



## Book Review

# Walter Leal Filho, Nicholas Oguge, Desalegn Ayal, Lydia Adeleke and Izael da Silva (Eds.) (2021) *African Handbook of Climate Change Adaptation*. Springer Nature

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African countries are responsible for an insignificant proportion of the greenhouse gas (CO<sub>2</sub>e) emissions that are driving global climate change. Their share of global emissions was just 3.9% in 2021 and estimates of cumulative historic emissions are even lower at less than 3%. The majority of these emissions are produced by a handful of oil, gas and coal producing states, such as South Africa, Egypt, Algeria, Libya and Morocco. Both the per capita and total emissions of most other African countries are tiny. Yet, according to the World Meteorological Association's 2022 report, *The State of the Climate in Africa*, the continent is suffering disproportionately from the effects of climate change. Warming in most countries is above the global mean and has been accompanied by increased variability in weather patterns as well as more frequent droughts and floods. Climate adaptation is particularly urgent because Africa's population is set to increase from 1.4 billion today to about 2.5 billion by 2050, according to United Nations (UN) predictions.

Published in 2021, *African Handbook of Climate Change Adaptation* seeks to address this challenge. It is a vast collection of 135 peer-reviewed articles and is over 2,800 pages long. The Handbook is divided into three parts: Climate Change, Agriculture and Food Security; Climate Change Technologies and Resource Management; and Interdisciplinary Aspects of Climate Change. Given that many of these articles have multiple authors, it is no exaggeration to state that it has involved several hundred, mainly African, scholars. Moreover, there are case studies from most countries on the continent. The primary aims of the editors were to "raise awareness on the relevance of climate issues for African nations ... by comprehensively documenting and disseminating the many ideas, approaches, methods, and projects being implemented across Africa today" (v). As the editors also stress, they hope that this handbook will be useful for both established and early career researchers, non-government organisations (NGOs), governments, and other relevant actors, such as companies, and national and international aid organisations (vi). The fact that this is an open access publication (thanks to support from the German Ministry of International Cooperation) is key to the contribution of this handbook. Many of the articles have been previously published in journals. However, without the effort that has gone into bringing them together in a single publication, they would have remained dispersed across specialist disciplinary journals and inaccessible behind paywalls.



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Achieving food security is one of the most important aspects of climate adaptation in Africa. Currently, one in five Africans are under-nourished and it is estimated that about 55 million children under five are stunted because of malnutrition. While food poverty has numerous causes, it is being exacerbated by climate change which is already disrupting agriculture and access to food. It is predicted, for example, that it will be impossible to grow wheat in Africa as temperatures rise. Yields for maize, which has become a core staple over the last 50 years, are already showing serious decline in many regions. Nonetheless, some of the chapters in Part One of the Handbook, which focuses on agriculture and food security, do provide grounds for optimism. The numerous chapters that document and analyse initiatives to implement climate smart agriculture (CSA) show that adaptation is feasible and can reverse declining yields. As Eleblu et al. (131–146) explain, CSA strategies include zero tillage, mulching with manures and crop residues, rotation, intercropping, diversification, natural pest management, agroforestry and using large trees for shade. More hi-tech strategies are also noted, such as geographic information system (GIS) mapping or selective breeding for resilient varieties of crops and livestock. However, it seems that adoption of CSA and levels of support and information are currently linked to the commodity value of crops. Karuri's excellent chapter (29–48), for example, shows that multi-stakeholder collaboration and support has been a key factor in the adoption of CSA strategies among small-scale tea and coffee producers in Kenya. Other case studies suggest CSA training and support for smallholders farming for subsistence and local markets is much more fragmented and uneven and often depends on local initiatives from grassroots NGOs.

Part One also presents a second encouraging fact in relation to future climate adaptation and food security. As several chapters show, root crops and other under-utilised indigenous vegetables could potentially fill some of the gaps in staples left by declining cereal yields. Root vegetables like cassava, yam and sweet potatoes are far more drought tolerant than wheat, rice and maize. They also have higher pest resistance and can be grown in marginal soils. Moreover, roots are highly nutritious, being rich in protein as well as carbohydrates, vitamins and minerals. Other indigenous vegetables discussed by Namani et al. (495–470) with similar nutritional properties and resilience could also play an important role in food security. An example of such is the African yam bean which is native to the tropical belt. However, roots and indigenous vegetables have been quite marginalised in most countries' food and agricultural policies. Therefore, capitalising on this potential will require much greater attention and support from the scientific community, agricultural outreach workers, policy-makers and ministries.

Part Two on Climate Adaptation, Technologies and Resource Management includes, as one would expect, chapters on the use of digital technologies and GIS to improve weather and other information systems. There are also chapters that provide interesting insights into the types of initiatives that will be valuable, not only for adapting to climate change but for addressing environmental problems more generally. Idowu et al. (1159–1168), for example, discuss the potential of microbacteria for dealing with PET plastic waste which is a huge problem, especially in urban areas. Likewise, Hammed and Sridhar's fascinating chapter (1293–1312) showcases examples of grassroots community initiatives that have successfully used green technological approaches to solid waste management. These have empowered and cleaned up neighbourhoods, and built resilience among residents, bringing associated health and well-being benefits. There are also several case studies that focus on the health and environmental problems that derive from the reliance on biofuels across the continent and evaluate the prospects for switching to clean energy sources. This is a major issue. According to figures cited by Danlami and Applanaidu (1423), 50% of energy use in Africa is derived from biomass fuels; in some countries this figure is much higher. In Nigeria, for example, 70% of households rely on biofuels, a figure that rises to 90% in some regions. Burning biofuels generally creates serious health problems, especially for women and children; and the use of firewood is also driving deforestation, which compounds the impacts of climate change on local micro-climates. One of the key findings of these case studies is that switching to clean technologies is a serious challenge, not only in terms of providing affordable secure electricity supply but also in relation to socio-cultural norms. As several articles emphasise, cooking with biofuels is deeply culturally embedded, shaping food preferences and taste, and often has ritual and religious significance.

The chapters in Part Three, Interdisciplinary Aspects of Climate Change, address a broad set of topics. These range from uncertainties in rainfall and water resource management and hydrological dynamics to unlocking the potential of climate finance and African European Climate Change partnerships. Several chapters present gender and intersectional frameworks and emphasise the importance of considering gender norms, divisions of labour and household power relations in climate adaptation policies and initiatives. This is a theme that also recurs across many of the case studies in earlier sections. De Jong Cleyndert et al.'s study of female seaweed farmers in Zanzibar (3–28) illuminates this well. Seaweed farming has been promoted across the tropics as a climate adaptation strategy and in Zanzibar it is an important livelihood strategy for women. But, as this chapter shows, as the shallow waters along the coast warm and seaweed yields decline, the only solution is to farm further out in cooler, deeper water. However, for women seaweed farmers, this requires capital to buy boats and tackle. It also crosses local gender norms because handling boats and swimming are viewed as male activities and most women cannot swim. While many of the women farmers involved in this study expressed a desire for training, enabling them to pursue the deep-water option would require significant investment and support. Ensuring that women are able to benefit from climate adaptation strategies was also a challenge raised in the studies of root cultivation discussed above. Growing roots has mainly been a female

subsistence activity and growing cash crops has been a male prerogative. In such contexts, it is unclear how expanding and commercialising the potential of root crops would affect gender dynamics and control of resources. Moreover, as Ngum and Bastiaensen (2169–2192) emphasise in their discussion of the diversity of gender relations in Cameroon, ensuring that women are empowered rather than disempowered by climate adaptation initiatives requires a sensitive, fine-grained approach that takes local ethnic and religious gender specificities seriously.

There is no doubt that I learned a lot about the state of climate adaptation in Africa from this Handbook. Unfortunately, in one short review, it is impossible to do justice to the full range of sectors and topics addressed. The quality of research presented is impressive and most chapters are very clearly written and accessible to non-specialists. However, the presentation leaves the reader with a lot of work to do, and the Handbook would have greatly benefitted from more active editing and stronger signposting. It is puzzling that the Preface is just two pages long and that there is no attempt to synthesise key themes, findings, challenges and successes in a more substantial introduction and/or introductions to each of the three sections. I also found the ordering of the chapters rather random. Chapters on similar themes are scattered both within and, in some cases, across the three sections, rather than grouped together in thematic subsections. This meant that I had to trawl through the very long list of contents to find related chapters and there is a risk that readers will miss hidden gems! In Part One, for example, it would have been quite feasible to have had sub-sections on climate adaptation and livestock farming, on the potential of roots and other indigenous vegetable crops, on cereals and cash crops, and on fishing and aquaculture. Additionally, some of the more general and overview articles could have been used to frame each section and contextualise micro-level case studies. For example, Eleblu et al.'s overview of CSA strategies mentioned above and Chiawo and Otiende's chapter on Climate Induced Food Crisis: Integrating Policy and Adaptation (1789–1810) would have worked well as the first two chapters of Part One, rather than being buried amongst different sections. Nonetheless, *African Handbook of Climate Change Adaptation* is an important and very rich resource that provides a solid reference platform regarding the challenges and potential for climate adaptation in Africa.

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