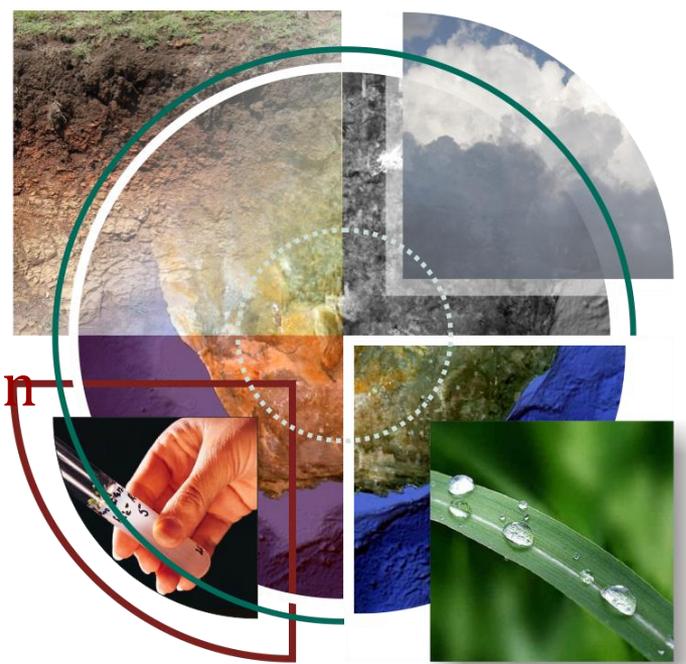


Research and Development need in Water-Energy-Food nexus in South Africa

NSTF Discussion Forum on
Water-Energy-Food Nexus – towards efficient national planning
Amanzingwe Lodge & Conference Centre
Broederstroom, Hartbeespoort, NW
23-24 October 2018

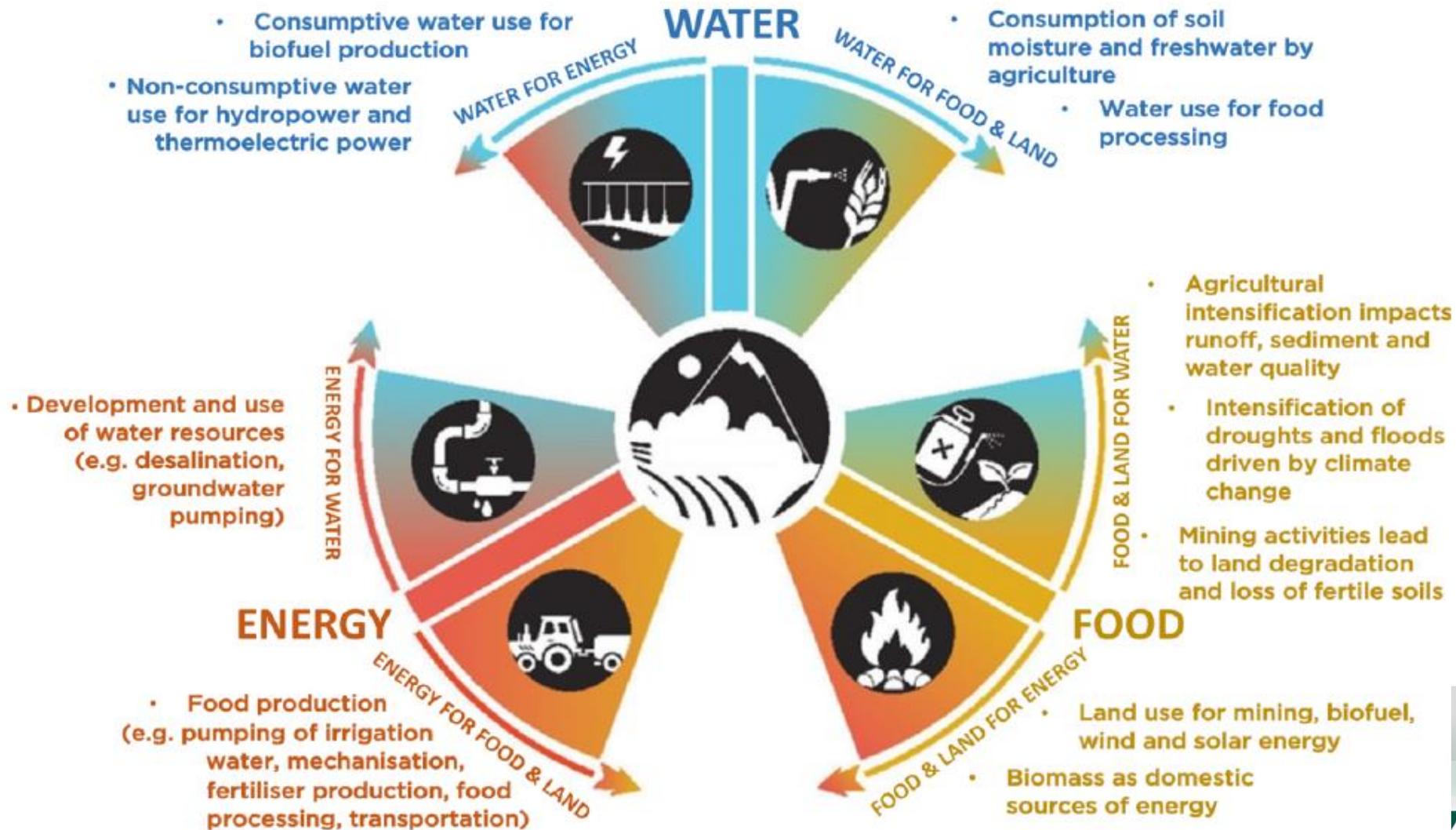
Dr. EJ Mwendera
Agricultural Research Council - Soil, Climate and Water (ARC-SCW)
Pretoria



Outline

- WEF linkages and relations
- WEF global perspectives
- Water management for enhancing WEF nexus
- Climate change adaptation as part of WEF nexus
- Water use and storage
- Potential nexus relations
- Research areas for addressing WEF nexus

Connections between water, energy and food systems



(Adapted from United Nations Economic Commission for Europe, 2016)

Water-Energy- Food nexus the global perspective

- ❑ Agriculture accounts for 70% of global water withdrawal. (FAO);
- ❑ Roughly 75% of all industrial water withdrawals are used for energy production. (UNESCO, 2014);
- ❑ The food production and supply chain accounts for about 30% of total global energy consumption. (UNESCO, 2012);
- ❑ 90% of global power generation is water-intensive. (UNESCO, 2014)
- ❑ Global water demand (in terms of water withdrawals) is projected to increase by 55% by 2050, mainly because of growing demands from manufacturing (400% increase). (UNESCO, 2014);
- ❑ More than 40% of the global population is projected to be living in areas of severe water stress by 2050. (UNESCO, 2014);
- ❑ By 2035, water withdrawals for energy production could increase by 20% and consumption by 85% (UNESCO, 2014).

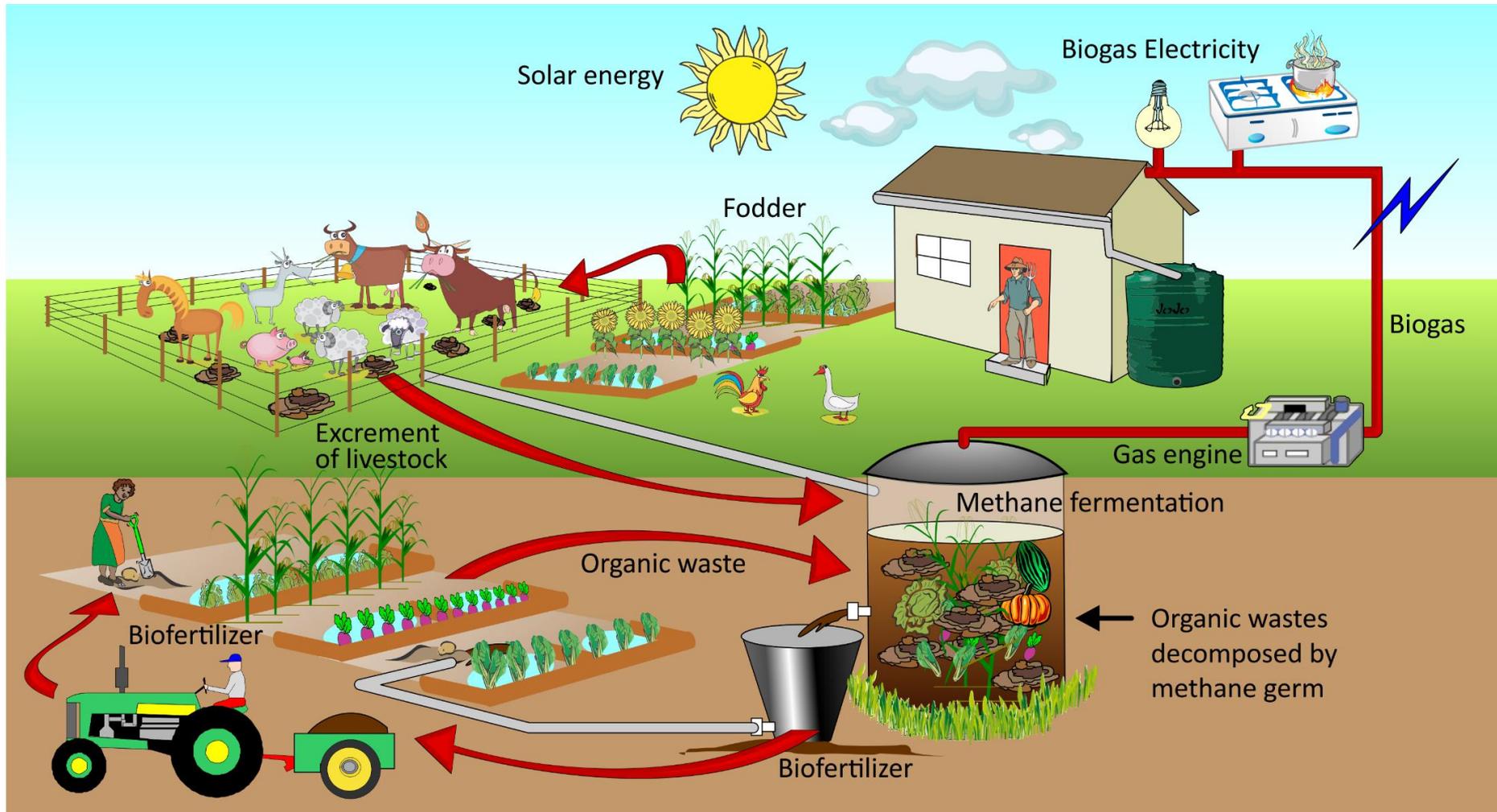
Rainwater harvesting & conservation practices and food security



More than 1400 households in rural communities in Thaba Nchu (Free State), Lambani (Limpopo province) and Krwakrwa (Eastern Cape), where the majority of community members live below the poverty line, have been empowered to implement and apply the RWH&C practices in their homestead gardens and/or croplands to improve their household food security status. The increase in crop yields with these technologies ranges from 10% to 70% depending on management practices compared to their normal conventional practices. It has also helped to increase their income, social well-being and crop diversity (nutritional status). This was achieved with simple and easily implementable practices with low maintenance cost.

(Source: ARC-SCW)

Up-scaling of rainwater harvesting and conservation to croplands and rangelands for food and renewable fuel (biogas) production



(Source: ARC-SCW)

Climate Change Adaptation & Mitigation

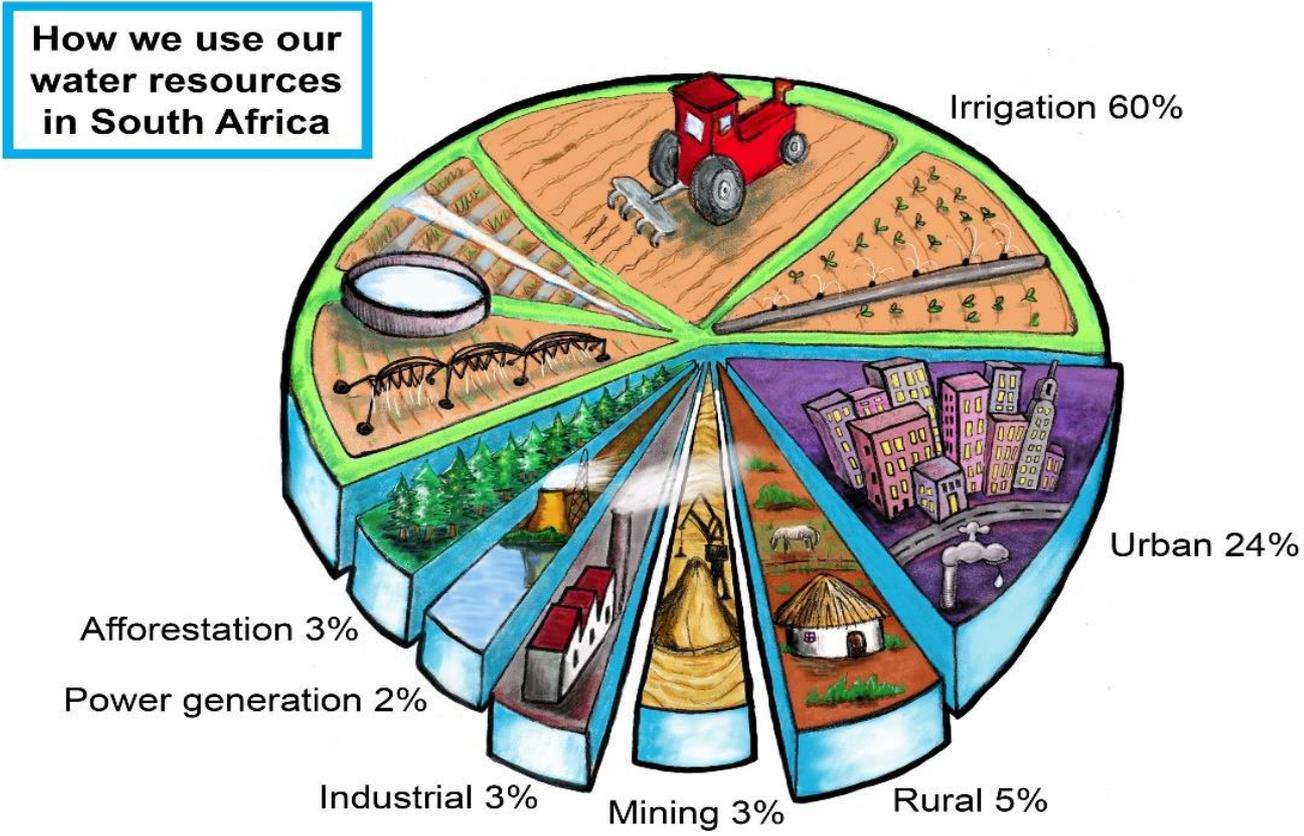
- Biogas project, to reduce farmers' dependence on wood and gas for heating, and reduce overall methane (a greenhouse gas) emissions from cattle farming

- Cropping system project, to improve food and nutrition security under changing climate
 - Crop rotation: maize with legume crops
 - Reduced tillage



(Source: ARC-SCW)

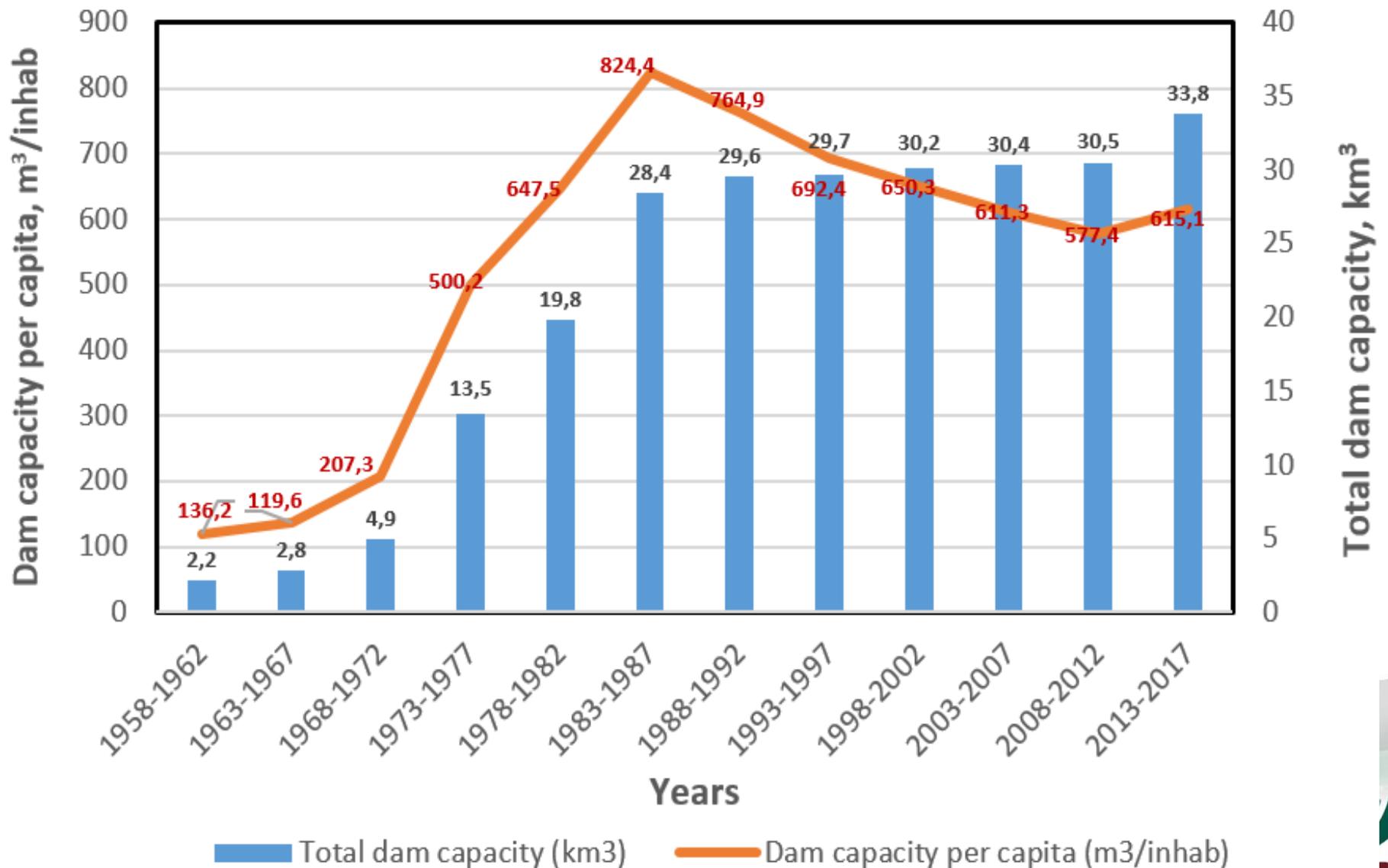
Use of water by major economic sectors in South Africa, 2015



In 2013, DWA reported that water use for power generation was 4.3%

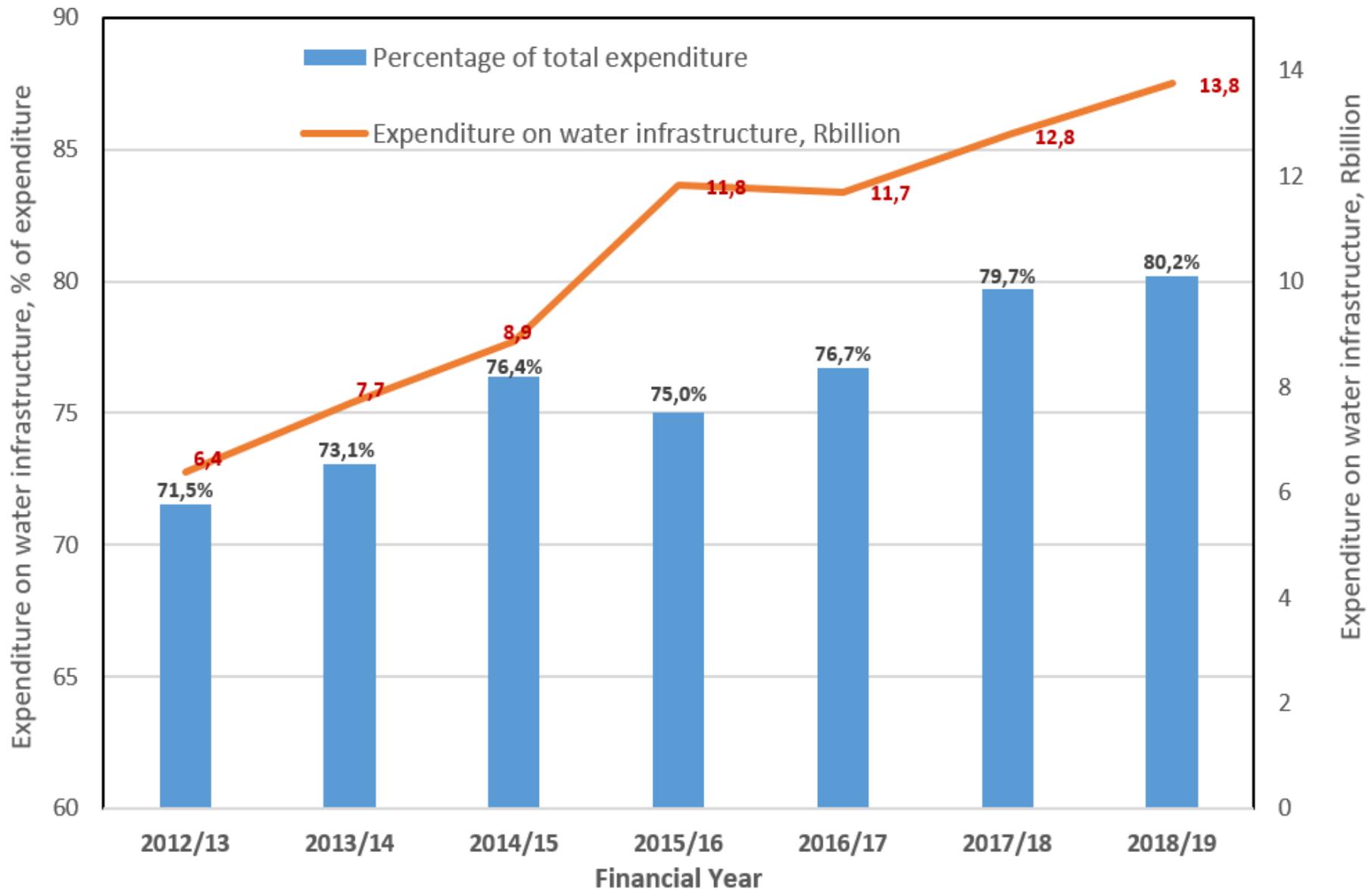
(Source: DWS, 2015)

Dam capacity in South Africa



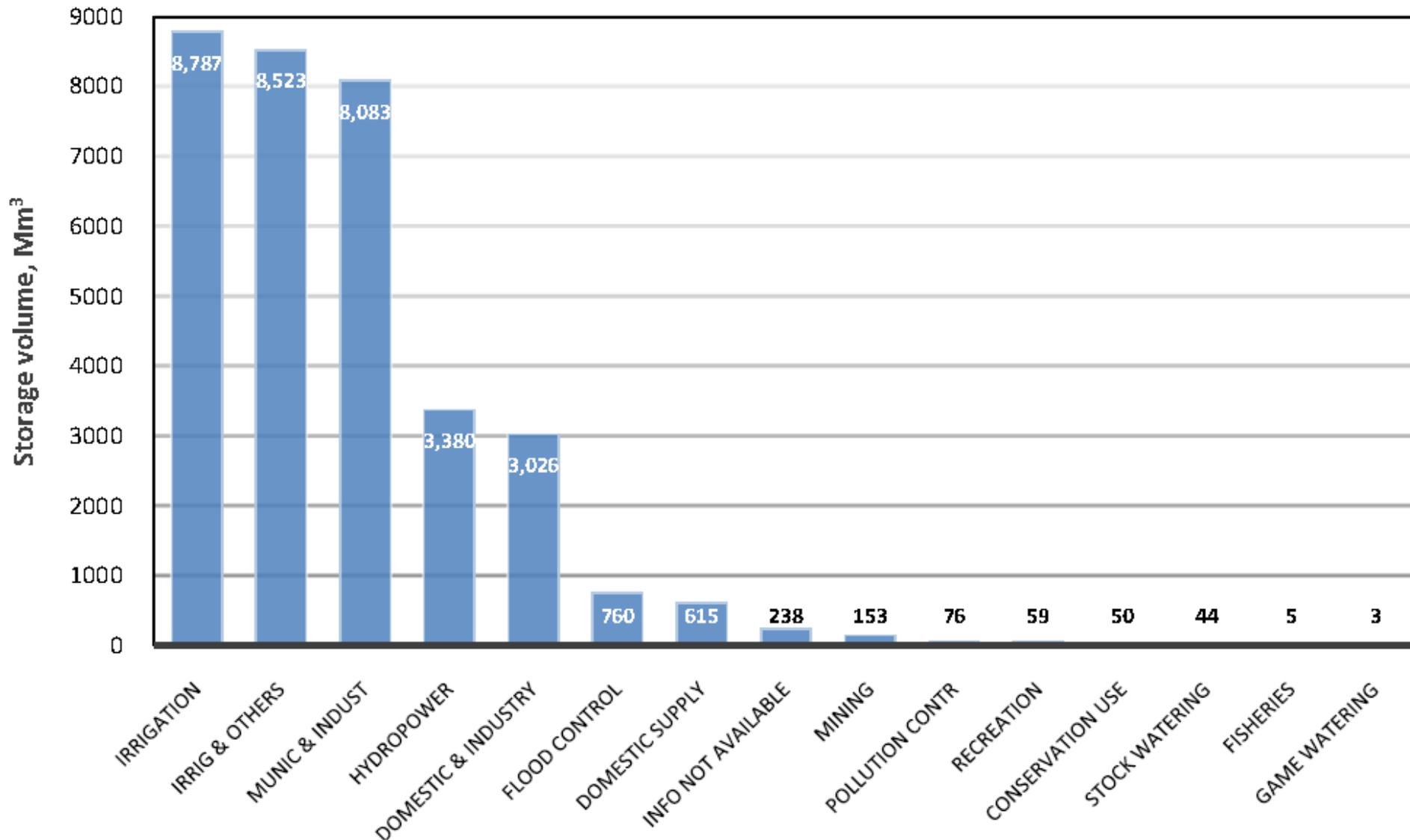
(Source: Mwendera & Atyosi, 2018)

Trend of expenditure on water infrastructure in South Africa



(Source: Mwendera & Atyosi, 2018)

Water storage capacity and main purpose of storage in South Africa



(Source: Mwendera & Atyosi, 2018)

List of potential nexus relations

Nexus relations	Water	Energy	Food
Water		<ul style="list-style-type: none"> • Desalinisation requires energy • Withdrawal of groundwater requires energy • Energy is needed for waste water treatment 	<ul style="list-style-type: none"> • Water for sanitation competes with water for food
Energy	<ul style="list-style-type: none"> • Water reservoirs for energy production • Fracking (and other types of energy) requires water • Bio energy crops need water 		<ul style="list-style-type: none"> • Bio energy crops compete for land with food crops
Food	<ul style="list-style-type: none"> • Crops need water • Food production may lead to water pollution • Water is used in processing 	<ul style="list-style-type: none"> • Fertiliser and pesticides use energy • Farm mechanisation uses energy • Energy is used in food chain and transport 	

(Source: Reinhard *et al*, 2017)

Which areas need to be researched?

- How are mutual WEF interlinkages expressed in resource, institutional and security terms?
- Resource use productivity and efficiency, incentive structures, governance and institutions in order to improve water, energy, and food security;
- How effects of climate change, as well as the measures and policies designed to address it impact on food, energy, and water stresses;
- WEF nexus through multiple domains of resources, institutions, and security
- Resource recovery for operationalizing WEF nexus
- Up-to-date accounting and auditing of available water resources and water use by all economic sectors;
- More efficient irrigation techniques to free up much needed water for electricity generation and for other economic sectors

Thank you