

Full Length Research Paper

Towards a theoretical model linking university education to climate change interventions in the African context

David Ssekamatte

Department of Management, Uganda Management Institute, Kampala, Uganda.

Received 23 January, 2020; Accepted 13 March, 2020

Climate change education continues to gain popularity among educationalists especially at university level. The Paris Agreement on climate change 2015 advocated for support towards this approach especially for universities in the developing nations. This paper aims to present a model linking university education to climate change interventions in the African context. This model has been developed based on findings from a larger study on opportunities and challenges for climate change education in the African context conducted in Uganda and Tanzania. The study adopted a multiple case study design with Makerere University in Uganda and University of Dar es-Salaam in Tanzania, collecting data from 58 participants. Data were collected through semi-structured in-depth interviews, focus group discussions and document review. Thematic analysis based on Braun and Clarke (2006) was used to analyze and interpret the data. Based on study findings, the model was developed by the research team. The model identifies the key roles (functions) of a typical African university and the potential climate change education interventions it can initiate. It also explains the various contextual factors dubbed key drivers for climate change education within the African context. Based on this model, it is expected that universities in similar contexts, that have not started climate change education programmes, could learn a big deal on potential interventions to implement and explore the key drivers for their own benefit. Those universities that are already implementing climate change education interventions could also find the model useful in helping them exploit the opportunities and key drivers to enhance their existing interventions.

Key words: Climate change education, African context, university education, key drivers.

INTRODUCTION

The problem of climate change has generated a lot of literature by researchers, writers and several international organisations because of its importance to the wellbeing

of humanity and nature. Experts that comprise the Intergovernmental Panel on Climate Change (IPCC) have created awareness globally about this issue through their

E-mail: dmssekamatte@gmail.com.

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

scientific reports on climate change. Scholars such as Farmer and Cook (2013), Filho (2010), Stern (2008) and others have also written about this global problem. Stern (2008 p. 3) reported that, “an overwhelming body of scientific evidence now clearly indicates that climate change is a serious and urgent issue. The earth’s climate is rapidly changing, mainly as a result of increases in Green House Gases (GHG) caused by human activities.” This illustrates the graveness of the problem of climate change and the urgent need to take action.

Fumiyo Kagawa and David Selby argue that education has a crucial role to play in raising people’s consciousness about the problem:

At such a moment of enormous human challenge, formal, non-formal, and informal education have a potentially crucial role to play. In both school age and adult learning communities, learners of all ages can be invited to take up the challenge of understanding and re-thinking the world, of shattering assumptions, shibboleths and the taken for granted, of deliberating where to go at this critical fork in the road (Kagawa and Selby, 2010, p. 5).

Kagawa and Selby (2010) underscore the important role formal and informal education at all levels can play to address issues of climate change. To them, the education system can be a very useful tool for promoting mitigation and adaptation to climate change. Others such as Boyde and Hume (2015, p. 78) recognise the fact that “education at all levels and particularly at higher level should play a key role in addressing existing and emerging ecological and socio-economic challenges including climate change.” Universities are key actors in this struggle. According to Cordero et al. (2008, p. 870) universities could engage in “educating students about climate change” by linking it to various socio-economic issues such as food security, accessibility to safe water and sustainable use of renewable and non-renewable energy in their livelihoods. Though this has happened in developed countries like Australia, Finland, Germany and Canada, very few studies have shown very few universities in Africa and Latin America that have climate change education programmes implemented at their campuses (Filho, 2010). There is limited research on climate change education in the African context (Lemons, 2011); this is a serious gap in the literature. Climate change education, therefore, continues to gain popularity among educationalists especially at university level. The Paris Agreement on climate change 2015 advocated for support towards this approach especially for universities in the developing nations.

This paper presents a model that emerged from a bigger study on the opportunities and challenges that universities face in addressing climate change issues in the African context. The model was developed based on thematic analysis of data collected from a comparative multiple case study of Makerere University in Uganda

and University of Dar-es-Salaam in Tanzania. The model illustrates the link between university education and climate change interventions in the African context. The paper briefly explains the methodology followed in undertaking the study that resulted into the theoretical model, illustrates the model and then explains each component of the model in detail. It also provides implications for practitioners of climate change education in universities.

METHODOLOGY

This paper is part of a larger study undertaken for three years in Uganda and Tanzania. The study examined the opportunities and challenges of climate change education at universities in the African context. Based on the social constructivist paradigm, the researchers adopted a qualitative approach and a multiple case study design to guide data collection, analysis and interpretation. According to Yin (2012), a multiple case study design enhances literal replication which may help to yield theoretical constructions that can be replicated across cases of the same contexts. The researchers using this design therefore considered Makerere University in Uganda and University of Dar es salaam in Tanzania as cases. These universities were considered because they are the oldest in the region and have been champions in conducting programmes on climate change in the region. The selection of the case universities was therefore purposive.

Data were collected using document review, semi-structured in-depth interviews and focus group discussions. Document review provided contextual information about the climate change situation in both Uganda and Tanzania and the case universities. The semi-structured in-depth interviews were used to collect data from 18 administrators of climate change related units, lecturers and researchers on climate change related disciplines from both universities. Five focus groups were conducted among 40 undergraduate and postgraduate students offering various programmes related to climate change across case universities. For both interviews and focus groups, a tape recorder was used during data collection which enabled the researchers to transcribe the data for analysis.

All data collected were analysed based on Braun and Clarke (2006)’s thematic analysis model. According to the authors thematic analysis is more flexible and compatible with many other analytical methods to generate findings from the data based on themes. The analysis began with a thorough reading of the transcripts to familiarize with the data. The researchers then generated initial codes with the help of MAXQDA software. The codes were then categorized to help in searching for themes that were later reviewed and a final list of themes that answer the research questions was agreed on among the researchers. The final themes were then written up into a report. The quality of the research findings was ensured based on Patton (2015)’s research quality criteria. According to the author the quality and credibility of research findings rests on: the philosophical belief in the value of the inquiry; the credibility of the inquirer; the systematic in-depth field work that yields high quality data and; systematic and conscientious analysis of data.

The theoretical model

A lot of literature can be found in scientific sources linking education to sustainable development in various parts of the globe. Several writers like Filho and Pace (2016);

Kagawa and Selby (2010); Rohweder and Virtanen (2009) and many others have written a lot on this link. All of them agree to the fact that education can play a key role in enhancing sustainable development. UNESCO and a few other agencies have advocated for education for sustainable development for over a decade now. A review of the literature on education for sustainable development revealed that Rohweder and Virtanen (2009) developed a model of learning for sustainable development in 2009. The model provides the critical factors that are key in integrating sustainability aspects into learning programmes at universities. The factors were categorized into three: contextual factors (integrative approach, spatiality and time perspective); the mental aspects (value clarification, systemic thinking, critical reflection and motivation building); and activity related aspects (partnerships, cooperation, communication and participations). The authors argue that these are key for educators in their quest for developing competences for sustainability. Climate change education is part of sustainability education and focuses on creating a platform where education institutions can engage in academic, research and community engagement programmes focused on supporting mitigation and adaptation to climate change. This implies that the model applies to climate change education and can be very handy in supporting universities to integrate climate change issues in their programmes.

However, based on the key findings from this study, the researchers found the model of learning for sustainable development inadequate to a certain extent in terms of supporting African universities to fully address climate change issues. First, it was developed focusing on pedagogical aspects of sustainability education within the context of developed nations. It did not take into consideration the context of African universities. Secondly, the model focused on learning and training functions of the universities. It ignored the other key functions; research and knowledge generation as well as outreach programmes. Thirdly, the model does not consider the institutional set up of the universities, especially the key institutional factors that drive university programmes given the context.

Therefore, based on these deficiencies and the key findings of the study, the researchers have come up with a theoretical model linking university education to climate change interventions within the African context. The model is presented in Figure 1.

The theoretical model illustrated in Figure 1 provides a graphical link between the university in terms of its major role and the climate change interventions. The role of the university has been dubbed the university in action. The model links the university in action to the potential climate change education interventions, supported by various key rivers contributing to the final outcome- societal improved lives and behavioural change for sustainability.

These parts of the model are explained below;

The university in action

The thematic analysis of data revealed that the university has five key roles they play in addressing climate change issues within the African context. These include: knowledge generation through research; training and capacity building on climate change; innovations and technological solutions to problems arising due to climate change; conducting sensitizations and guidance on climate change issues and; actively being engaged in supporting communities on mitigation and adaptation to climate change.

The above key roles are contextual in nature and may not be applicable to universities in other contexts. Universities especially in sub Saharan Africa are in critical condition given their low research output mainly due to inadequate research funding and infrastructure (Teferra and Albach, 2004). This implies that such universities need to enhance their research output and generate the much-needed knowledge on climate change. Sub Saharan African countries are characterised by low capacity in terms of scientists and academics generally. This is because of the socio-economic and political instabilities as well as poor working conditions that these countries have faced for some time. They also face a problem of brain drain where the few academics and experts migrate to developed nations in such for better employment conditions (Teferra and Albach, 2004). This means that there is a shortage in terms of experts and professionals on climate change which calls for increased training and capacity building initiatives. Universities can play a key role in this aspect.

Findings revealed that African countries are yet to advance in high level innovations and technology. Given the low capacities and expertise, it's unlikely that high level innovations and technology will be advanced. Therefore, participants argued that African universities can invest efforts in advancing innovations and technological solutions for climate change mitigation and adaptation. Across cases, findings showed that societies especially in sub-Saharan African countries are characterised by low levels of literacy, limited access to internet, undeveloped communication infrastructure and many other factors. The study participants, therefore, argued that universities can conduct sensitizations for communities and provide guidance to policy makers and other actors on climate change mitigation and adaptation. It also came out clearly that the universities can also support communities through local initiatives for climate change mitigation and adaptation. By supporting communities, the university will get an opportunity to interact with the community, pilot some of the innovations and technologies from their research and developing new ideas for mitigation and adaptation to climate change.

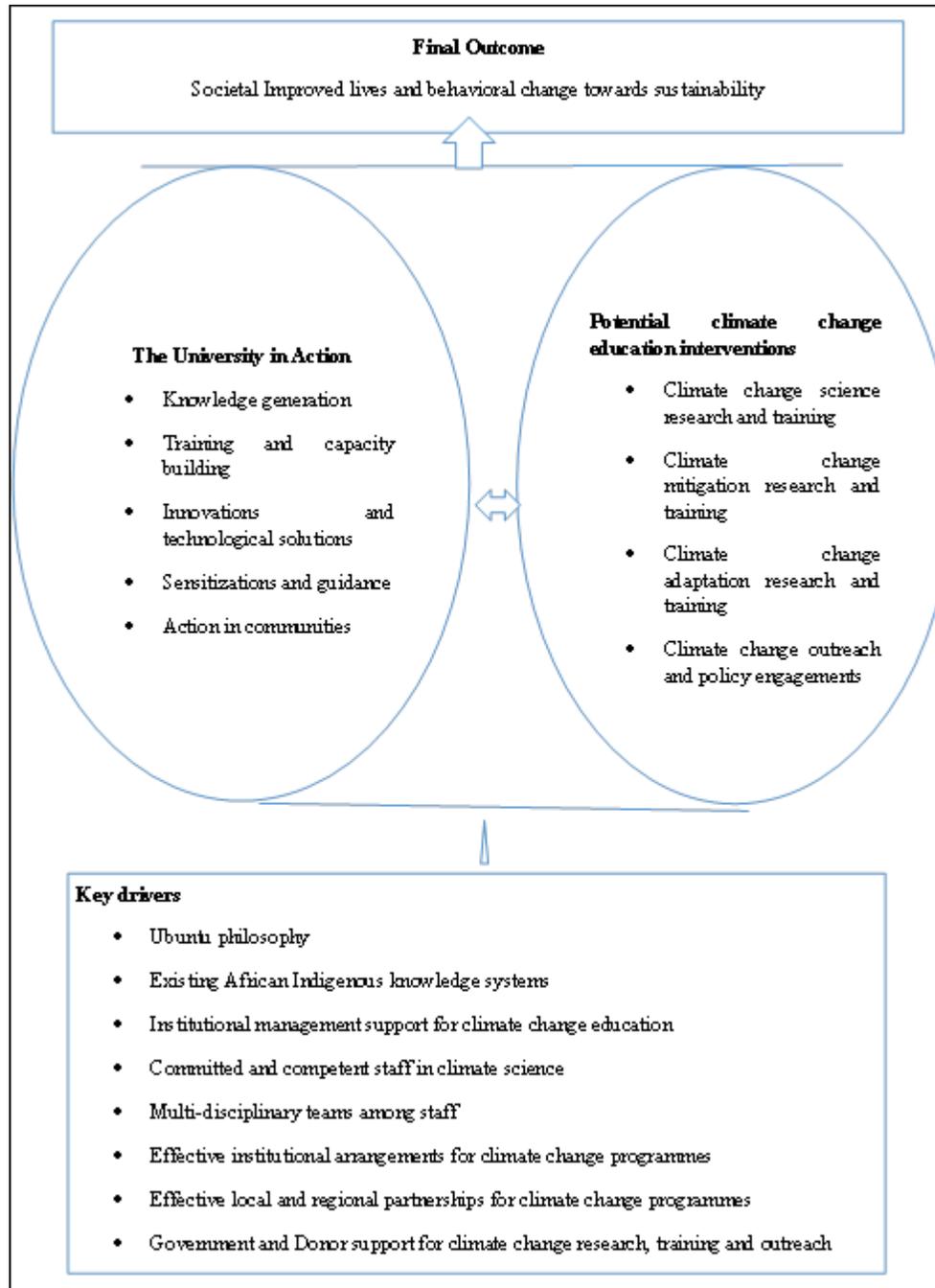


Figure 1. Theoretical Model: Linking University Education to Climate Change Interventions in the African Context.

Potential climate change education interventions

Analysis of data revealed that the case universities implement several training, research and community engagement programmes. The training programmes were; short courses, seminars, undergraduate and postgraduate programmes on climate change. The

universities conduct various research programmes mainly on climate change adaptation. Findings showed that implementing units at these universities conducted sensitization events, local adaptation community initiatives, policy engagement events, climate change festivals, and identification as well as empowerment of climate change champions in various communities across

Uganda and Tanzania. Based on these findings, the researchers came up with four potential climate change education interventions that African universities can engage in. They include: climate change science research and training; climate change mitigation research and training; climate change adaptation research and training and; climate change outreach and policy engagements.

Climate change science research and training relates to research and training programmes that are focused on understanding the science behind the climate change phenomenon. Such research would result in generation of scientific knowledge that is needed to create awareness about the existence of the problem, its effects and impacts on various sectors and creation of urgency to address the phenomenon. In sub Saharan African countries, experts and academics in climate change science are scarce. This implies that universities can ably develop training courses and programmes on climate change science like Meteorology etc. They can also come up with research projects focusing on generating climate change scientific knowledge.

Climate change affects almost all aspects of life including; health, livelihoods, air quality, economic and social infrastructure, water resources and many other sectors. Sub Saharan African countries have been characterised by low levels of science and technology to support mitigation of climate change. Therefore, universities can be handy in supporting governments and communities on climate change mitigation through training and research. Climate change mitigation research and training is a potential intervention that relates to specialized training courses and programmes focusing on dealing with the root causes of climate change, that is reducing the sources of greenhouse gases in the atmosphere. African universities could explore possibilities of developing postgraduate and short training programmes focused on mitigation. They could also initiate research programmes focusing on mitigation at various levels, that is national, regional and community levels.

Often the climate change phenomenon comes with various effects that result from failure to effectively mitigate it. African countries especially in the sub Saharan region do not have the capacity to mitigate due to low level of science and technology, financial resources and climate expertise. This makes these countries more vulnerable to the effects which call for adaptation measures. In this situation African universities can intervene by conducting adaptation research and training in their respective countries. Adaptation research would enhance the ability of societies around the university deal with the effects of climate change. Such research may focus on agricultural sector, infrastructural development, water resources management, livelihoods and other socio-economic aspects of communities. Programmes can be developed for short- and long-term training on adaptation to develop a pool of adaptation experts and human resource for their respective

countries.

Lastly, universities can actively participate in climate change outreach and policy engagements in their respective countries. Sensitization and outreach initiatives could be developed to disseminate climate change information and engage communities on mitigation and adaptation measures at their local level. Through outreaches, the university could explore piloting some of their innovations and technologies on climate change arising from their research projects. Universities especially in the sub Saharan Africa can support policy formulation and review on climate change in their respective countries. This is because most of these countries have weak political and economic systems. Based on research and the existing expertise within the universities, such countries could benefit from technical support on climate policy formulation, evaluation and guidance provided to the respective governments. Such policy engagements can be very useful in enhancing mitigation and adaptation efforts by governments in the respective countries.

Key drivers

Thematic analysis of data from the two case universities revealed several internal and external drivers for climate change education at African universities. Most of these drivers are quite unique to African universities and therefore contextual in nature. For this model, eight key drivers were singled out. They are: Ubuntu philosophy, existing African indigenous knowledge systems; institutional management support; committed and competent staff in climate science; multi-disciplinary teams among staff; effective institutional arrangements; effective local and regional partnerships and; government and donor support.

One of the African social and cultural systems is Ubuntu philosophy. Mugumbate and Nyanguru (2013, p. 83) described Ubuntu as “an African philosophy that places emphasis on being human through other people”. Across most of the African societies, this ethic is held as a key value in social and political realms. Societies promote values like collectively, solidarity, respect for human dignity and hospitality across all aspects of lives in their communities. For Nussbaum (2003) Ubuntu comprises compassion, reciprocity, maintaining harmony, supporting each other with justice and mutual care. These values are inherent in most of the African social and cultural structures and therefore are key drivers for what individuals, communities and nations do for humanity. African universities can engage actors and communities in climate change education initiatives based on this African ethic. Providing climate change education should be viewed as a way of promoting Ubuntu, social justice and social responsibility and caring for the other (Metz, 2016).

The existing African indigenous knowledge systems

can be key drivers for climate change education interventions at African universities. Indigenous knowledge has been described as “what indigenous people know and do, and what they have known and done for generations, practices that evolved and through trial and error and proved flexible enough to cope with change” (Eyong, 2007, p. 121). The author argues that African indigenous knowledge systems have inherent linkages with social equity and ecological responsibility which significantly contributes to sustainable development. Therefore, integrating such knowledge into climate change education programmes can yield various benefits including: enabling learners to acquire “community attitudes and values” for sustainable development; enhancing “learning about African cultures and local contexts” and; enabling students to “appreciate and respect the knowledge of elders and other community members” (Kaya and Seleti, 2013, p. 34).

Climate change education can also be driven by effective institutional management support provided by the university. Both strategic and administrative support to climate change education programmes is key in enhancing mitigation and adaptation. Strategically, the implementers will need support in terms of structural approvals, inclusion of climate change education components in strategic plans and research agenda for the university as well as structural provisions at senior management levels within the university. Administratively, climate change education requires quick approval processes for new programmes and courses, prudent financial management systems, effective monitoring and evaluation systems, robust management information systems and effective human resource related processes. Teferra and Albach (2004) reported that many African universities especially in sub Saharan Africa “suffer from poor, inefficient and highly bureaucratic management systems” (p. 31). Improved effective and efficient institutional management systems in African universities can significantly drive climate change education to higher heights.

Committed and competent staff in climate sciences is another key driver for climate change education at African universities. African countries especially those in the sub Saharan region, suffer from limited number of experts in various disciplines especially science related ones. The region has continued to suffer from the challenge of brain drain where scholars and academics leave university jobs and go to work in other sectors and government agencies for better pay and working conditions. This greatly affects the volume and quality of research and training at universities since replacements for such competent staff doesn't happen in a short time. There is also a challenge of migration of best scholars to developed countries. Many scholars and scientists have migrated to developed nations for better paying opportunities and working conditions which makes the situation for African universities worse (Teferra and Albach, 2004). Climate change education, therefore, can

be promoted effectively when universities have committed and competent staff which calls for interventions to build capacity of existing staff and train and recruit more to support the programmes.

The other key driver for climate change education is having multi-disciplinary teams among staff. Findings revealed that having piecemeal and isolated climate change research hardly creates significant impact at local community levels. Therefore, there is a need to create multi-disciplinary, or interdisciplinary research teams where a variety of skills, knowledge, experiences and resources can be put together to address a set of research questions on climate change in a single project. Rohweder and Virtanen (2009) advocated for adoption of an integrated and interconnected approach to learning for sustainability which calls for multidisciplinary, transdisciplinary and interdisciplinary approaches in delivering such learning. Such approaches enhance linkages among disciplines, sharing of knowledge and collaborative approach to bigger societal challenges like climate change. African universities could explore creation of multidisciplinary research teams and combine expertise and resources on climate change research programmes thereby enhancing quality, credibility of research and ability to mobilize resources on a large scale.

Climate change education requires effective institutional arrangements to enable effective delivery of training, research and community engagement programmes on climate change within the universities. Findings revealed that across the case universities, climate change education programmes had been institutionalized through establishment of climate change centres run by full time administrative staff. These are responsible for providing administrative support and coordination of the academic, research and community engagement programmes on climate change. They also support planning, resource mobilization and providing logistical support to the academic staff who implement climate change education activities. Participants of the study called for ensuring that these existing structures within the universities closely work with the rest of the academic units for proper coordination of programmes. Establishing institutional structures for climate change education can greatly enhance the interventions on climate change at universities in Africa.

The other key driver is effective local and regional partnerships for climate change education programmes. Across the case universities, findings revealed that local and regional partnerships were one of the success factors behind their climate change education interventions. UNESCO (2015, p. 67) argued that to promote climate change education, players need to form or strengthen “partnerships and collaborations”. These could be formed between “education communities, public organizations, NGOs, local communities, entrepreneurs etc” (Virtanen, 2010). Therefore, effective climate change interventions require local and international support which

could be in form of technical, financial, collective learning and other kinds of support for the programmes. Universities could explore partnerships with other universities, international NGOs, the private sector, donor agencies within and outside the respective countries, as well as public agencies to boost their climate change education interventions. This will promote sharing of technical expertise and experiences, financial resources, diverse perspectives, good practices, innovation and new technologies as well as collective advocacy for policy and action on climate change issues.

Lastly, universities in Africa can effectively address issues of climate change with support from government and donors. Findings reveal that most of these universities suffer from lack of funding especially from their home governments. Across the case universities, participants decried lack of financial support or limited support from governments to universities especially for research and innovation. This significantly affects research output and innovation from these universities. Teferra and Albach (2004) explained that “most countries in Africa have practically no funds allocated to research in university budgets” and “many of the research activities that are undertaken on the continent are largely funded and to a certain extent, managed and directed by external agencies” (p.39). Participants reported that most of the research at their institutions was donor driven and therefore had no input into the research agenda. They reported that donors mainly from the north pay almost all costs related to the research. This implies that universities in Africa need to seriously engage their government to fund research, training and outreach programmes on climate change in addition to the funding from donors. This will enhance research output and their voice in determining the research agenda and training based on local needs. Locally generated resources to universities especially from governments can go a long way in driving climate change education and consequently contribute to mitigation and adaptation on the continent.

Model flow

As shown above, based on the traditional roles of an African University (university in action) the university can implement various climate change education interventions (potential climate change education interventions). For this to happen, there is a need to take into account various factors, which are both internal and external contextual factors within the African context (key drivers). African universities will then be able to contribute to the realisation of societal improved lives and behavioural change towards sustainability (final outcome).

Implications for practitioners

Universities in Africa tend to operate in a relatively unique

context, with different expectations from their societies which somehow present different roles they ought to play, different cultural context and less endowed in terms of resources compared to those from the north. This implies that interventions by these universities on global issues like climate change need to be contextualized. This theoretical model is a good start for practitioners and scholars on climate change education at universities in Africa to start thinking about initiating interventions on climate change in their respective institutions. The model provides a good start for those who are yet to start climate change education programmes at their universities to think about the traditional roles their universities can play and the likely initiatives on climate change. It also provides them with a variety of key drivers that can be explored to stir their interventions. For the universities that have already initiated climate change education interventions, the model offers a simple theoretical frame to strengthen their interventions that already exists.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

- Boyde MC, Hume T (2015). Addressing the Challenge of Climate Changes: the Potential Role of Development Education in the Tertiary Sector. In S. McCloskey (Ed.), *Policy and Practice: A Development Education Review*, pp. 63-86.
- Braun V, Clarke V (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology* 3(2):1-41.
- Cordero EC, Todd AM, Abellera D (2008). Climate change education and ecological foot print. *American Meteorological Society*, pp. 865-872. doi:10.1175/2007BAMS2432.
- Eyong CT (2007). Indigenous Knowledge Systems and Sustainable Development; Relevance for Africa. In: E. K. Boon and L. Hens (Eds.), *Tribes and Tribals Bonn, Germany: Kamla-Raj Enterprises* pp. 121-139.
- Farmer T, Cook J (2013). *Climate Change Science: A modern Synthesis: Springer Science + Business Media. Volume 1.*
- Filho WL (2010). Climate Change at Universities: Results of a World Survey. In: W. L. Filho (Ed.), *Universities and Climate Change*, pp. 1-19.
- Filho WL, Pace P (2016). Teaching Education for Sustainable Development: Implications on Learning Programmes at Higher Education. In: W. L. Filho and P. Pace (Eds.), *Teaching Education for Sustainable Development at University Level, Switzerland: Springer International Publishing*, pp. 1-6.
- Kagawa F, Selby D (2010). Introduction to "Education and Climate Change: Living and Learning in Interesting Times". In: F. Kagawa and D. Selby (Eds.), *Education and Climate Change: Living and Learning in Interesting Times*, New York: Routledge Taylor and Francis Group. pp. 1-11.
- Kaya HO, Seleti YN (2013). African Indigenous Knowledge Systems and Relevance of Higher Education in South Africa. *The International Education Journal: Comparative Perspectives* 12(1):30-44.
- Lemons J (2011). The Urgent Need for Universities to Comprehensively Address Global Climate Change Across Disciplines and Programs. *Environmental Management* 48: 379-391.
- Metz T (2016). Recent Philosophical Approaches to Social Protection: From Capability to Ubuntu. *Global Social Policy* 16(2):132-150.
- Mugumbate J, Nyanguru A (2013). Exploring African Philosophy: The

- value of Ubuntu in Social Work. *African Journal of Social Work* 3:1.
- Nussbaum B (2003). African Culture and Ubuntu: Reflections of a South African in America. *World Business Academy* 17(1):1-12.
- Patton MQ (2015). *Qualitative Research and Evaluation Methods* (4th ed.). Thousand Oaks, California: Sage Publications Incorporated.
- Rohweder L, Virtanen A (2009). Developing the Model on the Learning for Sustainable Development in Higher Education. *Journal of Teacher Education for Sustainability* 11(1):31-42.
- Stern N (2008). *The Economics of Climate Change: The Stern Review*. New York: Cambridge University Press.
- Teferra D, Albach PG (2004). African Higher Education; Challenges for the 21st Century. *Higher Education* 47:21-50.
- United Nations Educational Scientific and Cultural Organization (UNESCO) (2015). *Putting Climate Change Education into Practice*. Paris France: United Nations Educational Scientific and Cultural Organization.
- Virtanen A (2010). Learning for Climate Responsibility: Via Consciousness to Action. In: W. L. Filho (Ed.), *Universities and Climate Change*, Berlin Heidelberg: Springer, pp. 231-240.
- Yin RK (2012). *Application of Case Study Research* (3rd ed.). Los Angeles: Sage Publications Incorporated.