

Second Annual Conference on Climate Change and Development in Africa
Addis Ababa, 19-20 October 2012

The water-energy-food nexus and climate change in Southern Africa

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Outline

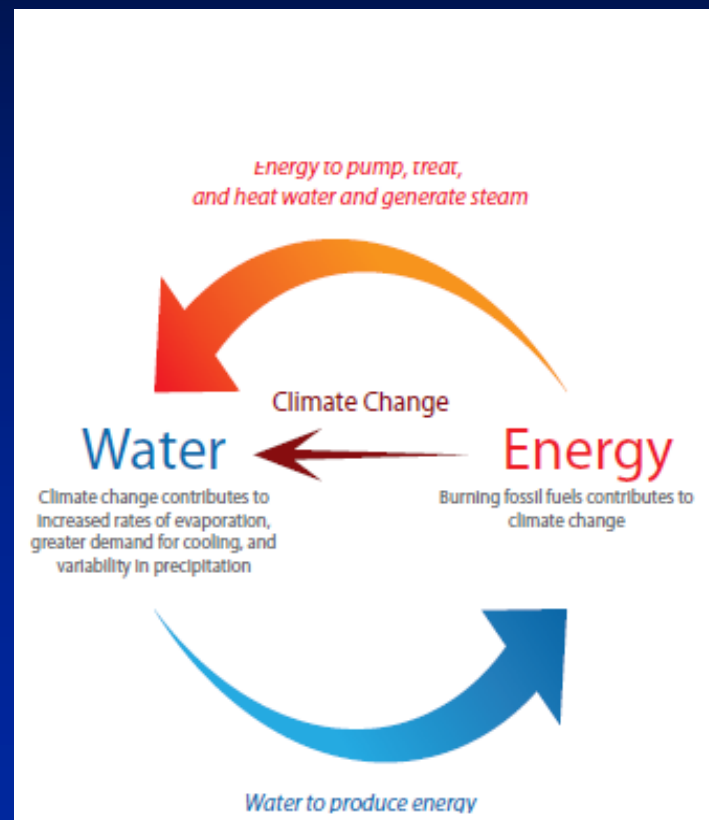
1. Introduction to the water-energy-food nexus in the context of climate change
2. The water-energy nexus in the context of climate change in Southern Africa - work completed by ERC
3. Research proposed



The water-energy nexus in the context of climate change

“Climate change may have been created by energy use, but it will be felt through water”

– Brandes

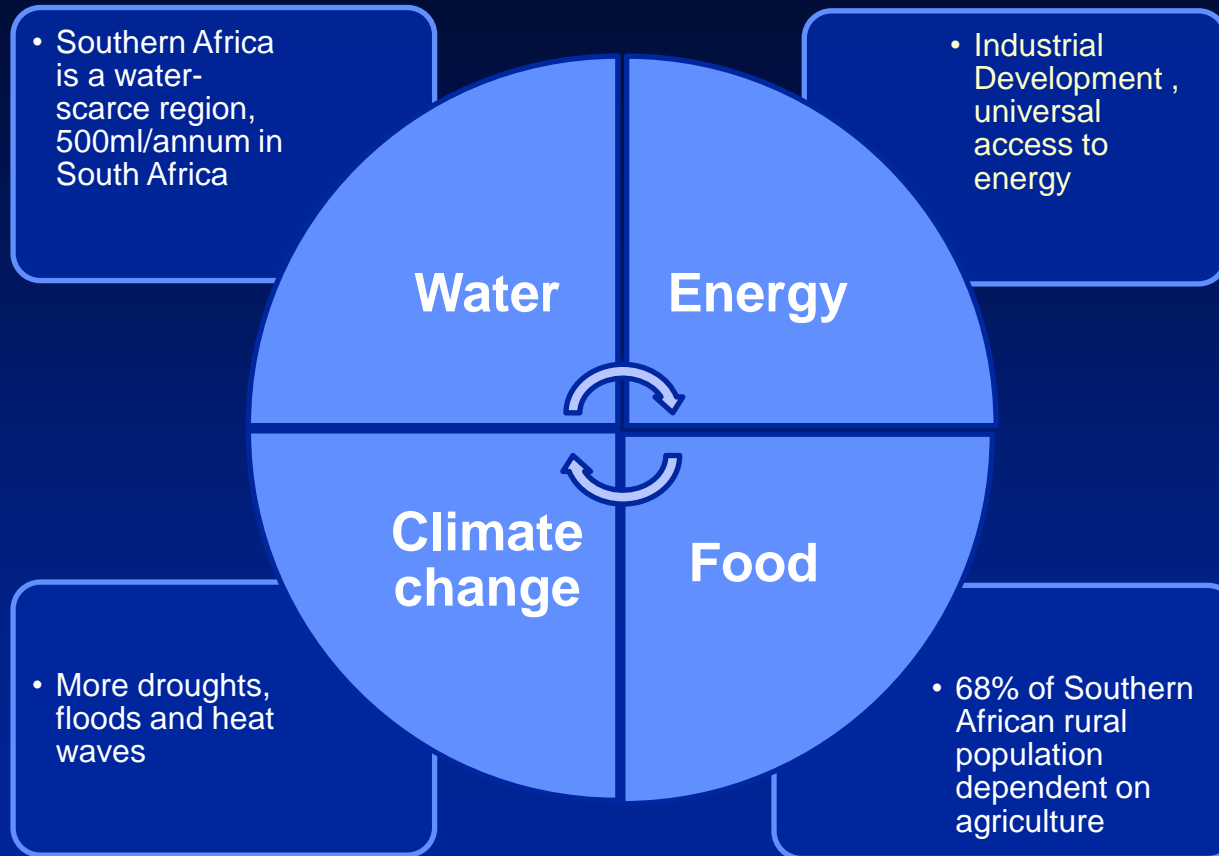


Source Maas 2010

Understanding the water-energy-food nexus and climate change is critical to development planning

- Water, energy, food and climate change are interlinked
- Water drives the turbines of hydroelectric power plants
- Cooling in thermal and nuclear power plants requires water
- At the same time coal-based plants emit large amounts of GHG into the atmosphere contributing to climate change which then leads to floods and droughts
- In times of drought little water flows into hydroelectric dams, choking off electricity generation
- For rural communities the greater frequency and severity of droughts and floods, caused by climate change, leads to crop failure, food insecurity and interferes with water supply technologies,

Water , energy, food and climate change nexus



The nexus is getting more and more attention but ...

- Bonn2011 Conference, Rio2012, Stockholm 6th World Water Forum
- Research Centres eg, IIASA developed integrated multidisciplinary approaches: Policy advice to Ukraine on how the complex linkages of the nexus can be sustainably developed
- Governments are aware of the linkages of these natural resources but policy and planning is not
- Policy makers and technology developers do not have access to tools to make sound, integrated and systematic assessment of policy or technological solutions

Themes of the Southern African study

1. The state of integrated planning of water and energy resources in the context of climate change at the national and local level
2. The water-energy nexus in policies of South Africa
3. Renewable energy technologies for rural water services in Namibia, Botswana and Mozambique. Opportunities and barriers. Is the nexus included in planning?
4. Adaptation technologies and strategies and water supply – opportunities and barriers in Lesotho

THEME 1

**The state of integrated planning of water
and energy resources in the context of
climate change**

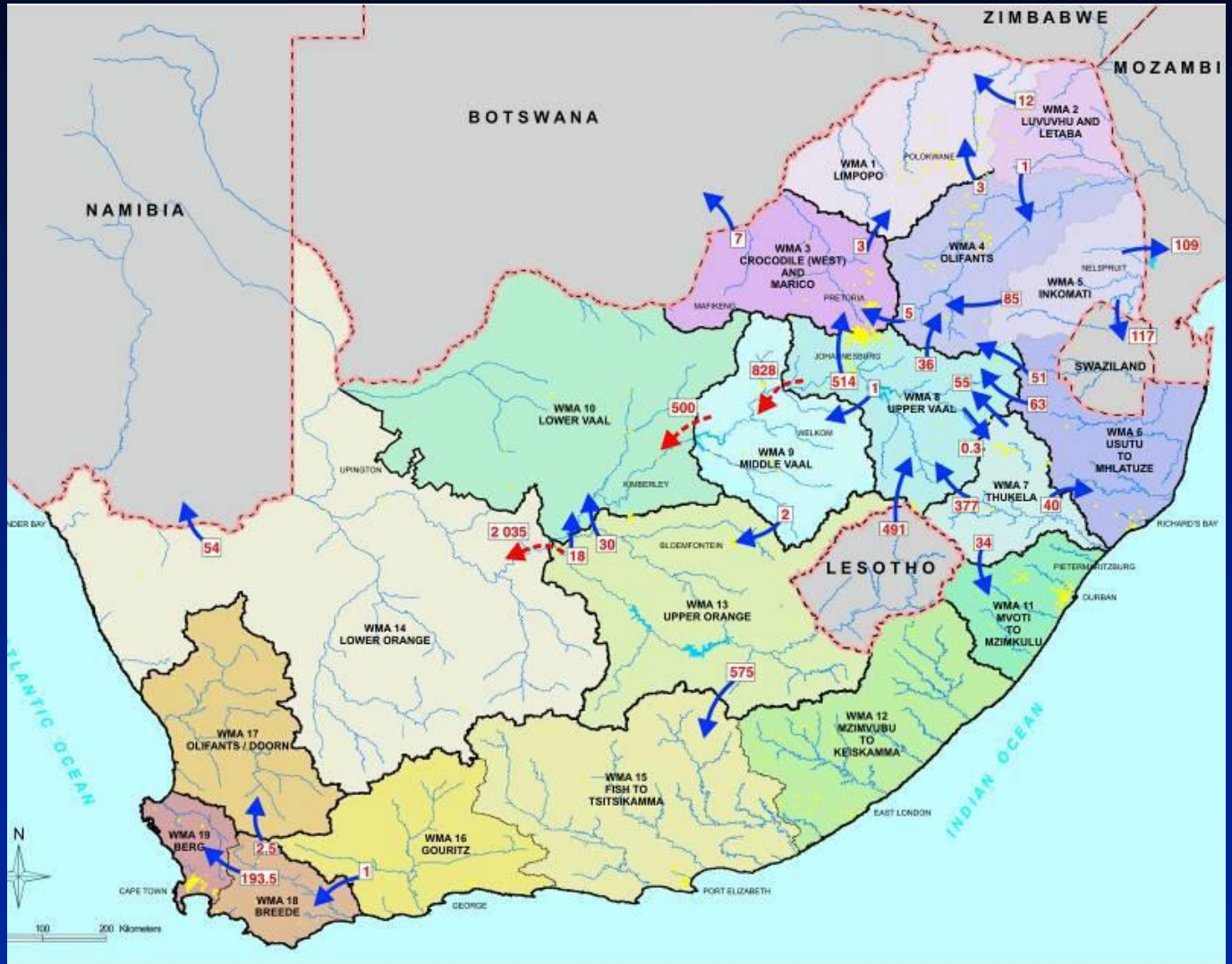
- Integrated water and integrated energy plans by sector have been prepared in South Africa and these plans are updated from time to time.
- So far, little attention has been paid to integrating water and energy planning and modelling, although in the water-scarce countries of Southern Africa it is not really possible to separate water and energy planning. Exception: Integrated Resource Plan on Electricity 2011 gives water demand
- Water resource planning is often carried out at the regional level of river-basins, but energy planning typically needs to be undertaken at a national or even supra-national level. Inter-basin transfers are potentially available policy actions.

Some data requirements

- Energy use in water supply
- Water consumption and withdrawal in energy generation by energy type, by technology and by industry sector
- Options of fossil and renewable energy sources in water-scarce regions
- Comparative cost of renewable and other water-efficient technologies



Interbasin transfer in Southern Africa: a solution to water scarcity




Research needed

- Planning the use of linked natural resources and climate change is complex
- The need for system thinking and modelling framework
- Development of a systems modelling framework for energy/water planning in the context of climate change. Policy options to include national impacts and constraints on local actions (e.g. implementation of community level renewable energy technologies as a policy)
- Stakeholder and expert workshops to integrate current knowledge and understanding of inter-dependencies
- Experiment with model to identify key areas of sensitivity or pressure, e.g. potential magnitude of water/energy cross-effects; potential magnitude of climate change effects; where local interventions may have greatest impacts in the broader system; where are greatest data sensitivities

THEME 2

The water-energy-climate change nexus in policies

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- South Africa was taken as an example because the country has, generally, progressive policies
 - South Africa hosted COP17, which raised awareness about climate change and its impact on the region, in national government departments, NGOs and the public
 - The nexus is mentioned at some conferences and in academia but generally awareness has to be raised for integrated planning to be implemented
 - At the local level, spatial development plans and integrated development plans provide for integration but also indicate that poor integration and sectoral separation are problems that need to be addressed

THEME 3

Energy technologies in rural water supply – case studies from Namibia, Botswana and Mozambique

Relevant issues

- Little or no awareness of nexus issues
- Lack of funding was identified as a problem; the limited government funding was put into large centrally-managed projects. External funding was essential for most of the projects, but problems have arisen with sustainability after completion of the project
- Perceptions and acceptance about the cost and performance of renewable energy technology was a significant barrier in remote rural areas
- Lack of participation of local communities in the planning and implementation of projects resulted in lack of ownership of projects

THEME 4

The nexus and implementing adaptation strategies in Lesotho

- This study links energy, water and climate change to land use and food security
- It was found that the most significant impact will result from the following:
 - intensive landscaping for storm water retention
 - technology for water supply and sanitation
 - general adoption of renewable energy technology
 - environmental education.



Ongoing and proposed research

Water-energy-food-climate change nexus and the rural poor in sub-Saharan Africa



- Governments are generally aware of the interlinkages of these natural resources but
- Policy makers and technology developers do not have access to tools to make sound, integrated and systematic assessment of policy or technological solutions and these tools have to be designed
- An opportunity to develop tools, planning approaches and interventions to address the livelihoods of the rural poor on an integrated basis

Ongoing and proposed research 2

- To provide an effective policy tool for the interlinked water, energy, food security problems of vulnerable and impoverished areas including climate change as another layer of complexity
- 60-80% of the people in sub-Saharan Africa live in rural areas which will usually not attract large scale industrial or agricultural interventions
- Other novel means may be necessary so that poor rural subsistence farmers can sustainably supply themselves with water, energy and sufficient food

What will the research achieve?

- Better understand the nexus within the context of rural livelihoods
- Develop causal loop diagrams and a systems model to identify the barriers to improved livelihoods of subsistence farmers in Southern Africa
- Prepare a list of implementable actions
- Implement actions at pilot sites
- Propose integrated policies that would better create and sustain livelihoods for the rural poor. To provide evidence-based policy advice exploring synergies inherent in the nexus

Thank you

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