

Science, Technology,
and Innovation
for Socio-economic
Development

**SUCCESS
STORIES
FROM AFRICA**

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Preface

This book has been prepared by the International Council for Science Regional Office for Africa (ICSU ROA) as part of its outreach activities, to showcase the achievements of science and technology in Africa. ICSU ROA, established in June 2005, has the mandate, amongst other things, to promote and facilitate the utilization of science, technology, and innovation (STI) for the socio-economic development of the African continent. This mission would be realised by harnessing the experience, knowledge, skills, and research infrastructure found within the ICSU community. Apart from producing this book, the Regional Office has also prepared and published four science plans as a contribution to the sustainable growth and development of the continent. These science plans deal with climate change and adaptation, sustainable energy, natural and human-induced hazards and disasters, and health and human well-being. The Regional Office has also built networks of scientists, engineers, and technologists, including the African Diaspora, for the implementation of projects that are being developed from the four science plans (www.icsu-africa.org).

The role of this book is to support Africa's science education and research, and to highlight the continent's contribution to the development of science and technology in the world, especially relating to the participants of the 29th ICSU General Assembly held in Maputo in October 2008. Another important objective for this volume is to demonstrate the importance of STI for sustainable growth and development in Africa. The book also gives a measure of recent advancements in science education and research (such as the use of natural resources) on the continent.

STI serves as a vital engine for the knowledge-driven socio-economic advancement of any nation. It is also recognized today that the development policies of prosperous national economies are strongly linked to excellence in STI. This book is an attempt to urge African countries to make a dramatic shift from resources- to knowledge-based economies. In an increasingly globalized world, high levels of investment in research and innovation are essential for economic competitiveness as well as for the development of vital sectors such as healthcare, environmental technologies, and sustainable energy – in other words, sectors that make tangible improvements to the quality of life of the populace, especially the rural and urban poor.

Africa has a rich history of indigenous knowledge systems that are still unknown to the outside world. It is also true that research activities in Africa have yielded results that remain largely unpublished in international journals. A good example is in medicine where, for centuries, scientific techniques have been deployed for culturally specific and psychologically significant treatments involving hydro- and thermal therapy, spinal manipulation, quarantine, and bone-setting (orthopaedics).

This book gives an account of modern scientific developments that may contribute significantly to the realization of the objectives of some of the Millennium Development Goals. It brings together, under one cover, research reports from different African scientists and institutions. It also gives the reader a selection of scientific success stories that cover science and technology innovations as applied to solving some of the chronic developmental and societal challenges that Africa faces in the fields of health, the environment, and energy sustainability.

The book comprises eleven chapters organized in four sections representing the disciplines covered.

The first section deals with issues relating to health. The chapter by Ameenah Gurib-Fakim (Mauritius) shows medicinal plants providing solutions for certain chronic diseases. It advocates the formulation and implementation of biodiversity policies and laws that translate ancestral

traditions into modern businesses that will make the continent healthier and keep it prosperous. The contribution from Philippe Rasoanaivo, David Ramanitrahasimbola, and Suzanne Ratsimamanga (Madagascar) outlines research in Madagascar on natural drug discovery and botanical formulation, and presents an account of the country's published and unpublished ethnomedical data. The chapter by Charles Wambebe, Hadiza Khamofu, Joseph Okogun, Nathan Nasipuri, Karynius Gamaniel, and the late Rev. P.O. Ogunyale (Nigeria) describes the discovery of an African herbal medicine, Niprisan, which, if successful, will save the lives of many people suffering from sickle-cell anaemia on the continent. The chapter by Dan K. Monyeki and H.C.G. Kemper (South Africa) investigates the development of under-nutrition in rural children in Ellisras, South Africa, from infancy to adolescence over an eight-year period. It emphasizes the introduction of community-based programmes to modify behaviour, thereby preventing the development of malnutrition factors associated with morbidity and mortality. The chapter by Jane M. Olwoch (South Africa) discusses the effects of climate change on the distribution of ticks and tick-borne diseases in sub-Saharan Africa, as well as the effects on the social and economic fabric.

The second section has two chapters. The first, by Kassim S. Mwitondi (UK), reviews successful information and communication technology applications in Africa, and analyzes and identifies key challenges to be overcome for the future. The second chapter, by Aderemi Kuku (USA), outlines the linkage between the mathematical sciences and socio-economic development, and highlights the importance of mathematics in science education and research.

The third section contains three chapters on issues related to the environment. The chapter by Romeela Mohee, Ackmez Mudhoo, Geeta Unmar, Vijayalaxmi Jumnoodoo, and Nafiisa Sobratee (Mauritius) focuses on composting organic waste to assess the degradation of plastic bags and to study the mechanistic pathways of pesticide decomposition in a composting environment. The chapter by Bhanooduth Lalljee and Sunita Facknath (Mauritius) discusses the vulnerability of small island states to the effects of globalization and investigates the main measures (including policies) taken by the government of Mauritius to face the challenges. Chris J.C. Reason (South Africa) argues for the application of regional ocean models to simulate circulation and tide, marine ecosystems, sediment transport, and biogeochemistry along African coastal waters, and discusses other features related to regional climate and marine biodiversity.

The final section deals with renewable energy. The contribution by Francis P. Gudyanga, Clement S. Shonhiwa, and Zivai Chiguvare (Zimbabwe) deals with the production of biodiesel from non-edible *Jatropha* seeds and describes the economic importance of this type of energy to the rural community.

This book is innovative in its scope and important in its conclusions. The collection of chapters reveals science, technology, and innovation as a critical driver for poverty reduction through accelerated socio-economic development in Africa. It shows the private sector to be an important player in education, research, development, and the commercialization of Africa's natural products such as traditional medicine and indigenous knowledge. The book is the first in a series of planned volumes of science, technology, and innovation success stories from Africa that will be published by the ICSU Regional Office for Africa.

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