



# Food Energy Water Nexus

Lessons from the South African  
experience

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# The nexus goes beyond footprints

## Interconnected & Interdependent...

- Electricity interruptions and rising prices now exacerbated by catastrophic drought
- Little arable land and dependent on oil imports bought with a devaluing currency, testing resource limits
- The role of strategic reserves and security of supply in social stability

## ...at the household level:

- Discriminatory resource access
- Compounded poverty & additional challenge of addressing historic imbalances

## ...at the landscape level:

- Natural resources not evenly distribute
- Richest sources overlap geographically
- 750 000 hectares of rich biodiversity, agriculture and source of major inland rivers in the NE potentially at risk from coal mining

## A holistic approach will deliver...

*Security for all  
(water, food,  
energy, human)*

*Equitable &  
sustainable growth*

*Resilient &  
Productive  
environment*

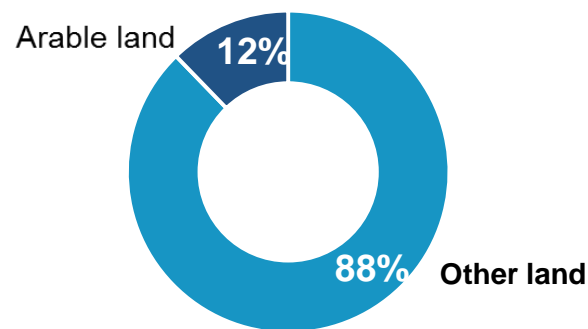
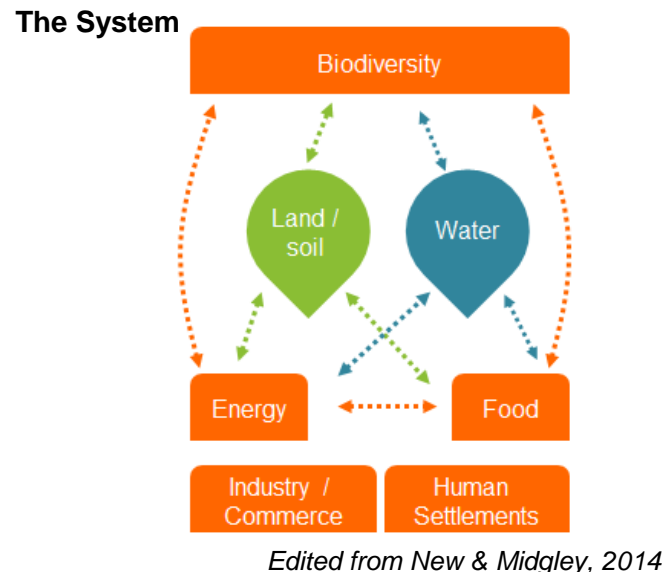


# The nexus in SA

## Food and agriculture

### Jobs, food security and social unrest

- 1 High levels of income inequality, unemployment and **significant household food insecurity**
- 2 Agricultural sector as a jobs creator and a **key to addressing pervasive resource access inequities**
- 3 Ag uses **3% of total electricity**, consumption has risen 3% p/a, and **around two thirds** of water resource
- 4 **Shifting dietary preferences and increased waste;** from improved economic conditions and urbanisation
- 5 Coal deposits in SA coincide with the best agricultural land. Several **coal reserves overlap with areas of highest rainfall and major inland rivers**. Trend - Unidirectional conversion of productive land





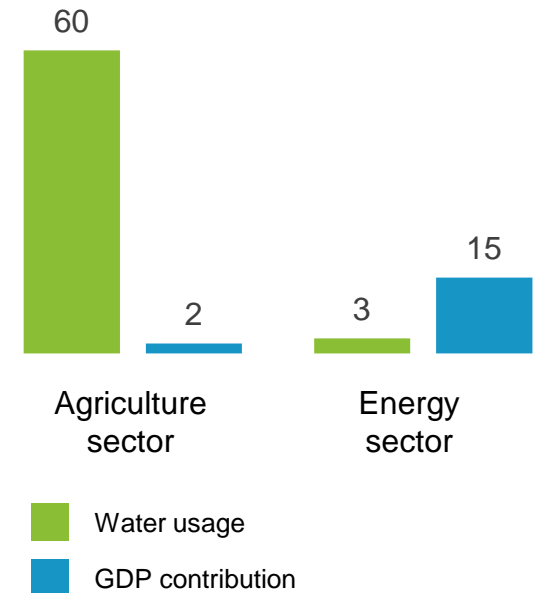
# The nexus in SA In agricultural policy making?

## Risks include lost jobs and reduced food security

- 1 **The National Development Plan and Industrial Policy Action Plan**, calls for a substantial increase in ag activity without explicitly acknowledging the concurrent burden on the water system
- 2 **The National Water Resources Strategy**, little additional allocation for ag and what savings can be achieved are earmarked for other uses
- 3 No policy measures for **managing the cost of energy on farms**, RE focused on the grid not farm applications.
- 4 The objective of job creation also sets hurdles for instance the **Environmental Impact Assessment** ... projects claim to be justifiable based on employment creation.

### Water demand: **best allocated where?**

Consumption of SA water vs GDP contribution (%)

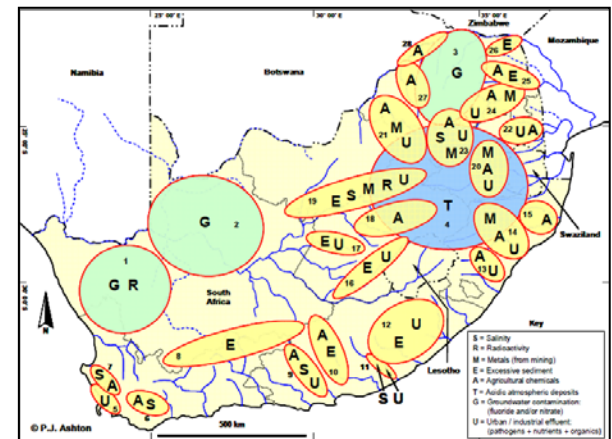


Mining GDP – 9%, Energy sector 15%, Ag only 2-3%

## Water is a major constraint to economic growth

- 1 Increasing consensus in business and development community that **water scarcity and quality issues** will increase dramatically in the short term with significant economic consequences
- 2 **Environmental degradation**, declining groundwater & unequal water distribution result, devastating water shortages, landscape changes- water deficits in half the 19 WMA and available supply already allocated
- 3 **Aging infrastructure and electricity interruptions**, impact water provision and wastewater services
- 4 **Electricity tariffs** (steady price increases (ie 2010 - 2011 increased by 26%) prohibitive cost accessing ground water and water treatment.
- 5 **Business is responding to the risk but** at the expense of public sector capacity and skill development?

Water quality: a crisis we could solve?



40% freshwater resources are in a **critical condition** and 80% are threatened.



# The nexus in SA

## Water in policy making

Insufficient water quality and quantity threaten our water security, food and energy production

1 Right to clean water is **enshrined in the constitution** the White Paper on a National Water Policy and the National Water Act. Critical importance of water recognised at the highest levels

2 Despite this and the DWA estimating a shortfall by 1,7% by 2025 the **NDP proposes an increase of +50% of irrigated land**, to grow agricultural jobs...?

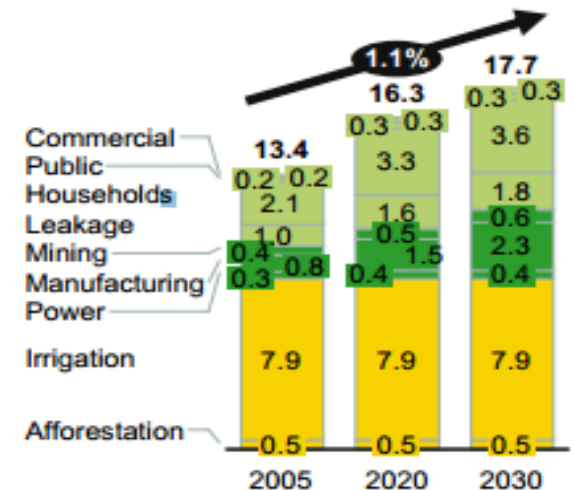
3 **Scale is key**, what looks manageable at national level, can be **problematic at provincial/local levels**

4 **Regional integration is NB** but first domestic resolution of lack of investment, capacity challenges, absence of harmonised policy and political hurdles

5 Agricultural sector battles with energy sector for **access to water**... shrinking it. DAFF is weakest link in DAFF-DWA-DOE chain

Water demand: can it be met?

Water demand by sector  
Billion m<sup>3</sup>





# The nexus in SA

## Energy and electricity

### Energy insecurity poses risks for food and water security

- 1 Energy is a rising cost for farmers – directly and indirectly (e.g. via fertiliser). Price takers experience falling ROI
- 2 Accessing new water resources will become prohibitive.
- 3 Most coal-based power plants within regions **partially or severely constrained** in terms of water. Kusile located in severely constrained Olifants WMA
- 4 **Coal mining led to contamination** in Olifants such that the water cannot be used in coal-fired power stations
- 5 Coal deposits in SA coincide with the best agricultural land. Several coal reserves overlap with areas of highest rainfall and major inland rivers.

### Water use by electricity-generation technology

Technology type	Water Use (l/kWh)
Wet-cooled coal (existing)	1.15–2.30
Wet-cooled coal (future) <sup>#</sup>	2.12–2.80
Dry-cooled coal (existing)	0.11
Dry-cooled coal (future)*	0.36
Nuclear	0.055
Open cycle gas turbine	0.01
Combined cycle gas turbine	0.25
Solar photovoltaic (PV)	0.01
Concentrated solar power (dry-cooled)	0.34
Wind	0

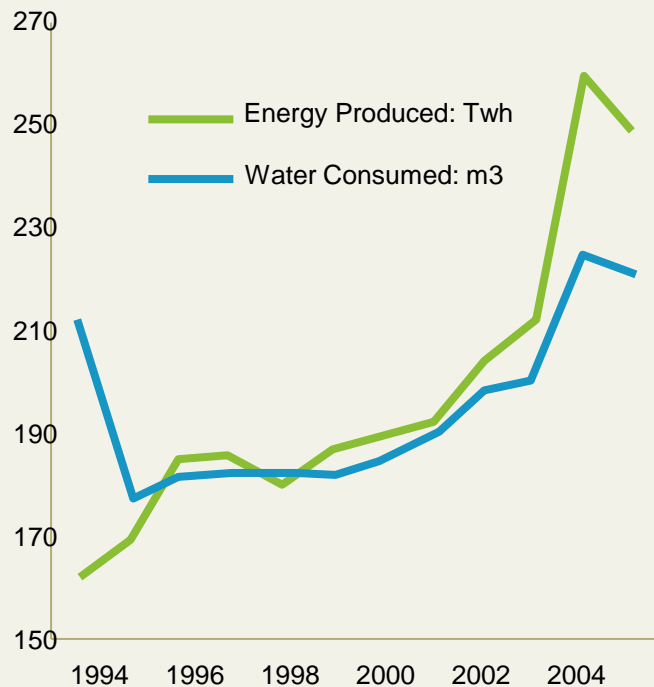


# The nexus in SA

## Energy and electricity in policy making

### High risks for energy security from availability and quality of water

Energy Produced versus Water Consumed



1

**Water and energy planning aligned**; electricity is a high value economic use of water “Priority user”

2

**Water recognised as a key constraint** in the Integrated Resource Plans. NDP and the IPAP call for shift to RE, biofuels 2% but no irrigation and caution in Fracking

3

But IRP **does not plan for scarcity risks** and policies focus on dry cooling technology and ignore long term solutions for low water intensive technology

4

**Electricity sector = 50% of GHG** carbon capture could increase consumption by 46-90%

5

Policy and planning shortcoming – consideration is water for energy not vice versa or impact on quality



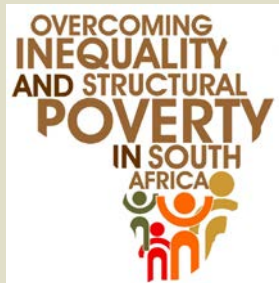
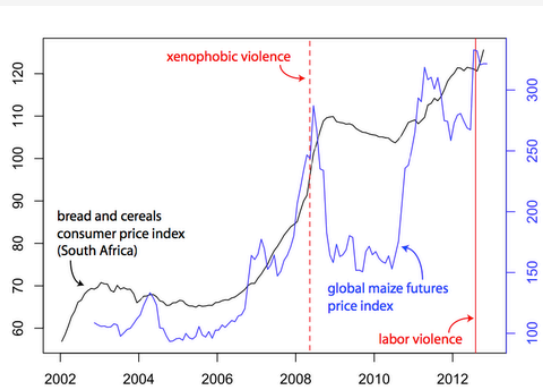


The relevance of nexus for South Africa

What would you do as a policy maker?

“When we try to pick out anything by itself, we find it hitched to everything else in the universe.” - John Muir

Are South African labour protests food riots?



Diarrhoea now the **THIRD-BIGGEST KILLER** in South Africa

**South Africa's Deepseated Economic and Social Crisis**  
Dissection: "South Africa Is An Angry And Frustrated Nation" And On The Brink