

The Water-Energy Nexus
Why water cannot be decoupled from energy, an
urgent South Africa perspective
by
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**WATER SHORTAGE
SOUTH AFRICA**

Your Water Abundance catalyst

The Water-Energy Nexus

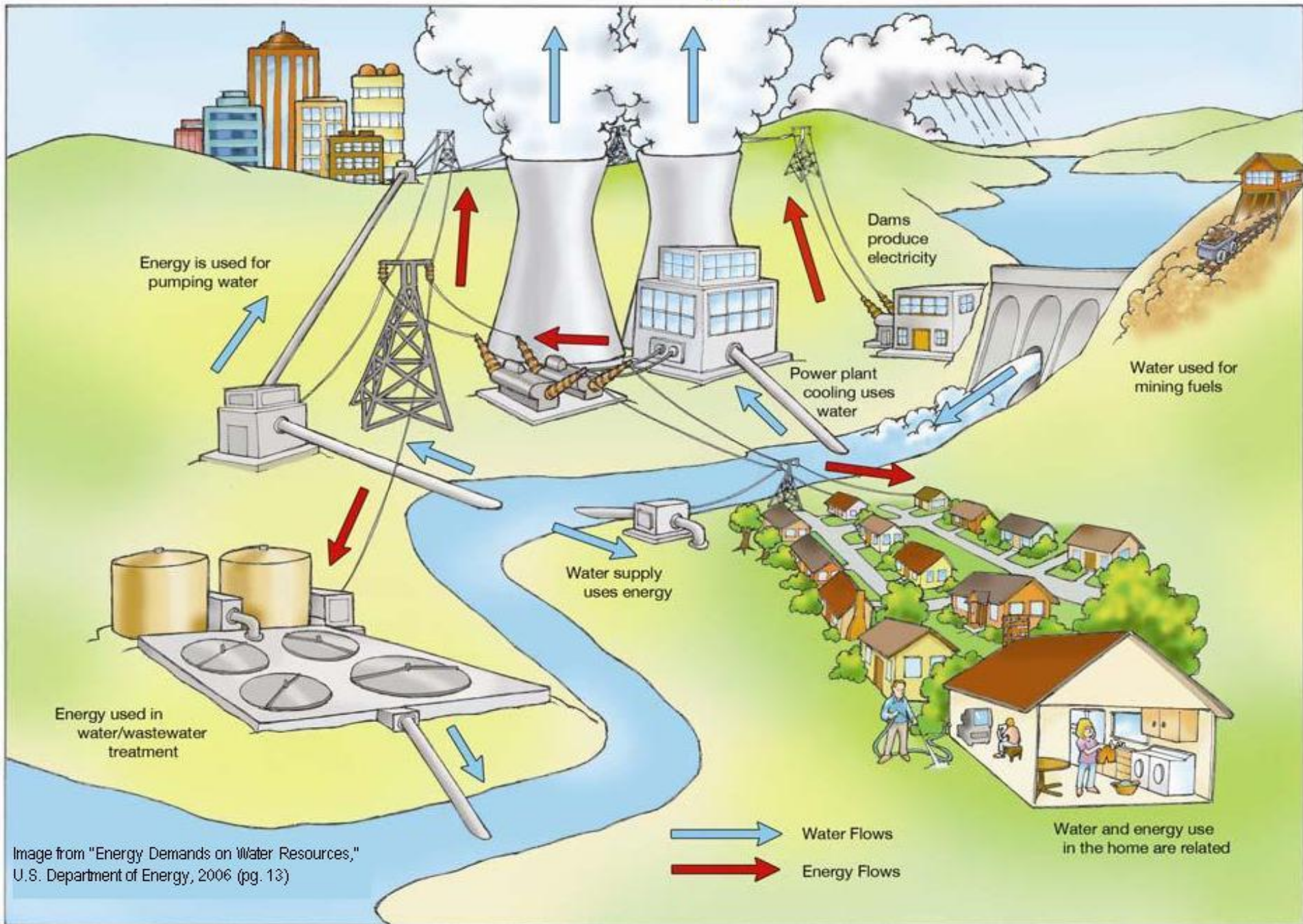


Image from "Energy Demands on Water Resources,"
U.S. Department of Energy, 2006 (pg. 13)

Executive Summary

- SA energy & water shortages symptoms
- Causes
- The Nexus relationships
- Status summary
- Quo Vadis?

Energy Shortage Symptoms

- Load shedding
- Blackouts at municipality level

Water Shortage Symptoms

- City of Cape Town Day Zero near miss
- Western Cape agricultural output 20% + down in 2018
- Makhandla Day Zero 2019
- Limpopo ongoing water crisis in Giyani area
- Beaufort West water shedding since 2018
- Bethal water shedding since 2018
- Tshwane water shedding
- Nelson Mandela Bay unicity <10% in dams 2018
- Severe drought resulted in water shedding in Gauteng in 2017/2018

Energy Shortage Causes

- Eskom generation fleet low availability <70%
- Coal availability to Eskom
- Grid & distribution maintenance backlog >R100bn resulting in increased outages
- Diesel shortages in SA due to open cycle gas turbines running longer
- Hydro schemes affected by drought
- Pumping schemes affected by energy shortages
- Widespread mismanagement allegations



Water Shortage Causes

Climate change induced drought

Over 40 municipalities declared failed due to insufficient capital to maintain water and sanitation infrastructure. Most notable the Emfuleni Municipality

Department of Water and Sanitation debt, failed “War on Leaks” and Giyani projects have depleted their ability to fund projects

Collapse of the regulatory function with no Blue & Green Drop reports since 2013

98% of SA’s water reserve is allocated since 2002

37% to 41% UAW (Unaccounted for Water) of muni potable networks

Very little of our waste water is adequately treated and reportedly less than 20%

Water Shortage Causes

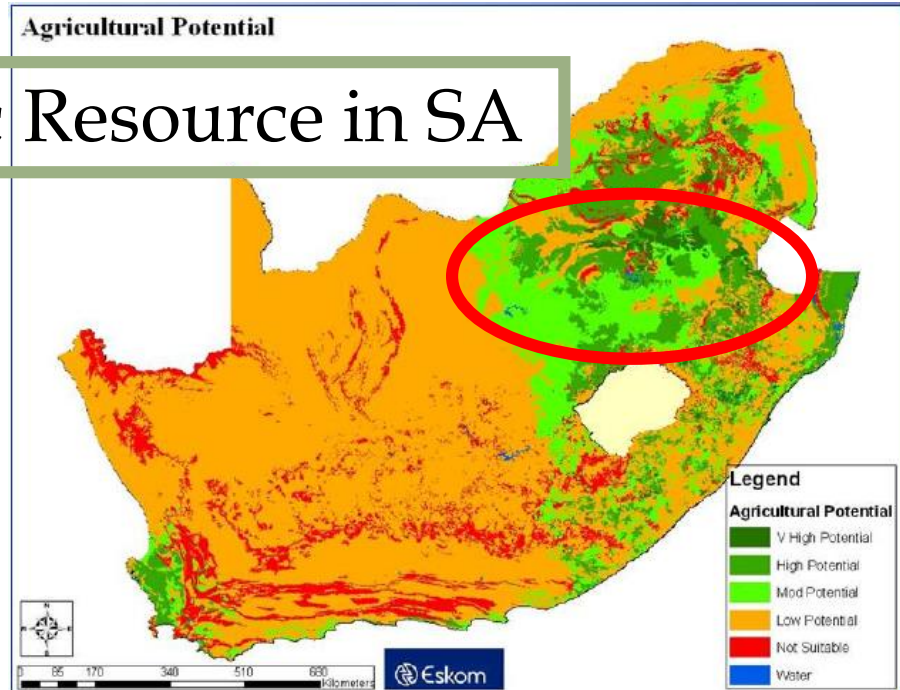
Waste water not reused at any significant level
No updated and valid national Water Strategy since 2011 nor policy certainty for investors
National increase of water shortages as drought hits and munis fail since 2016 compounded by over R870bn of underinvestment in water infrastructure that is estimated to now be in the Trillion Rand region
Widespread mismanagement allegations
The list carries on with much more
unfortunately this is just to illustrate the point

The Nexus Relationships

- Water is required to mine coal for primary energy to Eskom
- Water is required to process crude oil & Coal to liquid & gaseous fuels
- Water is required to generate electricity at hydro and pumped storage schemes
- Energy has regulatory certainty & water not
- Energy is facing wider visible constraint although water has many more issues
- Is the Nexus in SA in absolute crisis?

Energy Impacts on Water

Coal is a Strategic Resource in SA



Our coal deposits coincide with our best agricultural land and this means our dependence on coal is destroying our **national agricultural capacity because of acidification**.

Acid rain causes pollen tube deformation in maize by mobilizing aluminium and thus threatens our **national food security**. (Google “aluminium toxicity maize” for more info).

Coal Mining & Water



Our losses to **evaporation** exceed our precipitation so we need new strategic storage **other than dams** as a matter of national priority

The combined storage capacity of all dams in the Orange River basin is 194% of the MAR of the river as a whole, but 271% of the MAR in the South African portion of that basin – the **dam building** era is over

By embracing the mining sector we can develop new **strategic storage** as part of a deliberate **mine closure strategy**.

Status Summary 1/2

Water	Energy
National policy outdated	National policy in tatters
Bulk water fully allocated	Primary energy plentiful
Bulk provider in financial difficulties	Bulk provider in very serious financial difficulties
Regulator ineffective	Regulator reasonably effective
Regulator not independent	Regulator is independent
Skills shortage at national, provincial and local government & SOE levels	Skills shortage at national, provincial and local government & SOE levels
Water sector disorganised	Energy sector relatively organised

Status Summary 2/2

Water	Energy
Bulk provider not geared to provide “New” water	Bulk provider not geared to provide more energy
IWP’s not contemplated yet	IPP’s started but not independent grid access
Municipality infrastructure in tatters with 37% to 41% losses	Municipality infrastructure ageing but not failing to the extent of water
Infrastructure requires major recapitalisation of around R1.0 trillion	Infrastructure requires major recapitalisation of around R150bn
Major environmental impacts threatening humans, biodiversity & water resources	Major environmental impacts threatening humans, biodiversity & water resources

Quo Vadis 1/2?

Water	Energy
National policy to be updated	National policy to be finalised
Reduce, Reuse & New water	Primary energy plentiful
Bulk providers capacitation	Bulk provider restructuring
Independent regulators to be established	Regulator is independent
Retain, recruit & train at all levels	Retain, recruit & train at all levels

Quo Vadis 2/2?

Water	Energy
Bulk providers to be restructured to provide “New” water	Bulk provider to be restructured, announced by the President @ SONA
IWP’s concept to be included in policy updates	IPP’s to be allowed independent grid access
Municipality infrastructure to be prioritised	Municipality infrastructure to be prioritised
R870bn plus required, sector needs certainty	Grid requires R150bn plus, IPP’s?
Environmental compliance to be overhauled and integrated to reflect the current demands	Environmental compliance to be overhauled and integrated to reflect the current demands



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Your Water Abundance catalyst