

CHAPTER 3.

GLOBAL CHANGE IN TERRESTRIAL ECOSYSTEMS

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Problem statement

- Changes in terrestrial ecosystems are perceived to be compromising their ability to improve and sustain the quality of life of South Africans. This may be (further) compromised by Global Change drivers over an ill-defined time period
- It is unclear what critical set of Global Change drivers will influence a mega-diverse (fire-prone) terrestrial environment supporting a developing, mixed economy, with a unique land-use legacy, variable climate and steep climatic gradients
- No overarching models currently exist that encompass these elements and their interactions.

Global perspective and regional relevance

- Changes in the global climate and natural resource base, together with responses by international socio-economic and policy “actors” are occurring, including an increasing focus on sustainability objectives driven by international conventions such as the United Nations Framework Convention on Climate Change and Convention on Biological Diversity
- South Africa, already changing rapidly, needs to respond to the global threats of both climate and resource base change and policy responses to them in a way that maximises benefits and minimises threats to South Africans, and particularly those most vulnerable
- The complexity of South Africa’s ecosystems, climate regimes, geographic location, demographic shifts and socio-political development provides both opportunity and threat.

Regional strengths and advantages

- Unique mix of climate regimes
- Unique ecological richness and complexity
- Juxtaposition of distinct biomes
- Good environmental and climate history
- Many useful climatic gradients
- Sensitivity to ENSO/other global drivers
- Societal inter-dependence with ecosystem services

Consequent research gaps and uncertainties

- **Securing living landscapes**

To understand changes and implications for biodiversity based livelihoods and economies, from both an individual species-based and a systems level perspective

- **Projecting impacts of escalating land cover change**

To understand atmospheric change, related impacts on disturbances such as fire and grazing, and critical societal drivers that will change land cover over the next fifty years, and their management to achieve sustainability

- **Ensuring water security**

To ensure water security taking into account surface and ground water resources, water quantity and quality, the amplification of any changes in the hydrological responses to changes in climate, international water obligations, and the important links which water has to other systems

Consequent research gaps and uncertainties

- **Vulnerable people and vulnerable places**
To determine the places in South Africa most vulnerable to Global Change trends, and how these can be managed to reduce adverse impacts on people
- **Understanding the feedback**
To quantify the likely impacts of Global Change trends on the continued potential of the regional system as a carbon sink and source of other feedbacks to the global climate
- **Sustainable food and fibre production**
To satisfy the needs to feed a growing population with changing dietary expectations, to make South Africa food secure in the future as well as to make a positive contribution towards foreign earnings
- **Better landscapes for better lives: Enabling institutions for ecosystem management**
To guide the creation of enabling institutions that overcome regulatory, capability, communication, cultural and social barriers and limitations - for achieving sustainable landscapes

Capabilities and capacities

- Rich legacy in terrestrial ecology and adaptive management
- Rich legacy of environmental monitoring and experimentation
- Excellent/good research institutions
- Core skills in most required disciplines
- Core infrastructure (some missing)
- Small, dedicated, multidisciplinary collaborative science community

Spending 10 million ZAR

- Systematic review of available information on trends, drivers and available synthetic models.
- Nationally co-ordinated network of sites doing key monitoring and manipulation to test biome-specific processes and their drivers (drought/fire/biodiversity/alien invasives/CO₂/warming/land use change) [SAEON+].
- Nationally co-ordinated (nested?) network of observation “sites” to quantify ecosystem responses to seasonality and inter-annual climate variability.
- International summit to attract top thinkers in ecological integration and develop the above plans

Policy implications of outcomes

- Guidelines for regional sustainable development pathways relating to land use
- Guidance on resilience to extreme environmental events and sub-national co-ordination of adaptation responses to eee's
- Relevance for international policy positions on biodiversity and ecosystem function, including sustainable development, desertification, carbon cycling and sequestration.

Metrics for progress/M&E

- Integration and inter-comparability of “living” national data sets
- Sustainable collaboration across disciplines and institutions based on these data sets
- Information flow to decision making processes
- Publication of information and perspectives unique to the region based on these data sets
- Attraction of top international collaborators
- Sustainable development and inspiration of home-grown natural scientists
- Scientific basis for regional planning and international negotiating requirements