

Background note for a book project on
“Transformative Infrastructure for sustainability transition in Africa”

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in collaboration with

Stellenbosch Institute for Advanced Study (STIAS)

1. Background

It has been more than 25 years since the terms ‘sustainable development’ and ‘sustainability’ ‘rose to the prominence in international development discourse. The relative vagueness of the concept coupled with its increasing importance in national and international policies led to major institutional competition for influence over our future by capturing its interpretation from specific institutional interest and perspective. This led to proliferation of definitions and interpretations that put emphasis on one or the other aspect of sustainability and sustainable development (Mebratu, 1998). Over the subsequent decades, numerous processes were initiated from global to local levels focussing on different aspects of sustainability and sustainable development. As a result of these initiatives and processes, our knowledge and understanding about the natural environment and its interaction with our socio-economic systems has significantly expanded. Moreover, numerous communities and businesses have been able to develop thousands of innovative and creative solutions that help to minimize some of the adverse impacts at the local level.

Despite all the progress made so far, we have not been able to go beyond incremental gains which have limited capacity to contain and/or reverse the unsustainable momentum that has been built up over decades. This is manifested through the deepening socio-economic and social-ecological crisis expressed in the form of growing environmental degradation, persistent economic stagnation, increasing unemployment and growing disparities between and within countries. 2015 was a year during which a wider global consensus was achieved across science, politics and morality on the need for transformational change¹. As noted by Swilling et al (2012), the evolution of new modes of existences instigated by innovations that partially or provisionally resolved the crisis and destroyed the basis for pre-existing modes of existence, technologies and hierarchies of power are key prerequisites for such transformation. While significant progress has been made over the last couple of decades in terms of promoting incremental improvements, much work still remains to be done at various levels in terms of realizing the transformational change that is urgently needed.

As much as there is broad recognition and consensus on the need to have an alternative development path, there is a growing sense of frustration and helplessness on the lack of progress. Thomas Kuhn (1962) noted that, ‘the sense of malfunction in both political and scientific development that can lead to crisis is prerequisite to revolutions...and the significance of crises is the indication they provide that an occasion for retooling has arrived’. Looking at all the basic socio-economic and socio-ecological indicators both at the global and regional level, one can conclude that we are living in such a moment of crisis which requires fundamental retooling of development. This is particularly of significant importance for Africa as it has a major leapfrogging opportunity towards an inclusive, low carbon, and resource efficient economies. This Handbook looks at the key elements of retooling that need to be considered by African countries with a focus on key socio-economic infrastructure that will lead to a transformative transition towards an inclusive, low carbon, and resource efficient economies in Africa. The development of each chapters and the compilation of the Handbook shall be facilitated through the Fellowship support provided by Stellenbosch Institute for Advanced Study (STIAS) as part of its long-term research portfolio.

¹ The adoption of Agenda 2030 on Sustainable Development Goals (SDGs) and the Paris Declaration on Climate Change together with the Encyclical issued by Pope Francis on Climate change represents this development.

2. Proposed structure

The Handbook is proposed to have the following chapters based on specific themes which are key for transformational transition in the region.

- **Introduction:** provides a broad overview of the overall purpose of the Handbook and the specific focus of the individual chapters. Authors: **Mark Swilling** & Desta Mebratu, CST-Stellenbosch University.
- **Chapter one: Africa's Leapfrogging Opportunity to Sustainability:** this section shall provide the regional socio-economic and socio-ecological context for Africa's transition to an inclusive, low carbon and resource efficient society and highlights the major leapfrogging opportunities it has. Authors: **Desta Mebratu** & Mark Swilling, CST-Stellenbosch
- **Chapter two: Building Resilience of Africa's Socio-ecological Foundation:** presents the critical importance of building resilience of Africa's Socio-ecological systems as a foundation for its sustainability transition and highlights the possible resilience paths that African countries could consider. Authors: **Resilience Team**, CST-Stellenbosch University
- **Chapter three: Life Cycle Management for Sustainable Infrastructure Development:** this section reviews the significant opportunities that African countries have in developing a sustainable infrastructure and provides a life cycle management tool for managing the planning and development of their infrastructure. Author: **Getachew Assefa**, University of Calgari, Toolseeram Ramjeawon, Faculty of Engineering, University of Mauritius
- **Chapter four: Sustainable energy systems for Africa:** reviews the existing opportunities and practical modality of developing a sustainable energy system in African countries with a particular focus on distributed energy systems which address energy poverty and promote economic value addition and job creation at the local level. Authors: **Yacob Mulugeta**, University College of London and Lawrence Agbemabiese, University of Delaware
- **Chapter five: Eco-industrial development for Africa's Industrialization:** Industrialization of African countries economy is essential for the development of the region, but this has to be done on a more sustainable way. This chapter reviews and outlines the key steps for Eco-industrial development for Africa. **Patrick Mwesigye**, UNEP & Smail Al Hilali, UNIDO (tbc)
- **Chapter six: Sustainable urban development in Africa:** looks at the various means and ways of managing the push and pull factor of urbanization in Africa in such a way that it could lead to a more sustainable urbanization. **Gulelat Kebede**, The New School, New York & Urban Metabolism Team, CST-Stellenbosch University
- **Chapter seven: Planning for Distributed Renewable Economy:** this section presents the key elements and considerations for planning and implementing distributed renewable economy at the local level as a way of building sustainability transition through a bottom-up process. **Desta Mebratu** et al, CST-Stellenbosch University
- **Chapter eight: Governance for sustainability transition in Africa:** covers the key elements of retooling governance for sustainability transition in the African context with a particular focus on the shift in development governance that need to be made by African countries in order to make it a just transition. Author: **Mark Swilling**, CST-Stellenbosch University.
- **Chapter nine: Monitoring sustainability transition in Africa:** this section provides the key set of indicators through which African countries could monitor their progress towards an inclusive, low carbon and resource efficient society with a particular focus on the fundamental factors of the transition. Author: **Desta Mebratu** et al, CST-Stellenbosch University.
- **Chapter ten: Synthesis:** presents the golden threads of the different chapters in a form of a synthesis with the purpose of underlining the importance of utilizing the proposed tools in an integrated way in order to have the maximum result and impact. **Desta Mebratu** & Mark Swilling, CST-Stellenbosch University.

3. Proposed outline of chapters

Each chapter covers the specific priorities and challenges that need to be addressed by African policy and decision makers and strategic planners with a purpose of maximizing the region's leapfrogging opportunities to an inclusive, low carbon and resource efficient society. With an objective of ensuring logical coherence and flow across the handbook, the following outline is proposed to be followed by all chapters. This is a preliminary outline that will continue to evolve as needed, without losing its main focus and depending on the outcome of the research and interaction to be carried out during the course of developing the individual chapters.

- i. Introduction
- ii. Chapter one: The current state and trends in XXXXX (the respective sectors) in Africa
- iii. Chapter two: The challenges and opportunities of the sector in light of the transition to an Inclusive, Low Carbon and Resource Efficient Society
- iv. Chapter three: Existing/emerging knowledge, techniques and best practices in Sustainable XXXXXXXX development
- v. Chapter four: Key policy and strategic issues for African countries
- vi. Chapter five: Supporting tools for strategic decision making and planning
- vii. Conclusions

4. Key procedures

The following are some of the key procedures to be followed during the development of the chapters indicated in the proposed outline.

- i. Author's whose names are highlighted in bold in the preceding outline section shall take the lead responsibility in developing the respective individual chapters and communicating with the Editors of the Handbook.
- ii. Other contributing authors could be added by the lead authors as they find it necessary and after consulting with the Handbook Editors.
- iii. Based on specific needs identified, new chapters of the Handbook that are found necessary can be added by the Editors after consulting with Lead authors of other chapters.
- iv. Each Lead Author shall submit an expanded outline of the respective chapter together with a timeline for the delivery of the different levels of draft using the overall timeline of the Handbook given in section four as a basis.
- v. All contributing authors shall be expected to strictly adhere to internationally accepted principles and ethics of academic publication in preparing their chapters.
- vi. All contributing authors are encouraged to make every effort to interact with the Editors and other contributing authors using electronic media and/or in person side meetings whenever more than one of them are attending a common meeting or event.
- vii. Besides the possible interaction that could happen during an overlapping STIAS Fellowship, effort shall be made by the Editors to organize a minimum of one joint review meeting of contributing authors, preferably towards the later stage of drafting.
- viii. Editors shall circulate draft chapters submitted by lead authors to all contributing authors and consolidate the feedback received to be shared with the authors of the respective chapters.
- ix. Prominent intellectuals with extensive knowledge on development issues in Africa shall be invited to write a Preface/Forward to the Handbook once it is in its final stage.

4. Responsibility and time line

The following is proposed to be a common timeline, with the respective responsibilities, for the development of the individual chapters and finalization of the Handbook.

	Required action	Responsible person	Timeline
1.	Submission of an expanded chapter outline	Chapter lead authors	25 April 2018
2.	Feedback on expanded outline and chapter timeline	Editors	30 May 2018
3.	First draft of chapters	Chapter authors	31 September 2018
4.	Feedback on draft chapters	Editors & other contributing authors	31 November 2018
5.	Submission of revised drafts	Chapter authors	28 February 2019
6.	Authors' review and writing workshop in Stellenbosch	Chapter authors	25-30 March 2019
7.	Submission of final chapters	Chapter Lead Authors	30 June 2019
8.	Editing and formatting	Editors & publisher	November 2019

5. Support from STIAS

The Handbook project is developed in the context of a Regional Program on Distributed Renewable Economy (DRE) for Africa's Transition which is has been developed by the Centre for Complex Systems in Transition (<http://www0.sun.ac.za/cst/>) at Stellenbosch University. The Stellenbosch Institute for Advanced Study (www.stias.org), as the institute where the initial conceptualization of Distributed Renewable Economy was carried out, is supporting the development of the regional programme through support to this Handbook project. As part of this support, the final part of the development of the chapters for this Handbook is planned to be undertaken during Fellowship at Stellenbosch Institute for Advanced Study (STIAS). It is envisaged that, STIAS will provide up to 15 Fellow months for the preparation of the Handbook and support the organization of a group meetings for the lead authors. Due recognition shall be given to STIAS for the support provided to the Handbook project.

6. Profile of Editors

Desta Mebratu

Desta Mebratu is an Ethiopian national who is currently an Extraordinary Professor at Centre for Complex Systems in Transition, Stellenbosch University. He has more than 28 years of experience working for industries, government agencies, universities and international organizations. A chemical engineer by background, he has a PhD of engineering in Industrial Environmental Economics from Lund University, Sweden. He worked for different United Nations Agencies including the United Nations Environment Programme where he worked for more than thirteen years and served, among others, as Head of the global Business and Industry programme (2008-11) and Deputy Regional Director for Africa (2011-2016). He has published more than 40 articles in peer-reviewed journals, Handbooks, and conference reports, including co-Editing a Handbook on Sustainable Development Policy and Administration published by Taylors and Francis in 2008. He is Fellow of the African Academy of Sciences (AAS), Stellenbosch Institute for Advanced Study (STIAS) in South Africa and Pufendorf Institute for Advanced Studies in Sweden.

Mark Swilling

Mark Swilling is a Distinguished Professor of Sustainable Development in the School of Public Leadership, Stellenbosch University and the Academic Director of the Sustainability Institute, Co-Director of the Stellenbosch Centre for Complex Systems in Transition. He is also member of International Resource Panel facilitated by the United Nations Environment Programme, Fellow of the World Academy of Art and Science, member of the We-Africa Action Research Network and a member of the Board of the Development Bank of Southern Africa. He has published widely on topics related to sustainability and sustainable development of which the most recent and prominent one is the Handbook entitled 'Just Transitions: Explorations of Sustainability in an Unfair World' published by United Nations Press (Tokyo) in 2012. As member of the International Resource Panel, he co-led the production of the report on City-Level Decoupling which showed the importance of looking at the dynamic link between infrastructure and resource flows in understanding urban metabolism and promoting resource efficiency in cities.

7. Profile of Contributing Authors

Kristi Maciejewski

Kristi Maciejewski is a researcher at the Centre for Complex Systems in Transition (CST), in the School of Public Leadership at Stellenbosch University. She has a M.Sc. degree in Conservation Ecology from Stellenbosch University and a Ph.D in Zoology from the Nelson Mandela Metropolitan University. Her research interests include social-ecological systems, complex adaptive systems such as protected areas; multi-scale network analysis; and resilience, the amount of disturbance a system can absorb and remain within a domain of attraction. She particularly focuses on social-ecological regime shifts, how the change in the structure and function of a system impacts on ecosystem services and human wellbeing. Her research has been published in peer-review journals such as Ecological Applications, Ecology and Society, Ecosphere, Landscape Ecology, Biological Conservation and Ecosystem Services. She is a member of the Resilience Alliance and has strong collaborations with researchers from the Stockholm Resilience Centre at the Stockholm University in Sweden.

Scott Drimie

Scott Drimie is a researcher and facilitator working on food systems in southern Africa. He obtained his PhD from Cambridge University in the UK in 2000. Taking a largely political economy lens, he has focused primarily on food policy and the facilitation of new institutional arrangements for food system governance. Scott's academic work pivots on his role as Associate Professor (Extraordinary) in the Department of Global Health, Faculty of Health and Medicine Sciences and at the Centre for Complex Systems in Transition in the School of Public Leadership, Faculty of Economic and Management Sciences, both at Stellenbosch University. This work includes the development and teaching of Masters-level modules, PhD and Masters supervision and examination, as well as research. He has published over sixty peer-reviewed papers including journal articles and book chapters, and co-edited a recent book on informal settlements upgrading. Scott has directed the Southern Africa Food Lab (www.southernfricafoodlab.org) since October 2013, which is a multi-stakeholder initiative that brings together stakeholders in the regional food system to identify and pilot innovative means to achieve long-term, sustainable food security. The Food Lab is housed at the Faculty of Agri-Sciences at Stellenbosch University.

Getachew Assefa

Getachew Assefa is an Associate Professor of Environmental Design at the University of Calgary with a focus on sustainable development and design. He is the former Athena Chair in Life Cycle Assessment at the Faculty of Environmental Design. He has a B.Sc. degree in Chemical Engineering from Addis Ababa University in Ethiopia, MSc in Environmental Engineering and Sustainable Infrastructure and a Ph.D. in Industrial Ecology from Royal Institute of Technology in Stockholm. His research interest includes life cycle sustainability assessment, life cycle assessment, built environment assessment, environmental product declaration, industrial ecology, and sustainable consumption. He particularly focuses on the design and development of technical systems including energy systems, biofuels and bioenergy, waste management system, and buildings. He teaches courses in life cycle assessment, industrial ecology and sustainable development. He is the winner of University of Calgary's Sustainability Award for 2017 for Campus as Learning Lab Category, and Outstanding Teaching Performance Award from Schulich School of Engineering, University of Calgary in 2015 and 2016. His research has been published in peer-reviewed journals in such as the Journal of Cleaner Production, International Journal of Life Cycle Assessment, Journal of Building and Environment, and Journal of Sustainable Cities and Society. He has active teaching and research collaboration with three universities in Ethiopia.

Toolseeram Ramjeawon

Toolseeram Ramjeawon holds a Diplome D'Ingenieur from the Ecole Polytechnique de Montpellier (France) and a PhD in Environmental Engineering from the University of Mauritius. Professor Ramjeawon has more than 28 years of experience working for academic institutions, government agencies, industries and international organizations and is currently a Professor of Environmental Engineering in the Department of Civil Engineering of the Faculty of Engineering, University of Mauritius. He held a number of senior management positions such as Head of Department of Civil Engineering, Dean of Faculty of Engineering and Acting Vice Chancellor of the University of Mauritius. He also acted as Technical Adviser on Environmental Management to the Ministry of Environment of the Government of Mauritius and served as International and Regional consultant to a number of international organizations including United Nations Agencies and African Development Bank. He has more than 25 publications in refereed international journals with impact factors and more than 35 publications in refereed International Conference Proceedings. Professor Ramjeawon was a Fulbright visiting research scholar Virginia Tech, USA.

Yacob Mulugeta

Yacob Mulugetta is a Professor of Energy and Development Policy at the University College London; and held an academic post at the Centre for Environmental Strategy, University of Surrey, UK. He is a founding member of the African Climate Policy Centre (ACPC) at the UN Economic Commission for Africa (UNECA) based in Addis Ababa, Ethiopia where he worked as Senior Climate & Energy Specialist (2010-2013). He has 25 years of research, teaching and advisory experience specialising on the links between energy infrastructure provision and human welfare. His research is focused on three interconnected areas: energy systems and development; energy systems and climate change; and political economy of low carbon development. He served as a Coordinating Lead Author of the Energy Systems chapter of the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (Working Group III on Mitigation), a member of the core writing team for the IPCC synthesis report, Steering Committee member of UNEP's Emissions Gap Reports (2015-2017), and lead author in the upcoming IPCC Special Report on Global Warming of 1.5°C. More recently, he served in the drafting team of the African Renewable Energy Initiative (AREI), and continues to provide technical support for the initiative. In 2017, Yacob Mulugetta was elected Fellow of the African Academy of Sciences (AAS).

Lawrence Agbemabiese

Lawrence Agbemabiese holds a PhD in Urban Affairs and Public Policy from the University of Delaware (UD). Dr. Agbemabiese was a Program Officer from 2000 – 2012 at the Energy and Climate Branch, United Nations Environment Programme (UNEP) in Paris, France. In that capacity, he led several national and global initiatives on clean energy and low-carbon development including collaborative research and educational interventions. In 2012, he went back to University of Delaware. As an Associate Research Professor, he teaches courses and advises students on sustainable energy policy and planning, policy integration at the water-energy nexus, and international perspectives on energy and environment. Since transitioning to academics, Dr. Agbemabiese has remained engaged in sustainability-focused endeavors at global and national levels. In 2014, he was invited to join a 7-member team of practitioners and scholars tasked with designing the Africa Renewable Energy Initiative (AREI). AREI was subsequently approved and officially launched at the 21st Conference of Parties (COP21) in December 2015, Paris. Dr. Agbemabiese engages in processes of socio-technical inquiry, integrating and applying ideas and tools from multiple knowledge domains, including: participatory scenario building from Complex Adaptive Systems perspectives; multi-criteria analyses of alternative transition paths; and the diffusion of artificial intelligence applications in urban-regional policy, planning and management.

Patrick Mwesigye

Patrick Mwesigye is an industrial chemist/chemical engineer and an environmental scientist with over 25 years professional experience in academic institutions, private sector, government agencies and international organisations. He holds a PhD in chemical Engineering from University of Sydney, Australia, M.Sc in Chemical Engineering from Obafemi Awolowo University (Nigeria) and B.Sc. Industrial Chemistry (from Makerere University (Uganda)). His post-graduate training in environmental science and technology from IHE, Delft in Netherlands, gives him the versatility to handle various industrial processes and environmental management. Since 2009, he has been working as the Regional Coordinator of Resource Efficiency Subprogram for Africa at the United Nations Environment Program (UNEP). During this period, he has initiated a number of programmes and projects that promote efficient use of resources to improve industrial productivity and resources management in different African countries. This included preparation of toolkits, delivering capacity building training and providing technical backup support. Before joining UN Environment, he was the Executive Director of Uganda Cleaner Production Centre and Senior Lecturer of Industrial Chemistry at Makerere University in Uganda.

Smail Alhilali

Smail Alhilali has background in the field of environment and technology holding a master degree on mechanical engineering (Morocco, 1993) and a master degree on nuclear safety engineering (France, 1994). He has been working for the United Nations Industrial Development Organization (UNIDO) based in Vienna, Austria and is currently an industrial development officer within the Department of Environment of United Nations Industrial Development Organization (UNIDO). Since 2007, he has been responsible of the implementation of resource efficient and cleaner production related projects as well as eco-industrial parks development in developing and emerging countries. This included preparation of technical guidelines and training manuals and providing capacity building training for developing countries. Before joining UNIDO, he served in different positions within the National Centre for Energy, Science and Technology in Morocco from 1994-2003, and served as the Director of Morocco National Cleaner Production Centre from 2003-2007.

Gulelat Kebede

Economist by training, Dr Gulelat Kebede has over 25 years of professional experience at local, national and global levels. His most recent experience includes coordinating UN-Habitat's global activities in urban economy and municipal finance, and prior to that in training and capacity building. During his long career with the UN, he authored or contributed to many publications and capacity development tools in the areas of urban economy, governance, finance, leadership, sustainable cities, climate change and green economy. His work in Africa includes coordinating and supporting urban projects on local economic development, environmental planning and management, housing and municipal finance and local leadership. Since 2016 he has been contributing to United Nations Economic Commission for Africa's (UNECA's) work on integrating urbanization into national development planning. He was the lead consultant for the Economic Report on Africa 2017, a flagship report on urbanization and industrialization. He was visiting scholar to Darmstadt Technical University (Germany), University of Rome, University of Vietnam, Ho Chi Minh min, and University of Auckland and he is currently part time faculty at The New School, New York, and guest lecturer at School of Community & Regional Planning and Centre for Human Settlements, University of British Columbia.

Paul Currie

Growing up between New York and Johannesburg, Paul has a significant obsession with cities. Paul delved into ecology and evolutionary biology at Stony Brook University (New York) before returning to South Africa to do his MPhil in Sustainable Development at Stellenbosch University. He has a fascination with the emergent interactions between people and their built environments, and how these shape future development pathways. Paul's work seeks to operationalise the concept of urban metabolism in Southern contexts through a host of tools including resource flow accounting, system dynamics modelling, social network analysis, narrative analysis and data visualisation. His academic disciplinary pairing alongside his fascination with the dynamism of urban systems has led Paul to co-found uMAMA (urban Modelling and Metabolism Assessment Research Team) to delve into resource flows, resource efficiency and resource equity in African cities.