

# Climate change and adaptive land management in southern Africa

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Assessments  
Changes  
Challenges  
and Solutions

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# **Biodiversity & Ecology**

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## **Climate change and adaptive land management in southern Africa**

**Assessments, changes, challenges, and solutions**

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# Foreword

Dr Jane M Olwoch, SASSCAL Executive Director

Climate change and long-term environmental changes are linked in space and time. Temporal changes in the physical and social environment are behind the gradual increase in greenhouse gases since industrial times. The increase in population and spatial connectivity of people, places, and the planet has itself resulted in the exploitation of natural resources beyond local borders. The connectivity of ecosystems and services through energy flow and material exchange through the biosphere, atmosphere, lithosphere, and hydrosphere means that we live in shared spaces in which the biogeochemical cycles are at our disposal to maintain or change for the better or worse. Even without climate change, biogeochemical cycles have been altered by human activities beyond their capacity to come back to their natural states. It is well established that human activities through various types of land use and cover changes have altered the natural composition of nitrogen, phosphorus, and sulfur and further directly or indirectly influenced the climate system. Superimposed on the current and future projected climate change, changed biogeochemical cycles are already increasing the vulnerability of biodiversity, food security, water security, forests and woodlands, and human and animal health to climate change. The Intergovernmental Panel on Climate Change's fifth assessment report (2014) highlighted that as temperatures continue to rise and precipitation declines across many areas in Africa, ecosystems are already being affected by climate change, and future impacts are expected to be substantial. The report further states that such changes include shifting ranges of some species and ecosystems as a result of elevated carbon dioxide (CO<sub>2</sub>) and climate change, beyond the effects of land use change and other non-climate stressors. The effects of climate change on water resources are also reported with high confidence, as are impacts on food security in particular through the reduction in cereal production. Southern Africa continues to experience prolonged droughts, with the 2015 agricultural season in southern African being considered the driest in 35 years, leading to a deficit of 9.3 million tons in cereal crop harvests, among others.

To address such complex and cross-regional environmental and social challenges, a regionally integrated approach provides the most reliable and financially sustainable mechanism. SASSCAL's value proposition centers around regional integration, relevance, transdisciplinary research, and institutional cooperation and partnerships. The four-pillar value proposition also provides a framework in which future research, service production, and capacity-building programmes will be conducted. Furthermore, SASSCAL's mission is to strengthen the regional capacity to generate and use scientific knowledge products and services for decision making on climate change and adaptive land management through research management, human capital development, and service provision. To achieve this, quality climate and long-term environmental data must continuously be collected by way of demand-driven research. Similarly, support tools and research capacities must be developed, and the information derived must be made accessible to stakeholders. This ensures that the role of science is understood and mainstreamed in national and regional policy-making institutions through the production of services that are needed to strengthen adaptation and mitigation strategies. SASSCAL's research portfolio 1.0 outcomes from 88 research tasks are a vivid manifestation of the role of research in contributing to the region's research outputs and knowledge economy.

This book provides a comprehensive collection of research outputs, data infrastructure, tools, and capacity-building outcomes from SASSCAL's research portfolio 1.0. This book also signifies an entry into the future in which SASSCAL supported research continues unabated and anchored by the establishment of SASSCAL as an institution and successes from the SASSCAL 1.0 portfolio in terms of research outputs, services, and the research infrastructure. In addition, several strategic partnerships created in the region and abroad position SASSCAL as a sustainable institution that will guarantee long-term availability of knowledge and data; hosting of long-term data is a fundamental base to detect and understand changes over time and space.

It has been a long but fulfilling journey that has been enabled by strong collaboration between Angola, Botswana, Germany, Namibia, South Africa, and Zambia. Congratulations to all the researchers and students who have produced such quality products. Much deserved appreciation to all research and academic institutions that took part in the process. Special thanks go to the Federal Ministry of Education and Research (BMBF), which provided financial and technical support for the SASSCAL portfolio 1.0 and production of this book.

*Jane M Olwoch*