Risk and vulnerability planning in the Kruger to Canyons Biosphere Region: communicating the latest climate change research to key stakeholders

C DAVIS
CSIR Natural Resources and the Environment, PO Box 395, Pretoria, 0001, South Africa
Email: cdavis@csir.co.za – www.csir.co.za

INTRODUCTION

Climate change is currently becoming increasingly prominent in the science and policy communities, with a corresponding increase in the amount of attention directed to conducting realistic impact and adaptation studies at various spatial and temporal scales.

Traditionally, work investigating the impacts and responses of climate change has been restricted to the northern hemisphere. Scientific investigation exploring the impacts of climate change through the analysis of existing data and the development of models needs to be given more attention in southern Africa to improve our understanding of impacts and hence improve our ability to adapt.

Furthermore, the demand for such scientific products from managers, conservationists and planners is high, but is seldom met. Engagement with such stakeholders is required to create awareness and facilitate the initiation of adaptation measures. More so, this engagement is essential to quantify the products and information that is required by stakeholders of the scientific community and national and provincial governments to effectively reduce risk and vulnerability to climate change.

This project has been designed in the spirit that management and policy-makers should make full use of scientific outputs to adapt to the climatic changes which are a threat to the economic and natural resource sustainability of the Kruger-Canyon Biosphere Reserve.

THE KRUGER TO CANYONS BIOSPHERE REGION

The Kruger to Canyons study area (K2C) was designated as a Biosphere Reserve under the United Nations Educational, Social and Cultural Organisation (UNESCO) to preserve the integrity of the conservation areas while improving the livelihoods of the people who live within its borders.

The K2C incorporates state-conserved land, communally-managed nature reserves, communally-grazed areas, former homeland type dense settlement areas, commercial agriculture, private conserved areas, commercial forestry and provincial conservation.

The Kruger to Canyon Biosphere is home to almost half of the bird species in South Africa and 64% of the mammal species in South Africa. A large proportion of the population in this area directly relies on natural resources as a buffer against poverty, for food security and for revenue generation for example, eco-tourism. One of the possible consequences of a shift and change in the Kruger to Canyon Biosphere Reserve ecosystem may lead to a change in ecosystem goods and services which will have far-reaching knock-on effects on the ecosystem services and social and economic stabilty of the area.

Previous studies (Mason 1996; Kruger & Shongwe, 2004) indicate that climate change in the area may already be occurring.

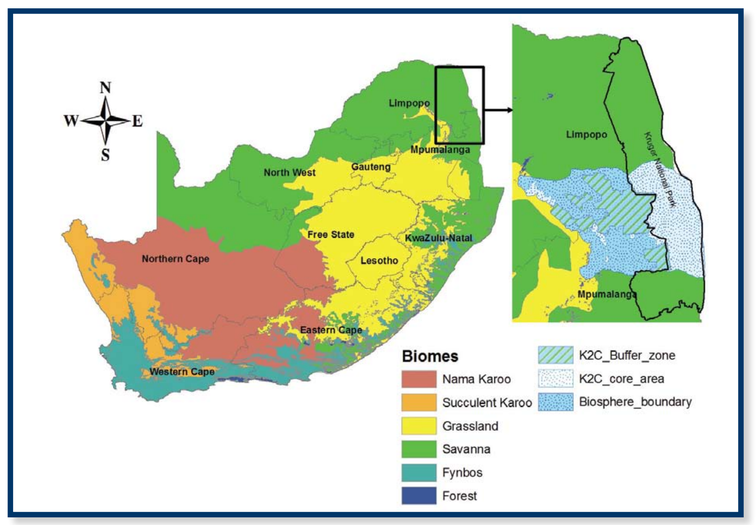
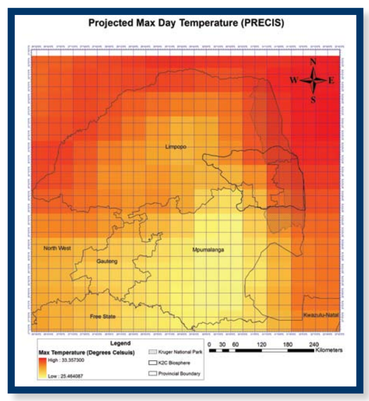


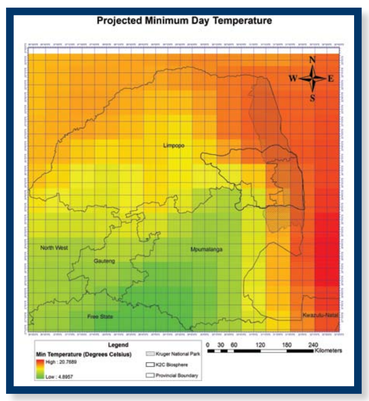
Figure 1: Location of the Kruger to Canyons Biosphere Region in South Africa (CSIR, Climate Change Research Group, 2010)

CLIMATE CHANGE PROJECTIONS FOR THE NORTH-EASTERN REGION OF SOUTH AFRICA

The term projection refers to estimates of future climate possibilities. An envelope of models is used to project different (but equally plausible) climate futures.
Increase in temperatures:

- Maximum 0.5 °C – 3.5 °C per annum
- Minimum 0.6 °C – 2.2 °C per annum with no areas experiencing below zero temperatures
- Mean 0.3 °C – 1.5 °C per annum.





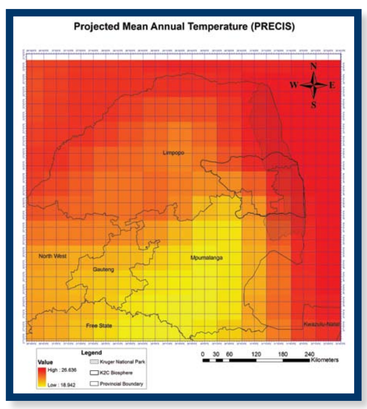


Figure 2: Projected future maximum, minimum and mean day temperatures obtained from the PRECIS regional climate model (CSIR, Climate Change Research Group, 2010)

INCREASE IN RAINFALL OF APPROXIMATELY 85-303 MM PER ANNUM

- There are distinct increases along the escarpment
- An extension of the rain season may occur
- Despite the increase in mean annual rainfall, future evaporation is expected to increase due to increasing temperatures.

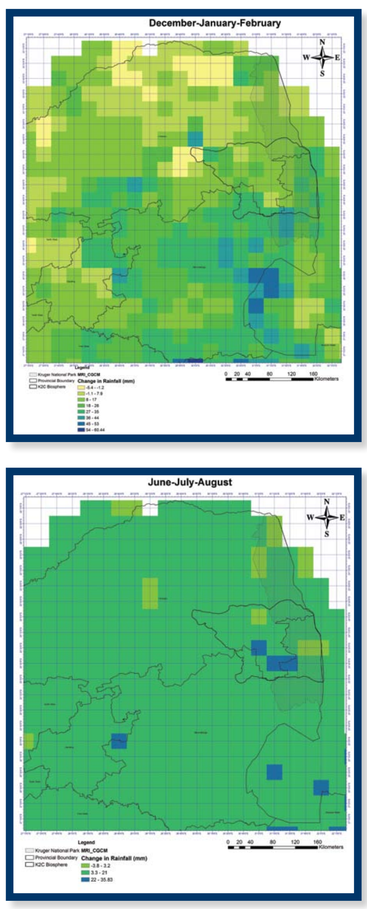


Figure 3: Projected seasonal rainfall change (December – January – February; March – April – May; June – July – August; September – October – November) obtained from the MRI-CGCM downscaled climate model (CSIR, Climate Change Research Group, 2010)

STAKEHOLDER WORKSHOPS

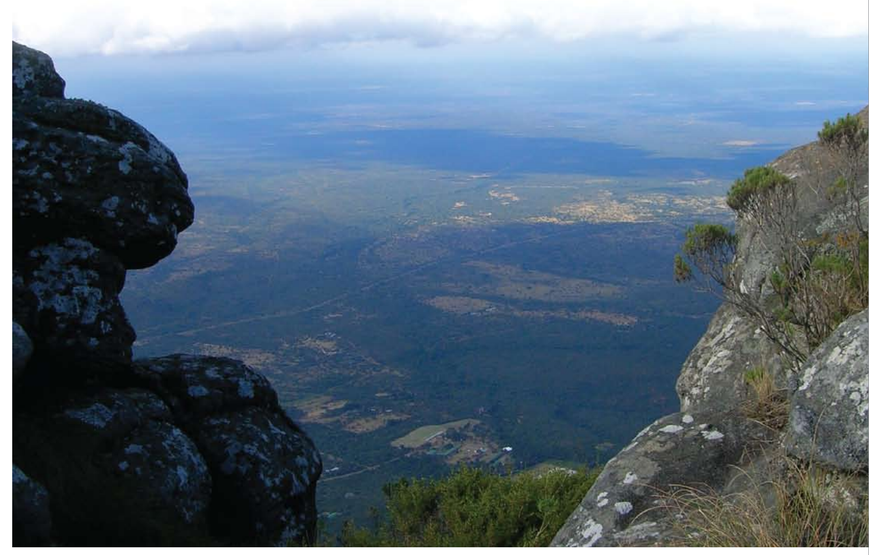
Interaction and iterative orientation with stakeholders in the area as a follow-up to initial user surveys was critical in order to avoid the 'front-end loader' approach to information transfer.

A three-day stakeholder workshop was held in the K2C Region in April/May 2010. Its aim was to provide stakeholders with:

- **access** to policy-relevant climate information;
- a **better understanding** of how to use the information and the limitations of the data; and
- an **ability to improve decisions** that will ultimately enhance the region's resilience to climate change.

Sector	Impact of concern	Time frame of concerns	Responses able to undertake
Agriculture	Increase of **extreme heat** events	Immediate	Erect protective shelters e.g. shadecloth for livestock and vulnerable crops
	Reduction in crop suitability and productivity	Medium – long	• Crop switching in the long-term • **Subsidies for subsistence/emerging farmers** • Improved agricultural extension network
Conservation	Species range shifts	Long	• **Expand the protected area network** through formal and informal conservation efforts • Assisted plant movement for endangered plants
	Impacts on **ecosystem services**	Medium	• Translate scientific findings and information into policy and law
	Alteration of key ecological process drivers	Short – medium	• **Alter key management strategies** • Introduce clearly-defined adaptive management
	Increased extent of **malaria** and heat stress will impact eco-tourism	Short – medium	• Increase malaria control programmes • Intensify marketing strategies for cooler winter times when malaria risk is lowest • Enforce clean energy requirements
Water	Variability in **water quantity**	Short – medium	• Set up 'drought' committees to disseminate information and make decisions for the long- and short-term
	Reductions in **water quality**	Short – medium	• **Invest in existing efforts e.g. Working for Water**

Understanding climate change and its possible impact on society is essential in critical sectors in South Africa to improve strategic adaptation responses.



Sector	Impact of concern	Time frame of concerns	Responses able to undertake
Provincial and local Municipality	**Disaster management;** increases in extreme events	Short – long	• Regulate and enforce developments that will buffer against disasters e.g. water storage • **Improve disaster management plans** based on future predictions
	Risks require improved facilities	Immediate	**Maintain and develop existing infrastructure** e.g. maintain sewage works and waste facilities
Local community	Food and economic security threatened by climatic extremes	Immediate	• Encourage **sustainable harvesting** and use of plants by community • Need to explore alternative energy sources
Forestry	Health of workforce; malaria, heat stress and respiratory / immune conditions	Immediate	More research and development of hybrids
	Species site matching	Immediate	Unknown
Cross-sectoral concerns	Uncertainty of the extent of change and the lack of baseline data	Immediate	• Increased capacity and budget for **baseline monitoring** • More precise models and accurate information • More directed research and development
	Increased presence of pests, pathogens, alien plant invasion and bush encroachment	Immediate	• **Use existing resources e.g. Working for Water and Working for Fire** • Research into land management plans to reduce tree cover
General adaptation options	• **Capacity, funding and knowledge dissemination** • **Increased awareness and climate change education in local communities** • **Local adaptive capacity** (e.g. municipalities) needs to be strengthened • Input short-term climate predictions into existing management strategies and promote scenario planning		

CONCLUSION

There was a keen desire among stakeholders to access climate change information. Stakeholders acknowledged that such information can provide a stepping stone for integrating short-term weather changes as well as longer-term climatic changes into planning.

Stakeholders highlighted key risks and vulnerabilities to the projected climatic changes as well as important gaps in policy that need to be urgently addressed. Key issues raised include, the need for investment in local infrastructure, capacity building and funding for sustainability projects. A shift in management and policy is required to effectively respond to current and future environmental and social stresses.

Decisions informed by the research will be tracked and monitored in partnership with relevant stakeholders.

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