its application to South Africa and SADC (ongoing study),*

Proposed WEF Nexus Research Projects Cont...

- ✓ A study of water scarcity implications for food- and energy security in South Africa,
- ✓ A review of the applicability of available WEF nexus models to South Africa.

Recommendations

- Intersectoral participation in effective policy-making may resolve many challenges and conflicts associated with the WEF nexus in South Africa. However, there is a need to disseminate WEF nexus knowledge among South African citizens and academics alike. It is recommended that future studies and research should investigate the following:





- ✓ Actively involving communities in WEF nexus projects to improve their understanding of the WEF nexus, especially among the poor

Recommendations Cont…

- ✓ Involving all parties (policymakers, researchers, and stakeholders) when developing policies for integrated sustainable resource management among the different departments
- ✓ Policies and strategies for land reform should include the sustainable use of resources in connection to the WEF nexus
- ✓ Investment from the private sector into WEF nexus research, especially policy development and innovative green technologies
- ✓ Developing an integrated model to assess the WEF nexus in South Africa, and creating a WEF nexus database

Thank you for your attention

Water Research Commission

University of Venda

UNIVERSITY OF KWAZULU-NATAL